SOILS OPERABLE UNIT
RECORD OF DECISION
MIDDLESEX SAMPLING PLANT

MIDDLESEX, NEW JERSEY

SEPTEMBER 2005

U.S. ARMY CORPS OF ENGINEERS
NEW YORK DISTRICT
FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM

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PREPARED BY
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NEW YORK DISTRICT
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WITH TECHNICAL ASSISTANCE FROM
URS CORPORATION
CONTRACT NO. DACW41-99-9012
PROJECT NO: 19577-079-149

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LIST OF ACRONYMS AND ABBREVIATIONS

<	less than
>	greater than
≤	less than or equal to
AEC	U.S. Atomic Energy Commission
ALARA	As Low As Reasonably Achievable
ARARs	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substances and Disease Registry
BHHRA	Baseline Human Health Risk Assessment
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
COCs	Contaminants of Concern
COPCs	Contaminants of Potential Concern
COPECs	Contaminants of Potential Ecological Concern
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ES	Environmental Surveillance
ESD	Explanation of Significant Differences
ESV	Ecological Screening Value
GSA	(US) General Services Administration
ft	Feet or Foot
FS	Feasibility Study
FUSRAP	Formerly Utilized Sites Remedial Action Program
HI	Hazard Index
km	Kilometer
m	Meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MED	Manhattan Engineer District
mg/kg	milligram per kilogram
mi	Mile
MML	Middlesex Municipal Landfill
mrem/yr	Millirem Per Year
MSP	Middlesex Sampling Plant
NCP	National Contingency Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJSCC	New Jersey Soil Cleanup Criteria
NPL	National Priorities List
O&M	Operation and Maintenance
ORNL	Oak Ridge National Laboratory

OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
pCi/g	PicoCuries per gram
PCOC	Potential Contaminant of Concern
PHA	Public Health Assessment
ppm	Parts per million
PQL	practical quantitation limit
PRAP	Proposed Remedial Action Plan
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
PW	Present Worth
Ra	Radium
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SLERA	Screening-Level Ecological Risk Assessment
SVOC	Semi-volatile Organic Compound
TAL	Target Analyte List
TBC	To Be Considered
TCE	trichloroethylene
TETLD	Tissue Equivalent Thermoluminescent Dosimeter
Th	Thorium
U	Uranium
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
VOC	Volatile Organic Compound
VP	Vicinity Property
yd^3	cubic yards
µg/L	microgram per liter

1. DECLARATION

1.1 Site Name and Location

The former Middlesex Sampling Plant (MSP) site is located in the Borough of Middlesex, Middlesex County, New Jersey (Figure 1). The plant site is no longer operational and is being addressed by the U.S. Army Corps of Engineers (USACE) under the Formerly Utilized Sites Remedial Action Program (FUSRAP). The MSP site is listed on the U.S. Environmental Protection Agency's (EPA's) National Priorities List (NPL) and in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), ID No. NJ0890090012.

Operable Unit (OU) – Soils

(The Groundwater OU is being addressed as a separate action).

1.2 Statement of Basis and Purpose

This decision document presents the Selected Remedy for the Soils OU at MSP, in Middlesex, New Jersey, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). USACE, as lead agency, has made the final remedy selection decision for the Soils OU of the MSP site and is documenting that decision in this Record of Decision (ROD) (NCP §300.430(f)(4)(i)).

This decision is based on the information contained in the Administrative Record for this site and has been made by USACE and EPA. Comments on the Proposed Remedial Action Plan for the Soils at MSP, provided by the New Jersey Department of Environmental Protection (NJDEP), were evaluated and considered in selecting the final remedy. See specific responses to NJDEP comments as provided in Section 3.0 Responsiveness Summary. Comments from the community were also considered during the selection of the remedy. The Administrative Record may be reviewed at the Middlesex Public Library, 1300 Mountain Avenue, Middlesex, NJ 07016.

1.3 Assessment of Site

The Selected Remedy described in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances and/or pollutants or contaminants from this site, which may present an imminent and substantial endangerment to public health or welfare. The media impacted at MSP include on-site soils, slabs, below-grade structures (i.e., foundations), and portions of the stormwater control system. Based on the findings of the remedial investigation (RI) and the results of the risk assessments completed at the MSP site, certain areas of concern present chemical and radiological risks for the anticipated future development of the property. Therefore, to accommodate the anticipated future use of MSP, remedial alternatives were evaluated and a remedy selected. The remedy selected is excavation and removal of contaminated soil and debris to an extent that will allow unrestricted use of the land. The selected remedy meets these objectives and provides the highest level of protectiveness to human health and the environment due to the removal of contaminated materials, resulting in unrestricted end use of the property.

1.4 Description of Selected Remedy

The remedy described in this document represents one of two planned response actions for the FUSRAP MSP site. This ROD for Operable Unit 1, the Soils OU, will address the remediation of contaminated soils and debris (e.g., soil, fill, and below-grade structures) in accordance with the remedial action objectives (RAOs) established in Section 2.8 of the Decision Summary. For the second OU, the Groundwater OU, currently in the feasibility study (FS) phase, USACE is addressing potential groundwater contamination associated with Federal Government activities at the MSP site.

The overall cleanup strategy for MSP soils will be to remove contaminated site media (i.e., surface and subsurface soils, asphalt pads, and demolition debris) to established cleanup goals and dispose of them off-site at an approved and permitted facility. The removal of the contaminated media will result in the removal of potential sources that may further impact the groundwater.

The following cleanup criteria have been established for the radiological and chemical contamination at the MSP site:

- An average of 5 picoCuries per gram (pCi/g) of radium-226 (Ra-226) above background for surface and subsurface soils. Although other radiological contaminants of concern (COCs) were identified at the site, Ra-226 is the dominant risk source and is co-located with the other radiological COCs. The cleanup criterion for Ra-226 accounts for the dose contributions from the other nuclides.
- Radiological soil remediation on the MSP property will meet the 15 millirems per year (mrem/year) above background dose limit specified in New Jersey Administrative Code (NJAC) 7:28-12.8(a)1.
- Chemical soil remediation will be consistent with the remedial goals set forth in the NJAC 7:26D for the following chemicals (i.e., a specified subset of semi-volatile organic compounds (SVOCs) called poly-aromatic hydrocarbons (PAHs), and Lead) which were found to pose unacceptable risk in the Baseline Risk Assessment:

    0.66 milligrams per kilogram (mg/kg) benzo(a) pyrene
    0.90 mg/kg benzo(a)anthracene
    0.66 mg/kg dibenzo(a,h)anthracene
    0.90 mg/kg benzo(b)fluoranthene
    0.90 mg/kg indeno(1,2,3-c,d)pyrene
    400 mg/kg lead

(It should be noted that the 0.66 mg/kg cleanup levels for benzo(a) pyrene and dibenzo(a,h)anthracene are based on the practical quantitation limits (PQLs) for these two chemicals, since risk-based levels were lower than the achievable PQLs. The use of these PQLs, although not at 10-6 risk, will result in a cleanup that removes contaminants to an acceptable risk range.)

The major components of the selected remedy, Alternative 3, achieve cleanup levels specified above and include the following (full descriptions of this and other alternatives are presented in Section 2.9 of this ROD):

- Soil excavation to an unrestricted-use cleanup level.
- Off-site disposal of the excavated soil a licensed and permitted facility.
- Demolition, removal, and off-site disposal of contaminated former storage pads and below-grade structures at a licensed and permitted facility.
- Release of the property for unrestricted use (i.e., no engineering or institutional controls needed.)
- Protection of groundwater.
- Reduction in toxicity, mobility, and volume of on-site contaminants through removal of source materials.

1.5 Statutory Determinations

1.5.1 Statutory Requirements

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions to the maximum extent practicable.

1.5.2 Statutory Preference for Treatment

None of the alternatives considered for the site causes a reduction in the toxicity or volume of contaminants through treatment. Although the Selected Remedy reduces the mobility of the hazardous substances, pollutants, or contaminants at this site through removal, it does not achieve this by treatment. Therefore, the remedy for this OU does not satisfy the statutory preference for treatment as a principal element.

1.5.3 Five-Year Review Requirements

This remedy will not result in hazardous substances, pollutants, or contaminants in soil remaining on-site above levels that allow for unlimited use and unrestricted exposure. Therefore, five-year reviews will not be required for this remedial action.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this Record of Decision. Additional information may be found in the Administrative Record for this site.

ROD Data Checklist
Middlesex Sampling Plant

ROD Data Checklist Item	ROD Section, Number Reference
The contaminants of concern (COCs) and their respective concentrations (Sources, Types and Extent of Contamination)	Section 2.5.3
The land use resulting from the implementation of the Selected Remedy	Section 2.6
The estimate of potential risk (Summary of Human Health Risk Assessment)	Section 2.7.1
The cleanup levels established for the COCs and their basis	Section 2.8.1
The estimated costs of the Selected Remedy	Section 2.12.7
The key factors that led to the selection of the Remedy	Sections 2.12, 2.13, 2.14, and 2.15
The principal threat source materials (Principal Threat Waste)	Section 2.13

1.7 Authorizing Signatures

29 AUG '05

Signature and Date:
William T. Grisoli
Brigadier General, U.S. Army
Division Engineer

9/28/05

Signature and Date:

U.S. Environmental Protection Agency
Region 2

2. Decision Summary

2.1 Site Name, Location, and Brief Description

The Middlesex Sampling Plant (MSP) site is located at 239 Mountain Avenue in the Borough of Middlesex, Middlesex County, New Jersey (NJ), approximately 18 miles (mi) southwest of Newark, NJ (Figure 1). MSP is listed on the U.S. Environmental Protection Agency's (EPA's) National Priorities List (NPL), (CERCLIS ID# NJ0890090012). Responsibility for the execution of the Formerly Utilized Sites Remedial Action Program (FUSRAP) at sites declared eligible by the U.S. Department of Energy (DOE) was first transferred by Congress to the U.S. Army Corps of Engineers (USACE) in Public Law 105-62, 13 October 1997, and programmatic authority was provided to USACE in Public Law 106-60, Section 611, 29 Sept. 1999. USACE is the lead agency for the MSP site CERCLA response actions, and EPA Region 2 is the support agency with oversight responsibilities. Plans and activities are also being coordinated with the appropriate NJ State agencies, including the NJ Department of Environmental Protection (NJDEP). Funding for cleanup of the MSP site is provided on an annual basis by the congressional appropriations designated under the Energy and Water Appropriations Act. This Record of Decision (ROD) is being issued by USACE with support from EPA Region 2, in consultation with NJDEP.

A 7-foot (ft) chain link fence surrounds the 9.6-acre MSP site. The two existing on-site buildings were previously used as an administration office and garage but are no longer operational and there are no current commercial and industrial activities at MSP. Two building slabs remain from the demolition of the former boiler house and process building. The majority of the site is paved, with a small grassy area surrounding the Administration Building and a landscaped area east of the Garage.

MSP site response will include the remediation of all on-site media impacted or potentially-impacted by radionuclide and/or chemical constituents. The Soils Operable Unit (OU) includes the building slabs and soils. The Groundwater OU includes the sediment, surface water, and groundwater.

2.2 Site History and Enforcement Activities

2.2.1 Activities Leading to Current Problems

The Middlesex Sampling Plant site began in 1910 as an industrial site, with the construction of a plant for the manufacture of asphalt paint. This plant included a brick warehouse, boiler house, garage, administration building, a dye warehouse, and four smaller buildings.

In October 1943, the Manhattan Engineer District (MED) leased the brick warehouse from the American Marietta Corporation and converted it into a process building to sample, store, test, and transfer ores containing uranium, thorium, and beryllium. Between 1943 and 1955, uranium assay was the primary operation at MSP. Uranium ores were received in burlap bags that were stacked and stored on the ground. The ore was thawed (if necessary), dried, crushed, screened, and collected in hoppers, the contents of which were then sampled for analysis. Ores were then packaged, weighed, and shipped to processing facilities. No chemical processing of ore materials was performed at MSP.

In 1946, MED was deactivated and MSP operations were continued under the direction of the U.S. Atomic Energy Commission (AEC). AEC purchased the leased facility by condemnation and various new buildings were constructed. These new structures included replacements for the administration building and garage, a thaw house, and a storage house. A chain-link fence was installed around the Site and most of the property was paved with asphalt for use as a drum storage area. Throughout the late 1940s and early 1950s, MSP received and shipped various research and decontamination wastes and incinerated low-level combustible waste. The incinerated ashes and noncombustible scrap were placed in drums and transported off-site for disposal.

During 1951 and 1952, MSP became an intermediate shipment point for uranium bars sent off-site for experimental machining into slugs. Scraps from this operation were returned to MSP for shipment to a uranium recovery processor. The site also assayed beryllium ore for shipment. Over the years that MSP was operational, the buildings, grounds, and nearby land parcels became contaminated with radium and uranium. The handling of ore sacks likely resulted in spillage, and subsequent migration mechanisms caused localized radiological contamination, both on- and off-site.

The AEC ceased primary operations at MSP in 1955. The site continued to be used for storage and limited sampling of thorium residues. All AEC activities terminated in September 1967 after decontamination of the structures and certification of the site for unrestricted release was complete. In 1968, AEC returned the MSP property to the General Services Administration, which transferred the property to the U.S. Department of the Navy. The site is presently owned by DOE but is no longer operational. The site is being addressed by USACE under FUSRAP.

2.2.2 Site Investigations

Numerous radiological investigations have been conducted at MSP. In 1967, after decontamination and before release of the site by AEC, the site was radiologically surveyed and found suitable for release for unrestricted use according to the standards in place at the time. Due to a lack of documentation of the radiological status of the property after its release and the implementation of the "as low as reasonably achievable" (ALARA) policy, the site was resurveyed for radiological constituents in 1976 by the Oak Ridge National Laboratory (ORNL). The results of this study identified radiological contamination above then-current guidelines at MSP and vicinity properties (VPs).

An Environmental Surveillance (ES) Program was established at MSP in 1981 to identify and quantify the effect of site removal action activities initiated by DOE in 1980 on the surrounding environment and public health. This was done to help ensure that the environment and public health were adequately protected from contamination present on the site. The current ES Program includes the periodic sampling of air, surface water, sediment, and groundwater.

A 1983 radiological survey was conducted to prepare for future remediation at MSP. The survey estimated the area and depth of radiological contamination on the grounds and under the process building, boiler house, administration building, and garage. Contaminated soils were identified around and under the process building and were found to extend south past the former thaw house. The highest contamination levels were found near the process building and in the southern portion of the site.

In November 1991, a chemical characterization study was conducted on both the VP and Middlesex Municipal Landfill (MML) piles and in situ soils. These piles were the result of interim cleanup actions at the MML and at properties in the vicinity of MSP. Target Analyte List (TAL) metals (except cyanide), lanthanides, polychlorinated biphenyls, total petroleum hydrocarbons, and Resource Conservation and Recovery Act (RCRA) toxicity characteristic constituents were selected for analysis in the Vicinity

Property Pile and Middlesex Municipal Landfill Pile samples. In situ soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and pesticides.

In August 1995, an investigation was completed to evaluate the fill behind the outfall headwall of the surface water drainage system. This sampling indicated soil contamination behind the headwall in the fill material to a depth of approximately 1.5 m (5 ft) below ground surface (bgs). Subsequent results from gamma logging indicated radioactive contamination in the drain lines or the fill around the drainage pipes.

The results of these investigations were used to plan the MSP Soils OU RI. The Soils OU RI, which provides the basis for the Soils OU FS, was initiated in 2000. It included extensive surface and subsurface soil sampling and analysis for radiological and chemical contamination. SVOCs, lead, and radionuclides were identified in these investigations as contaminants of concern (COCs), which contribute to unacceptable human health risks. The proposed remedial action will address the contaminants identified at the site in accordance with CERCLA and the NCP.

2.2.3 Site Actions

Based on the results of the 1976 ORNL investigation, MSP was placed in DOE custody in 1980 after contamination above then-current guidelines was found to be present on both MSP and surrounding VPs.

DOE initiated Phase I of a removal action to remediate the VPs in 1980. Two of these parcels, a church rectory and a residence less than a mile from the site, had been contaminated by fill that was transported from MSP during a 1948 site grading program. Contaminated fill that was also transported to MML during 1948 subsequently required cleanup as well. As part of the Phase I activities, an asphalt pad was constructed at the south end of MSP to accommodate placement of the waste materials from the VP cleanups. Improvements to the on-site drainage system were also made at this time. The old drainage system was replaced with a new system to collect surface water runoff in a below-grade settling basin prior to its discharge to the South Drainage Ditch.

The Phase II cleanup addressed the remaining contaminated parcels. Residual radioactivity was found in parcels of land adjacent to the site and along both the South Drainage Ditch and Main Stream.

The Phase I and II cleanup actions moved 35,200 cubic yards (yd^3) of radioactively contaminated soil to MSP, creating the VP interim storage pile. The contaminated soil was placed on an asphalt pad, covered, and sealed with a synthetic fabric. Organic materials from the excavation activities, including tree stumps and railroad ties, were burned on-site. The ash material was placed on a separate mat, covered with a synthetic fabric, and sealed.

A second interim storage pile, which accommodated radioactive wastes excavated from the MML, was constructed at MSP in 1984. This contaminated landfill material resulted from grading operations at MSP in 1948, when excess soil containing small amounts of a high-grade uranium ore was excavated and disposed of at MML. The contaminated material was subsequently covered to varying depths during landfill operations over the years.

A 1960 radiological survey at MML resulted in the identification and removal of approximately 650 yd^3 of contaminated material near the surface of the landfill. Two subsequent radiological surveys indicated the need for an additional removal action at MML. Excavation of this remaining radioactively contaminated material from MML began in 1984 when approximately 15,600 yd^3 of material was transported to MSP for interim storage. Removal actions were continued in 1986 to excavate the remaining 15,600 yd^3 of radioactively contaminated material from the landfill, for a total of 31,200 yd^3 excavated. The contaminated material at MSP from the landfill was placed in a curbed area on a synthetic liner. A sand drainage layer was installed between the contaminated material and the liner, which was intended to collect leachate from the pile. The MML interim storage pile was then covered with another synthetic liner and sealed to encapsulate the pile material.

Both soil piles were removed from the site and transported to off-site disposal facilities. The MML pile was removed in 1998, and the VP pile in 1999.

2.3 Community Participation

Community participation activities provide the public with an opportunity to express its views on the preferred remedial action. USACE and EPA considered State and public input from the community participation activities conducted during the Remedial Investigation/Feasibility Study in selecting the remedial alternative to be used for the MSP site. USACE held five public meetings between 1997 and 2005. Community participation was provided in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act.

The Soils OU Proposed Remedial Action Plan (PRAP) for the FUSRAP MSP site in Middlesex, NJ, was made available to the public on March 21, 2005. This document, along with the Soils OU RI and FS, is in the Administrative Record maintained at the Middlesex Public Library in Middlesex, NJ. The notice of availability for the document was published in the *Courier News, Star Ledger, and Home News Tribune.* A 30-day public comment period was held from March 21 through April 20, 2005. In addition, a public meeting was held on March 30, 2005. At this public meeting, representatives from USACE provided information and answered questions about contamination at the MSP and the remedial alternatives under consideration. A response to the comments received during this meeting is included in the Responsiveness Summary (Section 3) of this ROD. A transcript of the public meeting is available to the public and has been included in the Administrative Record and information repository.

2.4 Scope and Role of Operable Unit or Response Action

As with many Superfund sites, the concerns at the MSP site are complex. As a result, the site is broken down into two operable units (OUs), addressing independent portions of the site conditions. These are:

- Soils Operable Unit: Contamination of on-site soils and below-grade structures
- Groundwater Operable Unit: Contamination of groundwater, surface water, and sediments

The Soils OU is addressed in this ROD. The primary threats posed by the Soils OU are surface and subsurface soil and debris contaminated primarily with elevated levels of select PAHs (benzo(a)pyrene, benzo(a)anthracene, dibenzo(a,h)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene) and radionuclides that could result in human exposures above acceptable risk levels under commercial, industrial, or residential use. This contamination could also pose a threat to groundwater.

The remedy selected to address these primary threats includes removal of contaminated soils and below-grade structural debris, the disposal at off-site properly licensed or permitted disposal facilities; and the restoration of the site for unrestricted beneficial re-use. It is intended that the remedy be the final action for the MSP site soil. The Groundwater OU is being addressed in a separate RI/FS process and will have a separate ROD.

2.5 Site Characteristics

2.5.1 Conceptual Site Model

Constituents identified for remediation at the MSP include soil and other media contaminated with radionuclides (Ra-226 and U-238), Lead, and specific on-site SVOCs (benzo(a)pyrene, benzo(a)anthracene, dibenzo(a,h)anthracene, benzo(b)fluoranthene, indeno(1,2,3-c,d)pyrene). The primary source identified by the RI includes the surface and subsurface soils of the MSP site. The principal migration pathways are groundwater, surface water, and air. Figure 2 presents a conceptual site model of release mechanisms and transport in the environment.

A 7-foot (ft) chain link fence surrounds the 9.6-acre site. The two existing on-site buildings were previously used as an administration office and garage but are no longer operational, and there are no current commercial or industrial activities at MSP. Two building slabs remain from the demolition of the former boiler house and process building. The majority of the site is paved, but there is a grassy area surrounding the Administration Building and a landscaped area east of the Garage.

Two asphalt pads, formerly used for interim storage of the MML and the VP soil, cover the southern two-thirds of the site. The site surface slopes gently toward the south at an approximate grade of one percent, and is underlain by three abandoned stormwater drainage lines. Although currently disconnected from the storm drainage lines, a sump in the slab of the former process building also discharged water to the subsurface stormwater system. Due to concerns about radionuclide migration, the stormwater system was plugged with concrete in 1996 and the Wood Avenue drainage pipe was rerouted along the eastern perimeter of the site.

A settling basin near the southern site boundary receives stormwater runoff from the surface water collection system surrounding the two asphalt pads. The settling basin discharges to the South Drainage Ditch through a concrete headwall on the south site boundary. The South Drainage Ditch flows through a field to Main Stream. Main Stream then flows in a southwesterly direction through a wooded area and discharges into Ambrose Brook. An in situ granular activated carbon filter was installed behind the drainage ditch headwall in 1996 to reduce the potential for off-site migration of radionuclides through surface water media.

The topographic surface elevations range from approximately 18 m (58 ft) above mean sea level at its north end to 15 m (49 ft) above mean sea level along its south end. This translates to an average slope of approximately 1 percent. Soils at MSP are silty to sandy loams with thickness ranging from 0.45 m to more than 3.5 m (1.5 and 11 ft, respectively) over weathered bedrock. Soil mapping by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service in Middlesex County shows that the soil in the northern part of the site consists of moderately deep to shallow, moderately well drained soil. The soil in the southern part of the site consists of moderately deep, poorly drained soil. The northern soils were glacially derived, while the southern soils formed from weathered bedrock. Native soils in the area around MSP have been disturbed, stripped, or altered by urban development.

The stratigaphic units at MSP from the surface downwards are: asphalt and crushed stone; fill material that can include sewer pipe bedding; gravelly sand; clayey sand and sandy silt; silt; weathered bedrock and unweathered bedrock. Groundwater at MSP occurs within the shallow fill, the weathered bedrock, and the unweathered fractured bedrock.

2.5.2 Sampling Strategy

Investigation activities were performed throughout MSP to meet the goals of the Soils OU RI and further define the Soils OU FS. The activities centered on collecting data and compiling information regarding surface features, contaminant sources, surface water and sediments, and hydrogeology. The investigations were initiated in the late 1960s and continued into 2005. They are summarized in Section 2.2.2 of this ROD. The investigations included the collection, analysis, and evaluation of surface soil, subsurface soil, groundwater, surface water, sediment, and air samples. They also included direct radiation measurements.

The results of the investigations performed prior to 2000 were considered in the development and design the RI; however, due to alterations of the site due to past remedial actions these results were not used in the evaluation of the potential risk to human health and the environment (from site contamination) developed during the RI. Only the soil data obtained during the RI starting in 2000 were used in the evaluation of the potential risks posed from the site soils. The groundwater, sediment, and surface water data generated from the RI, data from a subsequent supplemental investigation that addressed off-site delineation of groundwater contamination, and the Environmental Surveillance program data generated from 2000 to 2005 were used in evaluating the potential risks to human health and the environment in the Groundwater OU RI and will be used in developing the Groundwater OU FS, Proposed Remedial Action Plan, ROD, and subsequent remedial action for the groundwater.

In 2000, USACE drilled and sampled 50 boreholes on-site as part of the Soils OU RI. The soil boreholes were drilled to depths ranging from 1.8 m to 3.3 m (6 ft to 11 ft). With the exception of two soil borings, two samples were collected from each borehole completed during this investigation and the boreholes were gamma-logged. Soil samples from all boreholes were collected from the shallow (0 m (0 ft) to 0.91 m (3 ft)) and deep (0.91 m (3 ft) to 1.82 (6 ft)) zones. The samples collected from all boreholes were analyzed for the full Target Compound List/Target Analyte List chemical and radiological parameters.

A background soil sampling program was implemented in January 2001. This sampling effort consisted of the installation of eight boreholes in six off-site (non-impacted) locations within a two-mile-radius of MSP. Soil samples from these background soil boring locations were collected from similar depths as on-site soil borings.

2.5.3 Sources, Types and Extent of Contamination

2.5.3.1 External Gamma Radiation

External gamma radiation dose rates are measured as part of the ES program using Tissue Equivalent Thermoluminescent Dosimeters (TETLDs) in place at MSP continuously throughout the year. Each TETLD measures a cumulative dose over the period of exposure (approximately one year). When corrected for background and normalized to exactly one year’s exposure, these detectors provide a measurement of the incremental annual gamma radiation dose at that respective location.

External gamma radiation measurements are collected at four perimeter locations at the site, one location in the Administration Building, and one off-site background location. Dosimeter results collected to date indicate consistent background gamma radiation dose levels at three of the locations and as much as 50 mrem/yr at the other two locations (well below the 100 mrem/yr standard, 10 CFR 20). The locations with elevated levels are located near the Garage and Administration Building.

2.5.3.2 Airborne Particulates

The calculated maximum effective dose equivalent for individuals occurred 75 m (245 ft) northeast of the vegetated area and was well below the 10 mrem/yr standard, (40 CFR 61.93a, Subpart H). Therefore, individuals in the vicinity of the site are not affected by the airborne emissions of radionuclide particulates from the site.

2.5.3.3 Site Soil Contamination

The *Soils Operable Unit Remedial Investigation Report for Middlesex Sampling Plant,* dated May 2004, identifies several classes of contaminants detected in MSP soils, including SVOCs, metals, and radionuclides. These contaminants, detected on-site at levels above background and risk-based screening levels, are considered Contaminants of Concern (COCs). Results of the investigative findings for the COCs at the site for soils, groundwater, and air are contained in numerous reports, which are part of the Administrative Record. A review of the COCs at MSP indicates the following:

- Elevated levels of COCs have been detected in surface and subsurface soils throughout MSP. The range of measured concentrations does not vary significantly across the site, as indicated by the fact that the average measured concentration is within one order of magnitude of background. The concentration of the main PAH benzo(a)pyrene ranged from non-detect to 60 mg/kg at the site.
- One lead sample was 64,900 mg/kg and the average of the remaining lead samples was 79 mg/kg, which is below the level of concern for residential properties of 400 mg/kg. The lead-contaminated area will be remediated along with the co-located radionuclide contamination.
- Radiological contamination is also primarily widespread at average levels within an order of magnitude of background. The levels of Uranium and progeny measured range from background (approximately 1.0 pCi/g) to 400 pCi/g, with averages in the range of 20 to 35 pCi/g (except for U-235, which has an average of 2 pCi/g). Generally, there is very little to no correlation between elevated concentrations of metals or SVOCs and elevated levels of radioactivity throughout the site.
- Because of past soil-moving activities, it is difficult to relate the occurrence of specific contaminant levels to historic MSP activities. However, some correlation may exist between metal concentrations and radioactivity in fill material around subsurface sewer pipes.
- Outdoor measurements of external gamma radiation are relatively low, which reflects the possible shielding effect of the asphalt covering the site soils.
- Outdoor measured levels of radon were indistinguishable from background concentrations.

The site contamination described above creates the potential for anyone coming on-site (e.g., an industrial worker, construction worker, or child) to be at risk via several exposure routes, such as dermal contact, inhalation, ingestion, or external radiation. The Baseline Human Health Risk Assessment (BHHRA) and a Screening-Level Ecological Risk Assessment (SLERA), included within the Soils RI, provide further evaluations of the levels of risk associated with each of the constituents. These evaluations are used to determine which chemicals and exposure pathways are significant.

Both the geology (underlying soils and rocks) and hydrogeology (movement of groundwater underlying the site) are complex. As mentioned previously, there are areas where the fluctuating water table contacts the contaminated soils, potentially allowing leaching of SVOCs to the groundwater (although none were detected during ES monitoring or the Groundwater OU RI). In addition, the material surrounding the stormwater system may provide a preferential path for contamination to enter the groundwater. Both of these situations create the potential for off-site migration of COCs via groundwater.

2.5.4 Materials to be Remediated

Figures 3 and 4 illustrate the estimated extent of surface and subsurface radioactive and chemical contamination. Surface soil is defined as ground surface to a depth of 2-ft (Figure 3), and subsurface soil is defined as greater than 2-ft to approximately 6.5-ft (Figure 4). The figures show the areas with contamination above cleanup levels that will be excavated and disposed of off-site. Removing these soils will reduce the risks at MSP to acceptable risk levels. The excavated areas will then be backfilled with uncontaminated soils and either seeded or restored to pre-excavation conditions.

Considering the Preferred Alternative, the volume of the radiologically contaminated soils is estimated to be approximately 24,600 yd^3. The additional volume of the non-radiological, chemically contaminated soils is estimated to be 23,200 yd^3.

2.6 Current and Potential Future Site and Resource Uses

The population of New Jersey, as estimated by the U.S. Census Bureau on April 1, 2001, is 8,414,350, with 750,162 people residing in Middlesex County. The population of Middlesex County has steadily increased over the past 30 years, with an overall growth of about 21-percent. Population projections for Middlesex County over the next 20 years indicate an increase of approximately 13-percent (Bureau of Census 1998/Middlesex County Planning Department). Approximately 96-percent of the county is urban or suburban in character. The area within 0.8 km (0.5 mi) of MSP is a mixture of residential homes, commercial and industrial properties, and undeveloped land. The residential population within 0.8 km (0.5 mi) of MSP is approximately 1,150 people. The preceding demographic data have been derived from the US Census Bureau Population Estimates.

Figure 5 shows the MSP site, the surrounding land, and the current uses of the surrounding land. There are no environmentally sensitive areas within the fenced borders of the site. MSP is zoned Industrial by the Borough of Middlesex Planning Commission. This area is bound by a Heavy Industrial zone approximately 914 m (3,000 ft) to the West, a Commercial/Light Manufacturing/Wholesale zone 61 m (200 ft) to the north, and an Attached Residential Cluster 640 m (2,100 ft) to the east. The property to the south of MSP is within the Piscataway Township. This property is zoned Residential and Light Industrial. The master plans for the Middlesex and Piscataway Townships do not recommend changes in zoning for MSP and its vicinity, and it is unclear whether future land use at MSP is expected to change. However, there has been recent significant residential development to the south of the site that is encroaching on the southern MSP boundary.

The location of the adjacent salvage yard and current industrial zoning reduces the potential for residential development at MSP. However, residential development may continue south and southeast of the site. MSP borders an area of residential zoning and may experience the pressures of expanding residential development. Therefore, both land use scenarios (residential use and commercial/industrial use) were evaluated to support screening of the alternatives in the Soils FS.

2.7 Summary of Site Risks Posed by Soils

As part of the overall RI/FS activities at MSP, several baseline human health and ecological risk assessments were conducted. These risk assessments were prepared to better understand the potential current and future impacts of site contamination on human health and the environment. This section summarizes the results of the BHHRA and SLERA that were prepared as a part of the Soils OU RI Report. The details of the BHHRA and SLERA are found in Sections 6.0 and 7.0, respectively, of the Soils OU RI. This documents the potential risks to humans and ecological receptors that result from exposure to contaminated soils at MSP. The routes of exposure considered for receptors at MSP and the surrounding human and ecological populations include soil ingestion, dust inhalation, and external radiation exposure.

The chemicals of potential concern (COPC) found in MSP soils were quantitatively characterized to understand the potential risks to human health from exposure to these contaminants. The results of the risk assessment are used to:

- Document and evaluate potential risks to human health, i.e., potential on-site workers and/or future residents,
- Assess the need, if any, for remedial action,
- Support the evaluation of remedial alternatives in the FS relative to the "no action" alternative, and
- Identify COPCs that require the development of chemical-specific remediation levels.

The BHHRA used the results from the sampling efforts conducted during the Soils OU RI to evaluate potential risks. These data represent current conditions at the site. Earlier remedial actions likely altered the site as characterized in sampling efforts prior to 2000.

Many of the chemicals and radionuclides detected in MSP soils occur naturally and are present at some concentration in almost all soils. Human activities may increase the concentration of these natural materials or other chemicals not normally found at the site. The MSP Soils OU RI identified the naturally occurring (background) concentrations of radionuclides, metals, and organic chemicals in the vicinity of the MSP site. These background concentrations were compared to the site-measured concentrations to determine which contaminants needed to be addressed in the risk assessment. The Soils OU RI Report concluded that, based on potential health impacts, there are some radionuclides, metals, and organic chemicals that needed further evaluation in the Soils OU FS. The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. Summaries of the results of these risk assessments are presented below.

2.7.1 Key Findings - Baseline Human Health Risk Assessment

The baseline risk assessment estimates what risks the site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action.

2.7.1.1 Identification of COCs

Table 1 lists those COCs for which a determination was made that remediation was required, along with the range of concentrations detected at the site.

2.7.1.2 Exposure and Toxicity Assessments

Figure 2 presents a conceptual site model of environmental transport media and principal exposure routes for contaminated soil at the MSP site.

It is unclear whether future land use at MSP is expected to change greatly from the current industrial land use. However, residential development may continue south and southeast of the site. The location of the adjacent salvage yard and current industrial zoning reduces the potential for residential development at MSP. MSP borders an area of residential zoning and may experience the pressures of expanding residential development. Therefore, both industrial and residential land use scenarios were evaluated in the BHHRA to establish risk levels, these risk levels were then compared to the risk range, and those chemicals and media exceeding the risk range were then evaluated to support screening of the alternatives in the Soils OU FS.

The evaluation of the potential cancer risks and non-cancer health hazards resulting from exposure to contamination at MSP considered the same four on-site receptors for both the current and future exposure pathways. These receptors were an industrial worker, a recreational trespassing adolescent, a residential receptor (including a child), and a construction worker. Table 2A provides carcinogenic risk information relevant to the COCs in the site soils. Oral and dermal slope factors are provided for the SVOCs (in $(mg/kg\text{-}day)^{-1}$), and for the radiological COCs (in risk/pCi).

Parameters used to quantify exposure for these receptors were developed for both reasonable maximum exposure (RME) and average exposure conditions. The RME parameters were intended to represent the highest exposure that is reasonably expected to occur at the site. The purpose of the RME evaluation was to ensure that risks incurred from contaminated soils were not underestimated for any population. Average exposure parameters were designed to represent the most likely exposure for the potentially exposed population. Exposure to site surface and subsurface soils were expected to be the result of daily activities in all settings and to occur from incidental ingestion, dermal contact, inhalation of dust, and external radiation.

- **Industrial Worker** – Exposures to site soils are expected to be the result of daily activities in an industrial setting, with exposure to surface soils occurring from incidental ingestion, dermal contact, inhalation of resuspended dust, and external radiation. The industrial receptor is a worker exposed over a 25-year employment, with eight hours on the site each workday, for a total of 2,000 hours of exposure per year.
- **Recreational Trespasser** – This receptor represents land use by a trespassing adolescent (age 6 to 15 years) living in a nearby residential area. This receptor is designed to account for occasional exposure to contaminated media during recreational activities such as hiking and biking, for two hours per week, 39 weeks per year, for a total of approximately 78 hours per year.
- **Resident** – An on-site residential land use scenario was evaluated to establish a baseline that represents potential risks if the site was released with no restrictions. This residential receptor represents EPA's RME residential scenario. The scenario assumes that a residential receptor is exposed to surface soils over a period of 30 years, of which 6 years is as a child. Cancer risks are considered over the long-term exposure at the site.
- **Resident Child** – The residential child scenario considers only non-carcinogenic impacts to a child resident on the site. This scenario represents the highest average daily dose rate due to the combination of extended exposure (350 days per year) and lower body weight. This exposure is assumed to occur for the six years as a "child".
- **Construction Worker** – This receptor represents a potential future worker who performs subsurface excavation and construction on underground utility lines or who works in basements. This receptor is expected to encounter surface and subsurface soil during construction activities over a relatively short period of time (2,000 hours in one year).

Table 1 presents a summary of the exposure point concentration (EPC) for each of the COCs detected in the site soils (i.e., EPC is the concentration that is used to estimate the exposure and risk from each COC in the soil). The table also includes a range of concentrations detected for each COC, frequency of detection, and how the EPC was derived.

The total risk from a future residential exposure to contaminated soils at this site is estimated to be 1.75E-03, or approximately two in a thousand, from chemical and radiological contaminants (i.e., primarily benzo(a)pyrene and radium-226).

2.7.1.3 Risk Characterization

For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$\underline{\text{Risk} = \text{CDI x SF}}$$

Where: risk = a unitless probability (e.g., 2×10^{-5}) of an individual's developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(\text{mg/kg-day})^{-1}$.

These risks are probabilities that usually are expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that an individual experiencing the RME estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual developing cancer from all sources is greater than 1 in 3. The NCP identifies cancer risks of 10^{-4} to 10^{-6} as protective for site-related exposures for Superfund sites.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose (RfD) derived for a similar exposure period. A RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). A HQ<1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemicals of concern that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. A HI<1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. A HI>1 indicates that site-related exposures may present a risk to human health. The HQ is calculated as follows:

$$\underline{\text{Non-cancer HQ} = \text{CDI/RfD}}$$

Where: CDI = Chronic daily intake
RfD = reference dose.

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

Table 2B provides a summary of the carcinogenic impact by exposure pathway and by COC per pathway. Uncertainties attributable to the numerous assumptions incorporated in the risk estimations are inherent in each step of the risk assessment process, as discussed in detail in the BHHRA. Such areas of uncertainty include identification and characterization of all COCs in all media of interest, exposure scenario and intake parameter assumptions, characterization of environmental fate and transport of constituents and resultant exposure pathways and routes, and the dose conversion factors and risk estimators used in the assessment. Limited toxicity data available for chemical constituents prevented the quantitative consideration of some potential COCs. However, most of the assumptions listed in the BHHRA were deliberately selected to provide conservative estimates of risk (i.e., they tend to overestimate rather than underestimate potential risks). Therefore, actual risks are expected to be lower than those presented in the assessment.

2.7.1.4 Baseline Risk Summary

The risk assessment addressed potential health impacts from radionuclides, metals, and organic compounds identified in the RI field investigation and toxicity screening process described above.

The risk assessment concluded that:

- The potential carcinogenic risks associated with surface soils are considered significant (above the risk range of 1×10^{-4} to 1×10^{-6}) for both the industrial and residential scenarios.
- The hazard indices are greater than 1 for the child resident scenario for surface-soil exposure. This indicates that potential non-carcinogenic impacts are likely to be greater than a Hazard Index (HI) = 1. As previously described, access to the site is currently controlled and children are not typically present on the site. The major contributors to the HI are iron (1.4), uranium (0.4), and thallium (0.3). The HI for iron is based on a concentration of 33,000 mg/kg which represents the 95% Upper Confidence on the Mean for all samples with the exception of an elevated surface sample result of 134,000 mg/kg located at VP-11. The elevated surface sample is considered an outlier based on the statistical evaluation of the other sample results. The elevated iron concentration is at location VP-11 and is co-located with elevated concentrations of PAHs. This area will be remediated, therefore, iron will not be addressed further in this ROD. The HI for each of the other scenarios was <1, and therefore not expected to be associated with adverse health effects even with a lifetime exposure.
- The annual radiation dose is estimated to be 73 mrem/yr for the residential scenario, 120 mrem/yr for a construction worker exposed to surface soils, and 140 mrem/yr for a construction worker exposed to subsurface soils. These levels exceed the 15 mrem/yr requirement established in New Jersey regulations (NJAC 7:28-12).
- Lead was detected in a surface soil sample at location PC-49 at a concentration of 64,900 mg/kg, which is above the screening level for residential soils of 400 mg/kg. This result of 64,900 mg/kg is more than two orders of magnitude greater than any other sample result. Excluding this value, the range of lead concentrations is 2 to 604 mg/kg with an average site-wide lead concentration of 79 mg/kg. This average concentration of 79 mg/kg is below the screening level of 400 mg/kg. The lead concentration located at PC-49 will be remediated.
- Radionuclides such as Ra-226 and U-238 are considered human carcinogens because of the radiation they emit. Possible exposure modes include ingestion, inhalation, and direct (external) radiation.
- Metals can cause cancer as well, but some also can cause other health impacts due to their toxicity. Exposure modes for metals include ingestion, inhalation, and dermal contact.
- PAHs are associated with potential increased cancer risks as described in Table 2B. Exposure can occur through ingestion, inhalation, and dermal contact with the soil.

The most significant contributor to risk from the site is the external radiation from Ra-226 and its decay products, accounting for 93 percent of the residential radiological risk and 82 percent of the total risk.

Chemical risk for the site resident is due almost entirely to the ingestion of and dermal contact with PAHs. Benzo(a)pyrene is the main component, at 1.4×10^{-4}, representing 70 percent of the chemical risk. Risk from benzo(a)anthracene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene is each on the order of 1×10^{-5}. These are each considered significant site contaminants and require remediation.

Based on the risk and hazard calculations, as summarized above, the following PCOCs have been identified for the MSP Site: semi-volatile organics include the PAHs benzo(a)pyrene, dibenzo(a,h)anthracene, benzo(b)fluoranthene, benzo(a)anthracene, and indeno(1,2,3-c,d)pyrene; radionuclides include Ra-226, U-238, U-235, U-234, and Th-230; and the only metal is lead because it was found at a concentration well above the screening level, although it is addressed concurrent with the radionuclide contamination found at the same location (PC-49).

2.7.2 Key Findings – Screening-Level Ecological Risk Assessment (SLERA)

The purpose of the SLERA was to evaluate whether valued ecological resources present at MSP are potentially exposed and adversely affected by the soil contaminants. In accordance with EPA guidance, the SLERA sought to identify significant factors or scenarios that would drive risk management decisions, rather than evaluate all possible wildlife receptors and exposure pathways.

The SLERA included the following principal components, as recommended by EPA guidance: 1) a site description and ecological characterization that identifies valued ecological resources and resource management goals; 2) the identification of risk management goals and assessment endpoints; 3) the identification of contaminants of potential ecological concern (COPECs); 4) the identification of potentially complete exposure pathways; 5) an evaluation of exposure and effects; and 6) a risk characterization and uncertainty evaluation.

Maximum detected surface soil concentrations were used as input into the SLERA. The maximum detected surface soil concentrations were derived from the soil analytical data. This SLERA provides a comparison of surface soil data to ecological screening values (ESVs). The surface soil data were evaluated for hypothetical risk to ecological receptors exposed to chemicals and radionuclides when concrete surfaces and asphalt paving are removed. Plants, soil invertebrates (surrogate, earthworm), and mid-level predators (surrogates: the shrew and American robin) were assumed to be ecological receptors affected by exposure to surface soils. Conclusions from the SLERA include:

- A number of metals were present in surface soil at maximum detected levels above background concentrations and ESVs. Benzo(a)pyrene also exceeded its ESV.
- Radionuclide dose rates were below their respective radionuclide dose rate ESVs. Therefore, radionuclides were not considered COPECs in surface soils at MSP.
- Two chemicals, for which there are no ESVs available, 4-chloroeniline and carbazole, were detected.
- All exceedances of ESVs occur as a result of screening maximum detections against the ESVs.
- These exceedances occur in limited areas co-located with PCOCs identified in the BHHRA and will therefore be remediated in response to protection of human health.
- Sensitive habitat has not been identified on-site, and the current and likely future land uses make it unlikely that this area will be a significant ecological habitat.

- Based on the above findings, the SLERA concluded that cleanup criteria for the remedy should not be based on potential risks to ecological receptors.

2.8 Remedial Action Objectives

The general Remedial Action Objectives (RAOs) for MSP are (1) to prevent or mitigate release of FUSRAP waste to the surrounding environment, and (2) to eliminate or minimize the risk to human health and the environment. The sources of contamination (e.g., soil and contaminated debris) identified in the RI and prior characterization activities are referred to as the waste media. The risk analysis, performed as part of the Soils RI, identified direct radiation, inhalation, dermal contact, ingestion of soil, and groundwater as potential pathways of future contaminant exposure. Although the Groundwater OU is being addressed in a separate ROD, the RAOs identified for this Soils OU ROD, considered the impacts to groundwater during development of the remedial goals for the soils COCs.

Cleanup goals at MSP were developed through a combination of applicable or relevant and appropriate requirements (ARARs) and site-specific risk calculations. ARARs are federal standards, requirements, criteria, limitations, or more stringent standards that are determined to be legally applicable or relevant and appropriate to the cleanup of a particular Superfund site. ARARs, generally, fall into three categories: 1. those that are chemical specific, 2. those that are location specific, which restrict or limit concentration of hazardous substances out of concern of the impact on certain media, and 3. those that are action specific which are usually restrictions on the conduct of certain activities or operation of certain technologies at a particular site. ARARs are used in conjunction with risk-based goals to govern response activities and to establish cleanup goals. In addition to ARARs, the lead agency may identify other federal or state policies, guidelines, or proposed rules of reducing the risks posed by a site, known as "To Be Considered" or "TBC" standards for the site. While not legally binding since they haven't been promulgated, TBCs may be used in conjunction with ARARs to develop CERCLA remedies.

The scenarios evaluated in the Soils RI were used to assess the potential residual risk to potential receptors after completion of various remedial action alternatives. These residual risks were then incorporated into the evaluation of the sufficiency of the alternatives.

Media-specific RAOs for MSP were developed in light of the probable pathways for impact on human health and the environment. In general, mitigation of these exposure pathways is the framework for identification of media-specific RAOs:

- To eliminate or minimize the potential for humans to ingest, come into contact with, or inhale particulates of radioactive constituents, or to be exposed to external gamma radiation.
- To eliminate or minimize the potential for humans to ingest, come into dermal contact with, or inhale particulates of specific chemical contamination (i.e., benzo(a)pyrene, benzo(a)anthracene, dibenzo(a,h)anthracene, benzo(b)fluoranthene, indeno(1,2,3-c,d)pyrene, and lead) .
- To comply with ARARs and address TBCs, specifically, NJAC 7:28-12.8(a)(1) Radiation Dose Standards.To minimize the toxicity, mobility, or volume of chemically and radiologically impacted soils at MSP.
- To comply with human exposure dose limits of NJAC 7:28-12.8(a)(1) for radiological contamination. NJAC 7:28-12.8(a)(1) defines this as radiological contamination levels that result in 15-mrem/year total effective dose or less.
- To minimize public and worker exposures to chemical and radiological contamination in soil during the implementation of the remedial measure.

- To eliminate or minimize the potential migration of contaminants into stream and storm drain sediments by surface water runoff, or by infiltration or percolation that result in contamination of the groundwater.

2.8.1 Radiological Soil Remediation Goals

The development of the radiological remediation goals takes into account radiation doses from the soil itself via dust inhalation, soil ingestion, and direct radiation. Secondary impacts are also considered through ingestion of plants growing in the contaminated soil and through their impact on groundwater that may be contaminated from the site soils.

Based on the findings of the Soils RI, and as presented in the Soils FS, it is apparent that Ra-226 is an appropriate and reliable indicator of the presence of elevated radiological contamination. This is due to its dominance as a risk source and because it is found to be co-located with the other radiological COCs. Use of Ra-226 as an indicator or surrogate nuclide during performance of site remediation will lead to greater efficiency during sampling and screening activities. To use this approach, the cleanup criterion for the Ra-226 is reduced to take into account the dose contributions from the other radionuclide contaminants of concern. The primary criterion that was used in each equation was the acceptable annual radiation dose of 15 mrem/yr (NJAC 7:28-12.8). These values are scenario-specific, site-wide averages, as demonstrated by a MARSSIM-like survey approach.

For the residential use scenario, a remedial goal of an average 5 pCi/g Ra-226 above background for surface and subsurface soils has been determined to be an acceptable surrogate to ensure that the radionuclides are remediated sufficiently.

2.8.2 Chemical Soil Remediation Goals

The remedial goals for the carcinogenic PAHs that posed unacceptable risks in the BHHRA are based on the New Jersey Soil Cleanup Criteria, which have been identified as To be Considered (TBC) guidance. These criteria are identified to reduce the risk due to the described exposure pathways and are also considered to be protective of groundwater. It should be noted that the 0.66 mg/kg cleanup levels for benzo(a)pyrene and dibenzo(a,h)anthracene are based on the practical quantitation limits (PQLs) for these two chemicals, since risk-based levels were lower than their 0.66 mg/kg PQLs. The use of these PQLs, although not at 10-6 risk, still results in a protective CERCLA cleanup.) These values are scenario-specific, site-wide averages, as demonstrated by a statistical based sampling approach.

Residential land use remedial goals for the specific SVOCs and single metal are identified below:

- 0.66 mg/kg benzo(a)pyrene
- 0.90 mg/kg benzo(a)anthracene
- 0.66 mg/kg dibenzo(a,h)anthracene
- 0.90 mg/kg benzo(b)fluoranthene
- 0.90 mg/kg indeno(1,2,3-c,d)pyrene
- 400 mg/kg lead

2.9 Description of Alternatives

The following alternatives were developed for consideration of the soils remedial action at the site. The commercial/industrial cleanup levels are provided for information, but are not being used as the remedial goals for the site. Section 2.14 provides the cleanup criteria of the Selected Remedy for the site. Table 3 provides a summary of the estimated costs and expected durations for each of the described alternatives:

Alternative 1: No Action

Alternative 2: Limited Action; Institutional Controls

Alternative 3: Excavation for Residential Use and Off-site Disposal

Alternative 4: Excavation for Commercial/Industrial Use and Off-site Disposal

2.9.1 Alternative 1: No Action

The no-action alternative is considered in accordance with the NCP requirements to provide a basis for comparison to other alternatives. Under the no-action alternative, no further actions would be taken, and the status of the site would remain unchanged. In addition, existing institutional controls would not be maintained (i.e., fencing and postings would not be repaired if they deteriorate), and the Federal Government need not maintain a site presence.

2.9.2 Alternative 2: Limited Action; Institutional Controls

Institutional controls, such as deed restrictions, and engineering controls, such as perimeter fencing, asphalt maintenance, and warning signs, would be implemented and maintained for a 50-year control period. This is a reasonable estimation of the time that the Federal Government is expected to maintain control of the site. Environmental monitoring (e.g., groundwater monitoring) would continue to be conducted and new monitoring may be employed to assess potential contaminant migration. The five-year reviews would also be conducted to assess the remedy's protectiveness. No further actions would be taken.

2.9.3 Alternative 3: Excavation for Residential Use and Off-Site Disposal

This excavation and disposal alternative will meet the CERCLA acceptable risk range for unrestricted future site use because all COCs would be remediated to their appropriate soil remediation goal. Removal of contaminated soil and debris would be followed by the collection and analysis of samples to confirm that the excavation has met the remediation goals.

Excavated and demolished material would be disposed of at a licensed or permitted off-site disposal facility. The excavated areas would be backfilled to a usable grade with clean soil. Groundwater or precipitation that might be removed from the excavation during remedial action would be collected, treated, and disposed of properly. Institutional and engineering controls, such as those described above, would not be necessary for this alternative. As required by CERCLA 121(c), a final determination of remedy effectiveness would be conducted and the site would be released for unrestricted future use.

This alternative will excavate and dispose off-site approximately 49,500 yd^3 of soil and debris at the following cleanup goals:

- Radionuclide-Impacted Areas: 24,600 yd^3 at a remediation goal of an average of 5 pCi/g (above background) for Ra-226.

- Non-Radionuclide, SVOC-Impacted Areas: 23,200 yd^3 at the following remediation goals for each specific PAH.
- 0.66 mg/kg benzo(a)pyrene
- 0.90 mg/kg benzo(a)anthracene
- 0.66 mg/kg dibenzo(a,h)anthracene
- 0.90 mg/kg benzo(b)fluoranthene
- 0.90 mg/kg indeno(1,2,3-c,d)pyrene
- Clean Excavated Areas: 1,600 yd^3 required to access some subsurface soils.

2.9.4 Alternative 4: Excavation for Commercial/Industrial Use and Off-Site Disposal

This excavation and disposal alternative will meet the CERCLA acceptable risk range for future site uses that are commercial/industrial in nature. The COCs would be remediated to their appropriate soil remediation goal. Removal of contaminated soil and debris would be followed by the collection and analysis of samples to confirm that the excavation has met the remediation goals.

Excavated and demolished material would be disposed of at a licensed or permitted off-site disposal facility. The excavated areas would be backfilled to a usable grade with clean soil. Groundwater or precipitation that might be removed from the excavation during remedial action would be collected, treated, and disposed of properly. Engineering controls, such as those described in Alternative 2, would not be necessary for this alternative. However, in order to ensure remedy protectiveness, land use controls, including a deed notice, would also be implemented as necessary to prohibit a change in land use (e.g., commercial/industrial to residential) or construction in contaminated soils. Controls and monitoring of any excavation work would also need to be included in the deed notice. These controls would ensure that material with levels of radium above those established for the residential land use (an average of 5 pCi/g above background) were not removed from the site. As required by CERCLA 121(c), a final determination of remedy effectiveness would be conducted and the site would be released for the intended future use. Since the land use is considered limited, the site would undergo five-year reviews to ensure the maintenance of adequate controls and conditions.

This alternative will excavate and dispose off-site approximately 43,000 yd^3 of soil and debris at the following cleanup goals:

- Radionuclide-Impacted Areas: 17,200 yd^3 at a remediation goal of an average of 11 pCi/g (above background) for Ra-226.
- Non-Radionuclide, SVOC-Impacted Areas: 24,900 yd^3 at the following remediation goals for each PAH:
- 0.66 mg/kg benzo(a)pyrene
- 4.00 mg/kg benzo(a)anthracene
- 0.66 mg/kg dibenzo(a,h)anthracene
- 4.00 mg/kg benzo(b)fluoranthene
- 4.00 mg/kg indeno(1,2,3-c,d)pyrene
- Clean Excavated Areas: 1,600 yd^3 required to access some subsurface soils.

Note that the volume of non-radioactive, SVOC-contaminated soil is larger in Alternative 4 than in Alternative 3 because part of the radioactive soil in Alternative 3 is co-located with SVOC-contaminated soil. Therefore, although the volume of radioactive soil decreases in Alternative 4, the area and volume of non-radioactive soil increases from Alternative 3 to Alternative 4. Overall, the volume requiring excavation in Alternative 4 is 5,700 yd^3 less than that in Alternative 3.

2.10 Common Elements and Distinguishing Features

For comparison purposes, this section describes the elements that are common to two or more alternatives. The primary common elements, engineered and institutional controls, are described below.

2.10.1 Engineered Controls

Engineered controls can include any activity implemented to control exposure to site contaminants. Alternatives 3 and 4 apply engineered controls by way of removal and disposal. The contaminated media would be excavated, demolished (i.e., building slabs and foundations), and then transported to a permitted off-site disposal facility. The site would then be restored with clean fill. Engineered controls are also included to a lesser extent in Alternative 2 in the form of a perimeter fence (access restrictions) and the maintenance of the asphalt cap.

2.10.2 Institutional Controls

Alternatives 2 and 4 both contain provisions for implementing institutional controls. Alternative 3 will remove contaminated soils and debris to meet remediation goals, which will allow for unrestricted land use. Therefore, institutional controls are not needed for this alternative. Alternative 4 would include some form of land use controls, including a deed notice, which would also be implemented, as necessary, to prohibit a change in land use (e.g., commercial/industrial to residential) or construction in contaminated soils. The deed notice would ensure that disturbance of any site subsurface soils would be monitored and controlled. Alternative 2, comprising only monitoring, institutional controls, and access restrictions, would also involve some notice on the property deed to ensure that the site is not considered for development and that access to the site was limited to maintenance of site security.

2.10.3 Distinguishing Features

Each remedy has features that distinguish it from the others. A listing and brief description of these features is provided below.

Alternatives 3 and 4 both achieve the general RAOs to prevent or mitigate release of FUSRAP waste to the surrounding environment and to eliminate or minimize the risk to human health and the environment. However, they achieve their effectiveness on different levels in that Alternative 3 involves cleanup to an average of 5 pCi/g above background Ra-226 while Alternative 4 allows contamination ranging from an average of 5 pCi/g to 11pCi/g Ra-226 above background to remain on-site. The contaminated soil volumes that would be excavated and disposed of under Alternatives 3 and 4 (including the radionuclide-contaminated volume, the chemical-contaminated volume, and clean surface soil that overlies contaminated subsurface soil) would be approximately 49,400 yd^3 and 43,700 yd^3, respectively. Alternatives 1 and 2 do not prevent or mitigate release of FUSRAP waste to the surrounding environment.

Alternatives 3 and 4 would be relatively difficult to implement, and Alternatives 1 and 2 would be relatively easy. Alternatives 3 and 4 comply with ARARs. Alternative 1 does not comply with ARARs. Alternative 2 would comply only as long as site access was restricted and the site was not developed for future beneficial use. However, the potential to adversely impact the environment still exists.

Alternative 1 offers no protection for future land use because exposures could result, since contaminants remain in place without controls or restrictions. Alternative 2 would have major land use restrictions since the contamination remains on-site. Alternative 4 would allow future development, but such development would be restricted to commercial/industrial. Alternative 3 would impose no restrictions on future land use. Restoration times and costs related to each of the four alternatives are summarized on Table 3.

2.11 Expected Outcomes of Each Alternative

2.11.1 Alternative 1: No Action

No action would be taken, and the status of the site would remain unchanged. In addition, existing institutional controls would not be maintained (i.e., fencing and postings would not be repaired if they deteriorated), and USACE would not maintain a site presence. Alternative 1 would not achieve remedial goals and is thus unacceptable.

2.11.2 Alternative 2: Limited Action: Institutional Controls

Institutional controls, such as deed restrictions, and engineering controls, such as perimeter fencing and warning signs, would be implemented and maintained for 50 years. Environmental monitoring (e.g., groundwater monitoring) would continue to be conducted and new monitoring might be instituted to assess potential contaminant migration. Five-year reviews would also be conducted to assess the remedy's protectiveness. No further action would be taken. Alternative 2 would achieve remedial goals over the short-term, but due to the long-lived nature of the contaminants (many thousands of years) and the reliance on institutional controls (e.g., deed notices), it is difficult to predict whether this alternative would remain protective over the long-term.

2.11.3 Alternative 3: Excavation for Residential Use and Off-Site Disposal

This excavation and disposal alternative will meet the CERCLA acceptable risk range for unrestricted future site use because all COCs would be remediated to their appropriate soil remediation goal. Institutional and engineering controls, such as those described above, would not be necessary for this alternative. As required by CERCLA 121(c), a final determination of remedy effectiveness would be conducted and the site would be released for unrestricted future use.

2.11.4 Alternative 4: Excavation for Commercial/Industrial Use and Off-Site Disposal

This excavation and disposal alternative will meet the CERCLA acceptable risk range for future site uses that are commercial/industrial in nature. The COCs would be remediated to their appropriate soil remediation goal. Removal of contaminated soil and debris would be followed by the collection and analysis of samples to confirm that the excavation has met the remediation goals. However, in order to ensure remedy protectiveness, land use controls, including a deed notice, would also be implemented, as necessary, to prohibit a change in land use (e.g., commercial/industrial to residential) or construction in contaminated soils. Controls and monitoring of any excavation work would also need to be included in the deed notice. These controls would ensure that material with Ra-226 above the established unrestricted use criteria (an average of 5 pCi/g above background) was not encountered or removed from the site. As required by CERCLA 121(c), a final determination of remedy effectiveness would be conducted and the site would be released for the intended future use. Since the land use is considered limited, the site would undergo five-year reviews to ensure the maintenance of adequate controls and conditions.

2.12 Comparative Analysis of Alternatives

2.12.1 Overall Protection of Human Health and the Environment

Definition: This criterion determines whether an alternative eliminates, reduces, or controls exposure to the site COCs to a level that protects public health and the environment.

Analysis: Alternative 1 offers no protection because exposures could result, since site contaminants remain in place without controls or restrictions. Alternative 2 offers protection of human health, however, no action is taken to be protective of the environment. Alternatives 3 and 4 provide relatively equal levels of protection, although Alternative 4 relies on deed restrictions and other institutional controls for long-term protection.

2.12.2 Compliance with Applicable or Relevant and Appropriate Requirements

Definition: This criterion evaluates whether an alternative meets federal environmental and state environmental statute facility citing laws or regulations that establish standards, requirements or criteria that are applicable or relevant and appropriate to the cleanup of the site COCs, or whether a waiver of the ARARs is justified.

Analysis: Alternative 1 does not comply with ARARs (estimated dose for a site resident or worker is greater than 15 mrem/yr). Alternative 2 complies with ARARs only as long as site access is controlled effectively. Alternatives 3 and 4 comply with ARARs.

2.12.3 Long-Term Effectiveness and Permanence

Definition: This criterion considers the capacity of an alternative to maintain long-term protection of human health and the environment over time.

Analysis: Alternative 1 provides no long-term protection of human health or the environment over time. Alternative 2 provides an incrementally higher level of effectiveness and permanence, but environmental protection is not achieved. Alternative 4 provides a high level of effectiveness and permanence since the material is removed in a single remedial action, and deed restrictions are imposed preventing human exposures at unacceptable levels. Alternative 3 supplies the highest level of effectiveness and permanence, since the material is removed in a single remedial action and the site is released for unrestricted future use (with no institutional controls).

2.12.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Definition: This criterion evaluates the capacity of treatment associated with a given alternative to reduce the harmful effects of the principal contaminants, their capacity to move in the environment, and the amount of contamination present.

Analysis: None of the alternatives cause a reduction in the toxicity or volume of contaminants through treatment. In the best case (Alternatives 3 and 4), the mobility of contaminants at the site is reduced through removal of the contaminated material from an uncontrolled location where contact with groundwater occurs on a regular basis to a controlled landfill where groundwater contamination and migration of contaminants is minimal. Therefore, although it does not occur through treatment, there is a reduction of the mobility of the contaminants under Alternatives 3 and 4. Alternative 1 achieves no reduction in toxicity, mobility, or volume of contaminants. Alternative 2 provides for a reduction in mobility by maintaining the cap, which acts to minimize infiltration and the potential for leaching of contaminants.

2.12.5 Short-Term Effectiveness

Definition: This criterion considers the length of time required to implement the alternative, and the risks posed to workers, residents, and the environment during implementation.

Analysis: Since there is no action involved with Alternative 1, this consideration does not really apply to it. Alternative 2 is easily and quickly implemented and does not increase risks to workers. Site contaminants also remain on-site under Alternative 2, and therefore this consideration is also not applicable to it. Alternatives 3 and 4 cause a slight increase in risk to the remedial workers and the community during implementation due to the soil moving activities and increased traffic. However, the methods used during implementation include acceptable and proven means to control and monitor any potential releases or increases in these risks. The short-term effectiveness of Alternatives 3 and 4 is much greater than that of the previous alternatives since the remedial goals are met as soon as the soil is moved from the site.

2.12.6 Implementability

Definition: This criterion considers the technical and administrative feasibility of implementing the alternative, including the factors of relative availability of goods and services.

Analysis: Alternatives 1 and 2 are both easily implemented. They require very little planning and preparation and the tools required are readily available. Alternatives 3 and 4 are relatively easy to implement in that they involve the use of common excavation equipment, and the labor, equipment, and materials required are available in most areas. Disposal facilities are also available that would accept the radionuclide- and chemical-impacted wastes, and existing means and methods for transportation of material with this type and levels of contamination have shown that it can be accomplished with minimal added risk to human health and the environment.

2.12.7 Cost

Definition: This criterion includes an estimate of the capital, annual operations, and present-worth costs. Present-worth cost is the total cost of an alternative over time in terms of today's dollars. Cost estimates are expected to be accurate within a range of +50% to –30%.

Analysis: Alternative 3 has the highest cost at $15.9 million. Alternative 4, since the excavation volume is less, costs are less ($13.4 million). Alternative 2 is estimated to cost $0.7 million. There is no cost associated with Alternative 1.

2.12.8 State Acceptance

Definition: This criterion considers whether the State agrees with, opposes, or has no comment on the Preferred Alternative.

Analysis: State acceptance was evaluated formally after the public comment period of the Soils FS and PRAP. NJDEP agrees that Alternative 3 represents the best balance of tradeoffs among the other alternatives evaluated and that it will adequately address the radiological soil contamination.

NJDEP raised concerns that USACE believes will be addressed by Alternative 3. Further coordination during Remedial Design and Remedial Action will substantiate this belief. See Responsiveness Summary (Section 3.0) for NJDEP comments and USACE responses.

2.12.9 Community Acceptance

Definition: This criterion considers whether the local community agrees with the Preferred Alternative. Comments received during the Public Comment Period are an important indicator of community acceptance.

Analysis: Community acceptance was evaluated formally after the public comment period on the Soils PRAP. The vast majority of comments were in favor of Alternative 3 (Excavation for Residential Use and Off-site Disposal).

2.13 Principal-Threat Waste

The NCP establishes an expectation that treatment that reduces the toxicity, mobility, or volume of the principal threat wastes will be utilized by a remedy to the extent practicable. It should also be noted that: (1) the processes identified to treat the contamination typically address the SVOCs and radionuclides separately, not in combination, and (2) the treatment processes are not effective in reaching the proposed remedial goals, particularly for the radionuclides. Per the NCP's definition of principal threat waste, there is no on-site contaminant at MSP that meets this definition.

2.14 Selected Remedy

Alternative 3, Excavation for Residential Use and Off-site Disposal, has been selected for implementation as the remedy for the MSP site Soils OU. The remedy will allow unrestricted use of the MSP.

2.14.1 Summary of the Rationale for the Selected Remedy

The selected remedy meets the threshold criteria and provides the best overall balance of tradeoff in terms of the five balancing criteria:

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume
- Short-term effectiveness
- Implementability
- Cost

The selected remedy addresses State and community concerns by removing contaminated materials from MSP.

2.14.2 Description of the Selected Remedy

Alternative 3, Excavation for Residential Use and Off-site Disposal, is the Selected Remedy. Alternative 3 specifies excavation of contaminated soil and debris, including an appropriate survey to confirm that the remedy has been effective in meeting the cleanup goals, and off-site disposal.

Excavated soil and debris would be disposed of at an appropriately licensed or permitted off-site waste management facility. This includes the surface and subsurface soils, the asphalt and concrete pads, the carbon filter, the sediment trap/settling basin, and the stormwater drainage system (estimated at approximately 49,400 yd^3).

The excavated areas will be backfilled with clean soil. Groundwater and precipitation that might be impacted during remedial activities will be collected, analyzed, and transported off-site for treatment and/or disposal, if necessary.

2.14.3 Summary of Estimated Remedy Costs

Total costs for the selected remedy (Alternative 3) are estimated at $15.9 million. Costs are based on excavation and disposal of contaminated soil and debris. Table 4 provides a more detailed summary of the costs associated with implementation of the selected remedy.

The estimated time to implement the selected remedy is approximately one year after completion of remedial design, which is estimated to require an additional year. The time to implement the selected remedy is dependent on USACE funding, which is appropriated by Congress for the USACE.

The information in the cost estimate summary (Table 4) is based on the best available information regarding the anticipated scope of the selected remedy. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record, an Explanation of Significant Difference (ESD), or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50% to -30% of the actual project cost.

2.14.4 Expected Outcomes of Selected Remedy

The MSP RAOs, as shown in Section 2.8, would be achieved for the contaminated soil medium. The Selected Remedy is protective of human health and the environment. It would allow for beneficial unrestricted future use of the site upon completion of the final remedy. A comprehensive sampling and analysis program will confirm that all contaminants have been removed to the required levels. This remedy will also effectively remove the source of the radionuclide contamination of the groundwater.

2.15 Statutory Determinations

The selected remedy satisfies the statutory requirements of CERCLA 121 and the NCP as described below.

2.15.1 Protection of Human Health and the Environment

This remedy would be protective of human health and the environment in the short and long term. Implementation of this remedy would reduce the radiological dose to the limit of 15 mrem/yr, and the chemical contamination to the chemical remedial goals at the site. These remedial goals are consistent with the NCP risk range as identified in RAGS Part B. Human and environmental exposure to site COCs will be eliminated to levels that are protective through excavation and off-site disposal of all excavated soil and debris. In addition, actions under this remedy would eliminate the potential for future off-site migration of contaminants. However, potential impacts to human health and the environment could be present in the short term due to excavation, waste handling, and off-site transport of contaminated soil. These exposures would be mitigated through appropriate safety, dust, and residual water control measures, as identified in the remedial action documents. The fact that the contamination would be removed to meet ARARs precludes the imposition of the CERCLA-stipulated five-year review requirement and institutional controls under this alternative.

2.15.2 Compliance with ARARs

Table 5 provides a summary of the cleanup criteria to be achieved. Achievement of the cleanup criteria will be identified throughout the remediation of the property. The selected remedy will comply with the ARARs listed in Table 6.

2.15.3 Cost-Effectiveness

The selected remedy meets the statutory requirement for a cost-effective remedy. Table 7 provides a cost-effectiveness matrix to demonstrate the effectiveness of the selected remedy against the other evaluated alternatives.

The estimated present-worth cost of the Selected Remedy is $15,900,000. Although the estimated cost for Alternative 4 is $13,400,000 ($2,500,000 less), the resulting land use would be restricted to industrial/commercial. In addition, institutional controls would have to be implemented. The additional cost to allow the site to be released for unrestricted use, however, is offset by the fact that the selected remedy is the most protective and has the greatest overall effectiveness.

2.15.4 Permanent Solutions and Alternative Treatment Technologies

The Selected Remedy represents the maximum extent to which permanent solutions and treatment are practicable at the site. The selected remedy represents the best balance of tradeoffs between the alternatives because it provides a permanent solution, and cost-effectively remediates the property for unrestricted use. The physical and chemical treatment technologies that were evaluated for treatment of MSP site contaminants were removed from further consideration due to the incompatibility of site conditions with the operational requirements of the equipment.

2.15.5 Preference for Treatment as a Principal Element

Although not through treatment, the volume of waste at the site is immediately and significantly reduced. The processes identified to treat the COCs typically address the SVOCs and the radionuclides separately, not in combination. Treatment technologies for soil volume reduction of radionuclides were not found to be acceptable for implementation at MSP.

2.15.6 Five-Year Requirements

Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unrestricted use exposure, a five-year review will not be required for this remedial action.

3. Responsiveness Summary

The Responsiveness Summary serves the dual purpose of: (1) presenting stakeholder concerns about the site and preferences regarding the remedial alternatives; and (2) explaining how those concerns were addressed and how stakeholder preferences were factored into the remedy selection process.

The following were received as either written comments or oral comments during the public comment period. Each comment is followed by a response to that comment.

3.1 NJDEP Comments and Responses:

1. **Comment:** As discussed in the Soils FS Report, the proposed remedial action is based, in part, on the findings of the Baseline Human Health Risk Assessment (BHHRA). It must be pointed out that NJDEP does not accept baseline risk assessments to determine whether remediation is needed on a site. The New Jersey Brownfield and Contaminated Site Remediation Act, N.J.S.A. 58:10B has set the acceptable cancer risk for human carcinogens at one-in-one-million (1x10-6) and acceptable non-carcinogenic risk for any given effect to a value not to exceed a Hazard Index of 1.0. These established acceptable risk values are for any particular contaminant and not for the cumulative effects of more than one contaminant at a site. NJDEP developed the New Jersey Soil Cleanup Criteria (NJSCC) to meet these mandates. NJDEP believes that using the NJSCC results in cleanups that are more protective than those based on BHHRAs that rely on the acceptable risk range (1x10-4 to 1x10-6) identified in CERCLA.

It is a positive step that USACE recognizes the NJSCC as “to be considered” criteria in the remediation process, but USACE only proposes to use the NJSCC for the remediation of those chemical contaminants that were found to exceed the acceptable risk as identified in the BHHRA. The chemical contaminants identified in the BHHRA were semi-volatile organic compounds. NJDEP requires that the remediation of the MSP meet *all* of the NJSCC, including those for volatile organic compounds and metals.

To address this concern thus ensuring that the NJSCC for Residential Direct Contact will be achieved, NJDEP will insist that the post-excavation sampling include analyses for all contaminants, not just the “Contaminants of Concern” listed in Table 3 of the PRAP. NJDEP cannot issue a letter of No Further Action to USACE unless the NJSCC are achieved.

Response: The USACE and EPA consider the NCP risk range of 1 in 10,000 to 1 in a million to be a protective range for human health and the environment, per the NCP (40 CFR 300.430(e)(2)(i)(A)(2)) and consistent with the *Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation (Part D, Section 4*), December 2001. Given the nature and extent of the radiologically and chemically contaminated soils at MSP, the USACE and EPA expect that residual levels of any remaining chemicals present on the MSP will be below levels in the non-promulgated NJ Soil Cleanup Criteria. Only the constituents identified in this ROD will be addressed by the remedial action. In addition, these residual levels would be several feet below the ground surface and are not directly available to receptors. USACE will perform sampling of the contaminants of concern in accordance with relevant federal and state standards to verify satisfaction of the cleanup levels and it is expected that the results will be consistent with the proposed NJ Soil Cleanup Criteria. Although the Federal Government owns the property and

DOE is accountable for it, FUSRAP funds are available for limited purposes. FUSRAP appropriations from Congress can only be used to clean FUSRAP sites in accordance with CERCLA.

2. **Comment:** Although not specifically discussed in the Soils PRAP (but detailed in the Soils FS Report), the following two regulations must be considered to be ARARs for the MSP site:

   N.J.S.A. 58:10B: *Brownfield and Contaminated Site Remediation Act*

   N.J.A.C. 7:26E: *Technical Requirements for Site Remediation*

Response: By definition, the referenced statute and regulation cannot be ARARs. "Applicable requirements' mean those cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at a CERCLA site." NJSA 58:10B, the Brownfield and Contaminated Site Remediation Act, requires the state to establish site remediation criteria. Since this statute requires action by the state, it does not directly apply to USACE. NJAC 7:26E, Technical Requirements for Site Remediation, known as the "Tech Rule," sets forth the procedures for NJDEP oversight of remediation, requirements of Health and Safety Plans and Quality Assurance Plans, and other non-substantive issues. The Tech Rule does not contain cleanup requirements that specifically address particular hazardous substances, pollutants, contaminants, actions, or locations associated with soils contamination at a CERCLA site. Therefore, the Tech Rule is not applicable to this Soils Operable Unit at the Middlesex Sampling Plant site.

In addition, "Relevant and appropriate requirements' mean those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility citing laws that, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited at the particular site." Under this definition, neither NJSA 58:10B nor NJAC 7:26E is relevant and appropriate. NJSA 58:10B (Brownfield and Contaminated Site Remediation Act) does not contain substantive requirements that address situations or problems similar to those encountered at the MSP site. NJAC 7:26E (Tech Rule) sets forth the procedures for NJDEP oversight of remediation, requirements of Health and Safety Plans and Quality Assurance Plans, and other non-substantive issues. No substantive requirements for soil remediation were identified in the Tech Rule. Because this Record of Decision addressed the Soils Operable Unit, the Tech Rule is not considered relevant and appropriate.

3. **Comment:** NJDEP agrees that the Soil Remediation Standards for Radioactive Materials, N.J.A.C. 7:28-12(a)(1), is an ARAR for the site. However, NJDEP does not believe that the associated proposed remedial goal of 5 pCi/g and 11 pCi/g of Radium-226 for residential and commercial uses, respectively, will adequately ensure that the 15 mrem/yr dose limit identified in N.J.A.C. 7:28-12(a)(1) will be met. The remediation standard should be presented as the sum of fractions less than or equal to 1. Nuclide specific standards need not be stated since the vertical extent and the amount of cover are unknown at this time.

Response: Dose modeling performed in the BHHRA and as part of the Soils FS development demonstrate the protectiveness of the Ra-226 criteria compared to the ARAR dose limit. The dose was estimated using the RESRAD code, NJAC 7:28-12 recommended parameters, and site-specific conditions. The reduction of the Ra-226 criteria to account for the dose contribution of the radionuclide COCs effectively implements the sum of fractions approach. This is considered as conservative since the time of maximum exposure for COCs was considered equal when it actually differs significantly.

Section 3.4.2.1.3 "Calculation of Residential Scenario PRG" in the Soils OU Feasibility Study presents a complete and conservative explanation of how the Radium-226 levels were developed as surrogates for radionuclide COCs identified for the site. Using one COC as a surrogate for the remediation has been acceptable for the cleanup at other contaminated sites as long as it is demonstrated that if the surrogate is cleaned up to the specified level, then the remaining COCs will meet their respective cleanup goals. This method provides for greater efficiency during sampling and screening activities. In summary, the justification is based on:

1. A conservative estimate of the contribution of the Radium-226 to the total dose/risk as compared to the other radionuclide COCs (Radium-226 being by far the primary contributor). The dose was estimated using RESRAD code and site-specific conditions.

2. Reducing the Ra-226 criteria to account for the dose contributions of other radionuclide COCs.

3. A complete evaluation of the site soils data (i.e., a comparison of the Radium-226 data to the other radionuclide COCs).

4. Radium-226 being commingled with the other radionuclide COCs.

Additionally, the demonstration of compliance with the Ra-226 criteria approach will be explained in the required remedial design documents and will be consistent with MARSSIM. It should be considered that given this demonstration approach, it is extremely unlikely that residual contamination at the criteria will remain since there is a 95 percent chance that an area at the criteria will be identified as failing to meet the criteria and thus, further remediation in that area would be required. This results in actual site residual concentrations well below the criteria.

4. **Comment:** Section 3.0 Site Characteristics, Airborne Particulates, page 11

   A citation for the "10 mrem/yr standard" for airborne particulates must be included in the text.

Response: The 10 mrem/yr standard is from Subpart H of the National Emission Standards for Hazardous Air Pollutants (NESHAP) as codified at 40 CFR 61.93a. This citation is included in Section 3.0.

5. **Comment:** Section 6.0 – Remedial Action Objectives (RAOs), page 29

   RAO No. 3 must state "To comply with ARARs and address TBCs."

Response: Section 2.8 Remedial Action Objectives, Item #3 will be changed from:

To comply with ARARs, specifically, NJAC 7:28-12.8(a)(1) Radiation Dose Standards.

To:

> To comply with ARARS and address TBCs, specifically, NJAC 7:28-12.8(a)(1) Radiation Dose Standards.

6. **Comment**: Section 6.0 – Chemical Soil Remediation Goals, page 30

   The NJSCC referenced in this section are for Residential and Non-Residential Direct Contact scenarios, not Impact to Ground Water as stated.

Response: The section states that the Remedial Goals are based on the NJSCC and "are considered to be protective of groundwater." The Impact to Groundwater Criteria for these chemicals are higher than the proposed Remedial Goals, and, therefore, the lower values are also protective of groundwater.

7. **Comment:** Section 7.0 – Summary of Remedial Alternatives, page 31

   In Alternative 2, it is stated that any institutional and engineering controls would be implemented and maintained by USACE for a 50-year control period. The New Jersey Technical Requirements for Site Remediation, N.J.A.C. 7:26E, offer no such time limitation on the implementation and maintenance of institutional and engineering controls. The statement about a 50-year control period must be removed from the PRAP even though Alternative 2 was not selected as the preferred alternative.

Response: As stated above, FUSRAP appropriations from Congress can only be used to clean sites in accordance with CERCLA. While USACE has endeavored to cooperate with New Jersey, CERCLA only requires compliance with substantive criteria imposed by states, not with procedural criteria. As discussed in response to Comment 2, New Jersey's Technical Requirements for Site Remediation have not been cited as ARARs since they do not contain any substantive requirements for this action. The 50-year time period was chosen for costing purposes, longer-term control might be necessary due to the longevity of the radiological materials.

3.2 Other Stakeholder Comments and Responses:

Verbal Questions at Middlesex Public Meeting: March 30, 2005

1. **Comment:** (Commenter A); Commenter requested electronic or hard copies of the PowerPoint Presentation given at the Public Meeting on 30 March 2005.

Response: Electronic and hard copies of the presentation were made available to those members of the public that left contact information.

2. **Comment:** (Commenter B); Commenter requested clarification regarding the need for off-site disposal of contaminated soil. Also wanted to clarify whether the contamination could be removed from the soil and the soil be re-used at the site.

Response: A cost-effective technology has not yet been identified to remove all contaminants from the soils to a level that would be acceptable for re-use on the site. Technologies are available to remove the semi-volatile organic contaminants from the soils; however, the soils at this site are also contaminated and co-mingled with radionuclide contamination. The efficiency and effectiveness of the removal of radionuclide contamination from the soils has been studied at other similar sites and has not been identified as effective for re-use of the soil.

3. **Comment:** (Commenter B); Commenter wanted clarification of the funding for this soils remediation.

Response: The Formerly Utilized Sites Remedial Action Program (FUSRAP) was established in 1974. The goal of FUSRAP is the remediation of sites contaminated as a result of the nation's early atomic energy program. In 1997, responsibility for FUSRAP was transferred to the USACE by the Energy and Water Development Appropriations Act of 1998. Funding for cleanup of the Middlesex Sampling Plant site is provided on an annual basis by the Congressional Appropriations designated under the Energy and Water Development Appropriations Act.

4. **Comment:** (Commenter B); Commenter requested an understanding of the USACE involvement of this project and why only the USACE is involved. Commenter also questioned whether other remediation scenarios were considered and whether this truly is the best alternative for this site. One Commenter (Commenter C) noted that they had hired their own consultant from Princeton University and found that the Selected Remedy is the best alternative to implement for the site.

Response: As stated above (Response to Comment 3), Congress has designated the USACE as responsible for the FUSRAP program. Moreover, the USACE must remediate the site in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and the National Contingency Plan (NCP). Under CERCLA and the NCP, the USACE must develop and evaluate appropriate remedial alternatives. The detailed discussion of the development and evaluation of alternatives for this site appear in the Feasibility Study for the site. That evaluation resulted in the alternatives summarized in the Proposed Remedial Action Plan.

5. **Comment:** (Commenter D); Commenter noted that Alternative 3 has 4,700 more cubic yards of soil removal than Alternative 4. Clarification was requested regarding the lack of 5-year monitoring for Alternative 3.

Response: The actual volume difference between Alternatives 3 and 4 is 5,700 cubic yards. Five-year monitoring is a requirement for remedies where some contaminated materials remain in place on the property upon completion of the remediation activities. When remediation alternatives identify restricted use criteria (i.e., commercial/industrial use), five-year reviews are required in accordance with CERCLA 121(c) to assess whether the protectiveness of the remedy is maintained with regard to human health and the environment. In the case of an unrestricted clean-up, the contamination levels remaining, if any, are below levels that cause risk and, therefore, there is no requirement for five-year monitoring reviews.

6. **Comment:** (Commenter D); Commenter wanted USACE to clarify whether the property would be owned by the Borough or the Federal Government upon completion of Alternative 3 remediation.

Response: The current owner of record for this property is the U.S. Department of Energy (DOE). USACE will complete the remediation. The EPA and NJDEP will verify whether USACE has completed the remediation in accordance with this Record of Decision. The disposition of this property will then be managed in accordance with applicable federal laws and regulations, and it is impossible at this point to determine exactly what will happen to the property after the remedy is complete.

7. **Comment:** (Commenter D); Commenter wanted to clarify the time it would take to get through the GSA land transfer process.

Response: The amount of time to transfer the property is dependent upon the Federal, State, or Local interest in this particular Middlesex property.

8. **Comment:** (Commenter D); Commenter was interested in the timeframe to complete the remedial design.

Response: USACE anticipates the Record of Decision will be signed by the end of this fiscal year, which ends 30 September 2005. It is anticipated that one year would be required for completion of the Remedial Design and supporting documents necessary to initiate the remediation.

9. **Question:** (Commenter D); Commenter wanted to identify the transportation route of the materials to be excavated and disposed of off-site.

Response: The MSP site does not have a rail siding available to conduct a direct loadout into a railcar, or gondola, for shipment to the designated off-site disposal facility. It is anticipated that transportation of this material will be similar to that process used when the storage piles were removed in 1999 and 2000, i.e., load the material into lined trucks, transport those trucks to a transload facility which loads them onto rail cars, and finally transport the material to a permanent facility that can receive this type of material. The exact process to be incorporated for this remediation will be more diligently considered and reviewed during the remedial design process. USACE will conduct this loadout in the most expedient and cost-effective manner with the paramount consideration being human health and safety.

10. **Comment:** (Commenter D); Commenter wanted to verify whether the selection of Alternative 3 meant the property could only be developed as a residential property or whether it could have a non-residential use, if owned by the Borough.

Response: While Alternative 3 is described as Residential Use, it is meant to refer to the unrestricted use of the property once remediation is completed. In the case where the Borough may be interested in the property, the Borough would have to implement the plan that it submitted to the Sponsoring Federal Agency (as described in response to Comment 6) to acquire and use the property in accordance with the criteria of that Federal Sponsoring Agency. The property could be developed for any purpose in the case where GSA actually conducted a fair market value appraisal and auctioned the property to the public.

11. **Question:** (Commenter A); Commenter wanted to verify whether the trucking routes (and the transfer sites) would be made public. Commenter also requested the location of the transfer site.

Response: A Transportation Plan that will be made available to the public upon completion of the remedial design documents. A transfer site will be determined upon development of the remedial design document by the designated Remediation Contractor. In 1999 and 2000, during the pile removal, the transfer site was in Pennsylvania, although it is not likely to be an out-of-state location for this action.

12. **Comment:** (Commenter A); Commenter wanted to clarify whether it will be a minimum of two years before the site is remediated.

Response: The USACE cannot provide an exact date when the selected remedy is to be completed although it is anticipated that approximately one year will be required for remedial design and an additional year will be required for remediation should Congressional funding be provided accordingly. However, the USACE cannot initiate the selected remedy at the MSP site until the Record of Decision is approved.

13. **Comment:** (Commenter A); Commenter wanted to verify whether there would be any deed notices on the site upon completion of the remediation.

Response: USACE anticipates the remedy will be completed to comply with the criteria cited for Alternative 3. It is USACE's intent that at the completion of the Soils Operable Unit final remedy, deed notices will not be required. At this time, work on the Groundwater Operable Unit is ongoing.

14. **Comment:** (Commenter A); Commenter was interested in identifying the other contaminants, besides radionuclides, and their levels, that are present at the site.

Response: As identified in the PRAP and this Record of Decision, the following constituents are present on-site at levels above acceptable risk levels to human health and the environment: benzo(a)pyrene, benzo(a)anthracene, dibenzo(a,h)anthracene, benzo(b)fluoranthene, indeno(1,2,3-c,d)pyrene, and lead. The range of concentrations for each of these constituents and the risk assessment which evaluates all potential risks are available in *Soils Operable Unit Remedial Investigation Report for the FUSRAP Middlesex Sampling Plant Site*, dated May 2004. This document is available in the Administrative Record at the Middlesex Public Library.

15. **Comment:** (Commenter A); Commenter requested clarification of whether arsenic or trichloroethylene (TCE) were present at the site.

Response: While arsenic and TCE were found to be present in the soils of the MSP site, the risks from arsenic and TCE were within the acceptable risk range and do not require further remedial action.

16. **Comment:** (Commenter A); Commenter requested the status of the groundwater at the site and whether there would be any concerns regarding vapor intrusion into future structures at the site.

Response: The groundwater is being handled as a separate Operable Unit (OU) and is still in the CERCLA RI/FS stage for evaluation at the site. Concern over vapor intrusion will depend on the results of the Groundwater OU RI/FS. The radionuclide cleanup criteria already consider soil affects to groundwater.

17. **Comment:** (Commenter A); Commenter wanted to clarify the status of all off-site contamination.

Response: The DOE remediated the off-site properties and locations that may have had contamination associated with the MSP site. USACE is not aware of any other off-site contamination associated with this site.

18. **Comment:** (Commenter A); Commenter wanted to verify whether there was any concern about impact to the surface water surrounding the site.

Response: To date, the analytical results of the surface water sampling conducted during the semi-annual environmental surveillance events at the MSP site have not identified any migration or appreciable impact on the surface water surrounding the site. Environmental Surveillance Reports indicate that there are some elevated levels of Uranium (near the New Jersey Primary Drinking Water Standard of 30 micrograms per liter [µg/L]).

19. **Comment:** (Commenter A); Commenter requested a list of the constituents that were analyzed in the samples collected for the site.

Response: The Environmental Surveillance program includes sampling and analysis of external gamma radiation, radon gas, sediment, surface water, and groundwater. Samples are analyzed for volatile organic compounds, semi-volatile organic compounds, metals, radionuclides, and select inorganic parameters. Similar analyses were conducted during the Soils and Groundwater RI activities. The results of these analyses are presented in great detail in the *Soils Operable Unit Remedial Investigation Report for Middlesex Sampling Plant*, dated May 2004. The *Groundwater Operable Unit Remedial Investigation Report for Middlesex Sampling Plant*, dated May 2005, is currently available in the Groundwater OU Administrative Record file at the Middlesex Public Library. The Groundwater OU will go through a similar process for evaluation of alternatives and remedy selection. All future reports will be available in the Groundwater OU Administrative Record file for this site.

20. **Comment:** (Commenter A); Commenter wanted USACE to clarify the number of monitoring wells on-site and whether the Environmental Surveillance program is continuous.

Response: There are currently a total of 24 shallow (overburden) and 7 deeper (bedrock) monitoring wells on-site. Seven of the shallow (overburden) wells and 3 of the deeper (bedrock) wells are included in the Environmental Surveillance program. The Environmental Surveillance sampling activities have been conducted on a quarterly or semi-annual basis since 1983.

21. **Comment:** (Commenter A); Commenter wondered whether a health assessment was conducted at this site.

Response: The U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR) completed the *Public Health Assessment (PHA) for the Middlesex Sampling Plant* in December 2001. ATSDR determined that no public health hazard is associated with either the surface water/sediment or groundwater pathways, and that as long as the site was inactive, no exposure to radionuclide-contaminated soil was occurring. A meeting regarding ATSDR's PHA occurred in 2002; however, nothing from the MSP was found to be causing any public health concerns. In addition, USACE conducted a Baseline Human Health Risk Assessment and Ecological Risk Assessment for this site. These findings are being addressed in the currently available CERCLA documentation for both the Soils and Groundwater operable units.

22. **Comment:** (Commenter A); Commenter wanted to clarify whether there would be any attempt to recover costs of remediation through the sale of the property.

Response: The process for future use and sale of the property would be as described earlier in Comment #6.

23. **Comment** (Commenter E); The Commenter wanted to clarify whether the hot spot for lead will be remediated even though the rest of the lead is an average of 79 parts per million.

Response: The area identified with a high level of lead is commingled with the radionuclide contaminants and will be remediated concurrently.

24. **Comment:** (Commenter E); Commenter wanted clarification between surface soil and subsurface soil.

Response: Surface soil is defined by NJDEP as 0 to 2 feet below ground surface. Anything below 2 feet is subsurface soils.

25. **Comment:** (Commenter E); The Commenter wanted to clarify whether any of the borings were drilled to bedrock.

Response: All soil boring sample locations were installed until top of bedrock was reached or until the formation refused to allow the tool or rig to go any deeper.

26. **Comment:** (Commenter E); Commenter requested clarification of migratory groundwater.

Response: USACE understands this comment to refer to the migration of contaminants by groundwater. This refers to the potential mobility of the contamination to move away from the MSP site.

27. **Comment:** (Commenter E); The Commenter wanted to verify whether any soil borings were free of contamination.

Response: Continuous sampling of the soils in each boring was conducted to the top of bedrock. In some cases, no contamination was identified above the cleanup levels, and in others contamination above the clean up levels was identified.

28. **Comment:** (Commenter E); Commenter wanted to clarify whether samples were collected from adjoining properties.

Response: Samples were collected from surrounding properties in the past. Any contamination identified on those properties was removed. However, USACE may excavate into adjoining properties as a result of side-slope cut backs needed to create a safe excavation. If during the remedial effort additional contamination is found laterally, we will continue to remove or "chase" the contamination, although it is not anticipated at this time.

29. **Comment:** (Commenter B); Commenter identified that incineration of contaminated soils and re-use of those incinerated soils was implemented at the Union Carbide site. Commenter wanted to clarify that USACE considered that technology for the MSP.

Response: USACE considered many technologies during the feasibility study process. Incineration is not an effective technology for remediation of radionuclides or the metals. Thermal processes, such as incineration, are a special class of treatment technologies. Incineration uses high temperatures to destroy organic materials. This process was removed from further consideration at MSP because site conditions are not optimal for proper operation of the technology. All technologies considered for implementation at the MSP site are listed in *the Soils Operable Unit Feasibility Study for Middlesex Sampling Plant Site*, dated March 2005.

30. **Comment:** (Commenter E); Commenter requested clarification of the data in Table 3, Contaminants of Concern, where the concentrations of constituents are identified as "e+01" and "e-01".

Response: This is meant to reference scientific notation, where 10E+01 indicates a value of 10, while a 10E-01 indicates a value of 0.1.

31. **Comment:** (Commenter E); Commenter wanted to verify whether the currently capped areas would require capping after remediation is complete.

Response: Effective implementation of the remedy proposed in Alternative 3 would eliminate the contamination source and therefore, the need for a cap to interrupt the exposure would not be necessary.

32. **Comment:** (Commenter F); Commenter wanted to clarify whether the preferred alternative could be changed from Alternative 3.

Response: USACE has selected the preferred alternative after evaluation of the nine criteria identified within the NCP. Two of the nine criteria are State and community acceptance. The Preferred Alternative presented in the Proposed Remedial Action Plan could change in response to public comment or new information. Public input is the last and most important evaluation criterion and can sway, modify, or cause final decisions to be changed or postponed. Comments from the public were given every consideration and the USACE and USEPA could have changed or modified the Preferred Alternative based on new information or public comments. In this case, however, there was not any opposition to the selection of Alternative 3.

33. **Comment:** (Commenter F); Commenter wanted to verify whether funds are available to implement Alternative 3.

Response: As discussed in the Response to Question 3, Congress has annually appropriated funds for FUSRAP cleanups. FUSRAP has been funded at a steady level since the USACE assumed control of the project. As with any federal project, however, the work does remain subject to the availability of funds.

34. **Comment:** (Commenter F); Commenter noted that Alternative 4 requires monitoring and Alternative 3 does not, with only a 4,300 cubic yards soil excavation difference.

Response: See Response to Comment # 5. The actual difference in soil volumes between Alternatives 3 and 4 is 5,700 cubic yards. This difference in soil excavation volumes is attributed to the distribution of contamination throughout the site. Implementation of Alternative 4, excavation to the commercial cleanup criteria, will leave contaminated material behind, which will require continued monitoring at the site. Implementation of Alternative 3, excavation to the residential cleanup criteria, will remove material down to a level that is at or slightly above background.

35. **Question:** (Commenter E); Commenter asked whether any dewatering activities would be anticipated during remediation.

Response: The need for dewatering activities will be further investigated and developed during the remedial design phase.

36. **Question:** (Commenter A); Commenter requested clarification on the average depth of the excavation.

Response: Excavation of the contaminated soils will likely occur from the surface to top of bedrock. It is anticipated that the average depth of the excavation will be between 6 to 8 feet below ground surface, although the top of bedrock varies from 5 to 11 feet across the site.

37. **Comment:** (Commenter A); Commenter requested clarification on whether the bedrock is fractured.

Response: Bedrock beneath the site has been identified to be fractured, although it is competent.

38. **Comment:** (Commenter A); Commenter asked whether there is a perched groundwater layer.

Response: A perched water table has not been identified beneath MSP.

39. **Comment:** (Commenter A); Commenter requested identification of the landfill.

Response: USACE has not selected a waste disposal facility/landfill for the MSP wastes. The USACE has a number of existing waste disposal contracts under which it has disposed of waste similar to that found at MSP. The National Contingency Plan requires that any disposal facility receiving shipments of waste from a CERCLA cleanup be evaluated for compliance with its licenses, permits, and all applicable laws and regulations. The USACE coordinates with a disposal facility's regulating agency to assure that the facility is in good standing with the regulator. In addition, the federal government is mandated to obtain services and products on the basis of full and open competition, to the maximum extent possible. Compliance with federal acquisition regulations will assure that the USACE obtains an economical price for disposal of the waste. USACE would ensure the waste acceptance criteria of the facility would allow it to receive the materials that would be excavated from MSP. The remedial design will be developed after the ROD is signed to determine the specific requirements for proper off-site disposal of these materials.

40. **Comment:** (Commenter A); Commenter wanted to verify the volume of contaminated material removed during sampling.

Response: Minimal volumes of soil were actually removed from the site for analyses by an off-site laboratory. The precise volume of soil removed at each sample location varied depending on the purpose of the samples. The majority of soil disturbed during the field sampling activities has been containerized in 55-gallon drums that are currently being stored on-site until the soils can be properly disposed of during remediation activities.

41. **Comment:** (Commenter A); Commenter was interested in reviewing the Health and Safety Plan for the site.

Response: The current Health and Safety Plans for the site are intended to protect the employees that may perform activities on this Superfund site, in accordance with the Federal Occupational Safety and Health Administration Hazardous Waste Site Opearations guidelines, while the contaminants are still present at the site. As the activities at the site change from surveillance to active remediation, these plans will be updated to incorporate the health and safety issues associated with the new activities. The existing Health and Safety Plans are available in the Information Repository for the site at the Middlesex Public Library.

Table 1
Middlesex Sampling Plant
Summary of Chemicals of Concern and
Medium-Specific Exposure Point Concentrations – Surface Soil

Scenario Timeframe:		**Current**						
Medium:		**Soil - Surface/subsurface**						
Exposure Medium:		**Soil**						
Exposure Point	**Chemical of Concern**	**Concentration Detected**		**Units**	**Frequency of Detection**	**Exposure Point Concentration**	**Exposure Point Concentration Units**	**Statistical Measure**
		Min	**Max**					
SURFACE SOILS								
	Benzo(a)anthracene	0.039	50	mg/kg	24/46	7.1	mg/kg	95% UCL
	Benzo(a)pyrene	0.04	60	mg/kg	26/46	8.4	mg/kg	95% UCL
	Benzo(b)fluoranthene	0.11	90	mg/kg	22/46	14	mg/kg	95% UCL
	Dibenzo(a,h)anthracene	0.21	8.05	mg/kg	7/46	1.4	mg/kg	95% UCL
	Indeno(1,2,3-cd)pyrene	0.069	40	mg/kg	21/46	6	mg/kg	95% UCL
	Lead (Note 1)	2	64900	mg/kg	46/46	3800	mg/kg	95% UCL
	Radium-226	0.314	158	pCi/g	46/46	17	pCi/g	95% UCL
	Thorium-230	0.911	198	pCi/g	46/46	34	pCi/g	95% UCL
	Uranium-234	0.593	147	pCi/g	44/46	26	pCi/g	95% UCL
	Uranium-235 (Note 2)	0.153	7.75	pCi/g	21/46	1.4	pCi/g	95% UCL
	Uranium-238 (Note 3)	0.243	148	pCi/g	45/46	28	pCi/g	95% UCL

Table 1 (con't)
Summary of Chemicals of Concern and
Medium-Specific Exposure Point Concentrations – Subsurface Soil
Middlesex Sampling Plant Soils Operable Unit

Scenario Timeframe:		**Current**							
Medium:		**Soil - Surface/subsurface**							
Exposure Medium:		**Soil**							
Exposure Point	**Chemical of Concern**	**Concentration Detected**		**Units**	**Frequency of Detection**	**Exposure Point Concentration**	**Exposure Point Concentration Units**	**Statistical Measure**
		Min	**Max**					
SUBSURFACE SOILS								
	Benzo(a)anthracene	0.05	24	mg/kg	26/55	4.6	mg/kg	95% UCL
	Benzo(a)pyrene	0.038	40	mg/kg	26/55	6.1	mg/kg	95% UCL
	Benzo(b)fluoranthene	0.073	50.9	mg/kg	23/55	9	mg/kg	95% UCL
	Dibenzo(a,h)anthracene	0.14	9	mg/kg	10/55	1.2	mg/kg	95% UCL
	Indeno(1,2,3-cd)pyrene	0.072	22	mg/kg	20/55	3.8	mg/kg	95% UCL
	Lead (Note 1)	8.5	604	mg/kg	55/55	69	mg/kg	95% UCL
	Radium-226	0.422	222	pCi/g	55/55	23	pCi/g	95% UCL
	Thorium-230	0.799	351	pCi/g	55/55	30	pCi/g	95% UCL
	Uranium-234	0.423	401	pCi/g	55/55	21	pCi/g	95% UCL
	Uranium-235 (Note 2)	0.14	16.2	pCi/g	18/55	1.7	pCi/g	95% UCL
	Uranium-238 (Note 3)	0.502	399	pCi/g	54/55	35	pCi/g	95% UCL

NOTES:

1 Lead is included as a COC due to one exceedance at 64,900 mg/kg.
2 Pa-231 and Ac-227 are included as part of the U-235 chain (actinium chain).
3 Pb-210 is included as part of the U-238 chain (uranium chain).
4 UCL = Upper Confidence Limit
5 mg/kg = milligrams per kilogram
6 pCi/g = picocuries per gram

Table 2A
Toxicity Data Summary
Middlesex Sampling Plant Soils Operable Unit

Pathway:						
Chemical of Concern	**Oral Cancer Slope Factor**	**Dermal Cancer Slope Factor**	**Slope Factor Units**	**Weight of Evidence/Cancer Guideline Description**	**Source**	**Date (Year)**
Benzo(a)anthracene	0.73	0.73	(mg/kg-day)-1	B2 - Probable human carcinogen	EPA - NCEA provisional value	1999
Benzo(a)pyrene	7.3	7.3	(mg/kg-day)-1	B2 - Probable human carcinogen	IRIS	1994
Benzo(b)fluoranthene	0.73	0.73	(mg/kg-day)-1	B2 - Probable human carcinogen	EPA - NCEA provisional value	1993
Dibenzo(a,h)anthracene	7.3	7.3	(mg/kg-day)-1	B2 - Probable human carcinogen	EPA - NCEA provisional value	1993
Indeno(1,2,3-cd)pyrene	0.73	0.73	(mg/kg-day)-1	B2 - Probable human carcinogen	EPA - NCEA provisional value	1993
Lead	NA	NA	NA	NA	NA	NA
Radionuclide of Concern	**Ingestion Cancer Slope Factor**	**Inhalation Cancer Slope Factor**	**Slope Factor Units**	**Weight of Evidence/Cancer Guideline Description**	**Source**	**Date (Year)**
Radium-226	3.4E-09	2.5E-08	Risk/pCi	A - Human Carcinogen	FGR 13	1999
Thorium-230	2.0E-10	2.9E-08	Risk/pCi	A - Human Carcinogen	FGR 13	1999
Uranium-234	1.6E-10	1.1E-08	Risk/pCi	A - Human Carcinogen	FGR 13	1999
Uranium-235	1.6E-09	2.3E-07	Risk/pCi	A - Human Carcinogen	FGR 13	1999
Uranium-238	2.1E-10	9.4E-09	Risk/pCi	A - Human Carcinogen	FGR 13	1999

FGR 13 - EPA Federal Guidance Report 13 - Cancer Risk Coefficients for Environmental Exposure to Radionuclides
Note: Since the HI values for the COCs are less than one non-carcinogenic and not listed in this ROD.

Table 2B
Risk Characterization Summary
Middlesex Sampling Plant Soils Operable Unit

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Combined adult-child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External Radiation	Exposure Routes Total
Surface Soil	Soil	On-site Direct Contact	Benzo(a)anthracene	8.1E-06	N/A	3.3E-06	-	1.1E-05
			Benzo(a)pyrene	9.6E-05	N/A	3.9E-05	-	1.4E-04
			Benzo(b)fluoranthene	1.5E-05	N/A	6.3E-06	-	2.1E-05
			Dibenzo(a,h)anthracene	1.6E-05	N/A	6.5E-06	-	2.3E-05
			Indeno(1,2,3-cd)pyrene	6.8E-06	N/A	2.8E-06	-	9.6E-06
			Radium-226	7.0E-05	N/A	-	1.4E-03	1.5E-03
			Thorium-230	8.5E-06	N/A	-	2.7E-07	8.8E-06
			Uranium-234	4.9E-06	N/A	-	6.2E-08	5.0E-06
			Uranium-235	2.7E-06	N/A	-	2.4E-05	2.7E-05
			Uranium-238	7.3E-06	N/A	-	2.3E-05	3.0E-05
	Dust	On-site Inhalation of Soil as Dust	Benzo(a)anthracene	N/A	2.5E-10	N/A	-	2.5E-10
			Benzo(a)pyrene	N/A	3.0E-09	N/A	-	3.0E-09
			Benzo(b)fluoranthene	N/A	4.8E-10	N/A	-	4.8E-10
			Dibenzo(a,h)anthracene	N/A	4.9E-10	N/A	-	4.9E-10
			Indeno(1,2,3-cd)pyrene	N/A	2.1E-10	N/A	-	2.1E-10
			Radium-226	N/A	6.0E-10	N/A	N/A	6.0E-10
			Thorium-230	N/A	1.4E-07	N/A	N/A	1.4E-07
			Uranium-234	N/A	4.0E-08	N/A	N/A	4.0E-08
			Uranium-235	N/A	4.6E-08	N/A	N/A	4.6E-08
							Total Cancer Risk	**1.75E-03**

- : Toxicity criteria not available to evaluate this route of exposure
N/A : Route of exposure is not applicable to this medium
Note: Since the HI values for the COCs are less than one non-carcinogenic and not listed in this ROD.

Table 3
Costs of Alternatives and Restoration Times

Alternative	Restoration Time (months)	Total, Capital and Present Worth of Operation and Maintenance (O&M) (Million $)
1	NA	NA
2	24	0.7
3	11.4	15.9
4	10.1	13.4

Table 4
Selected Remedy – Cost Estimate
Middlesex Sampling Plant

Item	Quantity	Unit Cost	Units	Capital Cost
Site Preparation/Demolition	1	$ 19,000.00	ls	$ 19,000
Soil Excavation/Loading	59,317	$ 6.00	yd^3	$ 356,000
Water Handling	6544	$ 19.00	kgals	$ 124,000
Water Disposal	6,543,609	$ 0.25	gal	$ 1,636,000
Backfilling and Compaction	71,716	$ 14.00	cy	$ 1,004,000
Septic Tank Demolition	165	$ 80.50	cy	$ 13,000
Construction Subtotal				**$ 3,152,000**
General Conditions				
Mobilization/Demobilization	5%		ls	$ 158,000
Temporary Facilities	2%		ls	$ 63,000
Construction Management	10%		ls	$ 315,000
Insurance, Permits, Taxes, etc.	1%		ls	$ 32,000
Construction Total				**$ 3,720,000**
Professional Labor				
Heath and Safety	5%		ls	$ 186,000
Program Support	6%		ls	$ 223,000
Engineering	9%		ls	$ 335,000
Project Subtotal				**$ 4,464,000**
Contingency	20%			$ 893,000
Project Total				**$ 5,357,000**
Transportation and Disposal				
- Disposal (Radionuclide-impacted)	37,029	$ 195.00	cy	$ 7,221,000
- Disposal (Chemical-impacted)	34,852	$ 95.00	cy	$ 3,311,000
Total Present Worth Cost				**$ 15,889,000**

Units:
ls = lump sum
cy = cubic yard
kgals = 1000 gallons
gal = gallons

Table 5
Summary of the Remediation Goals
for the Residential Cleanup of the COCs
Middlesex Sampling Plant

Contaminant of Concern	Remediation Goal	Basis
Radium-226	5 pCi/g	15 mrem/yr dose
benzo(a)pyrene	0.66 mg/kg	PQL (1 x 10^{-5} risk)
benzo(a)anthracene	0.90 mg/kg	1 x 10^{-6} risk
dibenzo(a,h)anthracene	0.66 mg/kg	PQL (1 x 10^{-5} risk)
benzo(b)fluoranthene	0.90 mg/kg	1 x 10^{-6} risk
indeno(1,2,3-c,d)pyrene	0.90 mg/kg	1 x 10^{-6} risk
Lead	400 mg/kg	1 x 10^{-6} risk

Table 6
Summary of ARARs
Middlesex Sampling Plant

Regulation/Requirement	Status for This Project
NJDEP: N.J.A.C. 7:28; Radiation Protection Programs (Substantive requirements appear in N.J.A.C. 7:28-12.8(a)(1) and (2), “Radiation dose standards.”)	ARAR
• N.J.A.C. 7:26; New Jersey Solid and Hazardous Waste Rules (not promulgated)	Chemical Specific TBC

Table 7
Detailed Evaluation of Alternatives
Middlesex Sampling Plant

Criteria	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Excavation for Residential Use and Disposal	Alternative 4 Excavation for Commercial/Industrial Use and Disposal
Overall Protectiveness of Human Health and the Environment				
Human Health Protection	Not protective. Exposure to contaminants likely to increase because existing controls would not be maintained and general public awareness would deteriorate over time.	Monitoring and institutional controls provide protection, assuming controls would be maintained. However, upon the loss of controls, this would not be protective.	Protective. All material exceeding cleanup criteria will be removed and disposed off-site. Future use of site will be residential. Potential risk due to remedial activities and off-site migration of contamination would be mitigated using engineering controls.	Same as Alternative 3, except restrictions and 5-year review would be used under commercial/industrial use for equivalent protection.
Environmental Protection	Not protective. Potential exposure to ecological receptors due to institutional controls not being maintained.	Not protective. Potential exposure to ecological receptors regardless of whether or not institutional controls are maintained.	Protective. All material exceeding criteria is removed from site, and site is backfilled with imported material. No further contaminants released to the environment.	Same as Alternative 3, except restrictions and 5-year review would be used under commercial/industrial use for equivalent protection.
Compliance with ARARS				
Federal, State, or Facility ARARs	Not compliant with ARARs or RAOs, as no remedial activity would be performed.	Not compliant with chemical ARAR and no way to ensure compliance with radiological ARAR.	Action would comply with residential future use ARARs.	Action would comply with commercial/industrial future use ARARs.
Long-Term Effectiveness and Permanence				
Magnitude of Residual Risk	Current and potential future risk and dose would remain.	If institutional control of the site maintained, then risk to public and workers would be low. However, current and potential future risks and doses remain.	Residual risk is low. Site released for unrestricted future use. Contaminants will be removed to below ARARs, including 15 mrem/yr dose.	Same as Alternative 3, except site would be released for restricted use.

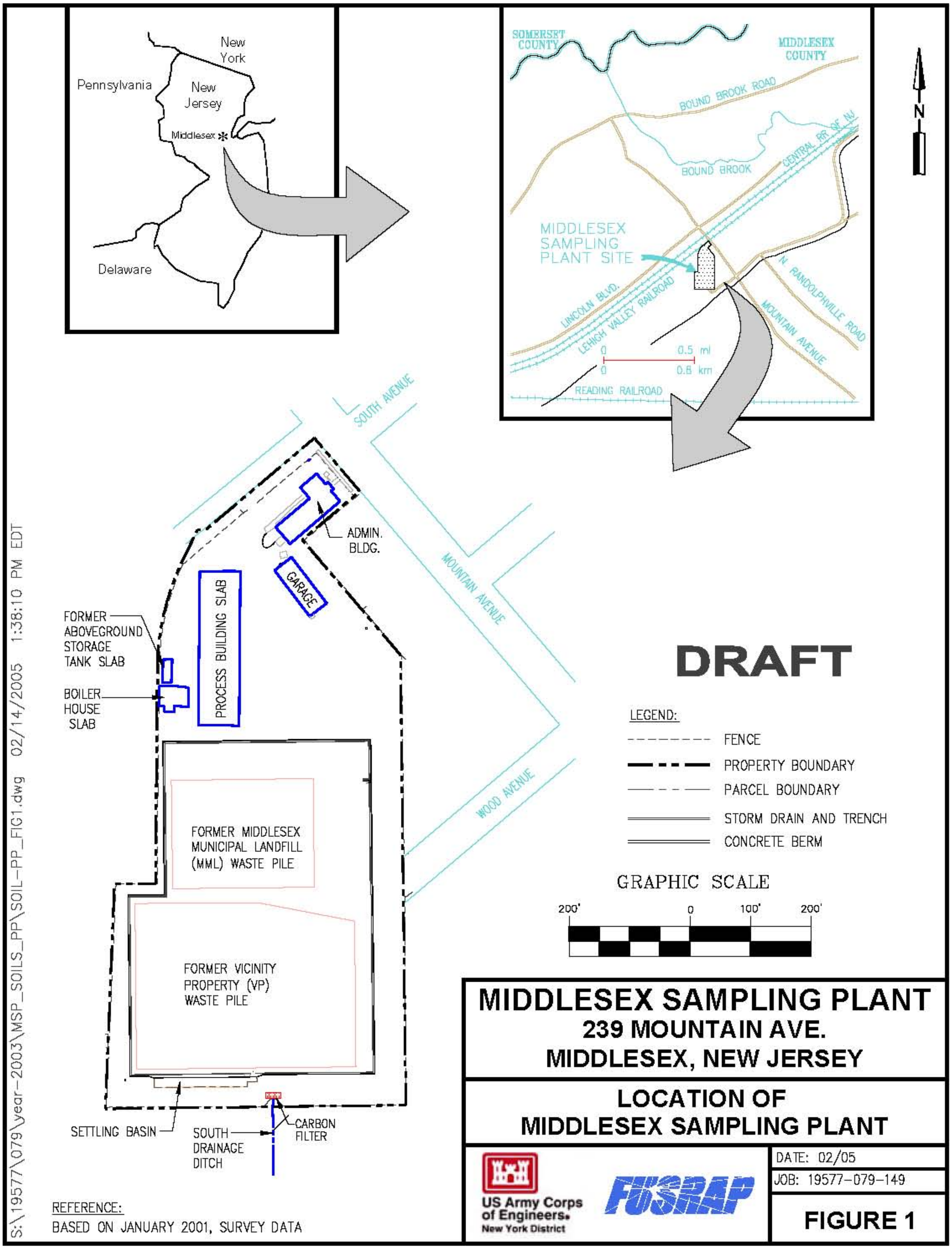
Table 7 (cont.)
Detailed Evaluation of Alternatives
Middlesex Sampling Plant

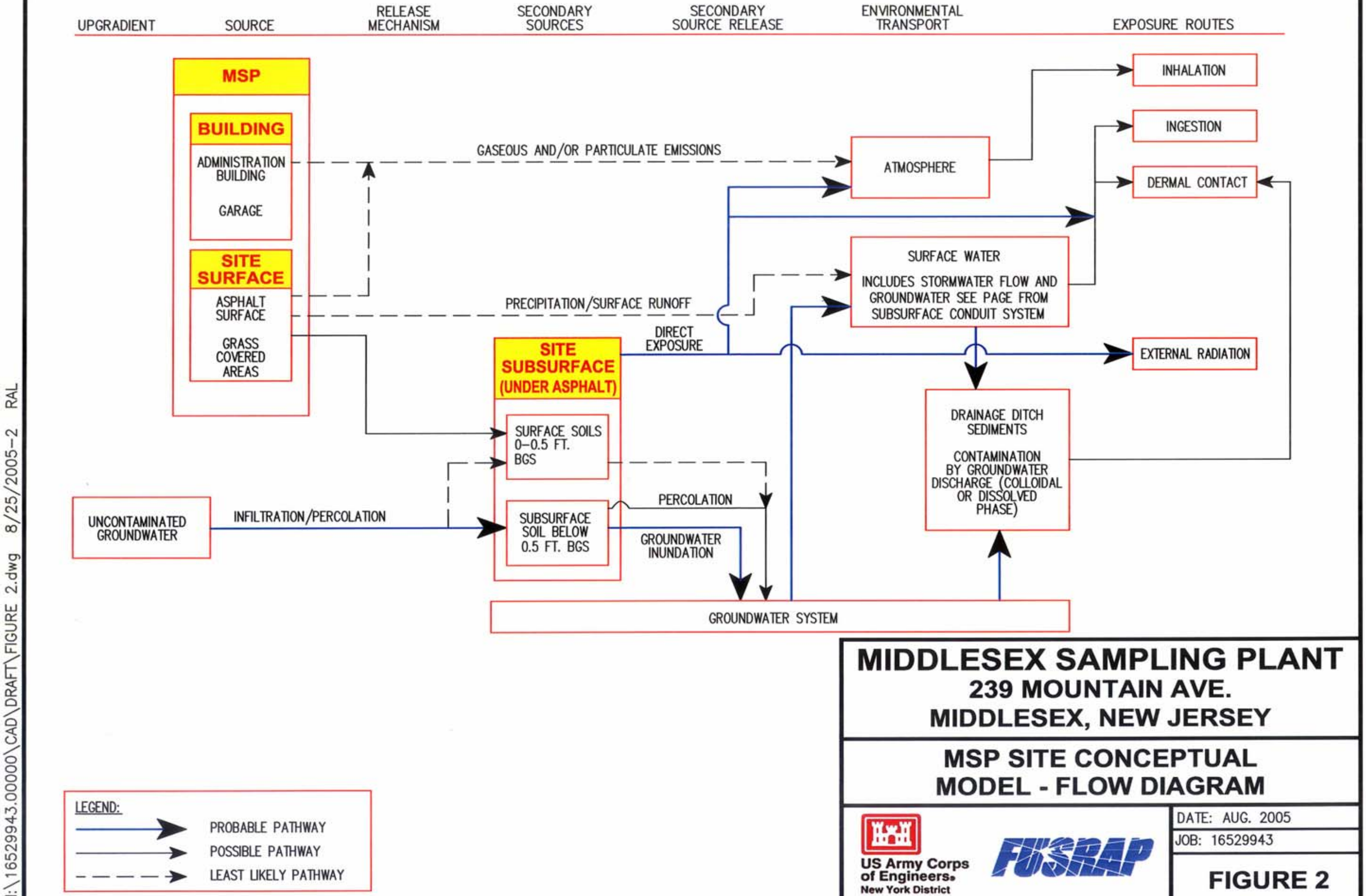
Adequacy and Reliability of Controls	No controls over remaining contamination would be provided.	Controls should be adequate and reliable in limiting site access. However, failure of controls would result in unacceptable risk and noncompliance with radiological ARAR.	Remedy is permanent and responsibility ultimately placed on disposal facility. Not dependent upon controls of any kind, so adequacy and reliability not an issue.	Same as Alternative 3, except certain controls would be necessary that would be considered adequate and reliable.
Short-Term Effectiveness				
Short-Term Risks to Community	No additional risk to community, however, because no action would take place there would be no short-term effectiveness.	No increased risk to community. Immediately effective in controlling site access and use.	Risk to community would be low. Implementation of engineering controls and safety protocols during soil excavation and transport of materials would minimize risk and exposure.	Identical to Alternative 3.
Impacts on Workers	Not applicable.	Potential impacts on workers installing restrictions and performing monitoring would exist, but would be very low and measures would be taken to mitigate.	Exposure risk to workers during excavation would be mitigated through safety protocols.	Identical to Alternative 3.
Time Until Protection is Achieved[1]	Protection is never achieved.	Immediate, however, insurance of future protection is not achievable.	11 months for full protection, but protective controls in place throughout remedial activities.	10 months for full protection, but protective controls in place throughout remedial activities.
Environmental Impacts	No additional impacts but contaminated soils remain, thus future impacts to groundwater and surface water are possible. Significant impacts on future reuse of property. Does not meet RAOs.	No additional direct impacts, but soils remain contaminated. Therefore, future impacts to groundwater and surface water are possible. Significant impacts on future reuse of property. Does not meet end-use objectives.	Future impacts to groundwater are minimized since contamination has been removed to ARARs. Potential short-term impacts on groundwater, soil, air quality, biota, and noise levels mitigated using engineering controls, air monitoring, and appropriate health and safety measures. However, considered effective in short-term and meets end-use objective (i.e., no restrictions on future use).	Identical to Alternative 3.

[1] Defines time to implement remedial action (after completion of remedial design). Actual time to implement may vary due to funding constraints. Funding may fluctuate because USACE funding is appropriated annually be Congress.

Table 7 (cont.)
Detailed Evaluation of Alternatives
Middlesex Sampling Plant

Reduction of Toxicity, Mobility, or Volume Through Treatment				
Treatment or Recycling Process Used	None.	None.	None.	None.
Amount of Contamination Destroyed, Treated, or Recycled	None	None.	None.	None.
Degree of Reduction in Toxicity, Mobility, or Volume	None.	None.	Although not through treatment, volume of waste at site is immediately and significantly reduced.	Identical to Alternative 3.
Type and Quantity of Residuals Remaining After Treatment	Treatment not applicable, but all initial contamination would remain.	Treatment not applicable, but all initial contamination would remain.	Treatment not applicable, but only residual contamination below ARARs would remain.	Identical to Alternative 3.
Implementability				
Technical Feasibility	Easily implementable	Procedure for institutional controls is well known; implementable.	Excavation is a well-known, reliable, and readily implementable, remedial method.	Identical to Alternative 3.
Administrative Feasibility	Governing agency would likely prefer removal actions, thus it could be difficult and time consuming to approve.	Governing agency would likely prefer removal actions. Leaving waste on-site is generally not a preferred option.	Feasible.	Similar to Alternative 3, except approval and permits to release site with restrictions could have impact.
Availability of Services and Materials	None required.	None required.	Equipment, materials, trades and disposal facilities are readily available.	Identical to Alternative 3.
Cost				
NPV of Capital and O&M	None, beyond 5-year review, which is insignificant.	$0.7 million	$15.9 million	$13.4 million


New York
Pennsylvania
New Jersey
Middlesex
Delaware
SOMERSET COUNTY
MIDDLESEX COUNTY
BOUND BROOK ROAD
BOUND BROOK
CENTRAL RR OF NJ
MIDDLESEX SAMPLING PLANT SITE
LINCOLN BLVD.
LEHIGH VALLEY RAILROAD
N. RANDOLPHVILLE ROAD
MOUNTAIN AVENUE
0 0.5 mi
0 0.8 km
READING RAILROAD
N
SOUTH AVENUE
ADMIN. BLDG.
GARAGE
MOUNTAIN AVENUE
FORMER ABOVEGROUND STORAGE TANK SLAB
BOILER HOUSE SLAB
PROCESS BUILDING SLAB
DRAFT
LEGEND:
FENCE
PROPERTY BOUNDARY
PARCEL BOUNDARY
STORM DRAIN AND TRENCH
CONCRETE BERM
WOOD AVENUE
FORMER MIDDLESEX MUNICIPAL LANDFILL (MML) WASTE PILE
GRAPHIC SCALE
200' 0 100' 200'
FORMER VICINITY PROPERTY (VP) WASTE PILE
SETTLING BASIN
SOUTH DRAINAGE DITCH
CARBON FILTER
MIDDLESEX SAMPLING PLANT
239 MOUNTAIN AVE.
MIDDLESEX, NEW JERSEY
LOCATION OF MIDDLESEX SAMPLING PLANT
US Army Corps of Engineers. New York District
FUSRAP
DATE: 02/05
JOB: 19577-079-149
FIGURE 1
REFERENCE:
BASED ON JANUARY 2001, SURVEY DATA
S:\19577\079\year-2003\MSP_SOILS_PP\SOIL-PP_FIG1.dwg 02/14/2005 1:38:10 PM EDT



MIDDLESEX SAMPLING PLANT
239 MOUNTAIN AVE.
MIDDLESEX, NEW JERSEY

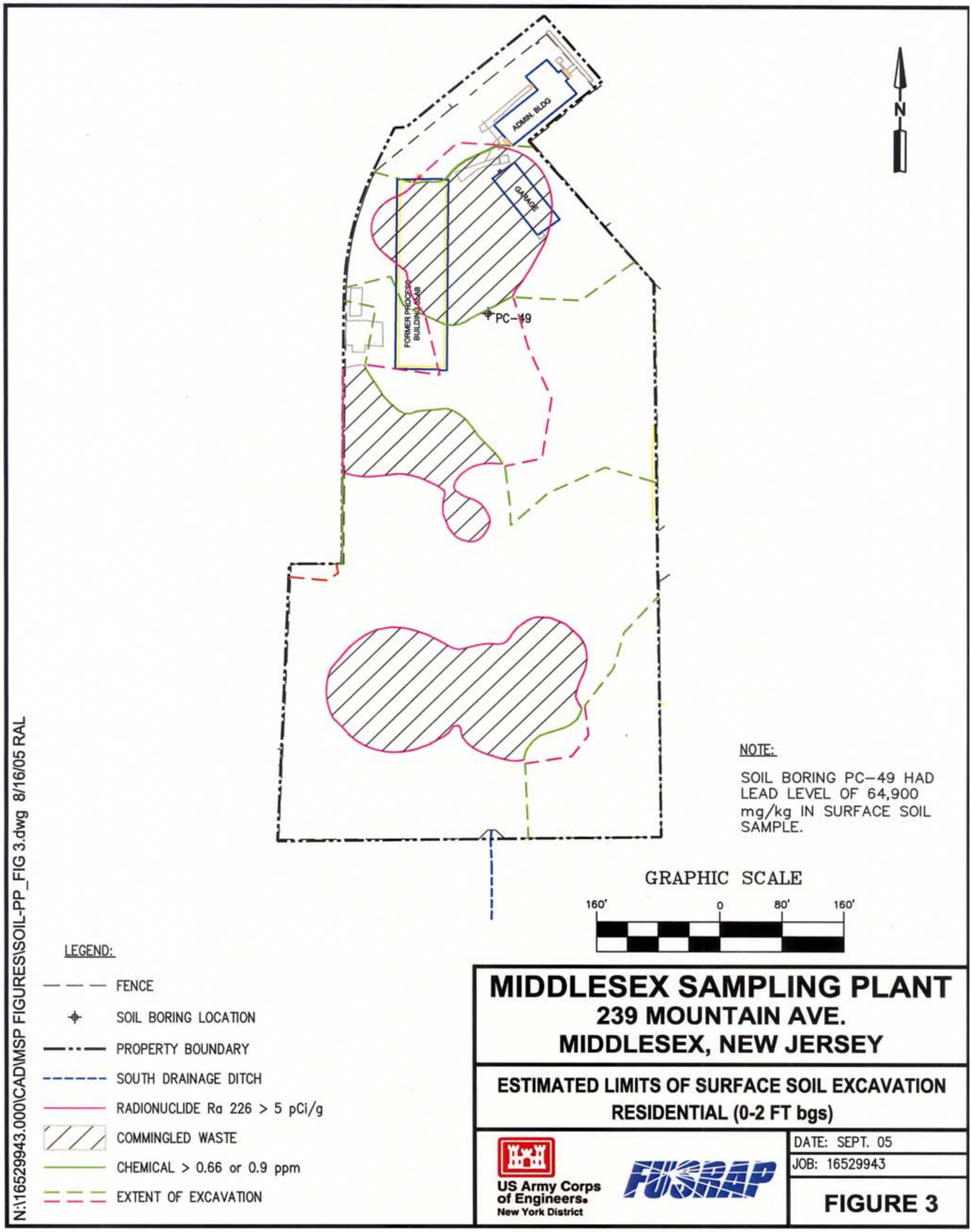
MSP SITE CONCEPTUAL MODEL - FLOW DIAGRAM

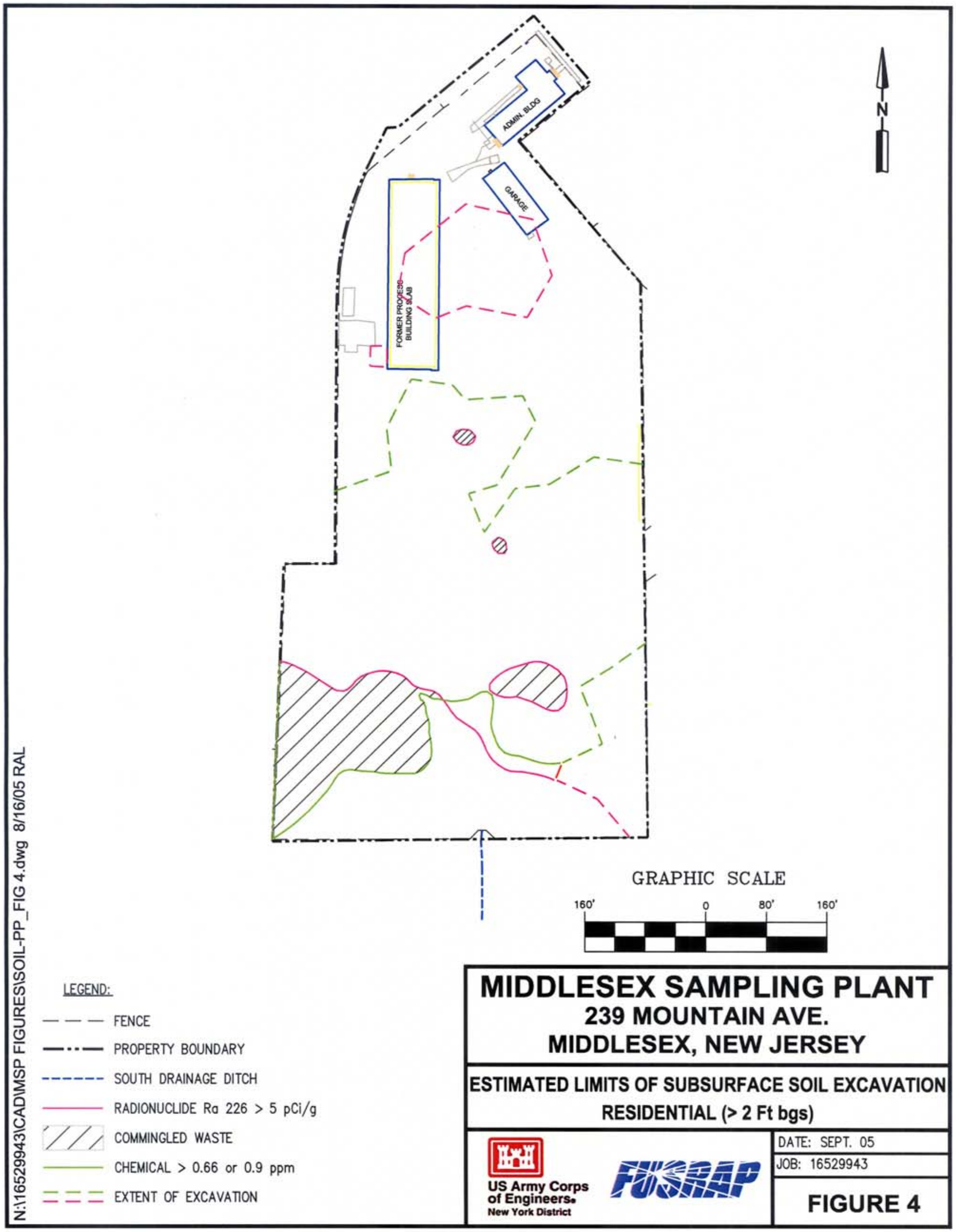
US Army Corps of Engineers®
New York District

FUSRAP

DATE: AUG. 2005
JOB: 16529943

FIGURE 2


ADMIN. BLDG
GARAGE
FORMER PROCESS BUILDING SLAB
PC-49
N
NOTE:
SOIL BORING PC-49 HAD LEAD LEVEL OF 64,900 mg/kg IN SURFACE SOIL SAMPLE.
GRAPHIC SCALE
160' 0 80' 160'
LEGEND:
FENCE
SOIL BORING LOCATION
PROPERTY BOUNDARY
SOUTH DRAINAGE DITCH
RADIONUCLIDE Ra 226 > 5 pCi/g
COMMINGLED WASTE
CHEMICAL > 0.66 or 0.9 ppm
EXTENT OF EXCAVATION
MIDDLESEX SAMPLING PLANT
239 MOUNTAIN AVE.
MIDDLESEX, NEW JERSEY
ESTIMATED LIMITS OF SURFACE SOIL EXCAVATION
RESIDENTIAL (0-2 FT bgs)
US Army Corps of Engineers
New York District
FUSRAP
DATE: SEPT. 05
JOB: 16529943
FIGURE 3
N:\16529943.000\CAD\MSP FIGURES\SOIL-PP_FIG 3.dwg 8/16/05 RAL



N
ADMIN. BLDG
GARAGE
FORMER PROCESS BUILDING SLAB
GRAPHIC SCALE
160'
0
80'
160'
LEGEND:
FENCE
PROPERTY BOUNDARY
SOUTH DRAINAGE DITCH
RADIONUCLIDE Ra 226 > 5 pCi/g
COMMINGLED WASTE
CHEMICAL > 0.66 or 0.9 ppm
EXTENT OF EXCAVATION
MIDDLESEX SAMPLING PLANT
239 MOUNTAIN AVE.
MIDDLESEX, NEW JERSEY
ESTIMATED LIMITS OF SUBSURFACE SOIL EXCAVATION
RESIDENTIAL (> 2 Ft bgs)
DATE: SEPT. 05
JOB: 16529943
US Army Corps of Engineers
New York District
FUSRAP
FIGURE 4
N:\16529943\CAD\MSP FIGURES\SOIL-PP_FIG 4.dwg 8/16/05 RAL

Figure 5
MSP, Surrounding Land and Land Uses