EM *U.S. Department of Energy*
Office of Environmental Management

Land Areas Engineering Evaluation/Cost Analysis for the Separations Process Research Unit (SPRU) Disposition Project

December 2006

Prepared for
U.S. Department of Energy
Environmental Management
SPRU Project Office

Prepared by
Environmental Resource Group, LLC

Contract Number: DE-AM09-03SR22289
Task Number: DE-AT09-03SR22377

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ACRONYMS AND GLOSSARY

ACRONYMS

ARAR	applicable or relevant and appropriate requirement
C-(six digit number)	correspondence reference
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical(s) of concern
DCGL	derived concentration guidance level
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EE/CA	Engineering Evaluation/Cost Estimate
EPA	U.S. Environmental Protection Agency
KAPL	Knolls Atomic Power Laboratory
LL	Lower Level (land area)
Naval Reactors	DOE Office of Naval Reactors, Schenectady Naval Reactors
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NF	North Field (land area)
NFA	No Further Action
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PUREX	plutonium uranium extraction
R-(six digit number)	report reference
RAOs	removal action objectives
RCRA	Resource Conservation and Recovery Act
REDOX	reduction-oxidation
SHPO	State Historic Preservation Office
SPRU	Separations Process Research Unit
SWMU	solid waste management unit
TAGM	Technical and Administrative Guidance Memorandum
UL	Upper Level (land area)

GLOSSARY

alpha particle. A particle emitted from the nucleus of an atom that contains two protons and two neutrons.

aquiclude. A subsurface rock, soil, or sediment unit that does not yield useful quantities of water.

beta particle. A high-speed particle, identical to an electron, which is emitted from the nucleus of an atom.

contaminated soil. Soil that has been polluted either by radioactive substances or chemicals to levels that may affect human health or the environment.

Curie. A measure of radioactivity based on the observed decay rate of approximately 1 gram of radium. The Curie was named in honor of Pierre and Marie Curie, pioneers in the study of radiation. One Curie of radioactive material has 37 billion atomic transformations (disintegrations) in 1 second. It is defined as the number of nuclear transformations occurring per minute. One Curie = 2.22×10^{12} disintegrations per minute.

decontamination. The process of removing chemical, biological, or radiological contaminants from, or neutralizing the potential effect on persons, objects, or the environment by washing, chemical action, mechanical cleaning, or other techniques. Deactivation processes also may be used as part of the treatment and disposal of wastes generated during decontamination efforts.

EE/CA (engineering evaluation/cost analysis). A document required for non-time-critical removal actions. It provides a framework for evaluating and selecting an alternative for removing hazardous materials from buildings or land. The EE/CA identifies the objectives of the removal action and analyzes the effectiveness, implementability, and cost of various alternatives that may satisfy the objectives.

effluent. Treated or untreated liquid emitted from a manufacturing facility wastewater treatment plant, including storm drainage water and groundwater.

fission product. An isotope, usually radioactive, produced as a result of the fission of a massive atom such as U-235.

gamma radiation. Electromagnetic waves or photons (rays) emitted from the nucleus of an atom.

historical site assessment (HSA). A detailed investigation to collect and compile existing information, primarily historical, on a site and its surroundings.

half-life. The average time it takes for one-half of any given number of radioactive isotopes to decay. Half lives of isotopes range from small fractions of a second to more than a billion years.

hyperaccumulator. A plant species that is capable of uptaking metals, including radionuclides, from soil or water.

low-level radioactive waste. See *radioactive waste*.

non-time-critical removal action. An activity conducted when, based on a site evaluation, the removal of hazardous material from a building or land areas is appropriate, and a planning period of at least six months is available before on-site activities must begin.

nuclear facility. A building that contains residual radioactive contamination or radioactive materials. Buildings G2 and H2 are nuclear facilities.

phytoremediation. Various mechanisms by which living plants alter the chemical composition of the soil matrix in which they are growing and/or uptake chemical or radiological contamination. Essentially, it is the use of green plants to clean up contaminated soils, sediments, or water including organic solvents, heavy metals, pesticides, or radionuclides.

picoCurie. One one-trillionth (1/1,000,000,000,000) of a Curie.

PUREX. A plutonium and uranium extraction process using the solvent tributyl phosphate. SPRU was a pilot plant used to research the PUREX process.

radiation. Energy in the form of high-speed particles and electromagnetic waves. The large spectrum of radiation energy includes visible light, radio and television waves, ultraviolet, and microwaves. Electromagnetic waves do not cause ionization of atoms because they do not carry enough energy to separate molecules or remove electrons from atoms.

radioactive waste. For the purposes of this EE/CA, radioactive waste is any radioactively contaminated industrial or research waste such as soil, paper, rags, plastic bags, protective clothing, cardboard, packaging material, and water-treatment residues.

REDOX (reduction-oxidation). A chemical extraction process for separating uranium and plutonium from mixed fission products. SPRU was a pilot plant used to research the REDOX process.

Rem, Roentgen equivalent man. A unit for measuring the biological effects of radiation on the human body. Rem is the most commonly used unit for dose reporting. The Rem takes into account the absorbed dose and biological effects of different types of radiation. It is a measurement of biological dose equivalence. The unit applies to both internal and external doses.

shallow soil. For purposes of this EE/CA, shallow soil is considered to range from the ground surface to approximately four feet in depth.

staging area. Temporary storage area for waste prior to shipment off site.

surveillance and maintenance. Periodic inspections and maintenance of structures, systems, and equipment necessary for the satisfactory containment of contamination and for the protection of the public, workers, and the environment.

EXECUTIVE SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) evaluates alternatives for the disposition of soil and groundwater contamination in the U.S. Department of Energy (DOE) Separations Process Research Unit (SPRU) land areas within the Knolls Atomic Power Laboratory (KAPL) site in Niskayuna, New York. Portions of the SPRU land areas are not currently available for reuse because of radiological and/or chemical contamination. KAPL plans to continue using the site, including SPRU land areas, for Navy Nuclear Propulsion Program purposes indefinitely.

This EE/CA fulfills requirements documenting the removal action alternatives selection process in accordance with the *Policy on Decommissioning Department of Energy Facilities Under CERCLA* (DOE and EPA, 1995), *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, 1993), and the *Decommissioning Implementation Guide* (DOE, 1999).

Description of SPRU Land Areas

SPRU land areas addressed in this document consist of the following three areas and contaminants of concern:

- Upper Level – This land area includes soil and groundwater under Buildings G2 and H2, the H2 Tank Farm, and the Pipe Tunnels. This area is impacted by radioactivity in groundwater underlying Building H2 and radioactivity in the soil exceeding industrial criteria. Chemical contamination is present in localized areas near the surface at concentrations exceeding New York Department of Environmental Conservation (NYSDEC) soil cleanup objectives.
- Lower Level – This land area includes the Lower Level Parking Lot and the Railroad Staging Area. Radioactivity is present in soils at the Lower Level Parking Lot and Railroad Staging Area at concentrations exceeding industrial criteria. Chemical contamination is also present in the soils in the Lower Level Parking Lot and the Railroad Staging Area at concentrations exceeding NYSDEC soil cleanup objectives. Radioactivity in groundwater exceeds industrial criteria in the Railroad Staging Area.
- North Field – This land area includes the Former Slurry Drum Storage Area. SPRU-related radioactivity is present above industrial criteria in shallow soil. There are no chemical impacts present in soil or groundwater in the North Field associated with SPRU operations.

Risk Evaluation Summary

DOE desires to address the low levels of residual radioactive contamination left in soils impacted by former SPRU operations, and to meet NYSDEC “No Further Action” requirements for residual chemical contamination in soil and groundwater. There is no exposure risk to the public from this contamination.

The primary exposure pathways in SPRU land areas are exposure to radiological contamination through inhalation or ingestion by workers who disturb soil subject to radiological controls. The radiological contamination in soil is isolated to the KAPL site. Risks associated with these exposure pathways are easily mitigated by standard radiological control practices. There is no exposure risk to the public from this contamination. DOE’s cleanup criteria for radioactivity is to remove radioactive soil contamination such that a site worker would not be exposed to more than an additional 25 milliRem per year from residual contamination left in soil. This cleanup criteria also meets the objective of As Low As Reasonably Achievable (ALARA) and will not limit the ability to release the SPRU areas for unrestricted use at the time of future site closure. Risks associated with these exposure pathways are easily mitigated by standard radiological control practices. There is no exposure risk to the public from these contaminants.

Residual radioactivity in groundwater in the immediate vicinity of Building H2 exceeds DOE criteria, as discussed in the *Nuclear Facility Engineering Evaluation/Cost Analysis for the Separations Process*

Research Unit (SPRU) Disposition Project (R-002263). As discussed in this Land EE/CA, low levels of radioactivity in groundwater at the Lower Level Railbed were detected, but below DOE criteria, and there is no exposure risk to the public from this contaminated groundwater. As reported by KAPL in its annual Environmental Monitoring Reports, the estimated collective dose from KAPL site operations to the population within 50 miles of KAPL was less than 0.001 percent of the natural background radiation dose.

Removal Action Objectives

DOE has evaluated SPRU land areas to address the significance of residual contamination and future land uses, and developed removal action objectives (RAOs). These objectives include: (1) restoring SPRU land areas to a state suitable for reuse by KAPL in an area zoned for industrial and research use, (2) reducing surveillance and maintenance costs, and (3) reducing or eliminating the potential for future radiological and chemical releases from SPRU land areas.

Cleanup goals for soil and groundwater at SPRU are based on DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE, 1993) and the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) Policy 4046, *Determination of Soil Cleanup Objectives and Cleanup Levels* (NYSDEC, 1994), and are also compared to the NYSDEC Proposed Industrial Soil Cleanup Objectives (NYSDEC, 2006). The DOE's objective is to achieve No Further Action (NFA) determination from NYSDEC for chemicals in the SPRU land areas.

Screening of Alternatives

A DOE team of subject-matter experts prepared a preliminary list of technologies to address soil and groundwater contamination in the three SPRU land areas. These technologies included containment, chemical/biological treatment, physical treatment, and removal. From this list, alternatives were developed to address the removal action objectives. A screening process was performed to identify alternatives that would meet the remedial action objectives; those not meeting the objectives were screened out. Table ES-1 summarizes the alternatives and the screening process results.

Table ES-1. Summary of Alternative Screening for SPRU Land Areas

ALTERNATIVE NUMBER	ALTERNATIVE TITLE	SCREENING RESULT
UPPER LEVEL ALTERNATIVES		
UL-1	No Action (Continued Surveillance and Maintenance)	Retained
UL-2	Upper Level Soil Removal	Retained
UL-3	*Cap Upper Level*	*Screened Out*
UL-4	*Phytoremediation*	*Screened Out*
LOWER LEVEL ALTERNATIVES		
LL-1	No Action (Continued Surveillance and Maintenance)	Retained
LL-2	Lower Level Soil Removal	Retained
LL-3	Railroad Staging Area Soil Removal and Parking Lot Cap	Retained
LL-4	*Cap Parking Lot and Railroad Staging Area*	*Screened Out*
LL-5	*Phytoremediation*	*Screened Out*
NORTH FIELD ALTERNATIVES		
NF-1	No Action (Continued Surveillance and Maintenance)	Retained
NF-2	North Field Soil Removal	Retained
NF-3	*Cap North Field*	*Screened Out*
NF-4	*Phytoremediation*	*Screened Out*

Analysis of Alternatives

Retained alternatives were analyzed based on criteria presented in the U.S. Environmental Protection Agency's *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, 1993). The alternatives were compared with regard to effectiveness, implementability, and cost. The comparative analysis of alternatives is summarized in Table ES-2. National Environmental Policy Act (NEPA) values also were considered for each removal action alternative.

Table ES-2. Comparison of Alternatives

Alternative	Comparative Ranking		
	Effectiveness	Implementability	Cost-Effectiveness
Alternative UL-1 No Action (Continued Surveillance and Maintenance) (30 year period)	Low No removal action; surveillance and maintenance only would not meet removal action objectives; would not meet needs of continuing-mission site.	High Most technically and administratively feasible; services and materials available.	Low $0 (This alternative may require a groundwater treatment system which is included in the SPRU facility removal action. alternatives costs.)
Alternative UL-2 Upper Level Soil Removal	High Complete (100%) removal of impacted soil exceeding cleanup goals meets removal action objectives; meets requirements for a continuing-mission site.	High Technically and administratively feasible; services and materials available. This alternative presumes that the buildings overlying soils are removed.	High $8 Million
Alternative LL-1 No Action (Continued Surveillance and Maintenance)	Low No removal action; surveillance and maintenance only would not meet removal action objectives; would not meet needs of continuing-mission site.	High Most technically and administratively feasible; services and materials available.	Low $3 Million (This alternative would require additional action in the future.)
Alternative LL-2 Lower Level Soil Removal	High Complete (100%) removal of impacted soil exceeding cleanup goals meets removal action objectives; meets requirements for a continuing-mission industrial site.	High Technically and administratively feasible; services and materials available.	High $31 Million
Alternative LL-3 Railroad Staging Area Soil Removal and Parking Lot Cap	Medium Removal of the majority of contamination and capping the remaining contamination would not meet all removal action objectives; would meet needs for a continuing-mission site.	High Technically and administratively feasible; services and materials available.	Medium $27 Million
Alternative NF-1 No Action (Continued Surveillance and Maintenance)	Low No removal action; surveillance and maintenance only would not meet removal action objectives; would not meet needs of continuing-mission site.	High Most technically and administratively feasible; services and materials available.	Low $3 Million (This alternative would require additional action in the future.)
Alternative NF-2 North Field Soil Removal	High Complete (100%) removal of impacted soil exceeding cleanup goals meets removal action objectives; meets requirements for a continuing-mission site.	High Large areas would be graded and excavated. During implementation, chemical impacts associated with KAPL activities may be encountered. However, it is technically and administratively feasible; services and materials available.	High $18 Million

Conclusion

The preferred removal action alternative for each land area will be based on comparative analysis and comments from regulators and the public gathered during the public comment period. Preferred alternatives have not yet been selected. Community involvement is a key component of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. The public is encouraged to comment on the alternatives presented in this preliminary EE/CA and dates of the comment period will be published in local newspapers. All submitted comments will be reviewed and considered. Following the public comment period, an alternative will be selected for DOE approval and funding. An Action Memorandum documenting the decision on the selection of alternatives for SPRU land areas will be prepared by DOE and transmitted to the public and to regulators for an additional 30-day comment period. All responses to public comments will be included in the administrative record.

This EE/CA is part of the SPRU Administrative Record. Copies are available at the following location:

Niskayuna Branch, Schenectady County Public Library
2400 Nott Street East, Niskayuna, New York 12309
(518) 386-2249

1. INTRODUCTION

The purpose of this Engineering Evaluation/Cost Analysis (EE/CA) is to identify, describe, and evaluate removal action alternatives for the cleanup of soil and groundwater contamination in the U.S. Department of Energy (DOE) Separations Process Research Unit (SPRU) land areas within the Knolls Atomic Power Laboratory (KAPL) site in Niskayuna, New York. Appendix A describes the regulatory framework under which this EE/CA has been prepared.

1.1 Site Description and Background

The SPRU land areas are located on approximately 24 acres in the northwest corner of the 170-acre KAPL site, which overlooks the southern bank of the Mohawk River. Land use southeast of the site is medium- to high-density residential and recreational land consisting of hiking trails, baseball fields, tennis courts, and a bike path located over a former municipal landfill in the Town of Niskayuna. Niskayuna High School is located approximately two miles to the southwest. Directly northwest of the site, land use is industrial research and development. Across the Mohawk River are low-density residences of the Town of Clifton Park. KAPL is zoned for research and industrial land use.

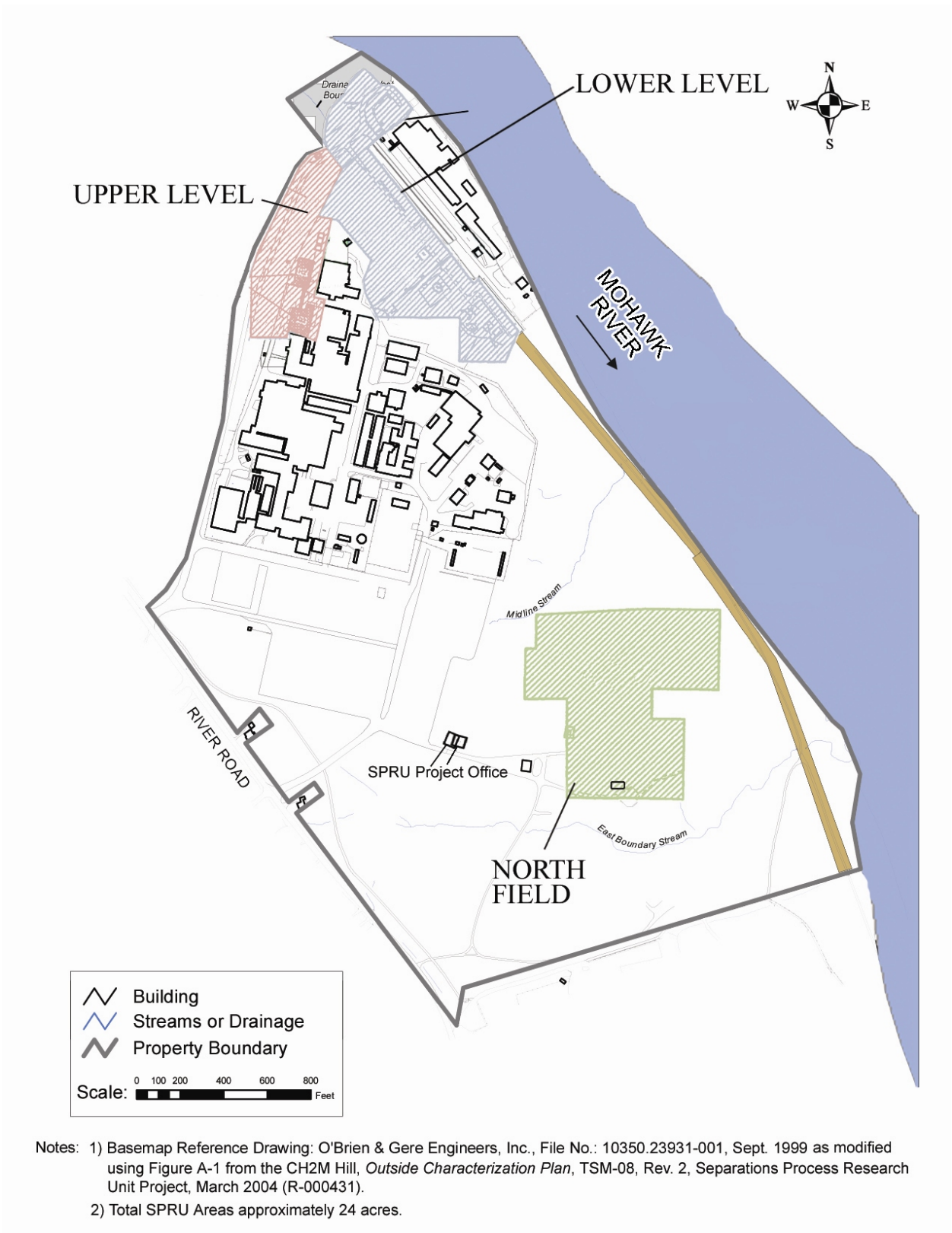
KAPL is owned by the U.S. government and operated by the U.S. DOE Office of Naval Reactors, Schenectady Naval Reactors (Naval Reactors), and their contractor, KAPL, Inc., a Lockheed Martin company. The KAPL site mission to design and develop nuclear-powered reactors for naval propulsion is expected to continue indefinitely. SPRU research and development activities were not associated with or used for the Naval Nuclear Propulsion Program.

The SPRU facilities were constructed in the late 1940s to research the chemical separation of plutonium and uranium. SPRU operated between February 1950 and October 1953, after which research activities ceased following successful development of reduction oxidation (REDOX) and plutonium uranium extraction (PUREX) processes subsequently used by Hanford and the Savannah River sites. Research was performed on a laboratory scale; SPRU was never a production plant. Decommissioning of SPRU began in October 1953 and continued through the 1990s. SPRU facilities and land areas are currently maintained in a safe condition and are subject to a surveillance and maintenance program. The DOE Office of Environmental Management manages the SPRU Disposition Project and has established a project office on site. The SPRU facilities are presented in the Facilities EE/CA (R-002263) and were addressed in a public meeting held in May 2006.

SPRU land areas addressed in this document and identified in Figure 1-1 include the following:

- Upper Level – Soil and groundwater under Buildings G2 and H2, the H2 Tank Farm, and the Pipe Tunnels
- Lower Level – Lower Level Parking Lot and the Railroad Staging Area, including the Former K5 Retention Basin, and the Former K6 and K7 Storage Pads
- North Field – Former Slurry Drum Storage Area and related radioactively contaminated areas

This EE/CA specifically addresses radiological and chemical contamination in the three SPRU land areas that are not currently available for reuse due to the presence of contamination. The SPRU Disposition Project mission is to address cleanup of the SPRU facilities and land, including transfer of all property back to the DOE Office of Naval Reactors, Schenectady Naval Reactors, and KAPL for continued mission use. The cleanup criteria for radioactivity is to remove radioactive soil contamination such that a site worker would not be occupationally exposed to more than an additional 25 milliRem or more per year from residual contamination left in soil.



Notes: 1) Basemap Reference Drawing: O'Brien & Gere Engineers, Inc., File No.: 10350.23931-001, Sept. 1999 as modified using Figure A-1 from the CH2M Hill, *Outside Characterization Plan*, TSM-08, Rev. 2, Separations Process Research Unit Project, March 2004 (R-000431).

2) Total SPRU Areas approximately 24 acres.

Figure 1-1. SPRU Land Areas

The Upper Level land area is approximately 115 to 120 feet above the Mohawk River. Along the northern margin of the KAPL site, the land surface slopes steeply to a natural bench comprising the Lower Level, approximately 15 to 20 feet above the river. The geology underlying the site consists of unconsolidated overburden materials overlying bedrock. Bedrock at the Lower Level is approximately 5 to 20 feet below existing grade, and in the Upper Level at depths from approximately 40 to 80 feet below existing grade elevations. Bedrock underlying the KAPL site is mapped as Ordovician aged Schenectady Formation, which consists of a series of alternating beds of sandstone, siltstone, and shale about 2,000 feet thick, dipping gently to the west and southwest. The Schenectady Formation is underlain by the Canajoharie shale, which is a dark gray to black, thinly bedded shale. The unconsolidated materials at the KAPL site consist mainly of glacial till deposits. The Mohawk Till is a grayish-blue, dense, compact formation that directly overlies the bedrock at most locations.

Groundwater resources at the KAPL site are limited because of the low permeability of the bedrock and unconsolidated deposits. There are no principal or primary bedrock or overburden aquifers underlying the KAPL site for development as commercial or public water supplies (R-002220). The groundwater flow direction under the KAPL site and SPRU land areas is generally toward the Mohawk River (R-002255).

The U.S. Environmental Protection Agency (EPA) designated the Schenectady Aquifer and Town of Niskayuna wellfield as sole source aquifers. Both draw from the sand and gravel aquifer that is recharged by precipitation and infiltration from the Mohawk River. The KAPL site and the SPRU land areas overlie these sole source aquifers, but the deposits under the site act as an aquiclude, preventing vertical migration of shallow groundwater (R-000159).

1.2 Sources, Nature and Extent of Contamination

The *Land Areas Historical Site Assessment for the SPRU Disposition Project* (R-002255) included existing and former SPRU facilities and adjacent land areas associated with the Upper Level, Lower Level, and North Field. The following sections describe the sub-areas within the three SPRU land areas that require remediation of radiological and/or chemical contamination.

1.2.1 UPPER LEVEL

The Upper Level (Figure 1-2) includes soil and groundwater below the following SPRU facilities:

- Building G2
- Building H2 and the H2 Tank Farm
- Pipe Tunnel between Buildings G2 and H2 and the Building G2 Crossover Tunnel

1.2.1.1 Soil and Groundwater Adjacent to and Under Building G2

Building G2 was built between 1947 and 1949, and operated from February 1950 to October 1953 as a research and development facility performing pilot-scale tests for separation processes. Building G2 contained laboratories, hot cells, and separations process testing equipment. The tunnel system beneath Building G2 was used to transfer liquid waste to Building H2 for processing.

It is anticipated that Building G2 will be removed as part of the SPRU Disposition Project facilities removal action. Soil and groundwater investigations conducted in the vicinity of Building G2 have not indicated significant soil or groundwater impacts. However, confirmation sampling will be conducted following the building demolition.

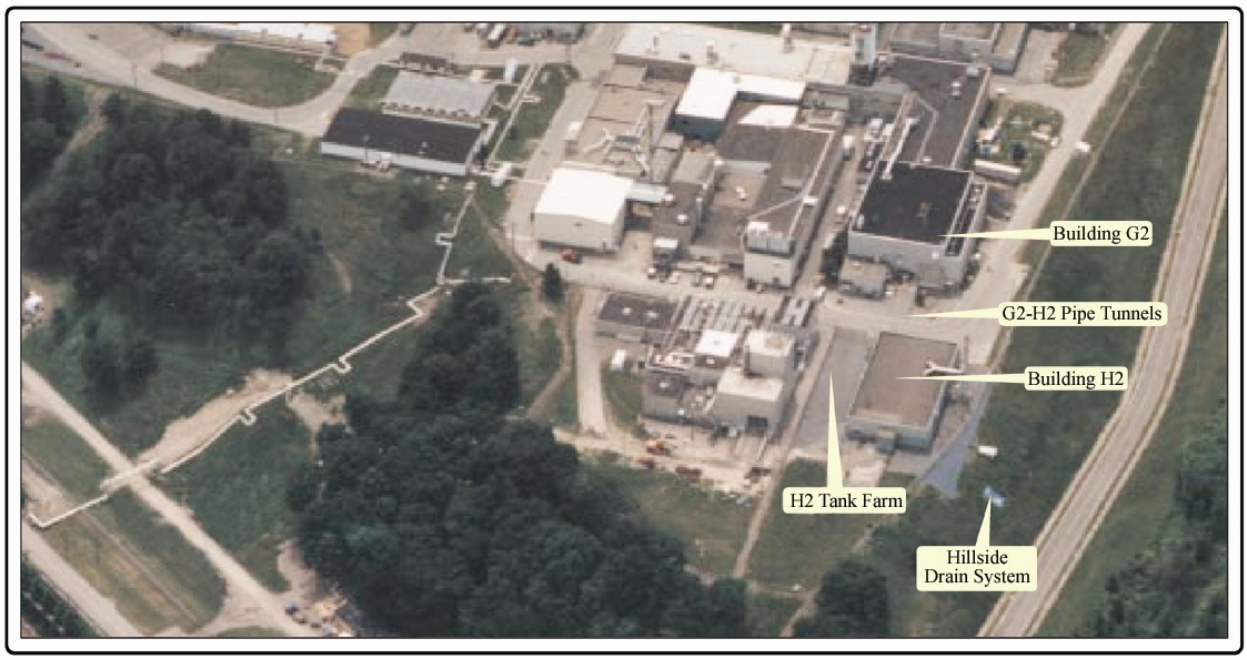


Figure 1-2. Upper Level

1.2.1.2 Soil and Groundwater Adjacent to and Under Building H2 and H2 Tank Farm

Building H2 was constructed between 1947 and 1949 to process and store aqueous waste primarily from Building G2. Activities in this building included processing waste from the K4 laundry in the Lower Level, the Former Hot Incinerator scrubber, and site laboratories conducting research. A small portion of the facility is still used to treat contaminated groundwater.

The H2 Tank Farm is located below ground level on the east side of Building H2. This area consists of one 5,000-gallon and six 10,000-gallon stainless steel storage tanks located in seven underground concrete vaults. It is anticipated that Building H2 and the H2 Tank Farm will be removed as part of the SPRU facility removal action.

Arsenic was detected in one soil sample west of Building H2 exceeding NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 (NYSDEC, 1994) and the NYSDEC Proposed Industrial Soil Cleanup Objectives (NYSDEC, 2006). It is also possible that soil under the H2 Tank Farm is impacted by radioactivity.

Contaminated soil in the vicinity of Building H2 and the H2 Tank Farm is the apparent source of radioactivity in groundwater. Groundwater under Building H2 is extracted through the Hillside Drain System, a series of foundation drains around the perimeter of Building H2, and treated to remove radioactivity prior to discharge. DOE expects the source of radioactivity to be removed as part of the facility removal. However, there is a potential for soil to be contaminated. It is expected that any remaining residual contamination will be readily accessible following the anticipated removal of Building H2.

1.2.1.3 Soil and Groundwater Under the Pipe Tunnels

The Pipe Tunnels consist of a reinforced concrete pipe tunnel system through which liquid waste, process chemicals, and reuse water were piped between the SPRU buildings, laboratories, equipment, and nearby non-SPRU laboratories and buildings. There is a potential for soil underlying the Building G2-H2 Tunnels to be contaminated.

The SPRU Pipe Tunnels will be addressed with Buildings G2 and H2 as part of the SPRU facilities removal action. It is not anticipated that soil or groundwater contamination is present under the Pipe Tunnels. However, confirmation sampling will be conducted after the tunnels are addressed.

1.2.2 LOWER LEVEL

The Lower Level areas addressed in this EE/CA, shown in Figure 1-3, include the Lower Level Parking Lot and the Railroad Staging Area, the Former K5 Retention Basin, and the Former K6 and K7 Storage Pads.

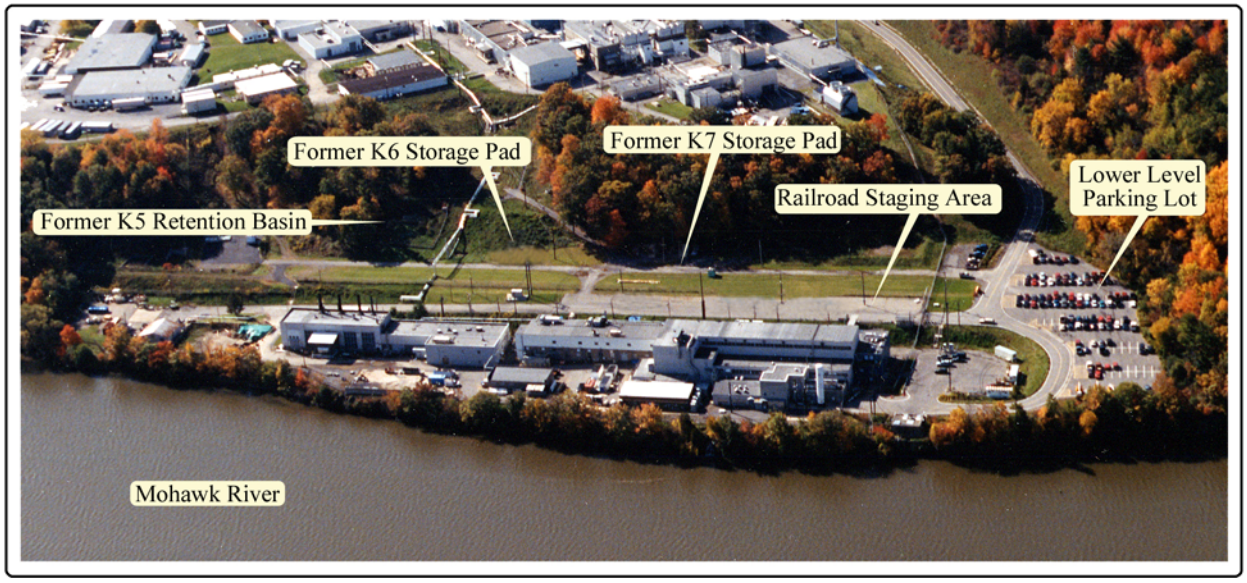


Figure 1-3. Lower Level

1.2.2.1 Lower Level Parking Lot

The Lower Level Parking Lot was found to contain radiological contamination and some metals (arsenic and mercury). Samples from two parking lot areas indicate cesium-137 in soil at concentrations exceeding SPRU cleanup goals. Soil sampling indicates that arsenic and mercury concentrations exceed the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 (NYSDEC, 1994) and the NYSDEC Proposed Industrial Soil Cleanup Objectives (NYSDEC, 2006).

1.2.2.2 Railroad Staging Area

Cesium-137 is present in the railbed area at concentrations exceeding SPRU cleanup goals. The Railroad Staging Area covers approximately 50,000 square feet of surface area (1.1 acres). Soil sampling indicates that chemical contaminants exceed NYSDEC's TAGM 4046 values (NYSDEC, 1994) and in some cases NYSDEC Proposed Industrial Soil Cleanup Objectives (NYSDEC, 2006).

The Former K5 Retention Basin was last used in the late 1960s. Sludge was removed from the basin in 1970, at which time cesium-137 was detected in area soil. The K5 Retention Basin was removed in 2006. The Former K5 Retention Basin area is currently being investigated. For the purposes of this EECA, DOE assumes that radioactive contamination and chemicals similar to the Railroad Staging Area will be identified.

The Former K6 Storage Pad was an 1,100-square foot concrete slab with walls used in the 1950s and 1960s for storing radioactive waste. The walls and slab were demolished in 2004. The soils underlying the Former K6 Storage Pad were chemically characterized and found to meet NYSDEC soil cleanup

objectives. NYSDEC has concurred that there is no further action necessary for chemicals at the K6 Storage Pad. Radioactivity, primarily cesium-137, is still present in soils.

The Former K7 Storage Pad consisted of a fenced and roofed concrete pad located west of the Former K6 Storage Pad. It was used to store solid waste in containers awaiting off-site disposal. The K7 Storage Pad was removed in 1988. Radioactivity was detected in underlying soils (R-000355). The soils underlying the Former K7 Storage Pad were chemically characterized and found to meet NYSDEC soil cleanup objectives. NYSDEC has concurred that there is no further action necessary for chemicals at the K7 Storage Pad.

1.2.3 NORTH FIELD

The SPRU North Field area includes the Former Slurry Drum Storage Area. Other KAPL solid waste management units (SWMUs) exist in the North Field. The KAPL areas included construction and demolition debris fill areas and landfills. KAPL is investigating these areas separately from the DOE SPRU project. Figure 1-4 shows the approximate location of the Former Slurry Drum Storage Area in the North Field.

Figure 1-4. Approximate Location of the Former Slurry Drum Storage Area

Investigations within the vicinity of the Former Slurry Drum Storage Area identified cesium-137 in soil with concentrations exceeding SPRU cleanup goals. The residual radiological impacts result from SPRU waste management practices in the Former Slurry Drum Storage Area, and truck traffic to the KAPL managed areas. No radioactive wastes were buried.

The DOE chemically characterized these areas and found no chemicals attributable to former SPRU operations. Detections of chemicals associated with KAPL operations were identified and will be further investigated separately by KAPL. NYSDEC has concurred that there is no further action necessary for chemicals by the DOE SPRU Disposition Project in this area.

1.3 Risk Evaluation Summary

The SPRU land areas were evaluated to determine the potential for exposure to radiological and chemical constituents, identify current or potential exposures that should be mitigated, and justify proposed removal actions.

The SPRU facilities were decommissioned in 1953, and deactivation and cleanup activities were performed in the late 1950s to mid 1960s. Temporary management of waste containers in the land areas resulted in spills leaving residual amounts of radioactivity in soil, and in some cases, groundwater in the immediate vicinity of the waste container storage areas. The DOE's investigations, inspections, and surveys indicate that residual radiological and chemical contaminants in excess of SPRU cleanup goals, NYSDEC TAGM 4046, and in some cases the NYSDEC Proposed Industrial Soil Cleanup Objectives are still present in the SPRU facilities and land areas.

The radiological contamination in soil is confined to the KAPL site. Localized radioactive contamination in groundwater was also found. Based on the KAPL comprehensive environmental monitoring program, there is no exposure to the public from radioactive contamination. Chemical contamination, primarily metals, was found in the Lower Level Parking Lot and the Railroad Staging Area, and in the Upper Level in the vicinity of the Tank Farm and near the interconnecting Pipe Tunnel. EPA, New York State Department of Health (NYSDOH), and NYSDEC have inspected these areas and concluded that the areas are adequately controlled to protect the public (C-002250 and C-002251, respectively). KAPL personnel must also be considered in the evaluation. DOE SPRU project contractor(s) control access to the Upper Level, Lower Level, and North Field areas. This prevents unintentional and unnecessary exposure to radioactivity and chemicals. The remaining consideration is for workers who must perform maintenance activities, or workers that may be involved with cleanup activities as proposed in this EE/CA.

The primary exposure pathways to maintenance or cleanup workers are exposure to radiological contamination through inhalation or ingestion. Risks associated with these exposure pathways are mitigated through restriction of activities or engineering controls in the case of cleanup activities.

The DOE's cleanup criteria for radioactivity is to remove radioactive soil contamination such that a site worker would not be occupationally exposed to more than 25 additional milliRem per year. To provide perspective on relative risks, the background dose to persons living in the Schenectady County vicinity is approximately 60 milliRem per year. This dose comes from various sources, including naturally radioactive substances in rocks and soil, cosmic rays (the dose from cosmic rays increases with elevation, including airplane flights), and fall-out from nuclear testing. For purposes of comparison, the dose received from a dental exam with a full suite of x-rays is about 160 milliRem. A mammogram exposes a woman to 250 milliRem. The dose from a CT Scan is 1000 milliRem.

1.4 Justification for the Proposed Action

The DOE is evaluating SPRU land areas remediation alternatives to address residual contamination at this legacy cold war site in order to reduce or eliminate surveillance and maintenance costs, address NYSDEC requirements to investigate and remediate chemical contamination, and follow-up on the DOE's agreement with Naval Reactors to remediate the former SPRU Project areas which were not related to Naval Reactor-sponsored research.

KAPL plans to construct or expand facilities in several of the SPRU land areas. However, portions of the SPRU land areas cannot be reused by KAPL in their present state. Although ongoing surveillance and maintenance activities currently sustain safe conditions, these activities will need to be funded and implemented for as long as contamination is present. Therefore, remediation actions are necessary to enable KAPL to reuse portions of SPRU land areas.

2. REMOVAL ACTION OBJECTIVES

The selected alternatives from this EE/CA will be implemented in a manner that is protective of human health and the environment. Table 2-1 summarizes existing conditions in the SPRU land areas, justifications for the removal action, and removal action objectives (RAOs).

Table 2-1. Summary of Removal Action Objectives

Existing Condition	Justification for Removal Action	Removal Action Objective
SPRU has no further need for the SPRU land areas, which are located within the KAPL site. Portions of the SPRU land areas are not available for reuse by KAPL due to contamination. The KAPL site is operated for the DOE Office of Naval Reactors/ Schenectady Naval Reactors, whose mission is expected to continue indefinitely.	SPRU land areas must be suitable for use by a DOE continuing-mission site before they can be transferred to KAPL. Soil and groundwater contamination must be controlled, reduced, or eliminated to be consistent with DOE continuing-mission site requirements.	Restore the SPRU land areas consistent with DOE Order 5400.5, which indicates cleanup to reduce potential exposure to site workers to less than 25 milliRem per year. Chemical contamination to be remediated to NYSDEC standards such that NYSDEC concurs with a no further action determination.
Contaminated SPRU land areas are managed by a surveillance and maintenance program.	The surveillance and maintenance program currently costs $150,000 per year (in 2006 dollars) and will continue as long as SPRU retains the facilities and land areas.	Reduce or eliminate surveillance and maintenance program costs.

2.1 Purpose and Scope of Removal Action

The purpose of the removal action for the SPRU land areas is to contain or remove contamination from the SPRU land areas, restoring them to a state consistent with DOE continuing-mission site requirements. The scope of the SPRU land areas removal action, based on potential radiological and chemical contamination identified in Section 1 and RAOs identified in Table 2-1, includes the following:

- Removing contaminated soil that is a source of groundwater contamination
- Covering or capping contaminated soil to prevent exposure
- Managing wastes generated during the removal action to limit exposure to the public, on-site workers, and the environment
- Transporting and disposing of wastes generated during the removal action to permitted and approved off-site waste disposal facilities

This EE/CA addresses the SPRU Upper Level, Lower Level, and North Field land area removal action alternatives. Contaminated soil and groundwater adjacent to the SPRU facilities are addressed in the Upper Level alternatives. Removal actions for SPRU facilities (Buildings G2 and H2, the H2 Tank Farm, and Pipe Tunnels) are addressed separately in the Facilities EE/CA (R-002263).

2.2 Applicable or Relevant and Appropriate Requirements

In accordance with 40 CFR Section (§) 300.415(j) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), non-time-critical on-site removal actions conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) are required to attain applicable or relevant and appropriate requirements (ARARs) to the extent practicable, considering the scope and urgency of the situation. ARARs include Federal and state environmental or facility siting laws or regulations and action-specific ARARs such as occupational safety or worker radiation protection requirements. Additionally, 40 CFR § 300.405(g)(3) states that other advisories, criteria, or guidance may be considered in determining remedies (the “to be considered” guidance category).

ARARs are grouped as: (1) chemical-specific, (2) location-specific, and (3) action-specific. Chemical-specific ARARs establish an acceptable amount or concentration that may remain in or be discharged to the ambient environment. Location-specific ARARs include restrictions placed on the conduct of activities solely because they occur in special locations such as wetlands, floodplains, historic properties, or critical habitat. Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous substances or other particular circumstances at a site. Action-specific ARARS include requirements imposed on removal actions such as worker safety, dust control requirements, stormwater pollution plans and runoff control, transportation and disposal of hazardous and non-hazardous wastes, and control of air emissions.

State requirements are ARARs if they are promulgated, substantive laws or regulations that are consistently applied and are more stringent than Federal requirements. Federal and state ARARs identified by DOE for the SPRU land areas EE/CA are summarized in Appendix B and include NYSDEC regulations and permits to be issued to support the removal action. ARARs will be updated as needed if the following key assumptions change:

- Removal actions will be conducted in a manner that is protective of human health and the environment.
- Removal actions will involve remediation of contaminated soil and groundwater in the SPRU land areas. Cleanup of the SPRU facilities is addressed separately.
- No endangered or sensitive species in the immediate area will be affected by removal actions.
- No wetlands, floodplains, historic structures, archaeological sites, or critical habitat will be affected by removal actions.
- All necessary NYSDEC permits will be applied for and approved.

DOE is using the non-time critical removal action process to address radioactive contaminants. This EE/CA accomplishes obtaining the public's input into the selection of a preferred alternative for each of the land areas. This EE/CA also is intended to serve the public involvement process for cleanup of chemicals under NYSDEC's Resource Conservation and Recovery Act (RCRA) Corrective Action Program. DOE has applied for the appropriate permit, and will submit work plans and other documents as required for NYSDEC approval.

2.3 Cleanup Goals

Cleanup goals for the SPRU land areas are based on the type and amount of radiological impacts and chemicals of concern (COCs) present in each area. Cleanup goals for radiological contaminants are based on the requirements of DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, which indicates a cleanup of radioactivity such that an onsite worker would not receive more than an additional 25 milliRem per year from residual contamination in soil. This cleanup criteria also meets the objective of As Low As Reasonably Achievable (ALARA) and will not limit the ability to release the SPRU areas for unrestricted use at the time of future site closure. Cleanup goals for chemical contaminants in soil are based on NYSDEC TAGM 4046 and compared to NYSDEC Proposed Industrial Soil Cleanup Objectives. DOE's objective is to achieve a No Further Action (NFA) determination from NYSDEC.

The primary contaminants throughout the SPRU land areas are cesium-137 and strontium-90 in groundwater, and cesium-137, arsenic, mercury, and silver in soil.

3. IDENTIFICATION AND ANALYSIS OF ALTERNATIVES

A DOE team of subject matter experts prepared a preliminary list of alternatives to address the RAOs. A screening process was performed to identify achievable and effective alternatives to address SPRU land areas and meet Federal and state requirements and site needs. The screening process assessed potentially viable and readily available technologies and approaches in the following categories:

- Containment
- Chemical or biological treatment
- Physical treatment
- Removal

Treatment technologies were considered based on their potential for meeting project-specific RAOs (see Section 2) and the NCP threshold and balancing criteria, which include:

- Protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Short-term effectiveness
- Reduction of toxicity, mobility or volume of contaminants
- Implementability
- Cost

To assist in determining whether alternatives meet RAOs and the NCP threshold and balancing criteria, DOE expanded these criteria by considering the following questions:

- Will it protect the public?
- Will it protect against further releases to the environment?
- Will it protect KAPL personnel?
- Will it protect personnel implementing the alternative?
- Will required services be readily available?
- How long will it remain effective after the alternative is implemented?
- Will it be technically feasible with current available technologies?
- What is the technical complexity of implementing the treatment technology?
- Will it be able to be implemented in compliance with ARARs?
- Will it support future missions?
- Will it meet KAPL's needs?
- Will it comply with relevant NYSDEC requirements?

Based on these criteria, DOE evaluated the following alternatives for the three SPRU land areas:

Continued surveillance and maintenance (no action): This is considered the "No Action" alternative because it does not involve active remediation. Continued surveillance and maintenance assumes that institutional controls would be implemented to minimize exposure to existing radiological and chemical levels; radiological levels would continue to attenuate over time by natural decay. This treatment technology was retained for development into area-specific alternatives.

Soil removal: This technology consists of excavating impacted soils exceeding radiological and chemical cleanup standards, and disposal at a permitted and approved off-site facility. Soil removal was retained for development into area-specific alternatives.

Capping: This technology involves placing a low permeability material on the ground surface to minimize human exposure and (if necessary) surface water infiltration and resultant contaminant

migration to groundwater. The cap alternative was retained for development into area-specific alternatives.

Phytoremediation: In-situ phytoremediation can be utilized to remove radiological or chemical impacts from shallow soils. Phytoremediation could be performed in-situ to remove radiological or metal impacts from shallow soils; it was retained for development into area-specific alternatives.

Hot spot removal: This technology includes removal and off-site disposal of soil only in areas where contamination significantly exceeds the cleanup goal. Remaining contamination would continue to be managed under the surveillance and maintenance program. This option was screened out based on anticipated high costs associated with ongoing surveillance and maintenance after hot spot removal.

In-situ vitrification/solidification: This technology immobilizes contaminants but does not reduce the volume of subsurface contamination. In-situ vitrification/solidification is effective with chemical contamination and would reduce the mobility of strontium-90 from the soil to groundwater. However, it was screened out due to anticipated high costs and limited effectiveness.

Cleanup of radioactivity for three different land uses criteria was also considered: (1) industrial, which is the current land use for the foreseeable future, (2) residential redevelopment, which is not likely but not improbable, and (3) agricultural use, which the DOE views as highly improbable. Each alternative involving soil removal was estimated for an industrial end state, and the cost for the most restrictive cleanup criteria is also provided as a point of comparison.

Summary: The technologies selected for further evaluation in this EE/CA as SPRU land area remediation alternatives include Continued Surveillance and Maintenance (No Action), Soil Removal, Capping, and Phytoremediation. The site-wide remedy will be composed of three alternatives, one for each land area. Alternatives for each land area follow:

Upper Level (UL)

- Alternative UL-1: No Action (Continued Surveillance and Maintenance)
- Alternative UL-2: Upper Level Soil Removal
- Alternative UL-3: Cap Upper Level
- Alternative UL-4: Phytoremediation

Lower Level (LL)

- Alternative LL-1: No Action (Continued Surveillance and Maintenance)
- Alternative LL-2: Lower Level Soil Removal
- Alternative LL-3: Railroad Staging Area Soil Removal and Parking Lot Cap
- Alternative LL-4: Cap Parking Lot and Railroad Staging Area
- Alternative LL-5: Phytoremediation

North Field (NF)

- Alternative NF-1: No Action (Continued Surveillance and Maintenance)
- Alternative NF-2: North Field Soil Removal
- Alternative NF-3: Cap North Field
- Alternative NF-4: Phytoremediation

These alternatives are described further in the following sections.

3.1 Upper Level Alternatives

Upper Level alternatives address soil contamination underlying the SPRU facilities in the Upper Level. They do not address removal of the buildings, the Hillside Drain System, or the Pipe Tunnels, which were discussed in the Facilities EE/CA.

3.1.1 ALTERNATIVE UL-1: NO ACTION (CONTINUED SURVEILLANCE AND MAINTENANCE)

Alternative UL-1 would include Upper Level radiation control, and if necessary, groundwater extraction and treatment. Costs for groundwater treatment were already included in the Facilities EE/CA, and therefore, are not duplicated in the cost for this alternative. For the purposes of this EE/CA, a 30-year duration was assumed for estimating surveillance and maintenance costs. The No Action Alternative is included to provide a baseline against which other Upper Level alternatives can be compared. Alternative UL-1 is retained for detailed analysis in Section 4.

3.1.2 ALTERNATIVE UL-2: UPPER LEVEL SOIL REMOVAL

Alternative UL-2 would involve removal of impacted soil underlying the facilities exceeding cleanup goals in the Upper Level. Activities in this alternative include.

- Removing impacted soil
- Disposing of impacted soil at permitted and approved off-site facilities
- Backfilling excavated areas

It is assumed that Buildings G2 and H2, the H2 Tank Farm, and a portion of the Pipe Tunnels will be removed as part of the SPRU facilities removal action.

At this time, DOE does not know if radioactive contamination extends below the footer drain system into the underlying soils. For the purpose of this EE/CA, the DOE has assumed it does and is including estimating excavation to a six foot depth under Building H2 and the Tank Farm for planning purposes.

Alternative UL-2 assumes that a 6-foot interval of contaminated soil below Building H2 would be removed from depths of 28-34 feet below ground surface and below a near-surface (perched) groundwater table. Therefore, dewatering would be necessary. It is expected that excavation using standard equipment would occur during the removal of Building H2 and the Tank Farm. Dust mitigation measures and storm water controls would be implemented during all earthwork activities. Confirmation sampling would be conducted in excavated areas. After verifying that cleanup goals have been achieved, the excavations would be backfilled with clean material and compacted. It is assumed that excavated areas would be re-vegetated.

Wastes generated during implementation of this alternative would be characterized and segregated by waste type (e.g., low-level radioactive, mixed low-level radioactive, hazardous and non-hazardous). Mixed waste is not anticipated in any of the land areas. Contaminated soil and debris would be transported to and disposed of at permitted and approved off-site facilities. All waste would be containerized according to U.S. Department of Transportation (DOT) requirements and transported using established commercial routes.

This alternative represents a complete removal option and assumes that continued surveillance and maintenance activities would not be required in the Upper Level. It is estimated that Alternative UL-2 would readily be completed within two years. Alternative UL-2 is retained for detailed analysis in Section 4.

Figure 3-1 shows the assumed area of excavation, and Figure 3-2 shows a simplified cross-section illustrating the interval of excavation under Building H2.

Figure 3-1. Assumed Area of Excavation for Alternative UL-2

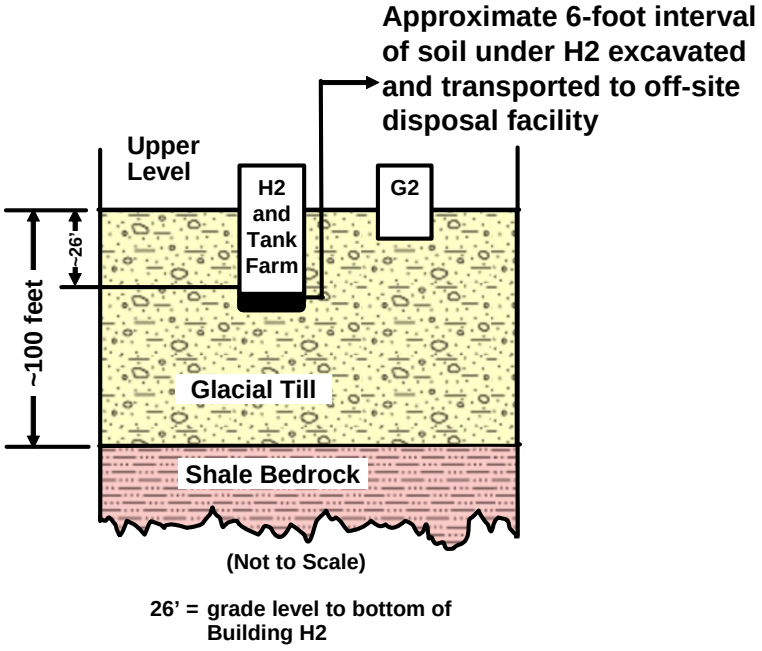


Figure 3-2. Cross-section Illustrating Assumed Excavation for Alternative UL-2

3.1.3 ALTERNATIVE UL-3: CAP UPPER LEVEL

Radiological impacts in the Upper Level are comprised of strontium-90 in the groundwater and cesium-137 in soil. Cesium-137 tends to adhere to soil more than strontium-90, which tends to migrate through soil to groundwater. An engineered cap would reduce surface water infiltration, but radiologically impacted soil would continue to be in contact with groundwater. Therefore, Alternative UL-3 will not be

considered further because a cap alone would not effectively contain radiological contaminants or reduce the potential for future releases to groundwater in the Upper Level.

3.1.4 ALTERNATIVE UL-4: PHYTOREMEDIATION

Alternative UL-4 would consist of phytoremediation to address radiological and chemical impacts. Phytoremediation is effective in treating radiological and chemical impacts if adequate land area is available for the process to achieve cleanup goals. However, phytoremediation project durations are difficult to estimate and the Upper Level would not be usable until the phytoremediation process is completed. Pilot testing would be conducted to evaluate effectiveness of several plant species at this location; however, radiological contaminants would continue to impact groundwater, and operation of the groundwater extraction and treatment system would be required during the pilot study and implementation. Additionally, impacted Upper Level soils are located in small discrete areas at depths that would significantly reduce the effectiveness of phytoremediation. Therefore, Alternative UL-4 will not be considered further as an Upper Level remediation alternative.

3.2 Lower Level Alternatives

Lower Level alternatives address soil and groundwater contamination in the Lower Level Railroad Staging Area, and soil contamination in the Lower Level Parking Lot. Both of these sub-areas are impacted with radiological and chemical contaminants.

3.2.1 ALTERNATIVE LL-1: NO ACTION (CONTINUED SURVEILLANCE AND MAINTENANCE)

Alternative LL-1 would include continuing surveillance and maintenance activities in the Lower Level such as annual landscape maintenance, mowing, radiation control, and DOE access controls for radiological and chemical contaminants in the Lower Level. For the purposes of this EE/CA, a 30-year duration was assumed for estimating surveillance and maintenance costs. The No Action Alternative is included to provide a baseline against which other Lower Level alternatives can be compared. Alternative LL-1 is retained for detailed analysis in Section 4.

3.2.2 ALTERNATIVE LL-2: LOWER LEVEL SOIL REMOVAL

Alternative LL-2 would involve the following activities:

- Removing radiologically and chemically impacted soil exceeding cleanup goals in the Lower Level Parking Lot and Railroad Staging Area
- Disposing of impacted soil at permitted and approved off-site facilities
- Backfilling and resurfacing the Lower Level Parking Lot
- Backfilling the Railroad Staging Area

Radiologically and chemically impacted soil in the Railroad Staging Area would be removed under Alternative LL-2, and small amounts of radiological and chemical contaminated soil would be removed from the Lower Level Parking Lot.

Alternative LL-2 assumes contaminated soil removal to an average depth of 4 feet in the Lower Level Parking Lot. Residual impacts below 4 feet in this area would not pose an exposure risk to future industrial users. Soil removal in the Railroad Staging Area would extend to an assumed average depth of 4 feet with localized areas deeper to remove continuing sources of strontium-90 impacts to groundwater in that area.

Pavement, surface vegetation, and soil would be removed using standard construction equipment. Dust mitigation measures and storm water controls would be implemented during all earthwork activities. Confirmation sampling would be conducted to verify cleanup objectives have been achieved prior to restoration of the areas to grade.

Contaminated soil and debris would be transported to and disposed of at permitted and approved off-site facilities. All waste shipments would be containerized according to DOT requirements and transported using established commercial routes.

Alternative LL-2 represents a removal action option and assumes that continued Lower Level surveillance and maintenance activities would not be required. It is estimated that Alternative LL-2 would take 3 years to complete. Alternative LL-2 is retained for detailed analysis in Section 4.

Figure 3-3 shows the assumed excavation areas for Alternative LL-2.

Figure 3-3. Assumed Areas of Excavation for Alternative LL-2

3.2.3 ALTERNATIVE LL-3: RAILROAD STAGING AREA SOIL REMOVAL AND PARKING LOT CAP

Alternative LL-3 would involve the following actions:

- Capping the existing Lower Level Parking Lot with an additional asphalt and bentonite layer
- Removing radiologically and chemically impacted soil from the Railroad Staging Area
- Disposing of impacted excavated soil at permitted and approved facilities
- Backfilling the Railroad Staging Area

The primary purpose of a cap in the Lower Level Parking Lot is to provide a long-term impervious barrier between vehicles and contaminated soil. This would prevent the inadvertent spread of contaminated soil. The cap would consist of an additional 2-inch layer of asphalt covering approximately 2,650 square yards. A geomembrane with bentonite layer would be installed on the slopes as the impervious cap. Existing potholes, cracks, and other damage in the parking lot would be repaired as necessary prior to installing the cap. The asphalt cap would be sloped to maintain surface water drainage.

The Lower Level Railroad Staging Area would be excavated as described in Alternative LL-2, including removing an average of 4 feet of impacted soil, backfilling and compacting clean fill, and disposing of the waste at permitted and approved off-site facilities. It is assumed that the Railroad Staging Area would be

re-vegetated and that current Lower Level surveillance and maintenance activities would not be necessary in the Railroad Staging Area. However, the asphalt cap would be maintained as necessary in the Lower Level Parking Lot. It is estimated that Alternative LL-3 would take 2 years to complete. Alternative LL-3 is retained for detailed analysis in Section 4.

Figure 3-4 illustrates areas to be capped and excavated under Alternative LL-3.

Figure 3-4. Assumed Areas of Excavation and Cap for Alternative LL-3

3.2.4 ALTERNATIVE LL-4: CAP PARKING LOT AND RAILROAD STAGING AREA

Alternative LL-4 would involve capping all Lower Level Parking Lot and Railroad Staging Area soils with radiological or chemical impacts above cleanup goals. A cap in the Railroad Staging Area would limit future uses by KAPL. Limitations on future use do not meet RAOs. Therefore, Alternative LL-4 will not be considered further as an alternative for the Lower Level.

3.2.5 ALTERNATIVE LL-5: PHYTOREMEDIATION

Alternative LL-5 would consist of phytoremediation to address radiological and chemical impacts to the Lower Level Parking Lot and Railroad Staging Area. Phytoremediation is effective in treating radiological and chemical impacts if adequate land is available for the time needed to achieve cleanup goals. Site conditions in the Lower Level Parking Lot and Railroad Staging Area are not conducive to this treatment technology because radiological impacts in the parking area are in discrete locations and are not co-located with chemical impacts. Widespread phytoremediation would be needed for an extended period of time to treat these areas. Additionally, Alternative LL-5 would require constructing a temporary parking lot for long-term use during the remediation process. Phytoremediation also would preclude KAPL's use of the Railroad Staging Area during remediation. Therefore, Alternative LL-5 will not be considered further as an alternative for the Lower Level.

3.3 North Field Alternatives

The DOE chemically characterized the North Field areas and found no chemicals attributable to former SPRU operations. Detections of chemicals associated with KAPL operations were identified and will be

further investigated separately by KAPL. As documented in a letter dated February 1, 2006, the NYSDEC concurred that there is no further action necessary for chemicals by the DOE SPRU Disposition Project in this area. Therefore, the North Field alternatives described in this section address only radiological impacts to surface and near-surface soil. Under a separate program, KAPL will address residual chemical contamination, closure of historical land disposal areas, and additional characterization where necessary in the North Field to define and remediate chemical impacts.

3.3.1 ALTERNATIVE NF-1: NO ACTION (CONTINUED SURVEILLANCE AND MAINTENANCE)

Alternative NF-1 would include continuing surveillance and maintenance activities in the North Field such as annual landscape maintenance and mowing, radiation control, and DOE access controls until radiological sources decay to the point that controls are no longer required. For the purposes of this EE/CA, a 30-year surveillance and maintenance period was assumed for estimating surveillance and maintenance costs. The No Action Alternative is included to provide a baseline against which other North Field alternatives can be compared. Alternative NF-1 is retained for detailed analysis in Section 4.

3.3.2 ALTERNATIVE NF-2: NORTH FIELD SOIL REMOVAL

Alternative NF-2 would include the following activities:

- Removing radiologically impacted soil from the North Field
- Disposing of impacted soil at permitted and approved off-site facilities
- Backfilling excavated areas in the North Field

Alternative NF-2 assumes an average of two feet of contaminated soil would be removed from impacted areas. Surface vegetation and soil would be removed using standard construction equipment. Dust mitigation measures and storm water controls would be implemented during all earthwork activities. Confirmation sampling would be conducted to verify cleanup objectives have been achieved prior to backfilling with clean material. It is assumed that the area would be re-vegetated. Excavation to an average of two feet would reduce the risk of exposure to surface and near-surface soils. Residual impacts remaining after excavation would not pose a risk to future industrial users.

Wastes generated would be characterized and segregated. Contaminated soil and debris would be transported to and disposed of at permitted and approved off-site facilities. All waste would be containerized according to DOT requirements and transported using established commercial routes.

Alternative NF-2 represents a removal action option and it is assumed that surveillance and maintenance activities would no longer be required in the North Field. It is estimated that Alternative NF-2 would take 2 years to complete. Alternative NF-2 is retained for detailed analysis in Section 4. Figure 3-5 shows the assumed areas to be excavated for Alternative NF-2.

Figure 3-5. Assumed Areas of Excavation for Alternative NF-2

3.3.3 ALTERNATIVE NF-3: CAP NORTH FIELD

Alternative NF-3 would involve the following activities:

- Site preparation and grading of contaminated areas
- Capping contaminated areas
- Disposing of wastes at permitted and approved off-site facilities

The area identified for capping, approximately 20,000 square feet (0.46 acres), would be prepared by removing vegetation and grading. Wastes generated during grading and preparation activities would be characterized and segregated by waste type. The cap would prevent erosion and mobilization of radiologically impacted surface and near-surface soil, and shield receptors from contamination.

KAPL will be performing additional characterization of SWMUs (unrelated to SPRU) in other North Field areas. Future subsurface explorations and invasive sampling would damage the cap and require cap repair. Based upon the low concentrations of radioactivity and the DOE's investigation showing that radioactivity has not been transferring to groundwater, a cap offers little added protection in the North Field. The soil generated from KAPL characterization investigations would potentially be radioactive and require special handling. Therefore, Alternative NF-3 will not be considered further as a remediation alternative.

3.3.4 ALTERNATIVE NF-4: PHYTOREMEDIATION

Alternative NF-4 would involve the use of phytoremediation to remove radiological contaminants from soil in the North Field. The process would include phytoextraction (also known as phytoaccumulation), where contaminants are removed from the soil by plant root uptake and accumulated in plant shoots and leaves. Before full-scale implementation of phytoremediation, a pilot study would be conducted to evaluate different hyperaccumulator plant species for uptake of cesium-137. Phytoremediation may be effective for uptake of radiological impacts in shallow soils, and North Field impacts are limited to surface and near-surface soil and therefore accessible to hyperaccumulator plants.

Plant selection is one of the most important factors determining phytoremediation success or failure. Chosen plant species must have appropriate characteristics for growing under site-specific conditions and would need to accumulate contaminants at a rate that would meet cleanup goals. Treatability studies such as bench scale tests and field studies can establish the plants that would be most responsive to specific site conditions. Treatability studies should be performed in real time since plant growth cannot be accelerated and should be carried out for at least one growth cycle, including dormancy (R-002254). Therefore, treatability studies could take several years using different plant species and various soil amendments.

The results of the pilot testing would be used to develop a potential time requirement to remediate the North Field using phytoremediation. Phytotechnologies are limited by plant growth rate, rooting depth, and length of the growing season. Specific site conditions, contaminant concentrations, and plant species affect the time to achieve cleanup goals. The seasonal nature of the technology also needs to be considered when estimating the amount of time required to accomplish cleanup objectives. In a study at Brookhaven National Laboratory in New York, the phytoremediation of cesium-137 using redroot pigweed took 18 years to reduce cesium-137 concentrations by 50 percent (R-002253). This technology would require an estimated 90 years to achieve cleanup goals after completion of pilot studies, compared to natural attenuation which would take approximately 150 years. Alternative NF-4 will not be considered further because of anticipated higher costs due to project duration, soil enrichment requirements, plant selection, duration of pilot studies, and uncertain effectiveness.

3.4 Summary of Alternatives Screening

A total of 13 alternatives were considered for SPRU land areas. Of these, six (6) were screened out and seven (7) were retained for further consideration in Section 4. Table 3-1 summarizes alternative screening results for the SPRU land areas.

Table 3-1. Summary of Alternative Screening for SPRU Land Areas

ALTERNATIVE NUMBER	ALTERNATIVE TITLE	SCREENING RESULT
UPPER LEVEL ALTERNATIVES		
UL-1	No Action (Continued Surveillance and Maintenance)	Retained
UL-2	Upper Level Soil Removal	Retained
UL-3	*Cap Upper Level*	*Screened Out*
UL-4	*Phytoremediation*	*Screened Out*
LOWER LEVEL ALTERNATIVES		
LL-1	No Action (Continued Surveillance and Maintenance)	Retained
LL-2	Lower Level Soil Removal	Retained
LL-3	Railroad Staging Area Soil Removal and Parking Lot Cap	Retained
LL-4	*Cap Parking Lot and Railroad Staging Area*	*Screened Out*
LL-5	*Phytoremediation*	*Screened Out*
NORTH FIELD ALTERNATIVES		
NF-1	No Action (Continued Surveillance and Maintenance)	Retained
NF-2	North Field Soil Removal	Retained
NF-3	*Cap North Field*	*Screened Out*
NF-4	*Phytoremediation*	*Screened Out*

4. ANALYSIS OF ALTERNATIVES

The EPA *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, 1993) identifies three criteria for evaluating removal action alternatives: effectiveness, implementability, and cost. The alternatives retained for analysis and presented in this section provide decision makers a range of removal action alternatives for each SPRU land area. They include:

Upper Level

- Alternative UL-1: No Action (Continued Surveillance and Maintenance)
- Alternative UL-2: Upper Level Soil Removal

Lower Level

- Alternative LL-1: No Action (Continued Surveillance and Maintenance)
- Alternative LL-2: Lower Level Soil Removal
- Alternative LL-3: Railroad Staging Area Soil Removal and Parking Lot Cap

North Field

- Alternative NF-1: No Action (Continued Surveillance and Maintenance)
- Alternative NF-2: North Field Soil Removal

4.1 Effectiveness

SPRU land area alternatives were evaluated relative to their effectiveness in meeting the RAOs presented in Section 2, and considering the following NCP threshold and balancing criteria:

- Overall protection of human health and environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Short-term effectiveness
- Reduction of toxicity, mobility, or volume through treatment

In addition to the RAOs and NCP threshold and balancing criteria, the effectiveness of the removal action alternatives was further evaluated based on the following questions:

- Will the alternative protect the public?
- Will the alternative protect against releases to the environment?
- Will the alternative protect personnel implementing the alternative?
- Will the alternative protect KAPL personnel?
- How long will the alternative work after the alternative is implemented?
- Will the alternative comply with ARARs?
- Will the alternative comply with relevant NYSDEC requirements?
- Will the alternative meet KAPL requirements?
- Will the alternative support future missions?

4.1.1 UPPER LEVEL ALTERNATIVES

Effectiveness of Alternative UL-1: No Action (Continued Surveillance and Maintenance)

Alternative UL-1 assumes that Upper Level surveillance and maintenance activities would continue indefinitely. There would be no reduction of toxicity, mobility, or volume of contaminants through treatment, except by natural attenuation. This alternative would not meet the RAOs removal action objectives outlined in Table 2-1.

Groundwater in the vicinity of Building H2 is impacted with strontium-90 and is currently extracted through the Hillside Drain System. Alternative UL-1 would not remove the potential source of strontium-90 in soil underlying the buildings, and the groundwater extraction and treatment system would continue to operate.

Although safety of the public and environment would be maintained, Alternative UL-1 would not be effective because of the potential continuing impact to groundwater quality from contaminated soils, and groundwater extraction and treatment would be necessary for an indeterminate period of time. Alternative UL-1 is rated low in the effectiveness criterion compared to other alternatives.

Effectiveness of Alternative UL-2: Upper Level Soil Removal

At this time, DOE does not know whether contamination is present in the soil underlying Building H2 and the H2 Tank Farm. However, Building H2 is anticipated to be removed as part of the SPRU facilities removal action, and for planning purposes it is assumed that up to 6 feet, or 1,300 cubic yards, of underlying soil will be contaminated and require removal under the footprint of Building H2 and the H2 Tank Farm. Removal of radiologically impacted soil underlying these SPRU facilities would eliminate remaining residual radiological contamination associated with the Upper Level. Soil removal also would eliminate the source of radiological impacts to groundwater. The Upper Level could be redeveloped by KAPL for industrial uses. Alternative UL-2 assumes that a groundwater treatment system would be operated for approximately 10 years after soil removal to remediate residual groundwater contamination. This alternative would meet all of the removal action objectives outlined in Section 2.1.

Containment and control of soil, debris, waste, and dust would be required to limit exposure to the public, on-site workers, and the environment during soil removal activities. Additional precautions and personal protective equipment would be required for personnel performing the removal action. Potential public and worker exposure would be addressed in health and safety plans and remedial design documents.

Alternative UL-2 would require approximately 90 truck trips through the community for soil disposal. Additional truck trips would be required for debris disposal and importing backfill material. All waste would be containerized according to DOT requirements and transported using established commercial routes.

Removal of the Upper Level impacted soil would allow for the removal of the pump and treat groundwater system. Contaminated soil and debris would be transported and disposed of at permitted and approved off-site waste facilities. Implementation of Alternative UL-2 also would eliminate the need for continued surveillance and maintenance in this area. The excavated areas would be restored to a state that is consistent with a continuing mission site. Alternative UL-2 is rated high in the effectiveness criterion relative to other alternatives. This alternative can be performed in compliance with the ARARs listed in Appendix B.

4.1.2 LOWER LEVEL ALTERNATIVES

Effectiveness of Alternative LL-1: No Action (Continued Surveillance and Maintenance)

Alternative LL-1 assumes that Lower Level Parking Lot and Railroad Staging Area surveillance and maintenance activities would continue indefinitely. There would be no reduction of toxicity, mobility, or volume of contaminants through treatment, except by natural attenuation. This alternative would not meet the removal action objectives outlined in Table 2-1.

The Lower Level contains radiological and chemical impacts to surface soil in controlled areas that are not accessible by the public. However, impacted surface soil would continue to be controlled by surveillance and maintenance activities. The current surveillance and maintenance program adequately protects workers, the public, and the environment from exposure to contaminants. However, Alternative LL-1 would not meet RAOs (reducing or eliminating surveillance and maintenance costs and restoring the Lower Level to a state suitable for reuse) outlined in Table 2-1.

Current surveillance and maintenance activities sufficiently protect human health and the environment by containing radiological and chemical contaminants within the Lower Level. However, the No Action Alternative would not allow for KAPL reuse of the site, would not reduce or eliminate surveillance and maintenance costs, and would not follow-up on the DOE's agreement with Naval Reactors to remediate the former SPRU project areas.

Effectiveness of Alternative LL-2: Lower Level Soil Removal

Alternative LL-2 would involve excavating approximately 6,500 cubic yards of impacted soil and backfilling with clean material. In the short term, decontamination and removal actions would include removing radiological and chemical contamination from areas where concentrations exceed cleanup goals. A temporary parking area would be constructed for employee use during Lower Level Parking Lot excavation activities. Wastes would be transported and disposed of at permitted and approved off-site waste disposal facilities.

Containment and control of soil, debris, waste, and dust would be required to limit exposure to the public, on-site workers, and the environment during soil removal activities. Additional precautions and personal protective equipment would be required for personnel performing the removal action. Potential public and worker exposure would be addressed in health and safety plans and remedial design documents.

Alternative LL-2 would require approximately 450 truck trips through the community for soil disposal. Additional trips would be required for debris disposal and importing backfill material. All waste shipments would be containerized according to DOT requirements and transported using established commercial routes.

Removal of the Lower Level impacted soil would protect human health and the environment by eliminating contaminants and potential sources of contamination. Contaminated soil and debris would be transported and disposed of at permitted and approved off-site disposal facilities. These activities would significantly reduce radiological and metal contaminants, and the Lower Level would be suitable for reuse following removal action completion.

Removing impacted soil exceeding cleanup goals would eliminate the need for the Lower Level surveillance and maintenance program. The excavated areas would be restored to a state consistent with a continuing-mission site. Alternative LL-2 can be performed in compliance with the ARARs listed in Appendix B, and is rated high in the effectiveness criterion relative to other alternatives.

Effectiveness of Alternative LL-3: Railroad Staging Area Soil Removal and Parking Lot Cap

Alternative LL-3 would involve excavating approximately 6,300 cubic yards of impacted soil from the Railroad Staging Area and capping approximately 200 cubic yards of residual soil contamination in the Lower Level Parking Lot. Following remediation activities, KAPL would continue to use the Lower Level Parking Lot, and the Railroad Staging Area would be suitable for KAPL re-use. This alternative would meet all of the removal action objectives outlined in Table 2-1.

In the short term, activities would include excavating impacted Railroad Staging Area soil and replacing it with clean, compacted fill material. Sampling conducted after soil removal would confirm effectiveness. Soil disturbance would be limited to the Railroad Staging Area, and dust containment and control would limit exposure to the public, on-site workers, and the environment. In addition, a temporary parking lot for KAPL employees would be constructed prior to repairing the existing parking lot paving and installing a 2-inch thick asphalt cap over the existing asphalt. Potential exposure to workers engaged in decontamination and removal activities would be addressed in site-specific health and safety plans and remedial design documents, and additional precautions and personal protective equipment would be required for personnel performing the excavation.

Railroad Staging Area soil removal would protect human health and the environment by reducing contaminant levels and removing sources of residual contamination. Soil removal also would eliminate the need for continuing the Railroad Staging Area surveillance and maintenance program. The Lower Level Parking Lot cap would provide a long-term impervious barrier between vehicles and contaminated soil. This would prevent the inadvertent spread of contaminated soil. The cap would be inspected periodically and maintained to ensure long-term effectiveness.

This alternative would require approximately 440 truck trips through the community for soil disposal. Additional truck trips would be required for debris disposal and importing backfill material. All waste would be containerized according to DOT requirements and transported using established commercial routes.

Alternative LL-3 is not considered as effective as Alternative LL-2 because residual soil contamination would remain under the cap in the parking area. However, it is protective of human health and the environment and would leave the Lower Level in a condition consistent with a continuing mission site. Alternative LL-3 effectiveness is ranked medium compared to other alternatives, and can be performed in compliance with the ARARs listed in Appendix B.

4.1.3 NORTH FIELD ALTERNATIVES

Effectiveness of Alternative NF-1: No Action (Continued Surveillance and Maintenance)

Alternative NF-1 assumes that North Field surveillance and maintenance activities would continue for 150 years to meet industrial use cleanup criteria and 180 years to reach unrestricted use cleanup criteria. Natural attenuation would be the mechanism by which the toxicity and volume of chemical contaminants is reduced. Alternative NF-1 would meet the RAOs outlined in Table 2-1 within approximately 150 to 180 years, depending upon the desired land use.

In the short term, surveillance and maintenance program activities sufficiently protect human health and the environment by minimizing worker exposure and containing radiological and chemical contaminants within the SPRU boundaries.

Although safety of the public and environment is maintained, Alternative NF-1 would not be effective due to the time required to meet cleanup goals and the need for continued surveillance and maintenance until cleanup goals are met. Alternative NF-1 is rated low in the effectiveness criterion compared to other alternatives.

Effectiveness of Alternative NF-2: North Field Soil Removal

An estimated 5,000 cubic yards of radiologically contaminated soil is present in the North Field. Alternative NF-2 would involve excavation of the contaminated soil exceeding cleanup goals from the North Field, and backfilling with clean material. Surface vegetation would be removed and the area graded prior to excavation. Restoration of the site would include placement of limited backfill and re-grading. Removing impacted soil would reduce residual radiological contamination and potential for exposure to the public, on-site workers, and the environment. Surveillance and maintenance activities would be discontinued. Alternative NF-2 satisfies the RAOs outlined in Section 2.1.

Containment and control of soil, debris, waste, and dust would be required to limit exposure to the public, on-site workers, and the environment during soil removal activities. Additional precautions and personal protective equipment would be required for personnel performing the removal action. Potential public and worker exposure would be addressed in health and safety plans and remedial design documents.

Alternative NF-2 would require approximately 350 truck trips through the community for soil disposal. Additional truck trips would be required for debris disposal and importing backfill material. Radiological waste from the North Field would be transported and disposed of at permitted and approved off-site waste facilities. All waste would be containerized according to DOT requirements and transported using established commercial routes.

In the long term, removing the North Field impacted soil would protect human health and the environment and eliminate the need for the surveillance and maintenance program. The excavated areas would be restored to a state that would reduce the future cost of KAPL's RCRA investigations in this area, or the need for future cleanup of radioactivity. Alternative NF-2 can be performed in compliance with the ARARs listed in Appendix B, and is rated high in the effectiveness criterion relative to other alternatives.

4.2 Implementability

Implementability of alternatives was evaluated considering the following questions:

- Is the alternative technically feasible with currently available technology?
- Is the alternative technically complex or difficult to implement?
- Is the alternative feasible in terms of administrative or procedural requirements?
- Are there services and materials readily available for performing the alternative?

4.2.1 UPPER LEVEL ALTERNATIVES

Implementability of Alternative UL-1: No Action (Continued Surveillance and Maintenance)

Alternative UL-1 is highly implementable because it requires no action other than continuing current surveillance and maintenance activities. Services and materials are readily available on site to continue surveillance and maintenance activities.

Implementability of Alternative UL-2: Upper Level Soil Removal

Alternative UL-2 is implementable based on DOE experience with soil removal at other sites. Grading and excavation are not technically complex and could be readily performed with the proper equipment, materials, and protective gear. Administrative and procedural requirements such as waste transportation, handling, and disposal requirements also could be met.

Conventional grading and excavation services and materials, including earthmoving equipment, are available from contractors with experience working at radiological and hazardous waste sites. Personnel experienced with decontamination techniques are available. Alternative UL-2 is ranked high in implementability.

4.2.2 LOWER LEVEL ALTERNATIVES

Implementability of Alternative LL-1: No Action (Continued Surveillance and Maintenance)

Alternative LL-1 is highly implementable because it requires no action other than continuing current surveillance and maintenance activities. Services and materials are readily available on site to continue surveillance and maintenance activities.

Implementability of Alternative LL-2: Lower Level Soil Removal

Alternative LL-2 is implementable based on DOE experience with soil removal at other sites. Excavation activities would be extensive, but are routinely conducted. Grading and excavation are not technically complex and could be readily performed with the proper equipment, materials, and protective gear. Administrative or procedural requirements such as waste transportation, handling, and disposal requirements also could be met. Temporary parking area construction could be accomplished.

Conventional grading and excavation services and materials, including earthmoving equipment, are available from contractors with experience working at radiological and hazardous waste sites. Personnel experienced with decontamination techniques are available. Alternative LL-2 is ranked high in implementability.

Implementability of Alternative LL-3: Railroad Staging Area Soil Removal and Parking Lot Cap

Alternative LL-3 is implementable based on DOE experience with soil removal and cap installation at other sites and facilities. A geomembrane with bentonite layer would be installed on the slopes as the impervious cap, and an asphalt cap would be installed on the level parking areas. Neither grading and excavation nor cap installation are technically complex and could be readily performed with the proper equipment, materials, and protective gear. Administrative and procedural requirements such as waste transportation, handling, and disposal requirements also could be met. Temporary parking area construction could be accomplished.

Conventional grading and excavation services and materials, including earthmoving and paving equipment, are available from contractors with experience working at radiological and hazardous waste sites. Personnel experienced with decontamination techniques are available. Alternative LL-3 is ranked high in implementability.

4.2.3 NORTH FIELD ALTERNATIVES

Implementability of Alternative NF-1: No Action (Continued Surveillance and Maintenance)

Alternative NF-1 is highly implementable because it requires no action other than continuing the current surveillance and maintenance activities. Services and materials are readily available on site to continue surveillance and maintenance.

Implementability of Alternative NF-2: North Field Soil Removal

Alternative NF-2 is implementable based on DOE experience with soil removal at other DOE sites and given the North Field site conditions. Removal of trees and vegetation would add an additional step to the soil removal process but is also readily implementable. Excavation activities would be extensive, but all activities in this alternative could be readily performed with the proper equipment, materials, and protective gear. Excavation is not expected to encounter groundwater, so no dewatering or water treatment/disposal is anticipated. Administrative or procedural requirements such as waste transportation, handling, and disposal requirements could be met.

Conventional grading and excavation services and materials are available from contractors with experience working at radiological and hazardous waste sites. Personnel experienced with decontamination techniques are available. Alternative NF-2 is ranked high in implementability.

4.3 Cost

In this section, costs of alternatives are presented for comparison purposes only. The cost estimates were developed by DOE certified cost estimators in 2003 and updated based on characterization data and current transport costs in 2006 by P.W. Grosser Consulting. Surveillance and maintenance costs were developed based on actual cost to the DOE Office of Environmental Management. Estimates considered assumptions that could impact costs of removal action alternatives, including:

- Surveillance and maintenance costs (for 30 years)
- Capital costs
- Labor costs
- Transportation and disposal costs

EPA guidance for feasibility studies suggests that cost estimates should be accurate within approximately –30 percent to +50 percent. Total life cycle costs for each alternative may be significantly affected by factors such as:

- Unanticipated characteristics of wastes generated causing more costly disposal fees
- Discovery of unanticipated contamination
- Changes in labor and fuel costs from historical averages
- Changes in regulations

4.3.1 UPPER LEVEL ALTERNATIVES

Costs for Alternative UL-1: No Action (Continued Surveillance and Maintenance)

Estimated costs for Alternative UL-1 include surveillance and maintenance activities for 30 years. The comparative cost estimate to implement Alternative UL-1 for 30 years is $0. However, a new groundwater treatment system may be required which would have a comparative cost of approximately $3 million for capital costs, installation, and 10 years of operation and maintenance. This estimated cost is included in the facility removal action alternatives. After the 30-year period, contaminants underlying the facilities may remain at concentrations exceeding cleanup goals and likely would require further action. This alternative ranks low in cost-effectiveness compared to Alternative UL-2.

Costs for Alternative UL-2: Upper Level Soil Removal

Estimated costs for Alternative UL-2 include removing approximately 1,300 cubic yards of soil underlying the facilities from the Upper Level. Transportation, disposal, backfill, and confirmation sampling costs also are included, as well as continued groundwater treatment system operation for an assumed duration of 3 years as a contingency. The comparative cost estimate to implement Alternative UL-2 is $8 million to reach industrial cleanup criteria. Because this alternative removes all soil above cleanup goals, no surveillance and maintenance activities are assumed to be necessary following remediation. This alternative ranks high in cost-effectiveness compared to Alternative UL-1.

4.3.2 LOWER LEVEL ALTERNATIVES

Costs for Alternative LL-1: No Action (Continued Surveillance and Maintenance)

Estimated costs for Alternative LL-1 include surveillance and maintenance activities for 30 years. After the 30-year period, contaminants would remain at concentrations exceeding cleanup goals and likely would require further action. The comparative cost estimate to implement Alternative LL-1 for 30 years is $3 million. However, as the existing Lower Level Parking Lot ages, capital improvements such as a new tack coat and asphalt patching will be needed. Costs for capital improvements are not included. This alternative ranks low in cost-effectiveness compared to Alternative LL-2.

Costs for Alternative LL-2: Lower Level Soil Removal

Estimated costs for Alternative LL-2 include removing approximately 200 cubic yards of impacted soil from the Lower Level Parking Lot and 6,300 cubic yards from the Railroad Staging Area. Transportation, disposal, backfill, and confirmation sampling costs are included. The comparative cost estimate to implement Alternative LL-2 is $31 million to reach industrial cleanup criteria. Because this alternative removes all soil above cleanup goals, no surveillance and maintenance activities are assumed to be necessary following remediation. This alternative ranks high in cost-effectiveness compared to Alternatives LL-1 and LL-3.

Costs for Alternative LL-3: Railroad Staging Area Soil Removal and Parking Lot Cap

Estimated costs for Alternative LL-3 include removing approximately 6,300 cubic yards of impacted soil from the Railroad Staging Area and installing a 2-inch thick asphalt cap over the Lower Level Parking Lot. Transportation, disposal, backfill, and confirmation sampling costs are included. The comparative cost estimate to implement Alternative LL-3 is $27 million to reach industrial cleanup criteria. Surveillance and maintenance activities are assumed not to be necessary in the Lower Level Parking Lot following soil removal and installation of the cap, but periodic inspections and maintenance of the asphalt cap would be performed. This alternative ranks medium in cost-effectiveness.

4.3.3 NORTH FIELD ALTERNATIVES

Costs for Alternative NF-1: No Action (Continued Surveillance and Maintenance)

Estimated costs for Alternative NF-1 include surveillance and maintenance activities for 30 years. The comparative cost estimate to implement Alternative NF-1 for 30 years is $3 million. After the 30-year period, contaminants would remain at concentrations exceeding cleanup goals and likely would require further action. This alternative ranks low in cost-effectiveness compared to Alternative NF-2.

Costs for Alternative NF-2: North Field Soil Removal

Estimated costs for Alternative NF-2 include removing approximately 5,000 cubic yards of impacted soil from the North Field. Transportation, disposal, backfill, and confirmation sampling costs are included. The comparative cost estimate to implement Alternative NF-2 is $18 million to reach industrial cleanup criteria. Because this alternative removes all soil above cleanup goals, no surveillance and maintenance activities are assumed to be necessary following remediation. This alternative ranks high in cost-effectiveness compared to Alternative NF-1.

4.4 Summary of Comparative Analysis of Alternatives

Table 4-1 summarizes the comparison of alternatives.

Table 4-1. Comparison of Alternatives

Alternative	Comparative Ranking		
	Effectiveness	Implementability	Cost-Effectiveness
Alternative UL-1 No Action (Continued Surveillance and Maintenance) (30 year period)	Low No removal action; surveillance and maintenance only would not meet removal action objectives; would not meet needs of continuing-mission site.	High Most technically and administratively feasible; services and materials available.	Low $0 (This alternative may require a groundwater treatment system which is included in the SPRU facility removal action alternatives costs.)

Alternative	Comparative Ranking		
	Effectiveness	Implementability	Cost-Effectiveness
Alternative UL-2 Upper Level Soil Removal	High Complete (100%) removal of impacted soil exceeding cleanup goals meets removal action objectives; meets requirements of continuing-mission site.	High Technically and administratively feasible; services and materials available. This alternative presumes that the buildings overlying soils are removed.	High $8 Million
Alternative LL-1 No Action (Continued Surveillance and Maintenance)	Low No removal action; surveillance and maintenance only would not meet removal action objectives; would not meet needs of continuing-mission site.	High Most technically and administratively feasible; services and materials available.	Low $3 Million (This alternative would require additional action in the future.)
Alternative LL-2 Lower Level Soil Removal	High Complete (100%) removal of impacted soil exceeding cleanup goals meets removal action objectives; meets requirements of continuing-mission industrial site.	High Technically and administratively feasible; services and materials available.	High $31 Million
Alternative LL-3 Railroad Staging Area Soil Removal and Parking Lot Cap	Medium Removal of the majority of contamination and capping the remaining contamination would not meet all removal action objectives; would meet needs of DOE continuing-mission site.	High Technically and administratively feasible; services and materials available.	Medium $27 Million
Alternative NF-1 No Action (Continued Surveillance and Maintenance)	Low No removal action; surveillance and maintenance only would not meet removal action objectives; would not meet needs of continuing-mission site.	High Most technically and administratively feasible; services and materials available.	Low $3 Million (This alternative would require additional action in the future.)
Alternative NF-2 North Field Soil Removal	High Complete (100%) removal of impacted soil exceeding cleanup goals meets removal action objectives; meets requirements of DOE continuing-mission site.	High Large areas would be graded and excavated. During implementation, chemical impacts associated with KAPL activities may be encountered. However, it is technically and administratively feasible; services and materials available.	High $18 Million

4.5 National Environmental Policy Act Considerations

This EE/CA fulfills requirements documenting the removal action alternatives selection process, in accordance with the *Policy on Decommissioning Department of Energy Facilities Under CERCLA Memorandum* (DOE and EPA, 1995), *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*, (EPA, 1993), and the *Decommissioning Implementation Guide* (DOE, 1999). As part of the CERCLA process, the National Environmental Policy Act (NEPA) values are also considered. NEPA values largely overlap with the removal action alternative evaluations summarized in Table 4-1. Consideration of NEPA values includes cumulative effects and mitigation measures that may be taken to avoid or reduce environmental impacts.

According to the DOE Secretarial NEPA Policy Statement, CERCLA documents are required to incorporate NEPA values (e.g., analysis of cumulative, off-site, ecological, and socioeconomic impacts) to the extent practicable (DOE, 1994). DOE has integrated NEPA values into the CERCLA process for remediating the SPRU land areas described in this EE/CA. While the CERCLA process includes elements that also are required by the NEPA process (e.g., community involvement, evaluation of alternatives, and consideration of environmental resources), a NEPA evaluation considers impacts to the entire human environment (e.g., socioeconomics, environmental justice, utilities, and infrastructure). Table 4-2 summarizes a review of NEPA considerations evaluated for the seven alternatives.

Table 4-2. National Environmental Policy Act Review Summary

NEPA Value	Alternative UL-1 No Action (Continued Surveillance and Maintenance)	Alternative UL-2 Upper Level Soil Removal	Alternative LL-1 No Action (Continued Surveillance and Maintenance)	Alternative LL-2 Lower Level Soil Removal	Alternative LL-3 Railroad Staging Area Soil Removal and Parking Lot Cap	Alternative NF-1 No Action (Continued Surveillance and Maintenance)	Alternative NF-2 North Field Soil Removal
Off-site Impacts	There are no potential off-site exposure hazards associated with residual contamination in the Upper Level.	Short-term off-site impacts may occur due to temporary and minor degradation of aesthetics, air quality, noise, and traffic, with a potential short-term increase of exposure to hazardous materials from off-site waste disposal requirements. Potential impacts could be mitigated or minimized through proper removal action planning. In the long term, most SPRU land area hazards and hazardous materials would be removed and no longer pose potential risk to the public and the environment.	Off-site impacts would be similar to those described for Alternative UL-1.	Off-site impacts would be similar to those described for Alternative UL-2.	Off-site impacts would be similar to those described for Alternative UL-2. However, some impacted soil would remain on-site under the parking lot cap and potential off-site impacts could come from contamination entering the environment if the cap fails or is not maintained.	Off-site impacts would be similar to those described for Alternative UL-1.	Off-site impacts would be similar to those described for Alternative UL-2.
Biological and Ecological Resources	A review of available Federal, state, and local government databases was performed to identify potential threatened, endangered, and sensitive species that may be located within the vicinity of the SPRU land areas. The database review identified the Indiana Bat and the Karner Blue Butterfly as endangered species that may be found in this part of New York State. Consultation and coordination with Federal (Department of the Interior and U.S. Fish and Wildlife Service) and State (NYSDEC, New York Natural Heritage Program) regulatory agencies are currently in progress regarding the need for further assessment and/or mitigative measures						
Socioeconomic Impacts (includes public services, recreation, and housing)	No socioeconomic impacts would be expected because no removal action would take place.	The removal action would be performed within the KAPL site property boundaries. Some construction equipment and labor would come from the local market, providing an associated increase in business to vendors who serve the construction trade, in amounts typical of a construction project of an equivalent size. There would be no impact to KAPL employment. Construction activities could result in local rental of construction equipment, and if non-local labor forces are used, the resulting money spent on hotels, rental cars, and meals. In the long term, the removal action would not affect lifestyles, neighborhood character or stability, property values, local tax base, employment, industry, commerce, or require the displacement of businesses or farms. No socioeconomic impacts would be expected. The removal action would not be expected to impact public services such as police, fire, schools, parks, or other public facilities or the	No socioeconomic impacts would be expected because no removal action would take place.	Socioeconomic impacts would be similar to those described for Alternative UL-2.	Socioeconomic impacts would be similar to those described for Alternative UL-2.	No socioeconomic impacts would be expected because no removal action would take place.	Socioeconomic impacts would be similar to those described for Alternative UL-2.

NEPA Value	Alternative UL-1 No Action (Continued Surveillance and Maintenance)	Alternative UL-2 Upper Level Soil Removal	Alternative LL-1 No Action (Continued Surveillance and Maintenance)	Alternative LL-2 Lower Level Soil Removal	Alternative LL-3 Railroad Staging Area Soil Removal and Parking Lot Cap	Alternative NF-1 No Action (Continued Surveillance and Maintenance)	Alternative NF-2 North Field Soil Removal
		existing neighborhood and regional parks or other recreational facilities. In the long term, no population or housing impacts would be expected.					
Environmental Justice	No environmental justice impacts would be expected because no removal action would take place.	No known minority or low-income populations that may be impacted by the removal action live within the immediate vicinity of the site; nor would any one group be more adversely affected than another along the transportation routes. No established communities would be physically divided by the removal action. No environmental justice impacts would be expected.	No environmental justice impacts would be expected because no removal action would take place.	Environmental justice impacts would be similar to those described for Alternative UL-2.	Environmental justice impacts would be similar to those described for Alternative UL-2.	No environmental justice impacts would be expected because no removal action would take place.	Environmental justice impacts would be similar to those described for Alternative UL-2.
Cumulative Effects	There are no potential exposure hazards associated with residual contamination in the Upper Level.	On-site activities may potentially impact other KAPL on-site activities that involve construction or removal of structures or other land area cleanup activities. On-site activities may also potentially contribute to cumulative effects from projects of other business or government projects in the immediate area. Noise levels, traffic increases, labor use, utilities, and services could have cumulative effects if multiple construction activities occur at or near the KAPL site. As the SPRU project planning moves forward, effects will be mitigated through coordination with KAPL and nearby businesses and governments to schedule on-site activities. Long term cumulative effects will increase protection of human health and the environment from the reduction of contamination sources through removal actions.	Because the contamination sources would remain, potential cumulative effects to human health could occur if surveillance and maintenance mitigation measures failed.	Cumulative effects would be similar to those described for Alternative UL-2.	Cumulative effects would be similar to those described for Alternative UL-2.	Because the contamination sources would remain, potential cumulative effects to human health could occur if surveillance and maintenance mitigation measures failed.	Cumulative effects would be similar to those described for Alternative UL-2.
Aesthetics/Visual Impacts	No change in aesthetics would be expected because no removal action would take place.	In the short term, temporary degradation in aesthetics may occur during the removal action due to the presence of excavation equipment. However, the SPRU facilities are located within the KAPL site boundaries and their visibility from the community is limited. It is not likely that adverse visual impacts to the nearby community would occur during or after the removal action. In the long term, no change in aesthetics would be expected.	No change in aesthetics would be expected because no removal action would take place.	Aesthetic impacts would be similar to those described for Alternative UL-2.	Aesthetic impacts would be similar to those described for Alternative UL-2.	No change in aesthetics would be expected because no removal action would take place.	This alternative would include the removal of any trees present in contaminated areas, which would adversely affect the aesthetics of the North Field.

NEPA Value	Alternative UL-1 No Action (Continued Surveillance and Maintenance)	Alternative UL-2 Upper Level Soil Removal	Alternative LL-1 No Action (Continued Surveillance and Maintenance)	Alternative LL-2 Lower Level Soil Removal	Alternative LL-3 Railroad Staging Area Soil Removal and Parking Lot Cap	Alternative NF-1 No Action (Continued Surveillance and Maintenance)	Alternative NF-2 North Field Soil Removal
Air Quality	No change in air quality would be expected because no removal action would take place.	In the short term, air quality may be degraded due to airborne dust, equipment and vehicle exhaust, and/or odors generated during the removal action. However, containment measures would reduce the potential for dust to migrate off site. No change in air quality would be expected in the long term.	No change in air quality would be expected because no removal action would take place.	Air quality impacts would be similar to those described for Alternative UL-2.	Air quality impacts would be similar to those described for Alternative UL-2.	No change in air quality would be expected because no removal action would take place.	Air quality impacts would be similar to those described for Alternative UL-2.
Cultural Resources	A review of available Federal, state, and local government databases was performed to identify any historic properties located within the vicinity of the SPRU land areas; no historic properties were identified. Consultation and coordination with the New York State Historic Preservation Office (SHPO) is currently in process regarding the need for further assessment and/or survey needs.						
Soil	Because the contamination sources would remain, the soil would continue to be impacted.	The removal action would not be expected to change the geology in the area, result in soil erosion or loss of topsoil, or substantively change slope stability. Backfill material would be clean, compacted imported fill. No impacts to geology and soil in the area would be expected.	Because the contamination sources would remain, the soil would continue to be impacted.	Soil impacts would be similar to those described for Alternative UL-2.	Soil impacts would be similar to those described for Alternative UL-2.	Because the contamination sources would remain, the soil would continue to be impacted	Soil impacts would be similar to those described for Alternative UL-2. However, due to the removal of surface vegetation and trees, this alternative may result in increased soil erosion or loss of topsoil.
Human Health	There are no potential impacts to human health associated with residual contamination in the Upper Level.	In the short term, temporary and minor exposure to hazards and hazardous materials may occur for workers engaged in removal action activities and exposure of the public, on-site workers, and the environment to hazardous materials due to airborne dust that may occur during the removal action. However, workers engaged in removal action activities would be properly trained and provided personal protective equipment. Dust control measures would be implemented to prevent dust migrating off site, and trucks transporting waste off site would be decontaminated and waste properly packaged prior to leaving the site. In the long term, most of the hazards and hazardous materials would no longer be present in the SPRU land areas, reducing the potential future risk of a release or exposure.	Because the contamination sources would remain, potential impacts to human health would remain as they are.	Health impacts would be similar to those described for Alternatives UL-2.	Health impacts would be similar to those described for Alternatives UL-2.	Because the contamination sources would remain, potential impacts to human health would remain as they are.	Health impacts would be similar to those described for Alternatives UL-2.

NEPA Value	Alternative UL-1 No Action (Continued Surveillance and Maintenance)	Alternative UL-2 Upper Level Soil Removal	Alternative LL-1 No Action (Continued Surveillance and Maintenance)	Alternative LL-2 Lower Level Soil Removal	Alternative LL-3 Railroad Staging Area Soil Removal and Parking Lot Cap	Alternative NF-1 No Action (Continued Surveillance and Maintenance)	Alternative NF-2 North Field Soil Removal
Water Quality	Because the contamination sources would remain, Sr-90 in groundwater under the H2 tank vaults would continue to impact localized groundwater quality.	Groundwater in the Upper Level migrates toward the Mohawk River. Excavation of radiologically impacted soil would have the objective of removing the source(s) of Sr-90 impacts to groundwater. No change in drainage from the site would be expected. The site is not located in a 100-year floodplain. During remedial activities, excavated materials would be managed so that they would not be dispersed by precipitation and contribute to runoff. In the long term, the removal of the contamination would reduce or eliminate the potential future impact to groundwater in the area.	Because the contamination sources would remain, Sr-90 in groundwater in the Lower Level Railbed would continue to adversely impact groundwater quality. Potential further impacts to water quality could occur if surveillance and maintenance mitigation measures failed.	Water quality impacts would be similar to those described for Alternative UL-2.	Water quality impacts would be similar to those described for Alternative UL-2.	Groundwater in the North Field area does not require remediation. However, because Cs-137 contamination sources would remain in shallow soil, potential impacts to water quality could occur if surveillance and maintenance mitigation measures failed.	Groundwater in the North Field area does not require remediation. Water quality impacts would be similar to those described for Alternatives UL-2.
Wetlands	There are no potentially jurisdictional wetlands in the Upper Level.		Assessment of potentially jurisdictional wetlands in the Lower Level and North Field is currently in progress.				
Land Use	If the impacted soil is left in place, potential reuse of land for other KAPL purposes may be limited.	If the impacted soil is removed to industrial cleanup goals, potential reuse of land for other KAPL purposes would not be restricted.	If the impacted soil is left in place, potential reuse of land for other KAPL purposes may be limited.	If the impacted soil is removed to industrial cleanup goals, potential reuse of land for other KAPL purposes would not be restricted.	If the impacted soil is removed to industrial cleanup goals or capped, potential reuse of land for other KAPL purposes would not be restricted.	Re-use of the North Field is not planned and therefore would not be affected if the soil is left in place.	Re-use of the North Field is not planned and therefore would not be affected if the impacted soil is removed to industrial cleanup goals.
Noise	No changes to on-site or off-site noise levels would be expected because no removal action would take place.	In the short term, temporary and minor increases in on-site noise levels may occur during removal action due to demolition, excavation, and/or construction activities, and minor increases in off-site noise levels may occur due to increased truck traffic to and from the site. Truck traffic to and from the site and site work would be limited to weekday working hours to limit the off-site noise impact to nearby residences. In the long term, no changes to on-site and off-site noise levels would be expected.	No changes to on-site or off-site noise levels would be expected because no removal action would take place.	Noise level impacts would be similar to those described for Alternative UL-2.	Noise level impacts would be similar to those described for Alternative UL-2.	No changes to on-site or off-site noise levels would be expected because no removal action would take place.	Noise level impacts would be similar to those described for Alternative UL-2.
Transportation and Traffic	No changes to transportation and traffic would be expected since no removal action would take place. Impacts to transportation and traffic could be observed due to the concurrent Facilities remedial action.	In the short term, a minor increase of truck traffic to and from the site would be expected during the removal action. However, routes would be planned to minimize the impact to the community during peak traffic hours, and the amount of waste materials and clean imported soil required would be minimized to the extent practicable. Since the Facilities remedial action would take place concurrently, a cumulative effect to transportation and traffic would be observed. In the long term, no changes to transportation and traffic would be expected.	No changes to transportation and traffic would be expected because no removal action would take place.	Transportation and traffic impacts would be similar to those described for Alternative UL-2.	Transportation and traffic impacts would be similar to those described for Alternative UL-2.	No changes to transportation and traffic would be expected because no removal action would take place.	Transportation and traffic impacts would be similar to those described for Alternative UL-2.

NEPA Value	Alternative UL-1 No Action (Continued Surveillance and Maintenance)	Alternative UL-2 Upper Level Soil Removal	Alternative LL-1 No Action (Continued Surveillance and Maintenance)	Alternative LL-2 Lower Level Soil Removal	Alternative LL-3 Railroad Staging Area Soil Removal and Parking Lot Cap	Alternative NF-1 No Action (Continued Surveillance and Maintenance)	Alternative NF-2 North Field Soil Removal
Utilities and Service Systems	No impact to utilities and service systems would be expected because no removal action would take place.	In the short term, a temporary and minor increase in utilities such as electricity and water used by the site may be required for the removal action, however, this would be an insignificant change to current normal use. In the long term, no impact to utilities and service systems are expected.	No impact to utilities and service systems would be expected because no removal action would take place.	Utilities and service systems impacts would be similar to those described for Alternative UL-2.	Utilities and service systems impacts would be similar to those described for Alternative UL-2.	No impact to utilities and service systems would be expected because no removal action would take place.	Utilities and service systems impacts would be similar to those described for Alternative UL-2.

5. RECOMMENDED REMOVAL ACTION ALTERNATIVES

The removal action alternatives that best satisfy the evaluation criteria for each SPRU land area based on the comparative analysis in Section 4 and public and regulatory comments will be discussed in this section when the document is revised after the public comment period. Preferred alternatives for the three SPRU land areas have not yet been selected.

Community involvement is critical and a key component of the CERCLA process. The public is encouraged to comment on the alternatives presented in this Draft EE/CA. DOE will provide the public an opportunity to comment on this cleanup action and hold a public meeting to solicit comments. Dates of the comment period will be published in local newspapers. All submitted comments will be reviewed and considered. Following the public comment period, an alternative will be selected for each land area, and a Final EE/CA will be prepared. An Action Memorandum Documenting the Decision on the Selection of the EE/CA for the SPRU Land Areas will be prepared and transmitted to the public and regulatory agencies by the DOE Office of Environmental Management. All responses to the public comments will be included in the administrative record.

This EE/CA is part of the SPRU Administrative Record. Copies are available at the following location:

Niskayuna Branch
Schenectady County Public Library
2400 Nott Street East
Niskayuna, New York 12309
(518) 386-2249

After the public and regulatory comment period, the selected removal action alternative for each land area will be presented in this section and will include a discussion of the evaluation process used to choose the recommended action.

Comments made during public and regulatory agency review of this document will be evaluated and considered during the alternative selection process.

6. REFERENCES

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R-002222 CH2M Hill *Radiological Characterization Report for SPRU Outside Areas, TSM-26, Revision 2.* June 2006.

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Appendix A

SPRU Land Areas Regulatory Framework

Resource Conservation and Recovery Act (RCRA)

The SPRU Project Office has submitted a Resource Conservation and Recovery Act (RCRA) Corrective-Action-Only Permit Application to NYSDEC. The permit application describes project activities that investigate potential chemical contamination on the site from SPRU-related activities. To support this activity, KAPL has also submitted a RCRA permit modification request to NYSDEC for the transfer of SPRU Solid Waste Management Units (SWMUs) to the SPRU Project. The transfer of the SWMUs will allow the primary responsible party, the DOE Office of Environmental Management, to perform the investigation and potential cleanup activities. In reviewing a permit application, NYSDEC will consider DOE-planned activities and methodology to ensure that these activities comply with applicable New York State regulations and result in no adverse effect on the public or the environment. The SPRU Project will not be disposing of RCRA hazardous waste on site.

The SWMUs may be decontaminated and/or removed as part of the removal action associated with the SPRU facilities, depending on which alternative is selected. The soil and groundwater that may have been affected by the SWMUs will be subject to a removal action to be addressed in a separate regulatory document.

Comprehensive Environmental Restoration, Compensation, and Liability Act (CERCLA)

Neither KAPL nor SPRU is included on the U.S. Environmental Protection Agency's (EPA's) National Priorities List. However, in accordance with the *Policy on Decommissioning of Department of Energy Facilities Under CERCLA* (DOE and EPA, 1995), the DOE will respond "…in a manner consistent with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan), regardless of whether or not the release or threatened release is from a site listed on the National Priorities List." Therefore, the decommissioning of the SPRU facilities is being planned as a non-time-critical removal action under CERCLA. Non-time-critical removal actions, as defined in the National Contingency Plan, are conducted under DOE lead-agency authority and typically have a planning horizon of six months or more.

This EE/CA fulfills CERCLA requirements for documenting the removal action alternative selection process in accordance with the *Policy on Decommissioning of Department of Energy Facilities Under CERCLA* (DOE and EPA, 1995), *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, 1993), and the *Decommissioning Implementation Guide* (DOE, 1999). As part of the CERCLA process, this document will be used as a means to communicate with and solicit input from regulatory agencies and public stakeholders on the proposed removal action alternatives.

National Environmental Policy Act (NEPA)

In conjunction with CERCLA and other Federal laws, the National Environmental Policy Act (NEPA) establishes policies and goals for protecting the quality of the environment. NEPA Section 102(2) requires that Federal agencies consider the possible effects (both adverse and beneficial) of proposed activities or actions. The NEPA regulations are promulgated by the Council on Environmental Quality established by NEPA. These regulations state that "Federal agencies shall to the fullest extent possible … integrate the requirements of NEPA with other planning and environmental review procedures required by law or by agency practice so that all such procedures run concurrently rather than consecutively" (40 CFR 1500). These Council on Environmental Quality regulations provide the framework by which NEPA values are to be considered and require that every Federal agency develop its own specific regulations or

implementing procedures for complying with the intent of NEPA (40 CFR 1500). The DOE regulations for implementing NEPA are found in 10 CFR 1021.

In accordance with DOE Order 451.1B (DOE, 2001) and 10 CFR 1021, the considerations (values) of NEPA must be evaluated during the CERCLA process. The DOE issued a Secretarial Policy Statement on NEPA (DOE, 1994), supported by a Department of Justice memorandum on the applicability of NEPA to CERCLA cleanups (Department of Justice, 1995). These documents strengthen the NEPA procedural process within DOE and streamline the NEPA process in areas where duplication or inefficiencies have been identified. The policy states that, as a general practice, DOE will rely on the CERCLA process for review of actions taken under CERCLA and will address NEPA values and public involvement procedures by incorporating NEPA values into the CERCLA process. CERCLA documents will be made available to the public as early as possible.

There are similarities between the NEPA and CERCLA processes. Both processes:

- Require consideration of a No Action Alternative
- Require the identification and analysis of alternative courses of action
- Provide for public participation and receipt of oral and written comments
- Provide for the concurrent consideration of other environmental review and regulatory requirements
- Have a data collection phase
- Result in formally documented decisions

Other

New York state and Federal laws (see Appendix B)

Appendix B

Applicable or Relevant and Appropriate Requirements

Table B-1. Chemical-Specific ARARs

Requirement	Citation	Description of Requirement	Type of Requirement	Reason for Inclusion
Clean Air Act - National Emission Standards for Hazardous Air Pollutants	40 CFR 61	Establishes primary and secondary NAAQS for ambient air quality to protect public health and welfare.	Applicable	Removal activities may generate airborne radionuclides/asbestos.
New York Water Classifications and Quality Standards	6 NYCRR Parts 701-703	Lists classifications of surface water and groundwater, sets forth procedures for deriving standards, and identifies surface water and groundwater quality standards and groundwater effluent standards.	To be considered	Do not violate or exceed established maximum contaminant level or specific levels established for contaminants. Does not incorporate Federal standards.
New York State Pollutant Discharge Elimination System (SPDES) Program	6 NYCRR Parts 750-758	Regulates permitted releases into waters of the State.	Applicable	New York State recognizes DOE Order 231.1A for applicability to radiological discharges (nothing known to be leaving site).
New York Cleanup Guideline for Soils Contaminated with Radioactive Materials	TAGM[1] 4003	Remediation of sites contaminated with radioactive material.	To be considered	New York State guidelines for determining cleanup levels.
New York Determination of Soil Cleanup Objectives and Cleanup Levels	TAGM 4046	Contains method for determining cleanup levels.	Applicable	New York State guidelines for determining cleanup levels
Project RCRA Corrective Action Permit	New York Part 370 Series	Requirements to investigate areas where waste is managed.	Applicable	Identifies investigation requirements and controls for areas where release of wastes occurred into the environment.
Radiation Protection of the Public and the Environment	DOE Order 231.1A (DOE Order 5400.5)	Contains derived concentration guides for radionuclides.	To be considered	New York State recognizes DOE Order 231.1A for applicability to radiological discharges.
Facility Safety	DOE 420.1 and 440.1	Identifies mandatory and reference Environmental Safety and Health standards.	To be considered	DOE Orders are non-enforceable policies and guidelines that must be followed at all DOE facilities.

1 Technical Administrative Guidance Memorandum

Table B-2. Action-Specific ARARs

Potential activities used to guide identification of action-specific areas are: soil removal, waste handling, stormwater runoff, erosion control.

Requirement	Citation	Description of Requirement	Type of Requirement	Reason for Inclusion
Occupational Safety and Health Act (OSHA)	29 CFR 1910 29 CFR 1926	Establishes limits for worker exposures during response actions and construction activities at CERCLA sites	Applicable	DOE requirement.
Air Quality Standards	40 CFR 50	National primary and secondary ambient air quality standards.	Applicable	May be applicable, relevant, or appropriate if excavation equipment exhaust and fugitive dust contribute significantly to air quality ranking for region.
Clean Water Act – SPDES - Stormwater Management and Sediment Control, Small Municipal Separate Storm Sewer Systems (MS4s[2])	40 CFR 122 NYCRR, Title 6 parts 750-758	Stormwater management and sediment control plan for land disturbances, general permit for discharges from MS4s.	Applicable	Removal activities may require an erosion control plan, MS4 permit, and State notifications.
Clean Water Act – Water Classification – National Pollutant Discharge Elimination System (NPDES)	40 CFR 122	Official classified water uses for all surface water and groundwater.	Applicable	Potential run off to waters of the State (Mohawk River).
Department of Transportation – Hazardous Materials Regulations	49 CFR	Regulates packaging, labeling, and transportation of hazardous material.	Applicable	These requirements are pertinent to the removal if waste is transported off site.
RCRA Part B Permit	40 CFR 260-264, 266, 268, 270, 124	Requirements for hazardous waste facilities/management/small quantity generators, also regulates clean closure, capping, and post-closure requirements.	Applicable	SPRU SWMUs are listed in Part B permit; provides pre-transport requirements through reference to U.S. Department of Transportation.
Occupational Radiation Protection	10 CFR 835	Radiation protection standards, limits, and program requirements, mandates as low as reasonably achievable (ALARA) principles. Criteria for radiation dosimetry programs.	Applicable	Establishes dose limits for employees and public during direct on-site access; codified from DOE Order 5480.11/.15.

2 Municipal separate storm sewer system

Requirement	Citation	Description of Requirement	Type of Requirement	Reason for Inclusion
Environmental Protection Program	DOE Order 450.1 (DOE Order 5400.1)	DOE environmental protection standards and requirements.	To be considered	Meet/exceeds applicable laws, regulations, and DOE requirements.
Radioactive Waste Management	DOE Order 435.1 (DOE Order 5820.2A)	Criteria for radioactive waste activities.	To be considered	DOE Orders are non-enforceable policies and guidelines that must be followed at all DOE facilities.
Hazardous Material Packaging for Transport-Administrative Procedures	DOE 460.2	Establishes administrative procedures for the certification and use of radioactive and other hazardous materials packaging by the DOE	To be considered	DOE Orders are non-enforceable policies and guidelines that must be followed at all DOE facilities.
Transportation of Hazardous Materials, Substances, and Wastes	DOE Order 5480.3	Specifies labeling and packaging of these substances in addition to 49 CFR 172.	To be considered	DOE Orders are non-enforceable policies and guidelines that must be followed at all DOE facilities.
Toxic Substances Control Act - Asbestos	40 CFR 763	Regulations governing abatement, transportation, and disposal of asbestos.	Applicable	Notification to State and approval prior to demolition. Worker training required.
Toxic Substances Control Act - PCBs	40 CFR 761	Identifies cleanup levels and disposal requirements for PCBs and materials containing PCBs.	Applicable	May generate PCB-containing demolition waste.
Environmental Protection, Safety, & Health Protection Standards	DOE Order 5480.4	Specifies regulations, standards, requirements, and guidance on environmental, safety, and health.	To be considered	DOE Orders are non-enforceable policies and guidelines that must be followed at all DOE facilities.
Contractor Occupational Medical Program	DOE Order 5480.8	Establishes requirements for the implementation of a Contractor Occupational Medical Program.	To be considered	DOE Orders are non-enforceable policies and guidelines that must be followed at all DOE facilities.
Construction Project Safety and Health Management	DOE Order 5480.9A	Establishes requirements for a Construction Safety and Health Program to protect DOE and contractor employees and the general public.	To be considered	DOE Orders are non-enforceable policies and guidelines that must be followed at all DOE facilities.
Contractor Industrial Hygiene Program	DOE Order 5480.10	Establishes requirements to implement a Contractor Industrial Hygiene Program.	To be considered	DOE Orders are non-enforceable policies and guidelines that must be followed at all DOE facilities.
Personnel Selection, Qualification, and Training	DOE Order 5480.20A	Establishes DOE requirements for DOE staff and contractor personnel selection, qualifications, and training.	To be considered	DOE Orders are non-enforceable policies and guidelines that must be followed at all DOE facilities.

New York regulations – Official Compilation of Codes, Rules and Regulations of the State of New York (NYCRR)				
New York Air Pollution Control	6 NYCRR Parts 200, 211, 212	Establishes air pollution control regulations.	Applicable	May be applicable or relevant if excavation equipment exhaust and fugitive dust contribute significantly to air quality.
New York Ambient Air Quality Standards – Air Quality Classification System	6 NYCRR Parts 256-257	Specifies emissions and ambient air concentrations/standards from an emission source.	Applicable	May be applicable or relevant if excavation equipment exhaust and fugitive dust contribute significantly to air quality.
New York Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites	TAGM 4031	Identifies guidance for dust suppression and particulate monitoring.	To be considered	Soil removal activities may affect air quality.
New York Solid Waste Management Facility Rules	6 NYCRR Part 360	Regulates solid waste management facilities.	Applicable	Solid waste generated may require disposal.
New York Hazardous Waste Regulations – treatment, storage, and disposal requirements (permitting)	6 NYCRR Part 370 Series	Requirements for management of hazardous waste.	Applicable	SPRU is small quantity generator of hazardous material.

Table B-3. Location-Specific ARARs

Requirement	Citation	Description of Requirement	Type of Requirement	Reason for Inclusion
Safe Drinking Water Act	42 U.S.C. s/s 300F et seq. (1974)	Established protection of sole source aquifers.	Applicable	SPRU facilities overly the Schenectady/ Niskayuna sole source aquifer.
National Historical Preservation Act	36 CFR 800	Identifies criteria for determining whether facility/site has any historical significance.	Applicable	Determine if any historic properties exist on site.
Canal Corporation property requirements			To be considered	To be considered if action goes off of the site boundary, nothing known to be leaving site.
General Electric property requirements			To be considered	To be considered if action goes off of the site boundary, nothing known to be leaving site.