BUILDING 1103A AREA DECOMMISSIONING PLAN

REV. 0

U.S. Army Research Laboratory
Aberdeen Proving Ground, MD

Contract No. W52P1J-04-D-0007
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Submitted to:
U. S. Army Joint Munitions Command
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RADIOLOGICAL · ENVIRONMENTAL · REMEDIATION

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ACRONYMS AND ABBREVIATIONS

ACM	Asbestos-Containing Material
AJMC	Army Joint Munitions Command
ALARA	As Low as Reasonably Achievable
ALI	Annual Limit on Intake
ANL	Argonne National Laboratory
APG	Aberdeen Proving Ground
ARL	Army Research Laboratory
CABRERA	Cabrera Services, Inc.
CAR	Corrective Action Request
CDE	Committed Dose Equivalent
CFR	Code of Federal Regulations
cm^2	square centimeter(s)
COC	Chain of Custody
CPR	Cardiopulmonary Resuscitation
DAC	Derived Air Concentration
DCGL	Derived Concentration Guideline Level
DDE	Deep Dose Equivalent
DoD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DP	Decommissioning Plan
dpm	disintegration(s) per minute
DRSC	Decommissioning Radiation Safety Commission
DU	Depleted Uranium
EPA	U.S. Environmental Protection Agency
FOL	Field Operations Lead
FSS	Final Status Survey
FSSP	Final Status Survey Plan
ft	feet
ft^2	square feet
ft^3	cubic feet
GET	General Employee Training
H&S	Health and Safety
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCDPZ	Harford County Department of Planning and Zoning
HSM	Health and Safety Manager
HSO	Health and Safety Officer
HVAC	Heating, Ventilation, and Air Conditioning
km/hr	kilometer(s) per hour
LDE	Lens Dose Equivalent
LLMW	Low-Level Mixed Waste
LLRW	Low-Level Radioactive Waste
µg/L	microgram(s) per liter
m	meter(s)
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
MDCR	Minimum Detectable Count Rate
MGS	Maryland Geological Survey
MM	Modified Mercalli
MOU	Memorandum of Understanding
mrem/yr	millirem per year
NCDC	National Climatic Data Center
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NVLAP	National Voluntary Laboratory Accreditation Program
PCB	Polychlorinated Biphenyl
pCi/g	picocurie(s) per gram
PM	Project Manager
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
QCM	Quality Control Manager
R& D	Research and Development
RCRA	Resource Conservation and Recovery Act
ROC	Radionuclide of Concern

RSL	Radiation Safety Lead
RSO	Radiation Safety Officer
RSP	Radiation Safety Program
RWP	Radiation Work Permit
RWT	Radiation Worker Training
SDE	Shallow Dose Equivalent
sec	second(s)
SOP	Standard Operating Procedure
SRD	Self-Reading Dosimeter
SSHP	Site Safety and Health Plan
T & D	Transportation and Disposal
TEDE	Total Effective Dose Equivalent
TLD	Thermoluminescent Dosimeter
^{234}U	Uranium-234
^{235}U	Uranium-235
^{238}U	Uranium-238
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
yd^3	cubic yard(s)

1.0 EXECUTIVE SUMMARY

This *Decommissioning Plan (DP)* presents the technical approach for decommissioning the Building 1103A Area of the U.S. Army Research Laboratory (ARL) located at Aberdeen Proving Ground (APG) in Aberdeen, Maryland. The ARL is the license holder for this target disassembly facility under U.S. Nuclear Regulatory Commission (NRC) nuclear materials license No. SMB-141. The licensee proposes a decommissioning objective of unrestricted use for the Site.

Characterization survey activities were conducted in May 2006 by Cabrera Services, Inc. (CABRERA) for the U.S. Army Joint Munitions Command (JMC), under Contract No. DAAA09-02-D-0024, Delivery Order 0029. Results from the characterization survey have been used to support the development of this *DP*, in accordance with NRC regulations and guidance. This effort is classified as a Group 4 decommissioning, as defined in NUREG-1757, Volume 1 (NRC, 2006), in that licensed material was used in a manner that resulted in residual contamination of buildings and soils, but not groundwater.

Historical activities at the Building 1103A Area have resulted in the radiological contamination of several structures and surrounding grounds. Radionuclides of concern (ROCs) include isotopes of uranium that comprise depleted uranium (DU), and their daughter progeny. Implementation of the decommissioning activities described in this *DP* will result in the removal of DU-contaminated materials from the Site by the following means:

- Dismantlement/demolition of portions of contaminated structures, followed by segregation of demolition debris into: 1) non-contaminated debris that may be disposed as standard industrial waste, 2) contaminated materials that may be decontaminated and reused elsewhere on base, 3) contaminated materials that may be disposed off-site at a permitted facility as special waste with unimportant quantities of source material, and 4) low-level radioactive waste (LLRW) and low-level mixed waste (LLMW) that must be disposed off-site at a licensed facility.
- Decontamination of structures that will remain onsite and disposal of LLRW.
- Excavation and disposal of contaminated asphalt and underlying soils.

Following the removal of contaminated materials, a final status survey (FSS) will be conducted in accordance with *Multi-Agency Radiation Survey and Site Inspection Manual*

(*MARSSIM*; NRC, 2000). A dose objective of 25 millirem per year (mrem/yr) above background is applicable to the Site, as specified in 10 CFR 20, Subpart E. This dose limit provides the basis for the development of derived concentration guideline levels (DCGLs) for residual radioactivity in the structures and soils that remain onsite following remediation.

The activities described in this plan will be performed under the oversight of the Army Radiation Safety Officer (RSO) of record, as specified in the NRC license. The work will be conducted in accordance with applicable health and safety (H&S), radiation safety, and quality assurance (QA) requirements. Completion of decommissioning activities at the Building 1103A Area is expected to result in the unrestricted release of the Site from NRC license requirements.

2.0 FACILITY OPERATING HISTORY

The Building 1103A Area is a former radioactive material processing and storage facility on Spesutie Island at APG. Historical site activities involving DU, conducted in accordance with NRC radioactive materials license SMB-141, have resulted in radiological contamination of the buildings and grounds. ARL has responsibility for this Site and desires to initiate the decommissioning process so that the area can be released from its NRC Nuclear Materials License requirements (see Appendix A) and reused for other purposes.

2.1 License Status and Authorized Activities

Authorized DU operations are identified in NRC Materials License No. SMB-141, as amended (see Appendix A). As the licensee, ARL is authorized to use DU at their facilities for the following:

- Research and development, as defined in 10 CFR 30.4;
- Fabrication, modification, and testing of components, parts and/or devices;
- Laboratory analysis and measurement studies;
- Calibration of the licensee's instruments;
- Munitions testing; and
- Processing of waste of other Army tenants located at APG.

2.2 License History

The Army has been authorized to use radioactive materials at APG since 1961. There have been multiple revisions/amendments to the existing license, with the most recent Amendment (No. 27) being issued on December 19, 2005.

2.3 Previous Decommissioning Activities

No previous decommissioning activities have been undertaken at the Building 1103A Area.

2.4 Spills

There have been no reports of previous spills involving DU at the Site. However, there was substantial flooding associated with Hurricane Isabel in 2003, during which a large portion of Spesutie Island was submerged in water. The flooding may have resulted in the transport and/or redistribution of surface DU contamination to low lying areas in the vicinity of the Site.

2.5 Prior Onsite Burials

No prior onsite burials are known to have occurred in the Building 1103A Area.

3.0 FACILITY DESCRIPTION

Details regarding the location, description, and environmental setting of the Building 1103A Area are described in this section.

3.1 Site Location and Description

APG is a government-owned and operated military research and development center located approximately 30 miles northeast of Baltimore, MD, and 60 miles southwest of Philadelphia, PA, on the shores of the Chesapeake Bay (Figure 3-1). The Building 1103A Area is located on the northern end of Spesutie Island, which is in the northeastern portion of APG, in Harford County (Figure 3-2).

The general layout of the Building 1103A area is shown in Figure 3-3. Floor plans of the main buildings comprising this area (i.e., Building 1103A, Building BRL12, and the Freestanding Vault) are depicted in Figures 3-4 through 3-6, respectively. Historical activities at the Site involved the unloading of DU contaminated targets in the central asphalt area; storage and staging of the targets in one of the three vaults; cutting and machining of the targets in Buildings 1103A (and, to a lesser extent, BRL12); and storage and reloading of the resulting steel pieces in preparation for decontamination, disposal, or reuse.

3.2 Population Distribution

The U.S. Census Bureau (USCB) listed the total population of APG in 2000 as 3,116 people (USCB, 2003). There are no permanent residences on Spesutie Island, where the Building 1103A Area is located; however, there are occupied dwellings approximately one mile northwest of the island access gate. The nearest towns to Spesutie Island are: Aberdeen, MD, which lies approximately 6 miles northwest of the gate and has a population of 13,842; and Havre de Grace, MD, which lies approximately 7 miles north of the gate and has a population of 11,331 (USCB, 2003).

3.3 Current and Future Land Use

APG occupies approximately 72,500 acres, 38% of which is water (ARL, 1997). The *Harford County Land Use Plan* (HCDPZ, 1988) recognizes APG as a federal reservation and does not designate or define its land uses. Instead, land use designations at APG are defined by the APG 1978 *Master Plan* and its 1980 *Executive Summary*. Current land uses include

field training, administration, community services, housing, research and development (R&D), storage, and restricted building and recreation (ARL, 1997).

ARL conducts R&D activities at its field test experimental facilities and firing ranges on Spesutie Island. The island lies within the secure area of APG and, other than the areas used for munitions testing, consists primarily of undeveloped forest and wetlands areas. It is anticipated that after the proposed Building 1103A Area decommissioning activities are completed, any future use of the area would be in keeping with R&D activities currently being conducted on other parts of the island.

3.4 Meteorology and Climatology

Spesutie Island is located within the Coastal Plain area of Maryland. The climate of the Coastal Plain may be characterized as "Continental," as it has four seasons. Located on the western side of the Chesapeake Bay near the Atlantic Ocean, the local climate is moderated by these two large bodies of water, as well as the Appalachian Mountains to the west. As a result, the winters are milder and relative humidity (annual average of 70.2 to 76.9%) is higher than in inland areas of the same latitude. A general flow of air masses from west to east brings inland air to the coast. Prevailing winds (annual mean speed of 12.6 kilometers per hour [km/hr]) are changeable, but come primarily from the northwest in the winter months and from the southwest in the summer months. (ARL, 1997)

The weather in the vicinity of APG can best be described as variable. January is typically the coldest month, and July is typically the warmest. Meteorological data reported by the National Climatic Data Center (NCDC) for the Aberdeen Phillips Air Field from 1971 to 2000 indicate 30-year mean monthly temperatures ranging from 33.6°F in January to 77.0°F in July, with an average annual temperature of 55.9°F. Mean monthly precipitation over the 30-year period ranges from 2.60 inches in February to 4.48 inches in September, with a total mean precipitation of 44.22 inches per year. (NCDC, 2007)

An average of 30 thunderstorms per year occur along the Chesapeake Bay. They are generally in the late spring or summer month. Hurricanes are infrequent but possible, with the most recent being Isabel in 2003. The probability of a tornado is approximately 1 in 2000 per year. The annual average snowfall at Aberdeen Phillips Field is 15.5 inches. Freezing temperatures are experienced an average of 20 days per year, from late October until mid-April. (ARL, 1997)

3.5 Geology and Seismology

The geology of southeast Harford County consists of Cretaceous and younger, unconsolidated sedimentary rocks of the Atlantic Coastal Plain. These deposits are underlain by the crystalline rocks of the Piedmont. The Coastal Plain formation increases in thickness from the Town of Aberdeen to the Chesapeake Bay. The Talbot formation is dominant within the boundaries of APG. This formation consists of yellow to brown sand, gravel, clay, and silt and is separated into two lithofacies: a lower, thick-bedded, cross-stratified gravely sand facies, and upper massive-to-thin clayey silt or silty clay. Alluvium and colluvium deposits, mainly consisting of reworked Coastal Plain sediments, are present in the floodplain of the rivers and creeks that traverse APG. (ARL, 1997)

Subsurface data from an exploratory well on Spesutie Island indicate the presence of a Cretaceous sand sequence ranging from 102 to 299 feet in thickness. Its extent is not known, but it likely extends under the entire APG area, thinning and rising toward the west. (ARL, 1997)

Soil types at APG are described in *The Soil Survey of Harford County Area, Maryland, 1979.* The soils of APG were formed by sedimentation of upland parent rock rather than by weathering of underlying bedrock. There are four major soil subtypes: Elkton sandy loams, Keyport fine sandy loams, Sassafras loams, and Sassafras silt loams. The Elkton series consists of deep, poorly drained, nearly horizontal soils; the Keyport series consists of deep, moderately well-drained, nearly horizontal and gently sloping soils; and the Sassafras series consists of deep, well-drained, gently sloping soils. (ARL, 1997)

Meadow and tidal marsh areas have a mixture of soils, and represent a soil condition rather than a soil type. The meadow areas are narrow strips of poorly drained alluvial material, occurring along a few streams and drainage ways. The tidal marsh areas are wet, marshy land along the lower courses of streams and the estuaries of the Chesapeake Bay. Marsh area soils are often peaty or mucky due to anaerobic conditions that occur when they are covered with water. They are saline or brackish, depending on the ratio of tidal water to fresh to which they are exposed. (ARL, 1997)

Specific soil types in the vicinity of the Building 1103A Area are detailed in the *Web Soil Survey* published by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS, 2007). As shown in Figure 3-7, the NRCS soil survey data

indicate that the Building 1103A Area contains surface soils consisting of Nassawango and Mattapex silt loams with 0 to 2% slopes. (NRCS, 2007)

There are no known major seismic faults underlying or near APG. A series of faults, or "fault swarms," lies beneath the Coastal Plain and in the outcrop of crystalline rock to the west of Aberdeen. The largest major fault in the region is the Mill Green Fault to the north and northwest. However, all faults in the crystalline basement rock are inactive. (ARL, 1997)

Regional foundation materials at APG are poorly consolidated sediments, and the local water table is shallow. Thus, liquefaction during a seismic event would be possible. However, minor seismic events that have occurred in unconsolidated sediments of the region have resulted in little or no effect on surface features or man-made objects. There is a low risk of significant damage from earthquakes of a recurrence interval shorter than 500 years (onsite Modified Mercalli [MM] intensity VI). Earthquakes with longer recurrence intervals are potentially damaging; however, resonance coupling between earthquake waves and water-saturated sediments is a potential risk at APG only at recurrence intervals substantially longer than 500 years. (ARL, 1997)

3.6 Surface Water Hydrology

Surface water systems at APG are directly linked to the Chesapeake Bay, its tidal and non-tidal tributaries, and their associated marshlands. The Chesapeake Bay is the largest estuarine (i.e., tidally influenced system where freshwater mixes with saltwater) system in the United States. The upper bay area, where APG is located, is unique in its seasonal and year-to-year fluctuations in salinity, nutrients, and turbidity. APG is located at the uppermost tidal influence where the unique mixing of fresh and saltwater provides productive spawning grounds and nursery areas for an abundance of marine, estuarine, and freshwater aquatic life. (ARL, 1997)

Spesutie Island is surrounded by water, with the Chesapeake Bay on the north, east, and south, and Spesutie Narrows, an aquatic inlet, on the west. As shown in Figure 3-8, the majority of Spesutie Island lies below the 100-year flood plain elevation, which is defined by the U.S. Army Corps of Engineers as 8 ft above mean sea level (ARL, 1997). By definition, these areas are considered susceptible to flooding, which was demonstrated during Hurricane Isabel when storm surges of 5 to 7 feet of water were reported in the area by the Maryland Geological Survey (MGS, 2004).

There are no natural surface water features within the boundaries of the Building 1103A Area. During non-flood periods, storm water from the area is directed by drainage swales and culverts along the roads. Storm water flows generally north toward the Chesapeake Bay.

3.7 Groundwater Hydrology

Groundwater in the Coastal Plain deposits occurs in the Talbot formation and the underlying Potomac Group. Most groundwater wells installed in the Coastal Plain deposits are screened in the higher yielding Talbot formation, which consists mostly of layers of sand and gravel. Groundwater in the Aberdeen area is used as a raw water supply and for subsequent treatment as potable water. Production wells are scattered throughout APG, with 10 wells that serve the Town of Aberdeen and eight that serve Harford County as potable water supplies. (ARL, 1997)

There are no groundwater supply wells on Spesutie Island used for drinking water production; however, ARL does have a monitoring well in the vicinity of the Building 1103A Area. Analytical results from this well indicate that the water is brackish and non-potable. Samples from this well have not indicated any radiological contamination in the groundwater.

3.8 Natural Resources

APG has extensive and varied wildlife habitats, including mature upland mixed oak forests, bottom land hardwood forests, and freshwater estuarine marshes. In total, approximately 80% of APG is covered with vegetation. Of the installation's approximately 45,000-acre land area, approximately 15,480 acres are forested; more than 10,380 acres are wetlands; 3,520 acres are herbaceous or old field habitats; 7,040 acres are mowed grass; and the rest of the land is developed. Wildlife species and vegetation present at the site are typical of the respective habitats. (ARL, 1997)

The installation supports extensive forests, mostly within portions where training and testing are conducted (i.e., the secure areas). There are five forest types at APG, all of which consist of hardwoods typical of the Maryland Chesapeake Bay area. APG has a forestry management program, but considering the location of the forests within the secure areas, timber planting and harvesting activities are extremely limited. (ARL, 1997)

At present, there are no forests or agricultural areas on Spesutie Island that are harvested for economic reasons. In addition, there are no natural resources such as mineral deposits, fuel,

or hydrocarbon resources on the island that are exploited for economic reasons. Neither are any groundwater or surface water resources used for potable, agricultural, or industrial water supply.

3.8.1 North American Waterfowl Management Plan

APG participates in the *North American Waterfowl Management Plan* (FWS, 2007), which addresses the protection and enhancement of wetland and waterfowl resources. The installation is used as a major wintering area for migrating waterfowl, and there are nesting sites for various raptors in addition to the Bald Eagle, including the Great Horned Owl, hawks, and osprey. (ARL, 1997)

The Bald Eagle (*Haliaetus leucocephalas*) is the only federally endangered species known to inhabit Spesutie Island. The Bald Eagle uses several areas on the island as nesting grounds, which are protected on a year-round basis, as described in APG's *Bald Eagle Management Plan.* No new work may commence within 200 meters of a nest between January 1 and April 15. There have been no nesting areas observed in the vicinity of Building 1103A; thus, decommissioning work in this area is not currently subject to these schedule restrictions.

Other species of concern that have been observed at APG include sharp-skinned hawk (*Accipiter striatus*), osprey (*Pardion haliaetus*), golden eagle (*Aquila chrysaetus*), peregrine falcon (*Falco perigrinus*), and tiger salamander (*Ambystima tigrinum*).

3.8.2 Chesapeake Bay Initiatives

Recognizing that the Chesapeake Bay is an estuarine system of great importance, the State of Maryland enacted the *Chesapeake Bay Critical Area Act of 1984* and the *Chesapeake Bay Critical Area Program Development Criteria* in 1986. These initiatives require local jurisdictions to implement a management and resource protection program for those areas within 1,000 feet of tidal waters and tidal wetlands, and any additional areas that are important to protecting the resources of the Chesapeake Bay. The protected areas are collectively known as the Critical Area, and encompass most of the ARL experimental facilities on Spesutie Island, including the Building 1103A Area. (ARL, 1997)

Harford County has developed a *Critical Area Program* in response to the Chesapeake Bay initiatives. The County's program is designed to protect coastal areas from the adverse impacts of development by minimizing the impacts of storm water runoff and sedimentation

on water quality; conserving fish, wildlife, and plant habitat; maintaining forested areas; minimizing the secondary impacts of development; and monitoring and controlling development in the Critical Area. (ARL, 1997)

The Army is committed to voluntary compliance with the provisions of the *Critical Area Program*, and has signed a Memorandum of Understanding (MOU) with the U.S. Environmental Protection Agency (EPA) to utilize its capabilities and expertise toward the protection and restoration of the Chesapeake Bay. As part of the MOU, the Army has developed an *Action Plan,* which includes requirements for storm water management and spill prevention, as well as wildlife conservation and habitat protection. (ARL, 1997)

4.0 RADIOLOGICAL STATUS OF THE FACILITY

A characterization survey of the Building 1103A Area was completed in May 2006. The survey results confirmed that historical activities involving DU have resulted in radiological contamination of the some of the structures and grounds, as described below. Details regarding the survey results are presented in the *Building 1103A Area Characterization Survey Report* (CABRERA, 2007), which is included as Appendix B.

4.1 Contaminated Structures

The scope of the characterization survey conducted at the Building 1103A Area included the interior and exterior surfaces of the following structures: Building 1103A, Building BRL12 and a Freestanding Vault. The gross DU surface screening limit (100 disintegrations per minute [dpm] per 100 square centimeters [cm^2]) and transferable activity screening limit (10 dpm/100 cm^2) used during the survey were derived in accordance with *NUREG 1757: Consolidated Decommissioning Guidance* (NRC, 2006). The data presented in the *Characterization Survey Report* accounts for background activity, as measured on the various types of building surfaces evaluated. The net activity data was used to delineate areas exceeding the building surface screening limit.

Based on the nature of historical activities conducted at the 1103A Area and the time period during which the structures were built, the characterization survey not only addressed DU contamination, but also included hazardous substances suspected of being present in the building materials. These included asbestos, polychlorinated biphenyl compounds (PCBs), and *Resource Conservation and Recovery Act* (RCRA) metals.

4.1.1 Building 1103A

Building 1103A houses the main machine shop used for the disassembly of firing range targets contaminated with DU. The Main Area of Building 1103A is constructed of cinder block exterior walls, a concrete slab floor, and a flat tar-and-chip roof. The ceiling is covered in some places with fiberboard. Under the same roof is a small Entry Area, which includes the furnace room, bathroom, meeting room, and changing room. The Entry Area has a drop-type acoustic tile ceiling, sheetrock walls, and tile flooring. The walls separating the Entry and Main Areas consist of sheetrock, and are lined with steel plates on the side facing the Main Area.

On the south side of the building is a Shop Area, which is a wood-frame addition to the main building. This area has a concrete slab floor and a pitched shingle roof. Steel plates line the lower portion of the walls in this area, and fiberglass insulation is present between the wood studs and overhead beams.

Building 1103A contains functioning ventilation, electrical, water supply, and sewer systems. The ventilation system has fiber filters on the air intake vents and exposed ductwork attached to the ceiling. The electrical system panel is located in the Shop Area, and electrical conduit runs along the walls and ceiling throughout the building to supply energy to light fixtures and wall outlets. There is a full bathroom in the Entry Area with sink, toilet, and shower facilities. This area was used for personnel and equipment decontamination during building operations involving radioactive material. Radiological characterization survey results for Building 1103A are summarized in Tables 4-1 and 4-2.

Table 4-1: Building 1103A Direct Alpha Measurement Summary

Area	Location	Alpha Activity (dpm/100cm^2)		
		Average	Standard Deviation	Maximum
Main Area	Floor	432	239	864
	Interior Walls	68	42	172
	Ceiling	10	8	26
	Overhead Horizontal Surfaces	1,245	1,045	2,654
Shop Area	Floor	386	59	428
	Interior Walls	80	62	276
	Ceiling	33	15	52
	Overhead Horizontal Surfaces	711	771	1,562
Entry Area	Floor	87	73	236
	Interior Walls	8	7	20
	Ceiling	*	*	*
	Overhead Horizontal Surfaces	375	301	812
Exterior Walls	North Wall	22	13	42
	South Wall	43	85	268
	East Wall	13	13	36
	West Wall	12	6	20

dpm/100 cm^2 = disintegrations per minute per 100 square centimeters
* = characterization survey measurements not obtained

Table 4-2: Building 1103A Removable Alpha Measurement Summary

Area	Location	Alpha Activity (dpm/100cm^2)		
		Average	Standard Deviation	Maximum
Main Area	Floor	60	36	124
	Interior Walls	28	25	88
	Ceiling	0.4	0.7	1.3
	Overhead Horizontal Surfaces	284	198	644
Shop Area	Floor	7.0	1.5	8.0
	Interior Walls	16	13	56
	Ceiling	7.2	6.2	18
	Overhead Horizontal Surfaces	159	145	315
Entry Area	Floor	7.8	7.0	20
	Interior Walls	2.2	1.3	4.3
	Ceiling	*	*	*
	Overhead Horizontal Surfaces	68	69	179
Exterior Walls	North Wall	0.2	0.6	1.0
	South Wall	1.6	3.1	9.9
	East Wall	0.1	0.5	1.0
	West Wall	0.3	1.0	2.3

dpm/100 cm^2 = disintegrations per minute per 100 square centimeters
* = characterization survey measurements not obtained

Based on the results of the Building 1103A characterization survey, the following assumptions were made regarding the radiological status of this structure:

- The majority of interior surfaces of the structure are assumed to be contaminated with fixed, as well as transferable contamination and require decontamination and/or removal. Epoxy paints applied to the walls and floors subsequent to the use of this building for DU processing may be shielding additional areas of contamination underlying the painted surfaces, which were not identified during the characterization survey.

- All ducts, vents, filter media, light fixtures, conduits, ceiling tiles, insulation, etc. mounted within Building 1103A are assumed to be contaminated and require removal.
- The roof is potentially contaminated. However, roofing material consisting of tar and chip must be removed to facilitate radiological surveys of the underlying roof structure.
- Exterior walls exhibit limited areas of contamination that should be further delineated to identify discrete areas that may potentially require decontamination.

In addition to exhibiting radiological contamination, the tile floor and associated mastic in the Entry Area, as well as the two interior fire doors are considered asbestos-containing material (ACM) and should be managed accordingly upon removal.

4.1.2 Building BRL12

Building BRL12 was built to provide additional space for machining operations associated with the dismantlement of DU-contaminated targets, as well as shielded storage space for staging the contaminated targets prior to disassembly. The main area (i.e., Central Room) of Building BRL12, where machining was performed, has a concrete floor, sheetrock walls (some of which are lined with steel), and acoustic tile ceiling. There are two air conditioning units mounted in the west wall of the building. The only utility system in the building is the electrical system, which is used to power the air conditioners, light fixtures, and wall outlets.

There are steel-lined storage vaults on the north and south ends of Building BRL12. Both vaults have concrete floors and steel-lined walls and ceilings. A single light fixture hangs from the ceiling in each vault. There is also a small office area situated between the main room and the north end vault. The office has sheetrock walls, tiled floor, and acoustic tile ceiling. Radiological characterization survey results for Building BRL12 are summarized in Tables 4-3 and 4-4.

Table 4-3: Building BRL12 Direct Alpha Measurement Summary

Area	Location	Alpha Activity (dpm/100cm^2)		
		Average	Standard Deviation	Maximum
Central Room	Floor	76	55	186
	Interior Walls	9	12	40
	Ceiling	19	15	36
North Vault	Floor	4,030	6,132	14,798
	Interior Walls	-1	7	10
	Ceiling	0	0	0
South Vault	Floor	43	23	68
	Interior Walls	1	3	6
	Ceiling	4	0	4
Office Area	Floor	98	*	98
	Interior Walls	**	**	**
	Ceiling	**	**	**
Exterior Walls	North Wall	5	6	12
	South Wall	6	5	12
	East Wall	7	8	22
	West Wall	4	7	12

dpm/100 cm^2 = disintegrations per minute per 100 square centimeters
* = single measurement obtained
** = characterization survey measurements not obtained

Table 4-4: Building BRL12 Removable Alpha Measurement Summary

Area	Location	Alpha Activity (dpm/100cm^2)		
		Average	Standard Deviation	Maximum
Central Room	Floor	7.4	4.1	14
	Interior Walls	4.4	3.2	8.7
	Ceiling	0.7	0.9	1.3
North Vault	Floor	274	470	1,107
	Interior Walls	0.8	1.0	2.3
	Ceiling	0.4	0.6	0.8
South Vault	Floor	5.9	4.1	12
	Interior Walls	0.3	0.7	1.3
	Ceiling	1.4	1.5	2.4
Office Area	Floor	7.5	*	7.5
	Interior Walls	**	**	**
	Ceiling	**	**	**
Exterior Walls	North Wall	0.9	1.1	2.3
	South Wall	0.6	1.2	2.3
	East Wall	1.0	1.6	3.6
	West Wall	0.3	0.6	1.0

dpm/100 cm^2 = disintegrations per minute per 100 square centimeters
* = single measurement obtained
** = characterization survey measurements not obtained

Based on the conclusions of the Building BRL12 characterization survey, the following assumptions were made regarding the radiological status of this structure:

- The floors are assumed to be contaminated with fixed, as well as transferable contamination and require decontamination and/or removal.
- Filter media in the air conditioners is assumed to be volumetrically contaminated and requires removal.
- In addition to exhibiting radiological contamination, the tile floor in the office is considered ACM and should be managed accordingly upon removal.

- The roof is potentially contaminated. However, roofing material consisting of asphalt shingles must be removed to facilitate radiological surveys of the underlying roof structure.
- Exterior walls exhibit limited areas of contamination that should be further delineated to identify discrete areas that may potentially require decontamination.

4.1.3 Freestanding Vault

A Freestanding Vault is situated directly southeast of Building BRL12. Like the BRL12 end vaults, this vault was used for the storage of contaminated targets. It has a concrete floor, and the walls and ceiling are completely lined with steel. A single light fixture hangs from the ceiling. Attached to the southern end of the vault is a wooden tool shed where maintenance equipment, such as a tractor and snow plow, is stored. Radiological characterization survey results for Building BRL12 are summarized in Tables 4-5 and 4-6.

Table 4-5: Freestanding Vault Direct Alpha Measurement Summary

Area	Location	Alpha Activity (dpm/100cm^2)		
		Average	Standard Deviation	Maximum
Interior	Floor	46	14	56
	Interior Walls	16	37	104
	Ceiling	1	1	2
Exterior Walls	North Wall	12	3	16
	South Wall	3	7	10
	East Wall	9	16	20
	West Wall	23	10	38

dpm/100 cm^2 = disintegrations per minute per 100 square centimeters

Table 4-6: Freestanding Vault Removable Alpha Measurement Summary

Area	Location	Alpha Activity (dpm/100cm^2)		
		Average	Standard Deviation	Maximum
Interior	Floor	3.0	2.6	4.8
	Interior Walls	3.3	4.2	12.6
	Ceiling	0.1	0.3	0.3
Exterior Walls	North Wall	1.2	0.7	2.3
	South Wall	0.1	0.8	1.3
	East Wall	1.5	1.1	2.3
	West Wall	0.3	0.6	0.8

dpm/100 cm^2 = disintegrations per minute per 100 square centimeters

Based on the conclusions of the Freestanding Vault characterization survey, the following assumptions were made regarding the radiological status of this structure:

- Interior surfaces exhibited minimal areas of fixed and transferable contamination that should be further delineated and decontaminated, as necessary.
- Analytical test results indicated that the paint on the walls and ceiling is lead-based and, if removed, should be managed as hazardous or mixed waste, as appropriate.
- The roof and exterior walls exhibited minimal surface contamination that should be delineated and decontaminated, as necessary.

4.2 Contaminated Systems and Equipment

The only potentially contaminated liquid system in the 1103A Area structures is the drain system in the Building 1103A bathroom and associated sewer lines. The bathroom contains a sink, toilet, and shower facilities. In addition to standard personnel hygiene use, the sink and shower were used for personnel and equipment decontamination during building operations involving radioactive material. Thus, the fixtures, drains, and sewer piping are assumed to be contaminated.

All heating, ventilation, and air conditioning (HVAC) ducts and filters within the 1103A Area structures are assumed to be contaminated. Although Building 1103A is equipped with a new ventilation unit on the exterior of the structure, this equipment is new, and information provided by site personnel indicates the system has not been used since it was installed. Therefore, it is assumed there is little potential for internal contamination within the HVAC unit itself.

4.3 Outdoor Areas and Surface Soil

The impacted outdoor areas include approximately one-third acre of asphalt pavement between the buildings and vaults (i.e., Central Asphalt), the small parking lot east of the perimeter fence enclosing the Building 1103A area (i.e., Adjacent Asphalt), and approximately one-third acre of grass-covered grounds within or adjacent to the Building 1103A area (i.e., Grounds).

The Central Asphalt area, which extends from the south side of Building 1103A to the southern fence, was used for the loading, unloading, and staging of contaminated targets, as well as for the transfer of targets among the disassembly buildings and storage areas. On at least one occasion, contaminated items were dismantled on the asphalt in front of Building BRL12 using an acetylene torch. The asphalt is cracked in many places, allowing for water seepage, and is prone to slight changes in elevation depending on the moisture content of the underlying soil. Small areas of yellow discoloration and/or DU fragments are present in several locations on the surface of the asphalt.

The Adjacent Asphalt lies east of Building 1103A and north of Building 1103B. It is presently used as a parking lot for employees working in nearby buildings. Elevated radioactivity was observed in cracks and depressions in the pavement in this area, as well as along the eastern edge of the parking lot where the pavement and soil meet.

The Grounds consist of the lawn adjacent to Building 1103A, as well as the grassy areas south and west of the central asphalt. Grounds were included in the characterization survey to evaluate possible impacts due to airborne migration of DU-contaminated dust and/or waterborne migration of DU-contaminated runoff. Survey and sampling results indicated no locations within the grass-covered areas that exhibited radioactive contamination.

Table 4-7: Soil Sample Results Summary for Outdoor Land Areas

Location	Soil Concentration (pCi/g)	
	^{238}U[1]	DU[2]
Average	160	177
Standard Deviation	398	440
Maximum	1,740	1,925

pCi/g = picocuries per gram
[1] = ^{238}U concentration based on reported ^{234}Th concentration in biased soil samples.
[2] = DU concentration determined by dividing the ^{238}U concentration by 0.904 (i.e., assumed activity fraction of ^{238}U in DU).

Based on the conclusions of the outdoor area survey and surface soil sampling conducted during the characterization, the following assumptions were made regarding the radiological status of these areas:

- Based on the irregular distribution of surface contamination and the poor condition of the asphalt, all of the Central Asphalt area is assumed to be contaminated. Both the asphalt and underlying surface soil (top six-inch depth interval) require removal and disposal as contaminated waste.
- Following removal of the asphalt and surface soil in the Central Asphalt area, the underlying subsurface soil should be investigated further to identify discrete areas that may require removal.
- There is minimal surface contamination in the Adjacent Asphalt area, but cracks and depressions should be investigated further to identify discrete areas that may require removal.
- None of the soil in the grass-covered Grounds areas is contaminated or requires removal.

4.4 Subsurface Soil Contamination

One subsurface soil sample indicated DU contamination during the characterization survey. This sample was collected from the Central Asphalt area, at a location south of Building BRL12 where the asphalt was cracked and visible evidence of oxidized DU was observed. Based on the nature of the DU contamination at the Site (i.e., insoluble metal particles) and

the low potential for lateral migration through the surface soil, there is no reason to suspect widespread subsurface soil contamination beyond a few discrete locations in the Central Asphalt area. However, as indicated in Section 4.3, following the removal of asphalt and surface soil in this area, the underlying subsurface soil should be investigated further to identify discrete areas that may require removal.

4.5 Surface Water

There are no natural surface water features within the boundaries of the 1103A Area.

4.6 Groundwater

Based on the limited nature of subsurface contamination, and the monitoring well sample data indicating no detectable DU, there is no reason to suspect any radioactive contamination in the groundwater.

5.0 DOSE MODELING

The goal of this effort is to select an appropriate decommissioning approach that adheres to the criteria set forth in the *Code of Federal Regulations* (CFR) for NRC license termination. The NRC has established a radiation dose limit of mrem/yr above background as the allowable annual dose to the public contributed by residual radioactivity at a site to be released for unrestricted use. In 10 CFR 20, Subpart E, *Radiological Criteria for License Termination*, the following release criteria are specified:

- Residual radioactivity that is distinguishable from background radiation and results in a total effective dose equivalent (TEDE) to an average member of the critical group that does not exceed 25 mrem/yr, including that from groundwater sources of drinking water; and
- Residual radioactivity that has been reduced to as low as reasonably achievable (ALARA) levels.

The determination of ALARA levels takes into account consideration of any detriments, such as deaths from transportation accidents expected to potentially result from excavation and waste disposal activities.

The goal of the Building 1103A Area decommissioning effort is to remediate the site and demonstrate its suitability for unrestricted release from NRC license requirements. A dose objective of 25 mrem/yr above background is applicable to this site and is used as the basis for the dose demonstration. The DU structures and soils release criteria are described below.

5.1 Unrestricted Release of Structures Using NRC Screening Criteria

Unrestricted release of the site requires an evaluation of the potential radiation dose to individuals that could be exposed in the future to soil, water, and foodstuffs derived from the site. The radiation dose provides a measure of risk due to the residual radioactivity remaining at the site upon completion of remediation activities. Residual radioactivity is defined as the amount of radioactivity in the soil or consolidated material that is in excess of naturally occurring background radioactivity in the surrounding areas.

The potential risk due to residual radioactivity may be translated into a remediation guideline or DCGL. The DCGL represents a site-specific activity concentration determined to be

protective of the health of individuals who may become exposed to the residual radioactive materials remaining at the site. The DCGL establishes a level consistent with the exposure scenario and dose pathways determined for the site, which ensures that any dose or risk remains protective of the health of individuals and is less than the regulatory limit. The guideline level is conservatively developed to address the risk to an average member of the critical exposure group.

The NRC has established radionuclide-specific screening levels that may be used as DCGLs for demonstrating unrestricted release. These DCGLs are based on conservative assumptions with a dose limit of 25 mrem/yr peak annual TEDE over a 1,000 year time period, as provided by 10 CFR Part 20, Subpart E. For the Building 1103A Area, the structure $DCGL_W$ was calculated using the NRC screening levels presented in Table 5.19 of NUREG/CR-5512, Volume 3 (NRC, 1999c). ROCs known to be present in the Building 1103A Area are limited to DU isotopes (i.e., uranium-234 [^{234}U], uranium-235 [^{235}U], and uranium-238 [^{238}U]) and their short-lived decay progeny. The referenced NRC screening levels for the DU isotopes are 90.6 dpm/100 cm^2, 97.6 dpm/100 cm^2, and 101 dpm/100 cm^2 for ^{234}U, ^{235}U, and ^{238}U, respectively.

The assumed DU composition is based on the isotopic uranium ratios routinely used for shipments of DU waste from APG (Barg, 1995). The activity fractions are calculated from the weight ratios and specific activities of each uranium isotope. The resulting composition consists of ^{234}U, ^{235}U, and ^{238}U activity fractions of 0.084, 0.012, and 0.904, respectively.

The $DCGL_W$ for structures and building surfaces was calculated to be 100 dpm/100 cm^2, based on the following formula:

$$DCGL_W = \frac{1}{\left(\frac{f_1}{DCGL_1}\right) + \left(\frac{f_2}{DCGL_2}\right) + \left(\frac{f_3}{DCGL_3}\right)}$$

Where: $DCGL_w$ = Combined gross activity DCGL (i.e., release limit)
$f_{1,2,3}$ = Activity fraction of radionuclide
$DCGL_{1,2,3}$ = DCGL of radionuclide

As noted in NUREG/CR-5512 (NRC, 1999c), these guideline levels are based on the assumption that the fraction of removable surface contamination is 10%.

5.2 Unrestricted Release of Surface Soils Using Site-Specific Information

A $DCGL_W$ of 230 pCi/g total DU will be used for evaluating soils for unrestricted release at the Building 1103A Area. This value was originally developed for use by Argonne National Laboratory (ANL) in decommissioning the APG Transonic Range (ANL, 1999), which was contaminated with source material similar to that at the 1103A Area. The soils $DCGL_W$ is based on a resident-farmer exposure scenario, and represents the modeled activity concentration corresponding to a potential dose of 25 mrem/yr to a hypothetical, exposed individual over a 1,000-year period. Calculations demonstrating the derivation of the soils $DCGL_W$ and its applicability to the Building 1103A Area are presented in Appendix C.

6.0 PLANNED DECOMMISSIONING ACTIVITIES

Decommissioning activities planned for the Building 1103A Area include the demolition and removal of portions of contaminated structures; decontamination of remaining structures and concrete slabs; excavation and removal of contaminated asphalt and soil; and FSS of the remaining structures and land areas in accordance with *MARSSIM* (NRC, 2000). Decommissioning activities will be performed in accordance with the radiation safety and H&S programs discussed in later sections of this *DP*. Appropriate precautions will be specified in the *Site Safety and Health Plan (SSHP)* and task-specific Radiation Work Permits (RWPs) to minimize the generation of airborne radioactivity and control the spread of contamination during each activity.

6.1 Contaminated Structures

The Building 1103A Shop area will be demolished or dismantled and removed from the Site during decommissioning. The concrete slab remaining after demolition will be surveyed and decontaminated, as necessary, to meet building surface FSS release requirements.

6.1.1 Buildings

All interior, non-load bearing walls in Buildings 1103A and BRL12 will be dismantled and removed; however, the exterior walls will remain intact and left in place. Overhead conduit and ductwork, as well as all suspended ceilings within these structures will be removed. Roofing material consisting of asphalt shingles or tar and chip will be removed, exposing the bare solid roof surface. The waste generated during building demolition and dismantlement activities will be carefully segregated to minimize the total volume of material requiring disposal as radioactive waste. Following removal of interior structures, the remaining surfaces will be decontaminated to facilitate FSS.

6.1.2 Remaining Concrete Slabs

Approximately 650 square feet (ft^2) of concrete slab will remain following removal of the Building 1103A Shop area. It is assumed that the entire Shop area concrete slab will require decontamination by an abrasive process, such as scabbling, to meet the FSS surface release criteria. Contaminated portions of the slabs will be decontaminated, as necessary, and the

additional waste generated during decontamination will be collected and disposed as radioactive waste.

6.2 Contaminated Systems and Equipment

The following systems and equipment associated with the structures discussed in Section 6.1 will be removed and disposed: electrical, ventilation, and plumbing systems. In addition, any outdoor culvert or basin used in the management of storm water in contaminated areas of the Site will be surveyed and removed, if necessary, prior to excavation of contaminated soils.

6.2.1 Electrical, Ventilation, and Plumbing Systems

Contaminated electrical, ventilation, and plumbing systems will be removed from the buildings prior to the initiation of any structural dismantlement or demolition activities. The following will be considered when removing these systems:

- Electrical components (e.g., transformers, switch gear, control boxes, etc.), which may contain PCBs, will be removed, scanned, and disposed appropriately as hazardous or mixed waste. Conduit and wiring will be removed, scanned, and disposed as either industrial or radioactive waste. Metals recycling may be considered for conduit and wiring removed from non-contaminated areas (i.e., BRL12 Office), depending on the amount of material and the degree to which it can be confirmed non-radioactive. Materials will be considered eligible for recycling or disposal as standard industrial waste only if it meets the unrestricted release criteria discussed in Section 12.1.

- Ventilation systems (e.g., vents, filters, fans, ducts, stacks, room air conditioners, etc.) will be removed, scanned, and disposed appropriately as industrial or radioactive waste, or decontaminated and reused, if possible. It is noted that even non-contaminated areas may contain ventilation system components with internal contamination, especially if they are in-line with ducts conveying exhaust air from the contaminated portions of the building. Thus, ventilation system components for which it is not practical to survey all interior surfaces will be disposed as radioactive waste. The only part of the ventilation system that is expected to be non-contaminated is the HVAC unit currently in place outside Building 1103A. This unit will be disconnected from the ventilation ducts prior to any other dismantlement activities so it can be surveyed, decontaminated (if necessary), and reused elsewhere on base, provided that the unrestricted release criteria discussed in Section 12.1 criteria are met.

- Plumbing systems (e.g., water supply piping, pumps, valves, faucets, etc.) will be removed, scanned, and disposed appropriately as industrial or radioactive waste. It is assumed that most plumbing system components will require disposal as radioactive waste. Any system components that appear to be suitable for disposal as industrial waste will be thoroughly evaluated to ensure that the unrestricted release criteria discussed in Section 12.1 are met.

6.2.2 Drains and Piping

Potentially contaminated drains and piping will be surveyed to determine the need for removal during structure decommissioning. This includes the Building 1103A bathroom drains and any buried sewer lines connecting this piping to collection lines outside the structure. Residual water will be flushed from the system prior to removing the lines. The water will be sampled for isotopic uranium, samples of trap sediment will be evaluated, and radiological surveys will be conducted on accessible areas of the pipes. If drain lines are determined to be contaminated, they will be removed and disposed appropriately.

6.3 Asphalt and Surface Soil

Contaminated asphalt and surface soil will be excavated from the Central Asphalt area as part of the decommissioning process. The soil underlying the asphalt in this area, which covers approximately 15,000 ft^2, is assumed to be contaminated to a depth of six inches across the entire surface. The Adjacent Asphalt parking lot, which covers an area of approximately 2,400 ft^2, is assumed to have minimal surface contamination and will require only spot remediation. The grass-covered Grounds do not contain any areas that require removal.

The total estimated volume of contaminated asphalt to be excavated and disposed is approximately 225 cubic yards (yd^3). The total estimated volume of contaminated soil to be excavated and disposed is approximately 335 yd^3. Based on analytical data collected during the characterization survey, it is assumed that the average DU activity in this waste stream will be 170 pCi/g. As such, it is anticipated that this material may be disposed at a permitted facility as special waste with unimportant quantities of source material, as defined in 10 CFR 40.13.

6.4 Schedule

The proposed schedule for the Building 1103A Area decommissioning is presented in Table 6-1. This schedule allows for the completion of fieldwork by August 30, 2008, and the submittal of FSS documentation to NRC by December 31, 2008.

Table 6-1: Schedule for 1103A Area Decommissioning

Activity	Estimated Date
Receive NRC Approval of DP	Mar 2008
Structural Assessment of Buildings	Apr 2008
Finalization of Work Plans	May 2008
Field Activities	Jun to Aug 2008
Submittal of FSS Report to NRC	Dec 2008

7.0 PROJECT MANAGEMENT AND ORGANIZATION

Implementation of this *DP* will be performed within the general management and organizational structure described in this section. An organization chart showing the principal decommissioning management positions is provided in Figure 7-1.

7.1 Decommissioning Management Organization

The Army will retain overall responsibility for management and execution of this *DP*. The project will be managed by JMC, and will proceed under the technical direction of ARL. The Army will procure the services of a specialty remediation company (Contractor) to execute the activities described in this *DP*, under contract to JMC. Onsite management and technical support will be provided by the ARL RSO. The Contractor will designate a Project Manager (PM) who will coordinate remediation activities and serve as the primary point of contact with Army management on project related issues.

7.2 Decommissioning Task Management

Remediation activities will be managed by the Contractor PM and executed in accordance with this DP. The DP contains the requirements necessary to successfully decommission the Building 1103A Area to achieve unrestricted release of the property for future use. Decommissioning tasks will be performed in accordance with the schedule presented in Section 6.4 Several key programs are fundamental to the safe execution of decommissioning activities. These are the *Contractor Radiation Safety Program (RSP)* and *SSHP*. The contractor Field Operations Lead (FOL), Site Radiation Safety Lead (RSL) and Site Health and Safety Officer (HSO) are responsible for executing day-to-day field activities in accordance with the *DP*, *RSP* and applicable RWPs, and *SSHP*.

7.3 Decommissioning Management Positions and Qualifications

Specific responsibilities and qualifications of key management personnel, as they relate to the field implementation of this DP, are discussed in this section.

7.3.1 JMC Decommissioning Manager

The JMC Decommissioning Manager retains ultimate responsibility for the execution of requirements set forth in this DP, as well as for compliance with the ARL NRC license and all

applicable federal and State regulatory requirements. The JMC Decommissioning Manager may delegate responsibilities to the Contractor PM as appropriate. However, the JMC Decommissioning Manager will review and approve all regulatory required documents prior to submittal to the appropriate regulatory agency.

7.3.2 ARL Radiation Safety Officer

The ARL RSO, as identified in NRC License Number SMB-141, reports to the JMC Decommissioning Manager and has responsibility for ensuring that decommissioning activities are conducted in accordance with the ARL NRC license. The ARL RSO will ensure that the Contractor RSP and implementing procedures are sufficient to fully address NRC license requirements and applicable regulatory radiation safety requirements.

7.3.3 Contractor Project Manager

The Contractor PM reports to the JMC Decommissioning Manager and has overall responsibility for ensuring that decommissioning activities are conducted in accordance with the DP, as well as with the Contractor *RSP* and *SSHP*. The Contractor PM is responsible for ensuring the appropriateness and adequacy of technical services provided during decommissioning, as well as for the successful integration of input from Army project management personnel, contractor support disciplines, and specialty subcontractors. The PM is responsible for executing project administration and controls, ensuring appropriate project staffing and training, and establishing personnel responsibilities and lines of communication. The PM will ensure that personnel assigned to the project are appropriately trained and have the necessary equipment and materials to perform their duties.

7.3.4 Corporate Radiation Safety Officer

The Contractor Corporate RSO is responsible for the acceptance of portions of the *DP* and *SSHP* that address radiation safety during decommissioning activities. Specifically, the Corporate RSO will:

- Assist the Contractor PM, as necessary, to ensure that the Contractor *RSP* and *DP* complies with all federal, State, and local requirements related to radiation safety;
- Oversee implementation of the Contractor *RSP*, including procedures applicable to decommissioning radiation safety;

- Review applicable RWPs, as necessary, prior to implementation of field activities;
- Ensure that the Site RSL is appropriately qualified and trained to implement the portions of the *DP*, *RSP*, and *SSHP* related to radiation safety, and that communication is maintained with the RSL throughout decommissioning activities. The Corporate RSO will provide direction to the Site RSL on any significant radiation safety issues that arise in the field; and
- Assist in the training of field personnel, as necessary, with respect to the identification and mitigation of site-specific radiation hazards and the use of radiation monitoring instruments, personal dosimetry, and contamination surveys.

The Corporate RSO may also conduct periodic onsite site inspections and audits of the radiation safety program to ensure that the requirements of the *DP*, *RSP,* and RWPs are being implemented properly.

7.3.5 Corporate Health and Safety Manager

The Contractor Corporate Health and Safety Officer (HSM) will be responsible for the review and approval of the *SSHP*. Additionally, the Corporate HSM will:

- Assist the Contractor PM, as necessary, to ensure that the *SSHP* complies with all federal, State, and local H&S requirements, modifying specific aspects of the *SSHP,* as necessary, to address field changes that may impact safety;
- Implement and oversee the corporate H&S program, in accordance with the Contractor's Corporate health and safety program;
- Ensure that the Site HSO is appropriately qualified and trained to implement the *SSHP*. Maintain communication with the Site HSO to ensure proper implementation of the *SSHP*, and provide direction on any significant safety issues that arise in the field; and
- Assist in the training of field personnel, as necessary, with respect to the identification and mitigation of site-specific hazards and the use of air monitoring instruments, personal protective equipment (PPE), decontamination procedures, and emergency/spill response.

The Corporate HSM may also conduct periodic onsite site health and safety inspections to ensure that the safety requirements of the *DP* and *SSHP* are properly implemented.

7.3.6 Quality Control Manager

The Contractor Quality Control Manager (QCM) will assist the Contractor PM in ensuring the quality of decommissioning work. The QCM will ensure that the project team properly implements the protocols and procedures required under the Army contract and the *DP*, and that corrective action is taken if performance does not meet internal or Army quality requirements. The QCM will be responsible for directing planning, implementing, and tracking quality control (QC) activities, and for maintaining internal communication regarding QC matters. The QCM will work with the Contractor PM to ensure that established QC measures are implemented in all phases of the work. The QCM may conduct periodic onsite and/or project audits, as necessary, to ensure that work activities are being implemented properly and that the data generated during the project are sufficient to satisfy the quality objectives outlined in the *DP*.

7.3.7 Field Operations Lead

The Contractor FOL reports to the Contractor PM and is responsible for supervising the day-to-day activities of the project team. The FOL is responsible for implementing the *DP* in accordance with the requirements of the *RSP* and *SSHP*. The FOL has the authority to stop work, if necessary, and take appropriate actions to ensure the health and safety of all field personnel, the environment, and the surrounding community. In addition, the FOL will:

- Coordinate the decommissioning task schedule with the Site RSL and Site HSO to ensure that radiation safety and health and safety requirements are adequately specified in RWP's, work plans, the *SSHP*, and/or job hazard analyses;
- Conduct daily plan-of-the-day/tailgate safety briefings (with assistance from the Site HSO and the Site RSL) to provide direction and supervision to field personnel regarding the requirements of the *DP* and supporting documents;
- Ensure that the work zones are established in such a way as to minimize potential H&S hazards and contamination risks;

- Oversee field staff and subcontractors during day-to-day operations to ensure proper execution of field activities in accordance with the *DP*, Contractor *RSP*, and *SSHP* requirements;
- Assist in the preparation of project work schedules, reports, field drawings, and required compliance submittals; and
- Maintain close communication with the Contractor PM regarding project progress and any problems encountered in the field, as well as coordinating with the Contractor PM to initiate corrective actions that may be necessary.

7.3.8 Site Radiation Safety Lead

The Site RSL reports to the Contractor PM and the Corporate RSO. The Site RSL is responsible for the day-to-day implementation of the *RSP* and applicable implementing procedures. Like the FOL, the Site RSL has the authority to stop work on any operation that jeopardizes the health and safety of site personnel, the environment, or the public. In addition, the Site RSL has the following responsibilities:

- Provide onsite training of field personnel to convey *DP* requirements related to the *RSP*, RWPs, and applicable radiation safety procedures;
- Ensure proper implementation of the *RSP* during field activities;
- Develop, implement, and brief affected decommissioning workers on RWPs for radiological aspects of decommissioning activities;
- Provide daily updates during the morning safety briefings to review applicable radiological procedures and alert the field crew to any change in radiological conditions, RWP revisions, or additional radiation safety issues that may arise that day;
- Ensure that all radiological surveys, field instrument QC checks, instrument calibrations, and personnel radiation monitoring, are performed and appropriately documented;
- Maintain communication with the Corporate RSO during field activities and coordinate resolution of radiological issues that may arise;

- Investigate any radiological incidents that may occur during decommissioning, and coordinate with the RSO to ensure that all regulatory reporting requirements are met;
- Ensure that radiological conditions in the work place are monitored in accordance with the RWP and procedure requirements, and initiate corrective actions, as necessary; and
- Brief the Radiation Safety Committee periodically (i.e., at least quarterly during decommissioning) on the status of the radiation safety program, individual and cumulative exposure received during decommissioning, radiological issues identified and corrective action status, as well as issues requiring Radiation Safety Committee resolution or approval.

7.3.9 Site Health and Safety Officer

The Site HSO reports to the Contractor PM and the Corporate HSM. The Site HSO is responsible for the day-to-day implementation of the *SSHP*. Like the FOL and Site RSL, the Site HSO has the authority to shut down any operation that jeopardizes the health and safety of site personnel, the environment, or the local community. In addition, the Site HSO has the following responsibilities:

- Provide onsite training of field personnel to convey *SSHP* requirements;
- Ensure proper implementation of the *SSHP* during field activities, including PPE requirements and H&S monitoring;
- Provide daily updates during the morning safety briefings to review applicable activity hazard analyses and alert the field crew to any changed conditions and/or additional safety hazards likely to be encountered that day;
- Maintain site H&S documentation such as training records, air monitoring equipment calibration forms, air monitoring results, accident report forms, etc., ensuring that the Contractor PM and Corporate HSM receive copies of all documentation on a daily basis;
- Maintain communication with the Corporate HSM during field activities and coordinate on any health and safety issues that may arise;
- Investigate any accidents/incidents or "near misses," and coordinate with the Corporate HSM to ensure that all reporting requirements are met; and

- Continuously monitor the work place for unsafe acts or conditions, and initiate corrective actions as necessary.

7.3.10 Waste Transportation and Disposal Lead

The Waste Transportation and Disposal (T&D) Lead reports directly to the Contractor PM and is responsible for supervising activities associated with the transportation of hazardous material and disposal of hazardous wastes. The T&D Lead will be responsible for preparing waste characterization/classification paperwork, generating profile and shipping manifest documents, and ensuring that radioactive material and waste leaving the site is packaged, labeled, and shipped in accordance with U.S. Department of Transportation (DOT) and U.S. Army and Department of Defense (DoD) regulations. The T&D Lead will be responsible for overseeing the radiological survey of packages and conveyances containing Class 7 radioactive material leaving the site, and for providing all survey and shipping records to the PM for inclusion in the project file.

7.3.11 Other Project Personnel

Individuals assigned to the project will be responsible for performing their work in a manner consistent with the project quality, radiological safety, and general safety and health requirements. Personnel will take all reasonable precautions to prevent injury to themselves and their fellow employees and be alert to potentially unsafe or harmful situations while performing their work. In addition, project personnel will:

- Know and understand the requirements of the *DP*, *SSHP*, *RSP*, and RWPs with respect to their individual responsibilities;
- Perform only tasks that they can perform safely and for which they have the proper tools and training;
- Comply with necessary PPE and personal monitoring requirements, as directed by the Site HSO and/or Site RSL;
- Notify the Site HSO of special medical conditions (e.g., allergies, illnesses, etc.), as well as prescription or non-prescription medication they are taking, which might affect their performance, safety or safety of other decommissioning personnel;

- Prevent spillage and splashing of materials to the greatest extent possible to prevent the spread of contamination and/or safety hazards;
- Practice good housekeeping by keeping their work areas neat, clean, and orderly; and
- Immediately report all injuries to the Site HSO and all contamination incidents to the Site RSL.

7.4 Decommissioning Radiation Safety Committee

The Decommissioning Radiation Safety Committee (DRSC) is a subcommittee chartered by the ARL Radiation Safety Committee. The primary purpose of the DRSC is to ensure that occupational and public exposures to ionizing radiation as the result of 1103A Area decommissioning activities are maintained within decommissioning administrative exposure limits, below federal exposure limits, and ALARA. To accomplish this, the DRSC provides direction and support to the RSP, with additional responsibilities as identified in the DRSC Charter.

7.5 Training

Personnel who participate in Building 1103A Area decommissioning activities will be appropriately trained to perform their assigned tasks, and will receive site-specific training specific to decommissioning activities and hazards. Current training certificates and records will be maintained onsite in the project file for the duration of the fieldwork.

Personnel requiring unescorted access to decommissioning work areas will be trained and qualified in accordance with 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response (HAZWOPER)*. HAZWOPER training and qualification will be verified complete prior to performance of work and repeated annually thereafter. Additional training and qualifications may include general construction safety, radiation safety, first aid and cardiopulmonary resuscitation (CPR), waste transportation, and/or other relevant topics.

Personnel with unescorted access to decommissioning work areas will be trained in regard to the types and magnitude of radiological, chemical, and physical hazards they might encounter. Visitors to the site will be escorted by appropriately trained personnel at all times. The following subsections briefly describe the various training requirements.

7.5.1 Visitor Training

Visitors (i.e., non-working observers) to the job site will participate in an abbreviated form of the initial site safety training prior to entering the work zone. This training will focus on potential health and safety hazards likely to be encountered while observing the work and will provide instructions regarding any limitations or restrictions on specific activities in which the visitor may or may not engage while onsite. A record of the site-specific visitor safety training and signatures of those participating will be maintained onsite. Visitors to the decommissioning work site will be escorted while in the work area and will not be allowed to enter contamination, radiation, or airborne radioactivity areas without specific approval from the ARL RSO.

7.5.2 General Employee Training

General Employee Training (GET) in radiation protection will be administered to project personnel who provide support during decommissioning activities but do not require unescorted access to radiological areas and do not work with licensed radioactive material. This may include employees that access the site infrequently or new employees who have not completed radiation worker training, both of which require a fully trained and qualified escort, as well as authorization from the Site RSL.

GET will be provided at the start of fieldwork and will consist of an oral presentation, handout materials, and completion of a form acknowledging receipt of training. GET will address the following topics:

- The type and form of radioactive material present at the facility;
- The location of radiation protection policies and procedures;
- Employee and management responsibilities for radiation safety;
- Identification of radiation postings and barriers;
- Protective equipment and procedures;
- Work zone setup and decontamination procedures;
- Emergency procedures; and
- How to contact Site decommissioning and project radiation safety staff.

7.5.3 Radiation Worker Training

Field personnel who require unescorted access to engage in activities within radiological areas at the Site or who work with licensed radioactive material will complete Radiation Worker Training (RWT) prior to their initial work assignment. RWT will address the following topics:

- Rights and responsibilities of personnel, as specified in 10 CFR 19, including the content of NRC Form 3, *Notice to Employees*;
- The general content and location of the *Radiation Protection Program*, implementing procedures applicable to radiation protection for the Building 1103A Area decommissioning, the NRC-issued license for the Building 1103A Area, as well as applicable NRC regulations;
- Radioactivity and radioactive decay, characteristics of ionizing radiation, and man-made radiation sources;
- Radiological hazards specific to the Building 1103A Area and planned decommissioning activities;
- Modes and effects of exposure to radiation (internal and external), risks associated with occupational radiation exposures, including the content of NRC *Regulatory Guide 8.29: Instruction Concerning Risks from Occupational Radiation Exposure* (NRC, 1996a), and special considerations with respect to exposure of women of reproductive age, including NRC *Regulatory Guide 8.13: Instruction Concerning Prenatal Exposure* (NRC, 1999a);
- Dose-equivalent limits and dose-equivalent determinations;
- Radiation survey instrumentation (e.g., calibration, use, and limitations), radiation monitoring programs and procedures, and warning signs, labels, and alarms;
- Basic protective measures (time, distance, and shielding), specific procedures for maintaining exposures ALARA, including the content of NRC *Regulatory Guide 8.10: Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable* (NRC, 1997), contamination control (e.g., protective clothing, equipment, workplace design, contamination monitoring), and radiation work permits; and

- Personnel decontamination and emergency procedures.

RWT will consist of classroom lecture, a practical demonstration, and a question/answer period. The typical duration of RWT is 8 hours. A graded exam to test employee proficiency in the class subject matter will be administered, and a passing score of 80 percent will be required. A challenge test may be administered in lieu of the formal classroom training session for individuals previously trained in the subject matter or demonstrating knowledge regarding radiological hazards expected to be present onsite, as authorized by the Site RSL. In addition to the challenge examination, the Site RSL may also exempt experienced health physics technicians from the practical demonstration portion of RWT.

7.5.4 Initial Site Safety Training

Site-specific health and safety training will be conducted at the commencement of field activities for all project personnel to address the requirements of the *SSHP*. All field personnel will be briefed on the *DP* and *SSHP*, ensuring that personnel understand the requirements and responsibilities, as well as the importance of adhering to the site health and safety requirements for the duration of the project. Site safety procedures and emergency protocols will be reviewed, and the field team members will be given an opportunity to ask questions or request clarification. At the conclusion of the training, project personnel will sign a form to acknowledge that they have received and understood this training. A record of the site-specific worker training will be maintained onsite.

7.5.5 Special Training and Qualifications

Other special types of training and/or qualifications may be required for project personnel, as necessary, to complete the tasks to which they have been assigned.

U.S. Department of Transportation Hazardous Material Training

Field personnel participating in the collection, packaging, handling, storage and/or transportation of hazardous material, as defined by the DOT, will be trained commensurate with their assigned responsibilities. This training will address the requirements in 49 CFR 172, Subpart H.

For incumbent employees, training will be verified to have been completed within the prior three years before assignment of tasks subject to this requirement. For new employees, training required by this section will be completed within 90 days of initial assignment. Prior

to completing the required training, a new employee may perform tasks subject to this training requirement provided the employee is supervised by a fully trained and qualified individual. Employees will be retrained every three years.

Respiratory Protection Training and Qualification

Personnel requiring the use of respiratory protection against non-radiological airborne hazards will be trained and qualified in accordance with 29 CFR 1910.134. Personnel requiring the use of respiratory protection for radiological airborne hazards will also receive training to address the requirements in 10 CFR 20, Subpart H. Respiratory protection training and qualification will be verified as complete prior to first use of respiratory protection and annually thereafter. Prior completion of training and qualifications (within 12 months of initial work assignment) required by this section may be accepted by the Site RSL, with submittal of appropriate training and qualification records.

Health Physics Technician Training and Qualification

Senior health physics technicians supporting the Building 1103A Area decommissioning will be required to meet certain minimum qualification requirements, such as certification by the National Registry of Radiation Protection Technologists (NRRPT), or demonstrate a pre-determined level of experience and knowledge that allow them to perform and supervise a wide range of radiological tasks in the field. Other health physics personnel will perform duties in support of health physics activities, as assigned and qualified by the Site RSL or designee. Prior to initial assignment, health physics personnel will become familiar with the radiation protection requirements, including procedures applicable to the Building 1103A Area decommissioning. This training may include review of applicable procedures, oral instruction, and, for new health physics personnel, hands-on application of procedure requirements under the supervision of a qualified, veteran field staff member. Ongoing training may include the annual review of procedures and additional training when an existing procedure is revised or a new procedure is introduced.

FSS Technicians and Support Personnel

Personnel supporting the FSS will be trained in *FSS Plan (FSSP;* see Appendix D) requirements and implementation, FSS instrumentation and procedures, FSS surveys and sampling, data collection and management, and quality assurance. This training may include review of applicable procedures, oral instruction, and, for new FSS technicians and support

personnel, hands-on application of procedure requirements under the supervision of a qualified, veteran staff member.

7.5.6 Daily Tailgate Safety Meetings

Daily safety meetings will be conducted to review the day's work plan, associated activities, and any anticipated hazards. This safety meeting will be required for all individuals scheduled to work that day. Records of attendee names and topics of discussion will be documented and maintained onsite.

Daily tailgate safety meetings will provide supplemental training, as necessary, and ensure that personnel are given clear direction and the proper tools for performing their respective tasks. These meetings will also provide a forum for the field personnel to relate any potential safety or quality concerns that have arisen on the job. Meeting notes and attendance sheets will be maintained onsite and included in the project file.

7.6 Subcontractor Support

Contractor efforts during the *DP* implementation will be focused on nuclear, health and safety, regulatory compliance, and project management matters. Specialty services necessary to complete certain aspects of the plan (e.g., waste transportation and disposal, analytical testing, equipment rental, crane operation, etc.) may be subcontracted to firms with the appropriate skills, resources, and experience.

Each subcontractor will designate a Task Manager and, as necessary, a health and safety and/or quality control contact. For subcontractors providing onsite field services, the subcontractor Task Manager will report directly to the FOL. Other subcontractors such as analytical laboratories, whose activities are conducted primarily at off-site locations, will coordinate their activities with the Contractor PM.

The Site RSL and Site HSM will verify that subcontractor personnel are adequately trained and qualified as specified in Section 7.5, and that subcontractor personnel perform their assigned activities in accordance with all NRC license commitments and requirements, *DP* requirements, and the programs, plans, and procedures applicable to the Building 1103A Area decommissioning.

8.0 HEALTH AND SAFETY PROGRAM DURING DECOMMISSIONING

Field activities necessary to complete the decommissioning of the Building 1103A Area have been evaluated for potential health and safety issues. Decommissioning activities involving work in radiological areas or with licensed radioactive material will be performed in accordance with the Contractor's NRC-approved *RSP* and implementing procedures. Additionally, decommissioning activities will be further evaluated to ensure that any occupational or industrial hazards inherent to the procedures are addressed in the *SSHP*. Site remediation activities that result in the creation of additional hazards not specified in the *SSHP* will require the development of a task-specific job hazard analysis prior to commencing work.

Decommissioning activities will be performed in a manner that is protective of workers, the environment, and the public in accordance with the Contractor's NRC-approved *RSP*. The Contractor will ensure that policies are developed and communicated to minimize personnel, public, and environmental exposure to known or suspected radioactive and/or hazardous material. The Contractor *RSP* will include procedures regarding the following topics, which are directly related to decommissioning activities:

- Record Retention;
- Radiological Conditions Awareness Reports;
- Radiological Compliance Audits;
- ALARA;
- Respiratory Protection Program;
- Bioassay;
- Dosimetry Program;
- Radiological Training;
- Personnel Protective Equipment;
- Emergency Response; and
- RWPs.

The Contractor *RSP* will also include additional administrative and operational procedures that will be used to guide the conduct of decommissioning activities. Copies of procedures relevant to decommissioning activities will be maintained onsite for the duration of decommissioning activities.

The Contractor will ensure that a workplace is provided in which employees, visitors, and subcontractors are adequately protected from hazards, including the hazards associated with exposure to radiation and radioactive material. While the expected exposures associated with the planned decommissioning operations are low, all exposures are assumed to entail some risk to employees, visitors, and contractors. The ALARA requirement will be communicated to all employees and subcontractors at the outset of this project so that all individuals entering the job site understand their personal responsibilities in maintaining radiation exposure ALARA. Methods to be used in reducing exposure potential will be reviewed during initial site-specific training and tailgate meetings. Monitoring and surveillance information will be available for personnel review, and will be summarized and discussed with the workforce on a periodic basis.

A *SSHP* will be developed to describe the practices to be used in minimizing employee exposure to occupational and industrial hazards that may be present during decommissioning activities. Sufficient documentation will be maintained to demonstrate the effectiveness of the health and safety program. The Site HSM, or designee, will monitor onsite health and safety during decommissioning activities. The Site HSM and Site RSL will coordinate occupational and radiation safety requirements and issues to ensure comprehensive protection of the decommissioning work force from potential hazards. The Site HSM, Site RSL, or designee, will conduct tailgate safety training, implement the individual monitoring and surveillance programs, and maintain all health and safety records generated during the decommissioning efforts.

8.1 Radiation Safety Controls and Monitoring for Workers

The Contractor *RSP* and implementing procedures provide instructions to ensure compliance with applicable regulatory requirements and to ensure that personnel occupational radiation exposure, as well as exposure to members of the public, during decommissioning activities do not exceed the limits specified in 10 CFR Part 20, Subpart C.

8.1.1 Occupational Exposure Administrative Limits

To further maintain occupational exposure to radiation ALARA, annual administrative exposure limits will be implemented for the duration of decommissioning activities. The decommissioning administrative exposure limits represent 10 percent of the federal exposure limits, and are as follows:

- TEDE of 500 mrem;
- Sum of deep-dose equivalent (DDE) and committed dose equivalent (CDE) to any individual organ or tissue (other than lens of the eye) of 5,000 mrem;
- Lens dose equivalent (LDE) of 1,500 mrem; and
- Shallow-dose equivalent (SDE) to the skin (whole body or extremity) of 5,000 mrem.

The following considerations will apply to calculations of dose equivalents:

- The assigned DDE will be for the part of the body receiving the highest exposure.
- The assigned SDE will be the dose averaged over the contiguous 10 square meters of skin receiving the highest exposure.
- The DDE, LDE, and SDE may be assessed from surveys or other radiation measurements if individual monitoring was not in the region of highest potential exposure, or the results of individual monitoring are unavailable.

The derived air concentration (DAC) and annual limit on intake (ALI) specified in 10 CFR 20, Appendix B, Table 1, will be used as benchmarks for assessing internal exposure and demonstrating compliance with the occupational administrative exposure limits.

Procedural controls will be implemented to allow for increases in administrative exposure limits using the following protocols:

- The Site RSL may implement an increase in administrative exposure limits up to 50% of the federal exposure limits, upon review and concurrence by the Contractor RSO;
- The ARL RSO may approve an increase in administrative exposure limits above 50%, but not exceeding 75% of the federal exposure limits; and

- The Radiation Safety Committee for the project may approve increases in personnel administrative greater than 75%, but not exceeding the federal exposure limits.

Note: Individuals with a current calendar year exposure of 75% of any federal occupational exposure limit or greater prior to performing decommissioning activities at the Building 1103A Area will not perform decommissioning tasks involving potential exposure prior to obtaining approval from the Radiation Safety Committee.

8.1.2 Exposure Limit for Minors

Minors (i.e., persons under the age of 18 years old) will not be employed in positions with actual or potential exposure to radiation or work with licensed radioactive material as the result of decommissioning activities.

8.1.3 Embryo/Fetus Exposure Limit

The dose equivalent to the embryo/fetus of a declared pregnant woman will not exceed 500 mrem for the entire gestation period. Dose will be based on the sum of the DDE to the declared pregnant woman and the dose equivalent to the embryo/fetus resulting from radionuclides in the embryo/fetus and radionuclides in the declared pregnant woman. Once a female decommissioning employee declares pregnancy, measures will be taken to provide for a uniform monthly exposure rate and avoid substantial variations in exposure.

If the dose equivalent to the embryo/fetus is found to have already exceeded 500 mrem or is within 50 mrem of this exposure limit when the female decommissioning worker declares pregnancy, the dose equivalent to the embryo/fetus will be limited to 50 mrem for the remainder of the pregnancy.

Note: The decision to declare pregnancy is strictly voluntary on the part of the pregnant female decommissioning employee. To declare pregnancy, the female employee must notify her supervisor or the Site RSL in writing of her intent to declare, along with the estimated conception date. The declared pregnant woman may voluntarily withdraw the declaration at any time during the pregnancy, also in writing to her supervisor or the Site RSL.

8.1.4 Member of the Public Exposure Limit

Radiation exposure to a member of the public as a result of decommissioning activities will not result in an individual receiving in excess of 100 mrem TEDE in a year. The dose rate in

any unrestricted area from external sources of licensed radioactive material will not exceed 2 mrem per hour. Compliance with the member of the public exposure limit will be accomplished by:

- Ensuring that the annual average concentration of radioactive material released in air and liquid effluents at the boundary of the restricted area does not exceed the values in 10 CFR 20, Appendix B, Table 2; and
- Ensuring that the exposure rate from external sources of radiation to an individual that may be continually present in an unrestricted area does not exceed 2 mrem per hour and 50 mrem per year.

As an additional ALARA measure, annual average air effluent concentrations will not exceed 20 percent of the values in 10 CFR 20, Appendix B, Table 2, Column 1, in accordance with NRC *Regulatory Guide 4.20: Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other Than Power Reactors* (NRC, 1996b). (Refer to Section 9.0 for effluent monitoring and control.)

8.1.5 Compliance with Exposure Limits

Radiological areas will be posted and controlled to maintain occupational exposure ALARA. Postings will comply with the requirements of 10 CFR 20, Subpart J, using the definitions for radiological areas specified in 10 CFR 20.1003. All decommissioning personnel are required to be cognizant of radiological postings and obey written and verbal instruction provided by radiation safety personnel.

Radiation safety personnel will assess the adequacy of radiological postings during the conduct of surveys. Surveys will be conducted using survey instrumentation and equipment suitable for the nature and range of hazards anticipated. Equipment and instrumentation will be calibrated and, where applicable, operationally tested prior to use in accordance with procedural requirements. Routine surveys will be conducted at a specified frequency to ensure that contamination and radiation levels in restricted and unrestricted areas are maintained ALARA and do not exceed license, federal, State, or Site limits. Additional surveys will be conducted during decommissioning to assess radiological hazards prior to work and whenever work activities create a potential to impact radiological conditions.

As required in 10 CFR 20.1502, the need for individual monitoring of internal and external exposures will be determined and documented prior to the start of work based on existing

data. Potential exposures to personnel working at the site during decommissioning include exposure to external sources of radiation, inhalation of airborne radioactivity, and incidental ingestion of radioactive material. Personnel will perform routine monitoring for radioactive contamination to minimize the spread of contamination.

Radiation monitoring (external and/or internal) will be conducted when it is likely that any individual will exceed 10 percent of the federal limit in 10 CFR 20, Subpart C. If external exposure monitoring is necessary, personnel dosimeters, typically a thermoluminescent dosimeter (TLD), will be processed by a dosimetry processor holding current accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology (NIST). A direct reading dosimeter (self-reading dosimeter [SRD]) may be used in addition to the TLD to provide an immediate estimate of external exposure, if necessary.

Personnel dosimetry devices will indicate the amount of ionizing radiation to which the wearer was exposed and will normally be worn on the individual's upper front torso, unless specified otherwise by health physics personnel or the applicable RWP. If a personnel dosimeter is lost, misplaced, or an SRD indicates an off-scale reading, the employee is required to notify their supervisor, health physics and/or the RSL immediately. If air samples detect the presence of radiation in excess of 10 percent of the DAC specified in 10 CFR 20, Appendix B, Table 1, DAC-hour tracking will be initiated and the need for a bioassay program evaluated. An area or room will be posted as an Airborne Radioactivity Area if the airborne concentrations are in excess of the values specified in 10 CFR 20, Appendix B, Table 1, or such that an individual without respiratory protection could receive an exposure of 12 DAC-hours in one week.

Occupationally exposed workers who have received radiation exposure prior to employment on the decommissioning project are required to provide a copy of their radiation exposure history records, including the names and addresses of previous employers and locations where they have received exposures, or a written estimate of current year and lifetime cumulative exposure. If records are not provided, the RSL or designee will make an attempt to obtain records of occupational radiation exposure using information provided by the employee or individual's employer. Records of individual exposure will be maintained on NRC Form 4 or equivalent.

8.1.6 Air Sampling Program

Radiological air sampling and monitoring will be performed in accordance with written procedures to demonstrate compliance with 10 CFR Parts 20.1204 and 20.1501(a)-(b). Air samples will be collected under known physical conditions (e.g., sample time, flow rate). Air sampler flow meters are calibrated every 12 months and following repair and/or modification.

Both breathing zone and general area air samples will be collected from areas where there is a potential for generation of airborne radioactive material. Breathing zone air samples will be the primary method of monitoring the worker's intake of radioactive material. General area air samples will also be collected from general and localized areas, especially in areas located downwind from excavations and other areas with the greatest potential for generation of airborne radioactive material. Appropriate air sampling equipment will be selected. The type of sampling to be conducted will determine the appropriate collection media required to collect the contaminant. The frequency at which air filters will be changed will be determined based on the radiological and physical condition of the work location, worker stay times, and the type of air sampling performed.

Air sampling will be performed prior to initiating decommissioning activities in order to document background radioactive airborne particulate activities. Air sampling will be performed to monitor airborne particulate activity when excavation activities commence, routinely during decommissioning activities, and after any significant changes in operating conditions. Sampling durations will be determined prior to the commencement of sample collection based on the required action levels, counting instrument sensitivities, and other conditions, as warranted.

Following air sample collection, the filter media may be stored for at least 12 hours in order for short-lived radon progeny to be allowed to decay. Air samples will then be counted with sufficient time to achieve the required minimum detectable concentration (MDC) goals for each specific radionuclide. Air sample analysis results will be compared with the DAC for radionuclides. Breathing zone air samples will be collected using personal lapel (or equivalent) air samplers or grab samplers. If the breathing zone concentration exceeds 10 percent of DAC values, the Site RSL will be notified so that appropriate actions can be taken, and exposures received by workers can be evaluated and included in their personal exposure file.

8.1.7 Respiratory Protection Program

Personnel exposure to known or suspected airborne radioactive and/or hazardous material will be maintained ALARA. Personnel protection from airborne radioactivity hazards will first consider engineering and administrative controls to eliminate or mitigate the cause of the airborne hazard.

In the event that engineering and administrative controls are not sufficient to maintain personnel exposure ALARA, respiratory protection may be used. Use of respiratory protection will be in accordance with a documented respiratory protection program consistent with the requirements of 10 CFR 20, Subpart H. Only respiratory protection devices approved by the National Institute for Occupational Safety and Health (NIOSH) will be used.

8.1.8 Contamination Control Program

Licensed radioactive material will be controlled to minimize the spread of contamination and maintained in posted radioactive material storage areas except during movement or other periods when the material is constantly attended to prevent unauthorized access. When in storage, licensed radioactive material will be secured from unauthorized access or removal. When not in storage, licensed radioactive material will be attended by a qualified radiation worker, as authorized by health physics personnel.

Areas with removable surface contamination in excess of the applicable limits in *Regulatory Guide 1.86* (USAEC, 1974) will be posted as contamination areas. Material and equipment requiring unrestricted release from radiological areas will be surveyed and decontaminated, if necessary, to ensure that surface contamination does not exceed these limits. Material and equipment with fixed or removable contamination in excess of these limits may be moved between radiological areas with proper containment (e.g., wrapping, etc.), as necessary, to minimize the potential for the spread of contamination outside of posted areas. Movement of radioactive material between radiological areas, including contaminated equipment, may be performed by qualified radiation workers with authorization from health physics personnel.

Routine surveys will be performed throughout the decommissioning process, with each survey planned in advance with regard to the specific radiation type, the predetermined radiation levels, the location where radiation is expected, and any special condition warranting a survey.

Typical personnel protection for work in contaminated areas or intrusive tasks with the potential for removable contamination or where residual radioactivity may be encountered will be Level D modified PPE, including hard hats, Tyvek® coveralls, safety glasses with side shields, steel-toed shoes, disposable shoe covers, and gloves. In lieu of steel-toed shoes and disposable shoe covers, reusable steel-toed boots may be used provided they are surveyed and decontaminated, as necessary, prior to reuse. Actual personnel protection requirements will be specified on the applicable RWP.

To ensure proper control of radioactive materials, individuals working in contaminated areas during this decommissioning effort will monitor themselves for contamination using calibrated, hand-held instruments prior to leaving the contaminated work area. Equipment and materials will be monitored by health physics personnel and decontaminated, as necessary, prior to removal from contaminated areas. Records of release surveys will be maintained on standardized forms and maps and will be placed in the decommissioning records.

In the event that a sealed radioactive source requiring a specific NRC license is used onsite, the Site RSL will verify that the conditions of the license regulating the use of the sealed source are satisfied. This will include verifying the training of the operators, the frequency of wipe tests, as well as storage and control requirements.

8.1.9 Exposure Control

Application of engineering, administrative, and personnel protection provisions will control personnel exposure to radiation and radioactive material. The priority of application will be as follows, in descending order:

1. Engineering - Engineering controls will be used, as practicable, to minimize or prevent the presence of uncontained radioactive material. Engineering controls will typically consist of containment, isolation, ventilation, and decontamination.

2. Administrative - Administrative controls will be used to control work conditions and work practices. Administrative controls will typically consist of the following:

    - Access Control: Routine access to work areas will be limited to those personnel necessary to accomplish tasks or activities. Access will also be controlled with respect to training and use of specified PPE.

- Postings and Barriers: Postings will be used to inform personnel of relevant hazards or conditions and associated access requirements. Barriers may be used to prevent unauthorized access.
- Procedures: Written procedures may be used to describe specific radiation protection requirements necessary for tasks that involve radioactive material.
- RWPs: RWPs will be used to describe specific or special worker protection requirements for activities involving radioactive material and not covered by a procedure. RWPs may also be used in conjunction with a procedure.
- Contamination Control: Action levels and limits for radiation surveys, described later in this section, will be used to control the levels of radioactivity on equipment and in work areas.

3. Personal Protective Equipment - PPE will be used to control personnel exposure to radioactive material when engineering controls are not practical and administrative controls are not sufficient. PPE requirements for work in radiological areas will be specified on the applicable RWP.

8.1.10 Radiation Surveys

Radiation surveys will be performed to describe the radiation types and levels present in a specific area of the site, or during a specific task, to identify or quantify radioactive material and to evaluate potential and known radiological hazards. The following types of radiation surveys will be performed:

1. Contamination Surveys - Measurements will be performed to quantify removable alpha, beta, and beta-gamma radiation, as applicable. The measurements will be made by wiping an area with cloth, paper, or tape and measuring the removable activity. Contamination surveys will be performed at a frequency specified by the Site RSL and/or in the RWP.

2. Radiation Surveys - Exposure rate measurements will be performed to determine whole body and, as necessary, extremity exposure rates.

3. Personnel Monitoring - Personnel will monitor themselves and any hand-carried items, such as pens, paper, clipboards, etc., prior to exiting contamination areas.

8.1.11 Action Levels

Action levels are established to inform facility personnel when a situation needs to be evaluated so that corrective actions can be taken. Action levels are set so that corrective actions can be made before a regulatory limit is exceeded. Exceeding an action level (e.g., 10% of the DAC for breathing zone air monitoring results) requires investigation including evaluation of preventative and/or corrective action. The investigation, and documentation of such, is completed to a level of detail commensurate with the significance of the condition.

8.1.12 Instrumentation Program

Radiation survey equipment and instrumentation suitable for detecting and quantifying the radiological hazards to workers and the public will be present onsite throughout decommissioning activities. Instruments used for radiation detection and measurement will be calibrated annually and after any maintenance or repair that may affect calibration. Instruments will be operated in accordance with applicable procedures or manufacturer manuals. Procedures will contain instructions on the proper use of the instrument, as well as precautions and limitations. Only personnel trained in the proper use of the instrumentation will use radiation detection instruments. A calibration sticker will be attached to the instrument to allow the operator to verify that the instrument is within current calibration prior to use. Radiation survey instruments will be visually inspected, battery checked, and source checked prior to use. The selection of equipment and instrumentation to be utilized will be based upon knowledge of the radiological contaminants; concentrations, chemical forms, and chemical behaviors that are expected to exist as demonstrated during radiological characterization activities. Equipment and instrumentation selection will also take into account the working conditions, contamination levels, and source terms anticipated during the performance of decommissioning work.

8.2 Nuclear Criticality Safety

The licensed radioactive materials at the Building 1103A Area consist of source material in the form of DU. There are no special nuclear materials, as defined in 10 CFR 70.4, present at the site. Therefore nuclear criticality safety measures are not necessary.

8.3 Health Physics Audits, Inspections, and Recordkeeping Program

The health physics program will be subject to routine audits and inspections. Each are performed to determine whether radiological operations are being conducted in accordance with regulations, license conditions, and written procedures.

The audit will be conducted by the Contractor Corporate RSO or designee. The audit will consider the basic functional areas of the program (e.g., RWPs, radiation protection procedures, radiological surveys and air monitoring, ALARA program, individual and area monitoring results, access controls, respiratory protection program, and training). The audit will be conducted in accordance with a site-specific audit plan developed by the auditor. A written report describing the results will be generated upon completion of the audit and distributed to decommissioning project management. As necessary, a written corrective action plan will be prepared to address non-compliance issues. All corrective actions will be tracked to completion. Once corrective actions have been completed, a written closure report will be generated documenting the completion of corrective actions.

Health physics personnel will conduct periodic inspections. These inspections will be routine reviews of decommissioning operations and activities, normally completed against a written checklist. The checklist items will typically consist of routine procedure requirements. Any findings discovered during the routine inspection will be recorded on a tracking log. The log will include a description of planned corrective action and the date of completion of the corrective action.

8.3.1 Personnel Records

A personnel file is maintained for each employee assigned work duties involving radioactive materials. The content of these files include:

- A record of radiation exposure received by the individual during previous employment;
- A record of personnel dosimeter measurements to provide a permanent record of radiation exposure received during decommissioning;
- Any written exposure investigations due to lost or damaged dosimetry, anomalous dosimetry processing results, or personnel contamination incidents. If necessary, the

investigation report will include any estimated exposures requiring inclusion in the individual's cumulative exposure record;

- Internal exposure assigned using the results of DAC-hour tracking (air sampling) or bioassay; and
- Training and qualifications.

Personnel records will be maintained in a secured location, typically a locked fire-proof file cabinet, when not continuously attended by authorized personnel. The Site RSL or designee will ensure that individual records are protected from unauthorized review or distribution. Only the Site RSL, Site HSM, individual's supervisor, and individual will have access to an individual's personnel records. Personnel records will be maintained indefinitely and personnel may review their file or request copies of information within their files at any time during normal working hours.

8.3.2 Radiation and Contamination Records

Records of radiation, contamination and airborne radioactivity surveys will be maintained at the decommissioning project site. Survey records may be posted at specific work locations or included with applicable RWPs.

8.3.3 Audit and Inspection Records

Records of audits and inspections completed, as well as the completion of any necessary corrective actions, will be maintained at the decommissioning project site.

8.3.4 Liquid and Air Effluent Records

Records of liquid and air effluents will be maintained at the decommissioning project site to demonstrate compliance with the effluent limits in 10 CFR 20, Appendix B, and NRC *Regulatory Guide 4.20* (NRC, 1996b).

8.3.5 Records of Waste Disposal

The following records will be maintained at the project site during decommissioning: 1) radiation and contamination survey records in support of the shipment of radioactive material and waste, 2) shipping manifests, and 3) certifications generated for the shipment of

radioactive materials to a disposal facility. Original waste documentation will be submitted to the generator (Army) and copies will be maintained in the contractor's project files.

9.0 ENVIRONMENTAL MONITORING AND CONTROL PROGRAM

The Building 1103A Area decommissioning project management team will ensure that exposure of ionizing radiation to workers, the public, and to the environment will be maintained ALARA, and that decommissioning activities will be conducted in a manner that supports this commitment. Engineering and administrative controls will be utilized to the maximum extent practical to minimize the potential for air and liquid effluents and to ensure that any releases to the environment comply with 10 CFR Part 20 requirements, as well as with applicable regulatory guides.

9.1 Effluent Monitoring

The primary routes of contaminant transport in effluents during the onsite decommissioning activities are anticipated to be airborne dust from building dismantlement and demolition, soil excavation, concrete scabbling, waste resizing and loading, and general use of vehicles and equipment. While concentrations of radionuclides in site effluents may increase slightly during decommissioning activities, the effluents will be closely monitored to ensure the effectiveness of engineering and administrative controls in maintaining radioactivity concentrations ALARA.

General area air samplers will be positioned at locations along the perimeter of the site that present the greatest likelihood of airborne effluent releases. In addition, samplers will be positioned downwind of work locations to ensure that the samples collected within the immediate work area are representative of actual releases. The positions of the air samplers will be evaluated frequently by the Site RSL to take into account any shifts in prevailing wind direction and any movement in the locations of dust-generating operations. Samples will typically be collected daily from the downwind samplers and weekly from the perimeter samplers, unless the Site RSL determines a more frequent collection and analysis period is necessary. Consideration will be given to more frequent filter change-outs during periods of high dust conditions, as determined based on professional judgment.

Air samples collected during decommissioning will be analyzed for airborne radioactivity concentrations. Air samples will be analyzed onsite for gross alpha and gross beta radioactivity, and a portion of the samples will be sent to an accredited off-site laboratory for confirmatory analysis. Air effluents will be maintained ALARA and not greater than 20 percent of the limits in 10 CFR 20, Appendix B, Table 2, Column 1. Background air samples

will be collected prior to the commencement of site activities in order to establish a baseline for background radionuclide concentrations.

Significant amounts of liquid effluent are not expected to be generated as a result of decommissioning activities. Potentially contaminated liquids, such as storm water runoff from contaminated areas, which are generated during decommissioning, will be sampled and the concentration verified to be less than the liquid effluent limits in 10 CFR 20, Appendix B, Table 2, Column 2, if release of the liquid via an environmental pathway is necessary. Liquid effluents that exceed the regulatory limits will be transported to another location on base for treatment.

Note: The air and liquid effluent limits in 10 CFR 20, Appendix B, Table 2, are annual average limits. Short term air and liquid effluents may be higher, provided that the annual average does not exceed 20 percent of the 10 CFR 20, Appendix B, Table 2, Column 1 limits for air effluents and the 10 CFR 20, Appendix B, Table 2, Column 2 limits for liquid effluents.

9.2 Effluent Control Program

If visible dust is generated during decommissioning activities, controls will be implemented to moisten the excavation areas, as necessary, to reduce the potential for generating airborne radioactivity. Any soil or other material that is staged in piles, containers, or vehicles will be covered as practical to prevent dispersion by wind and precipitation. If radiological air monitoring results indicate the presence of airborne contaminants in excess of the effluent limits specified in Section 9.1, work will be stopped, appropriate personnel including the Contractor Site RSL will be informed, dose evaluations will be performed, and corrective measures will be implemented, as necessary, to control the additional spread of contamination.

The only foreseeable source of contaminated liquid effluents is the accumulation of rain water in open excavations and storm water runoff. If potentially contaminated liquid effluents are generated as a result of excessive rainfall, runoff will be controlled through the use of berms, silt fencing, absorbent materials, solidifying agents, or by other means, as necessary. Storm water that collects in open excavations prior to the completion of final status surveys will be sampled and analyzed prior to release. The spread of potentially contaminated soil and silt materials will be controlled through the use of silt fencing and berms, as necessary, to limit the spread of contamination by means of erosion.

10.0 RADIOACTIVE WASTE MANAGEMENT PROGRAM

The solid and liquid radioactive waste generated during decommissioning of the Building 1103A Area will be managed as described in this section.

10.1 Solid Radioactive Waste

It is estimated that approximately 28,600 cubic feet (ft^3; 1,100 cubic yards [yd^3]) of solid waste will be generated during decommissioning activities. This includes building demolition debris, scrap metal, piping (metal and/or polyvinyl chloride [PVC]), asphalt, and soil. Descriptions and estimated volumes of waste materials are presented in Table 10-1.

Waste materials from decommissioning activities will be segregated and resized, as necessary, to meet packaging requirements and the disposal facility's acceptance criteria. Sized waste will be staged at the site and placed in hard-top intermodal containers to await transport. Contamination containment devices such as intermodal liners and tarps, in conjunction with sound health physics practice, will be used to prevent loose contamination from becoming dispersed during waste handling and loading activities.

LLRW and LLMW meeting the proper acceptance criteria will be transported to Energy Solutions of Utah, in Clive, UT, for disposal. Contaminated soil and asphalt will be transported to U.S. Ecology in Grandview, ID, for disposal as special waste with unimportant quantities of source material. These waste streams will be properly profiled, as required by the disposal facility; and will be characterized, packaged, labeled, marked, placarded (if necessary), manifested, and transported in accordance with applicable regulations in 10 CFR 20 and 49 CFR.

If any waste is generated that meets the unrestricted release criteria specified in *Regulatory Guide 1.86* (USAEC, 1974) and qualifies for disposal as non-hazardous waste, it will be hauled to a local industrial waste landfill facility, such as the Honeygo Run Rubble Landfill in Perry Hall, MD.

Table 10-1: Types and Estimated Volumes of Solid Waste

Source of Waste	Estimated Volume[1] (ft^3)	Potential Hazard	Description
Building 1103A	40 4,400 475	Rad Rad Rad/Haz	Reusable steel plate Contaminated building debris Contaminated debris with ACM, PCBs, or metals
Building 1103A Shop	50 6,500 75	Rad Rad Mixed Rad/Haz	Reusable steel plate Contaminated building debris Contaminated debris with ACM, PCBs, or metals
Building BRL12	60 170 80 1,700	Rad Rad Mixed Rad/Haz Low Rad Contamination	Reusable steel plate Contaminated building debris Contaminated debris with ACM, PCBs, or metals Slightly contaminated construction debris
Central Asphalt Area and Grounds	15,000	Low Rad Contamination	Slightly contaminated asphalt and surface soils
TOTAL[2]	**28,600**		

[1]Estimated volumes assume the following bulking factors: 50% for general demolition and scabbling debris, and 30% for ex situ asphalt and soil.
[2]Total volume is based on the following individual waste streams: 11,100 ft^3 LLRW, 630 ft^3 LLMW, and 16,700 ft^3 special waste with unimportant quantities of source material, and 150 ft^3 reusable steel plate.

10.2 Liquid Radioactive Waste

There are no existing contaminated liquids at the Building 1103A Area, with the exception of residual potentially contaminated liquids contained in the Building 1103A bathroom drain piping. It is assumed this liquid volume is minimal and limited to drain traps. The majority of liquid radioactive waste requiring collection, treatment and disposal will be generated as a result of building surface decontamination. It is estimated that approximately 365 gallons of liquid waste will be encountered or generated during decommissioning activities. as identified in Table 10-2. Contaminated liquid waste will be collected and transported to another location on base for treatment. The Army intends to treat, sample, and discharge this wastewater in accordance with its existing National Pollutant Discharge Elimination System (NPDES) permit.

No additional sources of contaminated water currently exist at the Site, and groundwater is not expected to be encountered during demolition and excavation activities. Mitigative measures will be implemented during excavation activities (e.g., covering the excavated areas with tarps to keep rain water from collecting, installing straw bale barriers, etc.), as necessary, to prevent the uncontrolled release of contaminated liquids. If rain water does accumulate within open excavations prior to the completion of final status surveys, the water will be sampled and analyzed prior to release.

Table 10-2: Estimated Volumes of Liquid Waste

Source of Waste	Estimated Volume (gal)	Estimated Total Uranium Concentration (µg/L)
Residual Drain Lines	65	1,200
Decontamination Fluids	300	1,200
TOTAL	**365**	

gal = gallon
µg/L = micrograms per liter

11.0 QUALITY ASSURANCE PROGRAM

Field surveys will be performed in a manner that ensures the quality and accuracy of data and provides auditable documentation of activities. Details of the field QA and QC requirements are described in this section. Additional QC procedures, which are addressed in the Contractor's corporate QA program and standard operating procedures (SOPs), include instructions on the following subjects:

- Daily instrument background and source check measurements to confirm that equipment operation is within acceptable tolerances;
- Training of all individuals executing standard operating procedures;
- Periodic internal audits; and
- Implementation of split and duplicate sampling, as well as blind spike sample analysis to evaluate the adequacy and accuracy of laboratory performance.

11.1 Organization

Only qualified and trained personnel will operate the equipment and instrumentation used in the field activities specified in this *DP*. Personnel will be trained in the technical, QC, and health and safety aspects of the project, as well as in the calibration, maintenance, and procedures for their assigned equipment.

Daily tailgate safety meetings will provide supplemental training and ensure that personnel are given clear direction and the proper tools for performing their respective tasks. These meetings will also provide a forum for the field personnel to relate any potential safety or quality concerns that may require attention decommissioning project management. Tailgate meeting notes and attendance sheets will be maintained onsite and included in the project file.

Persons responsible for ensuring that the QA Program has been established and for verifying that activities affecting quality are being correctly performed will have sufficient authority, access to work areas, and organizational freedom to accomplish the following:

- Identify quality concerns;
- Ensure that further decommissioning activities are controlled until proper resolution of a non-conformance or deficiency has occurred;

- Initiate, recommend, or provide solutions to quality problems through designated channels; and
- Verify implementation of solutions.

The Contractor QCM will maintain responsibility for ensuring that the decommissioning quality objectives are met. This person will have direct access to responsible management at a level appropriate for implementing corrective actions, as necessary, and thus, will report directly to the PM, or designee, to ensure the required authority and organizational freedom to perform this function. The Contractor QCM may designate others, as appropriate, to implement specific elements of the QA Program.

11.2 Document Control

Data will be recorded and documented in accordance with the Contractor's data management system. Radiation survey maps will identify the location being surveyed, as well as the name of the surveyor, date and time of survey performance, and signatures of those who review and approve the survey data. To the extent practical, State plane coordinates will be used to define the locations of soil samples. If not available, site-specific references will be used to describe sample locations.

Data management personnel will ensure that chain-of-custody (COC) and data management procedures are strictly followed for samples related to the FSS. Established protocols will be used to ensure the proper collection, documentation, handling, preparation, storage, and shipment of samples. Field data related to sample collection will be recorded in field logbooks and/or on field data sheets at the time of sample collection and reviewed on a daily basis. Other sample documentation (e.g., labels, COCs, log sheets, etc.) will be checked for consistency with the field documentation prior to shipping samples off-site.

Both direct radiation measurements and analytical data will be thoroughly documented to ensure repeatable results. Radiation survey data will be recorded in a verifiable manner and reviewed for accuracy and consistency. Each of the major phases of the decommissioning process will be documented in a manner that is suitable for conducting audits or assessments.

Substantive changes to the *DP* will be submitted to the NRC in writing for review and approval before they are implemented. The records discussed in the preceding paragraphs will be maintained in a centralized project file until the license termination

11.3 Control of Measuring and Test Equipment

The Site RSL, or designee, is responsible for determining the radiological instrumentation necessary to execute the *DP*. Only radiological instrumentation approved by the Site RSL will be used to collect radiological data. The Site RSL is responsible for ensuring that individuals are appropriately trained to use project instrumentation and other equipment, and that instrumentation meets the required detection sensitivities. Instrumentation will be operated in accordance with either a written procedure or manufacturers' manual. The procedure and/or manual will provide guidance to field personnel on the proper use and limitations of the instrument.

Instruments used to perform surveys will have current calibration and maintenance records generated during the performance of decommissioning, maintained on site for review and inspection. The records will include, at a minimum, the following:

- Type of equipment,
- Equipment identification (model and serial number),
- Manufacturer,
- Date of calibration, and
- Calibration due date.

Instrumentation will be maintained and calibrated to manufacturers' specifications to ensure that the required traceability, sensitivity, accuracy and precision of the equipment/instruments are maintained. Radiological instruments will be calibrated using NIST-traceable sources.

Prior to daily use, project instrumentation will be QC checked (response tested) by comparing instrument response to a benchmark response. Equipment will also be inspected for physical damage, current calibration and erroneous readings in accordance with applicable procedures and/or protocols. Instrumentation that does not meet the specified requirements of the calibration, inspection, or response check will be removed from operation until the cause is identified and corrected.

11.4 Corrective Action

The Contractor QCM has overall responsibility for reporting contract, procedure, and regulatory violations identified to the Contractor PM. The Contractor PM will notify the ARL RSO of any violations, and the RSO will determine whether the violation requires notification of the appropriate regulatory agency.

Any deficiency or nonconforming conditions will be documented on a Corrective Action Request (CAR) Form. This form is typically completed by the individual identifying or reporting the nonconformance, and then submitted to the Contractor QCM. The completed form provides a detailed description of the nonconforming condition and references the affected documents, if any, that apply.

The Contractor QCM will review the CAR and initiate appropriate corrective action. Following implementation of the action, the QCM will re-evaluate the situation to verify that the response successfully addressed the original concern. The QCM may also initiate preventive action to avoid future occurrences, if necessary. If the re-evaluation indicates that the corrective action has achieved satisfactory results, the Contractor QCM will accept the response and close the CAR. The Contractor QCM will maintain a log of all CARs, indicating the current status of each. After corrective action has been verified complete, the closed CAR (original) will be maintained in the project file.

11.5 Quality Assurance Records

QA records will be maintained in a centralized project file throughout the decommissioning project. Analytical data reduction, QC review, and reporting will be the responsibility of the analytical laboratory. The laboratory will provide a data package for each set of analyses, which will include a copy of the raw data in electronic format, as well as any other information needed to verify and/or reproduce the analytical results. The data packages will serve as basic reference sheets for data validation, as well as for project data end use.

The generation, handling, computations, evaluation, and reporting of final status survey data will be conducted as specified in the *FSSP* and implementing procedures. Included in these procedures will be a system for data review and validation to ensure consistency, thoroughness, and acceptability of the data. Some data points will be chosen for evaluation and examined to determine compliance with QA requirements and other factors that determine the quality of the data. Any rejected sample data or data omissions identified

during the data validation will be evaluated to determine their impact on the project. Other corrective actions may include re-sampling and/or re-analysis; evaluating and amending sampling and analytical procedures; and accepting data as reported, with an acknowledgment of the level of uncertainty.

The individual(s) responsible for sample collection will initiate COC records. A copy of the COC form will accompany the samples throughout transportation and analyses, and any breach in custody or evidence of tampering will be appropriately documented.

11.6 Audits and Surveillance

Periodic audits will be performed to verify that decommissioning activities comply with the DP and established decommissioning procedures, and to evaluate the overall effectiveness of the QA Program. The Contractor QCM will verify that qualified personnel are employed to conduct audits to ensure that the applicable procedures are being properly implemented. The audits will be conducted on at least a quarterly basis for the duration of decommissioning activities. A comprehensive audit of the decommissioning RSP will be conducted annually. External program audits may also be performed at the discretion of the JMC Decommissioning Manager, ARL RSO, or Contractor PM.

Audit results will be reported to the Contractor PM and Contractor QCM in writing, and actions to resolve identified deficiencies will be tracked and appropriately documented. The audit information will become part of the decommissioning record for the site.

12.0 FACILITY RADIATION SURVEYS

Decommissioning of the Building 1103A Area involves the performance of several types of radiation surveys, including characterization, remediation support, and final status surveys.

12.1 Release Criteria

Removable equipment and materials currently located within the Building 1103A Area, as well as equipment and material used during decommissioning activities, that have potential surface contamination will be surveyed prior to removal from contaminated areas. Items with total or removable contamination less than the values in *Regulatory Guide 1.86* (USAEC, 1974) will be released for unrestricted use, as discussed in Section 8.1.8. If contamination is detected above these limits, the equipment or material may be decontaminated and re-surveyed, disposed as radioactive waste, or stored in designated locations for transport to other ARL NRC-licensed locations for future use.

12.2 Characterization Surveys

A characterization survey of the Building 1103A Area impacted structures and outdoor areas was completed in May 2006. Results of the characterization survey indicated the presence of elevated DU contamination on structure surfaces, as well as elevated concentrations of DU in the asphalt and soil in outdoor areas. The results of the characterization surveys are summarized in Section 4.0, and presented in detail in Appendix B.

12.3 In-Process Surveys

Radiological support surveys will be performed during building demolition, decontamination, and outdoor area excavation to provide information related to residual radioactivity and to guide remediation activities. Surveys will also be conducted on outgoing waste shipments, as necessary to verify that waste acceptance criteria are met.

12.4 Final Status Survey

Following the completion of remediation activities, a FSS will be performed to demonstrate compliance with the established DCGLs (see Section 5.0 and Appendix C) to ensure that the unrestricted release criteria have been achieved for structures and outdoor areas. The FSS has been designed in accordance with *MARSSIM* guidance (NRC, 2000), as described in the

Building 1103A Area FSS Plan provided in Appendix D. The FSS will be conducted as outlined in the plan, and the results will be summarized in a FSS Report, to be submitted to NRC approximately 90 days following the completion of field activities.

13.0 FINANCIAL ASSURANCE

Financial assurance and funding of activities performed in support of the decommissioning and radiological release of the Building 1103A Area is provided through the U.S. Government, specifically through the U.S. Army.

13.1 Cost Estimate

A summary-level cost estimate for the implementation of this DP in FY 2008 is provided in Table 13-1. Assuming that all of the steel plate removed from the interior walls of Building 1103A will be suitable for decontamination and reuse elsewhere on base, the total estimated cost for the Building 1103A Area decommissioning is $3.2 M.

Table 13-1: Estimated Costs for the 1103A Area Decommissioning

Item	Cost ($1,000)
Planning and Procurement	72
Mobilization, Demobilization, and Field Support	818
Decontamination	27
Soil Excavation	21
Building Demolition	299
Radiological Surveys and Sampling	83
Waste Management and Brokering	160
Waste Transportation and Disposal	1,664
Completion Report	76
TOTAL	**3,220**

13.2 Certification Statement

As a federal agency, JMC will issue a statement to the NRC regarding its intent to fund the Building 1103A Area decommissioning activities, as outlined in this *DP*.

14.0 REFERENCES

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FIGURES

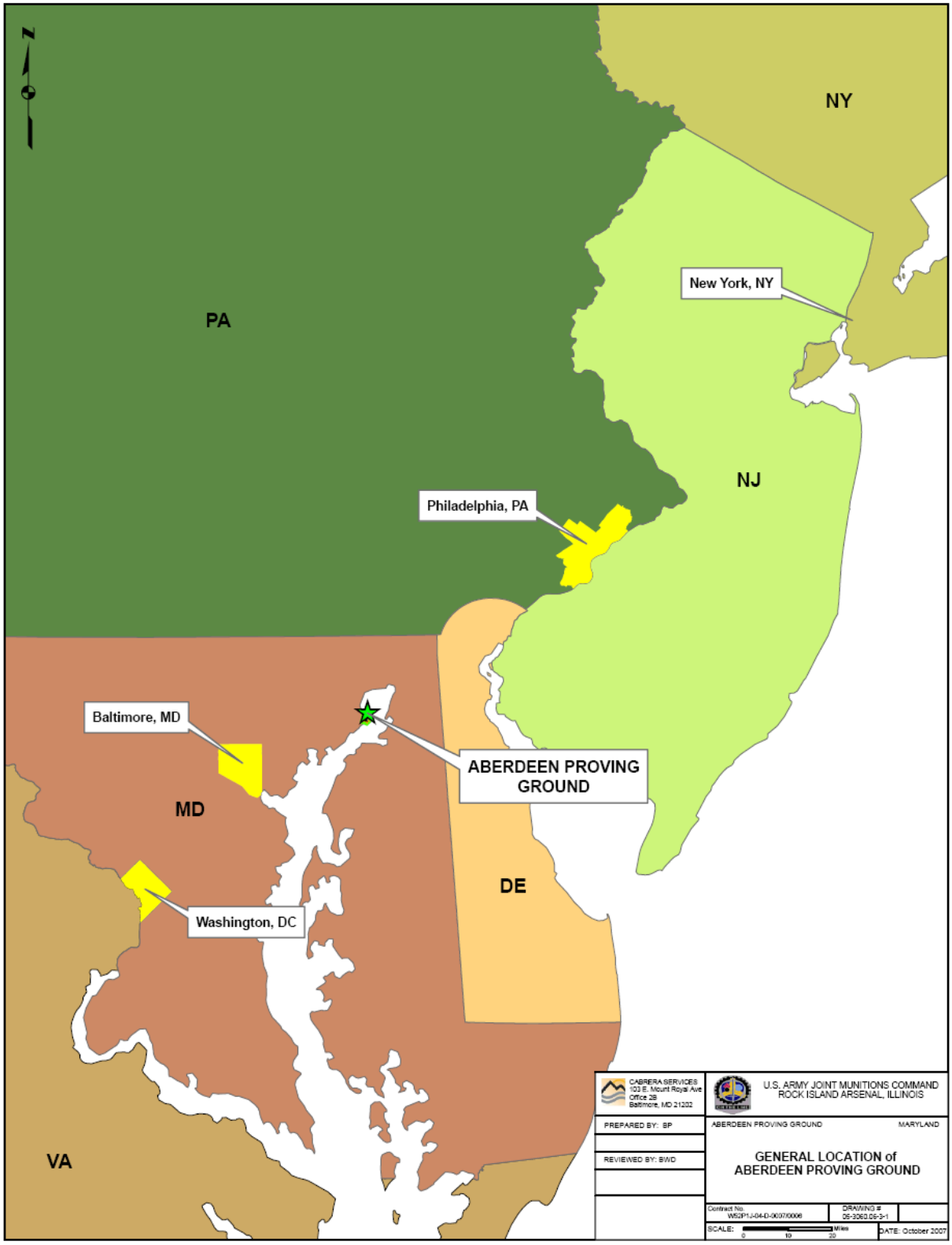

Figure 3-1: General Location of Aberdeen Proving Ground

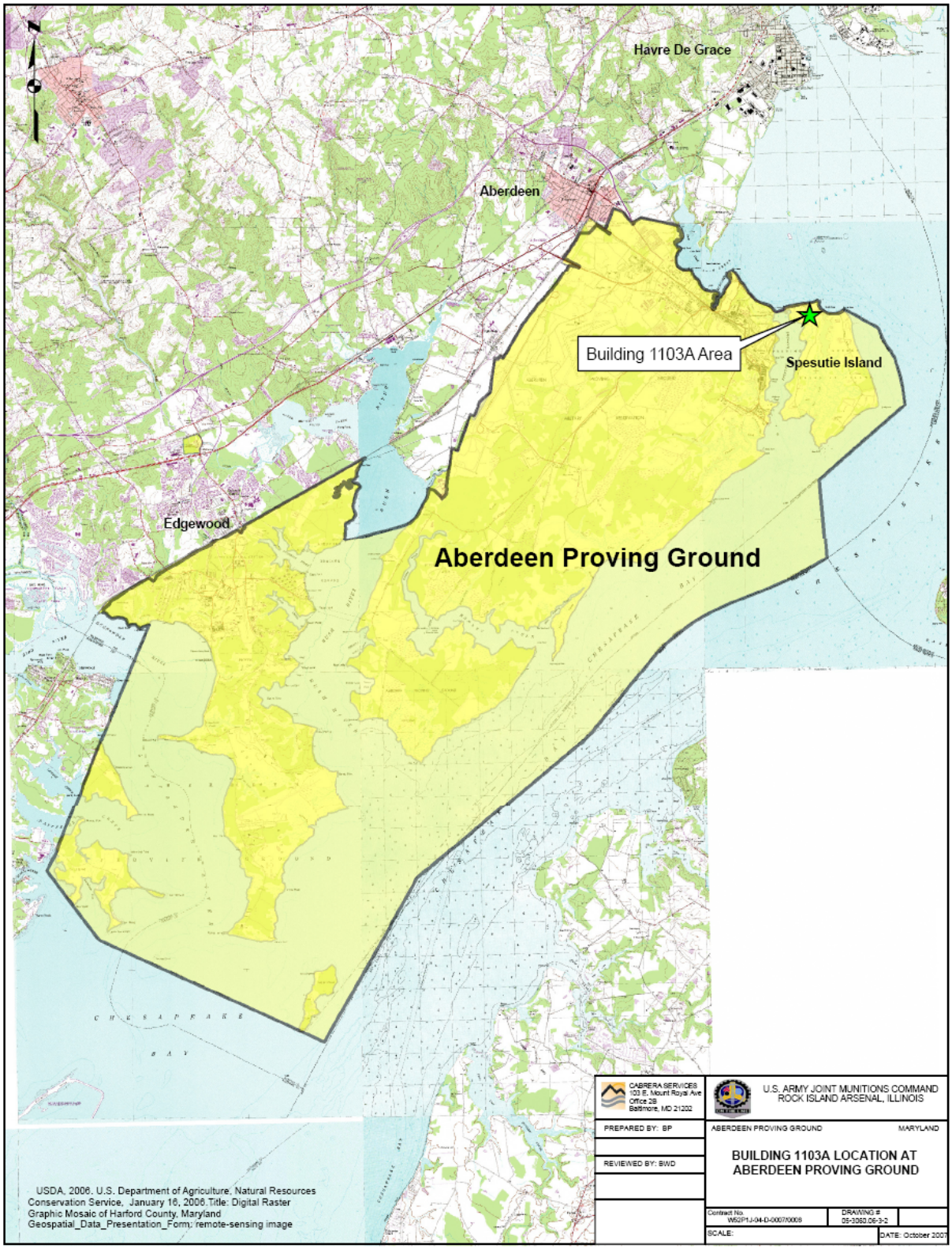

Figure 3-2: Aberdeen Proving Ground

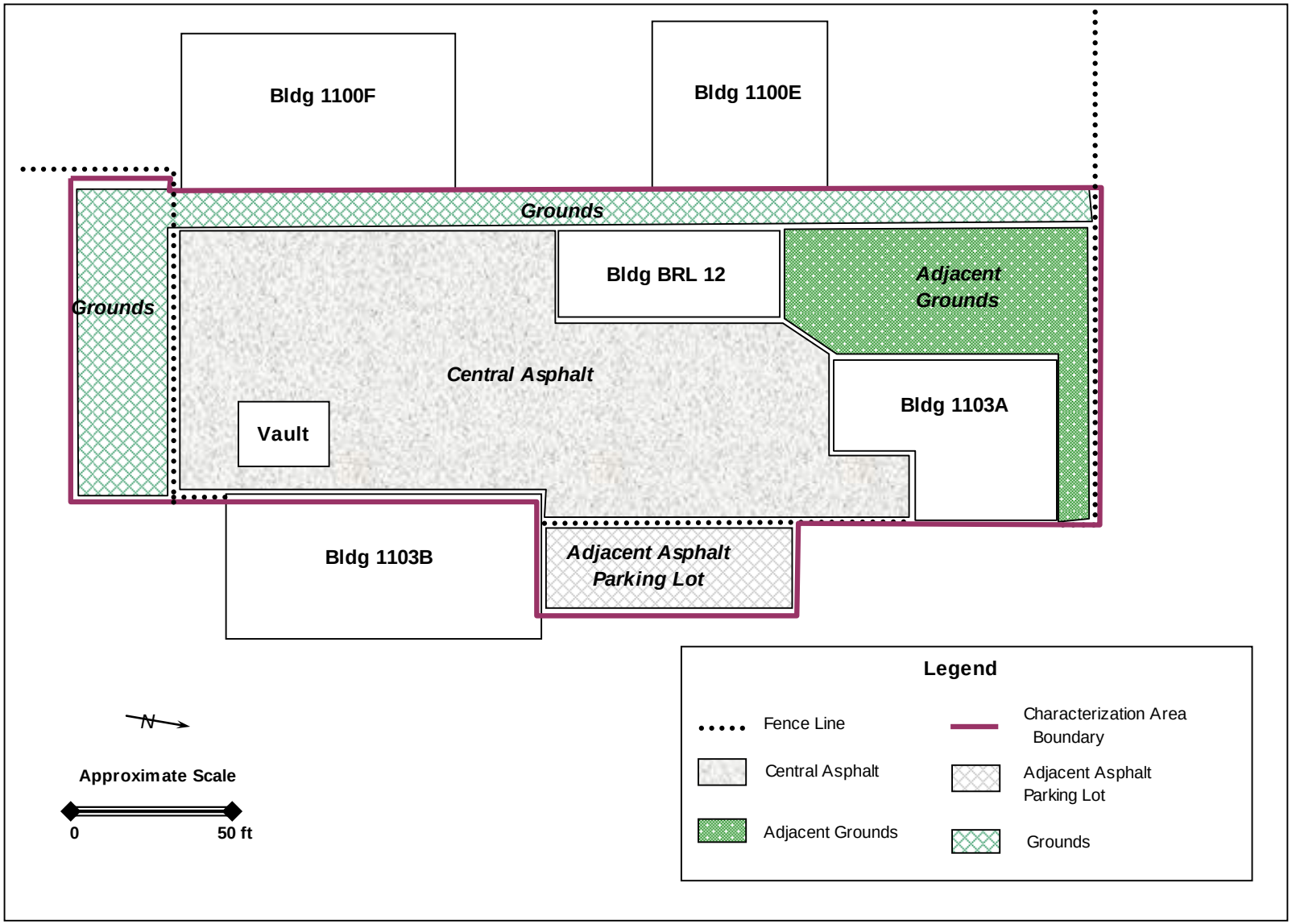

Figure 3-3: Building 1103A Area Range Layout

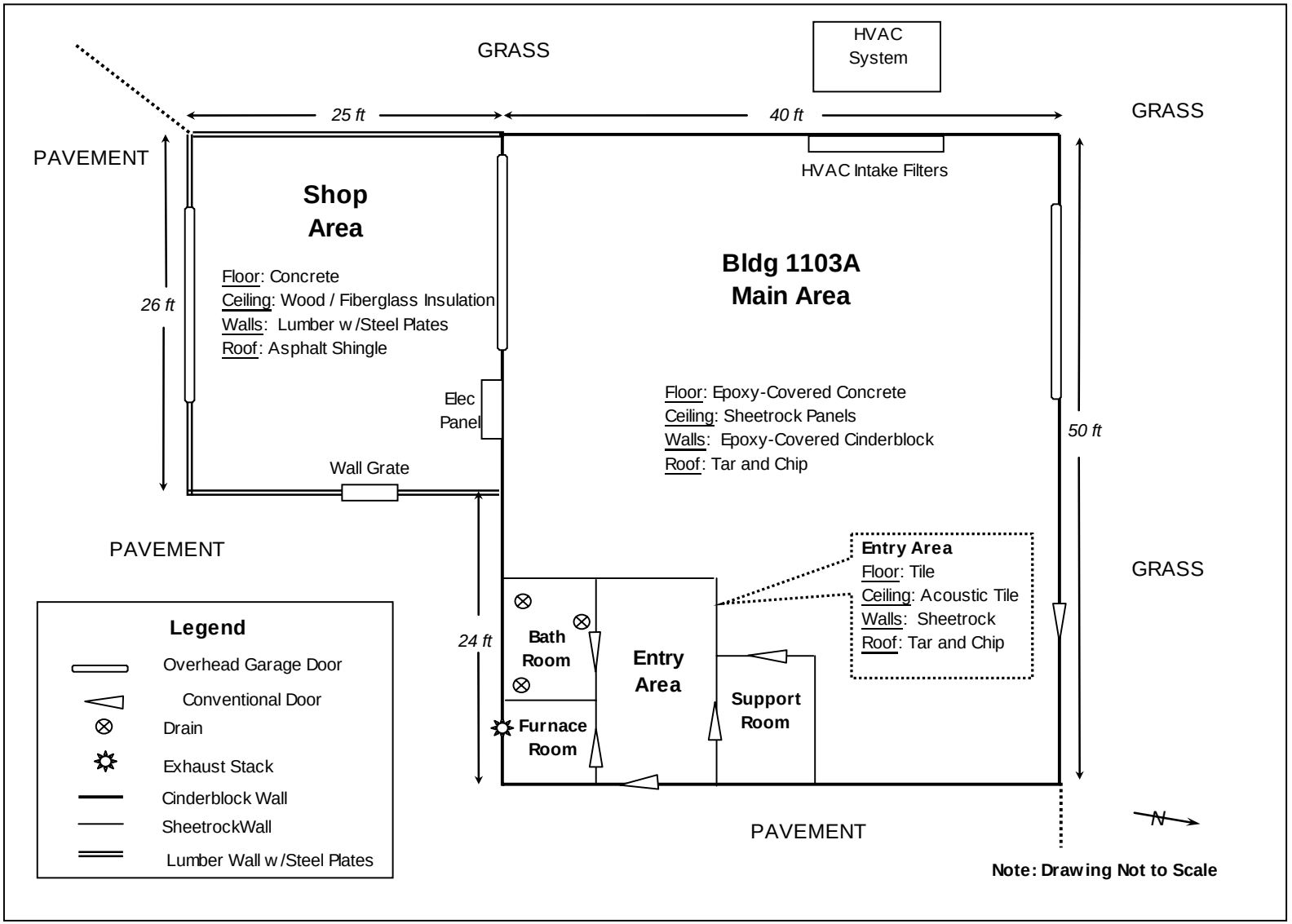

Figure 3-4: Building 1103A Floor Plan

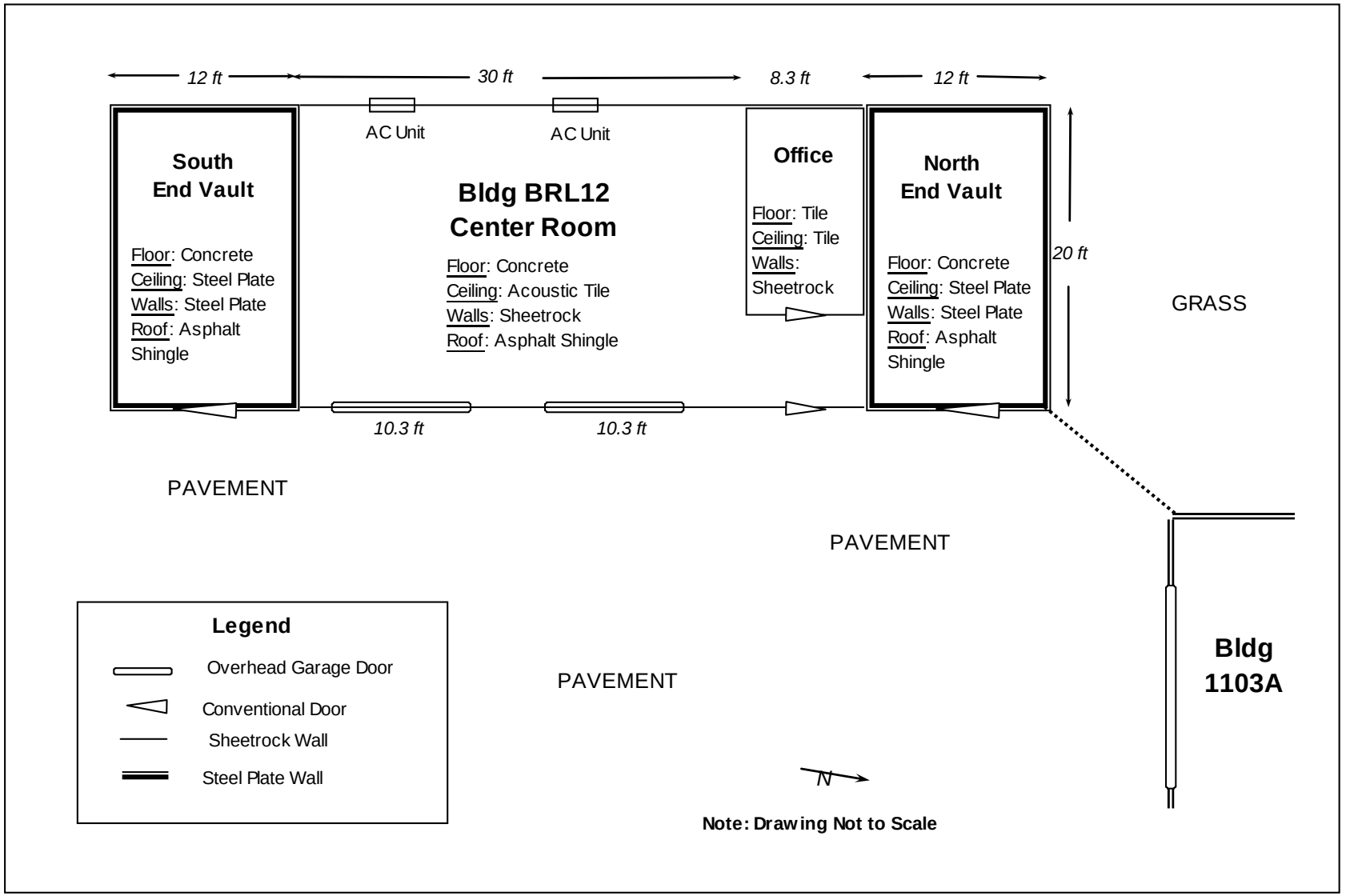

Figure 3-5: Building BRL12 Floor Plan

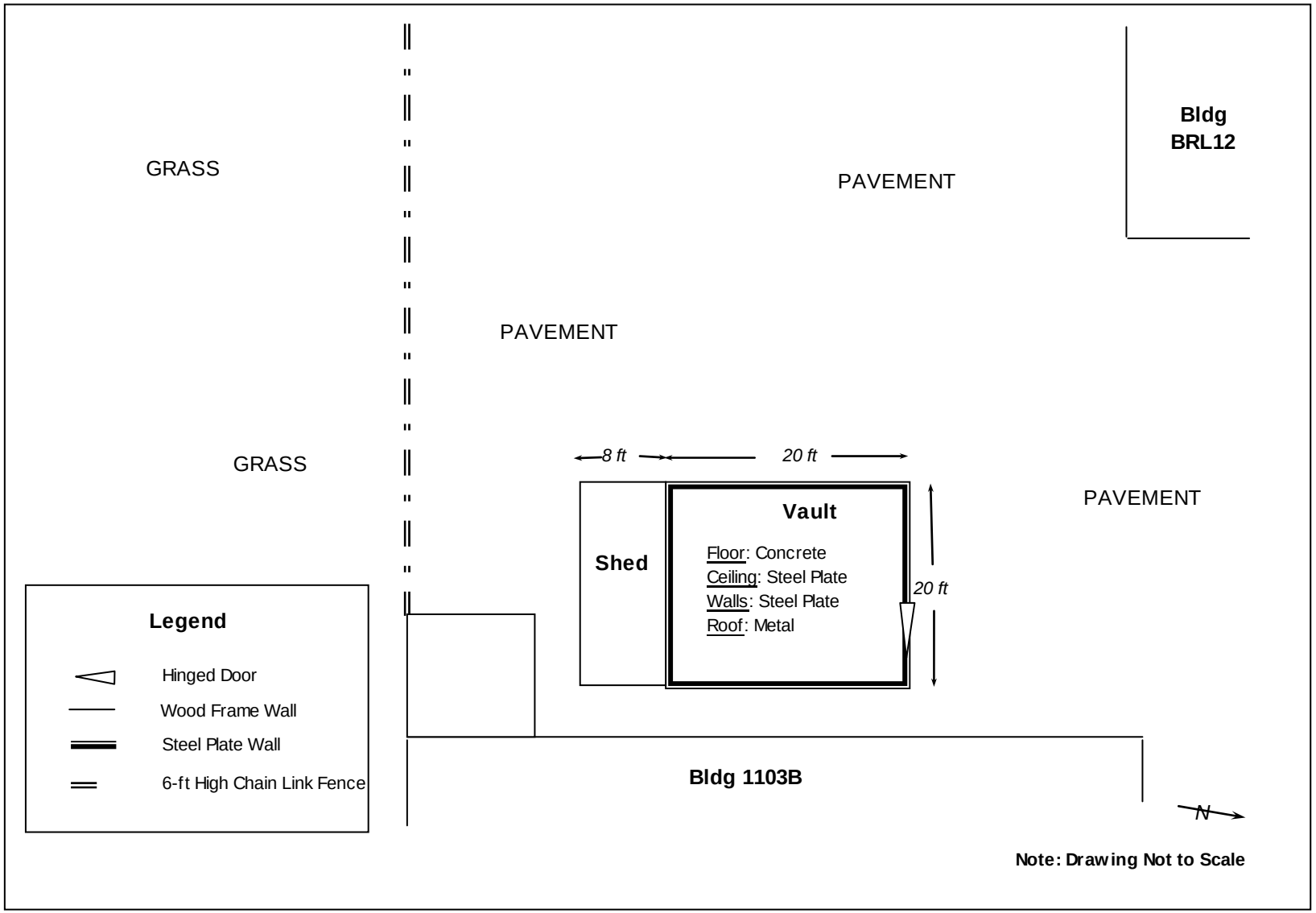

Figure 3-6: Freestanding Vault

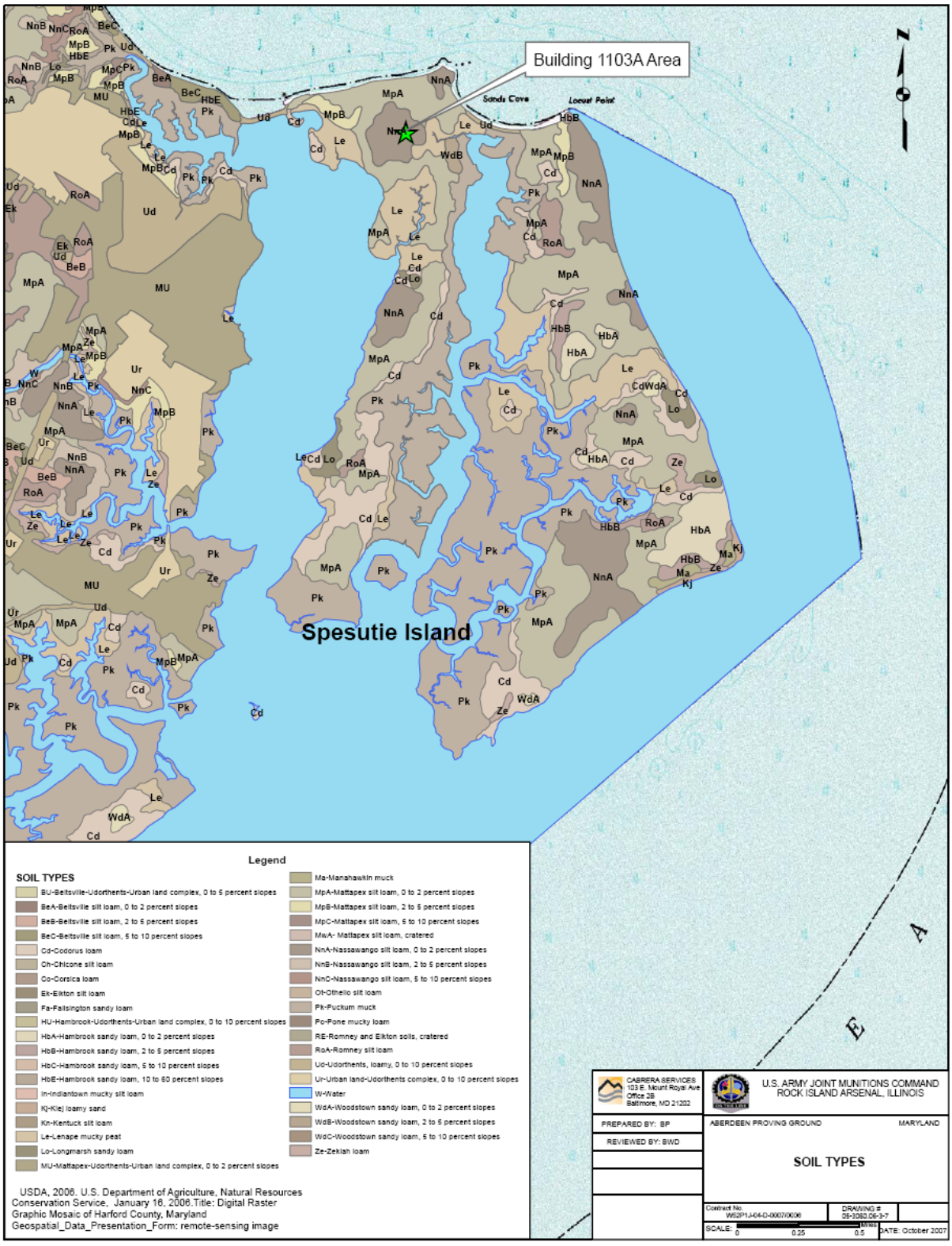

Figure 3-7: Soil Types at the 1103A Area

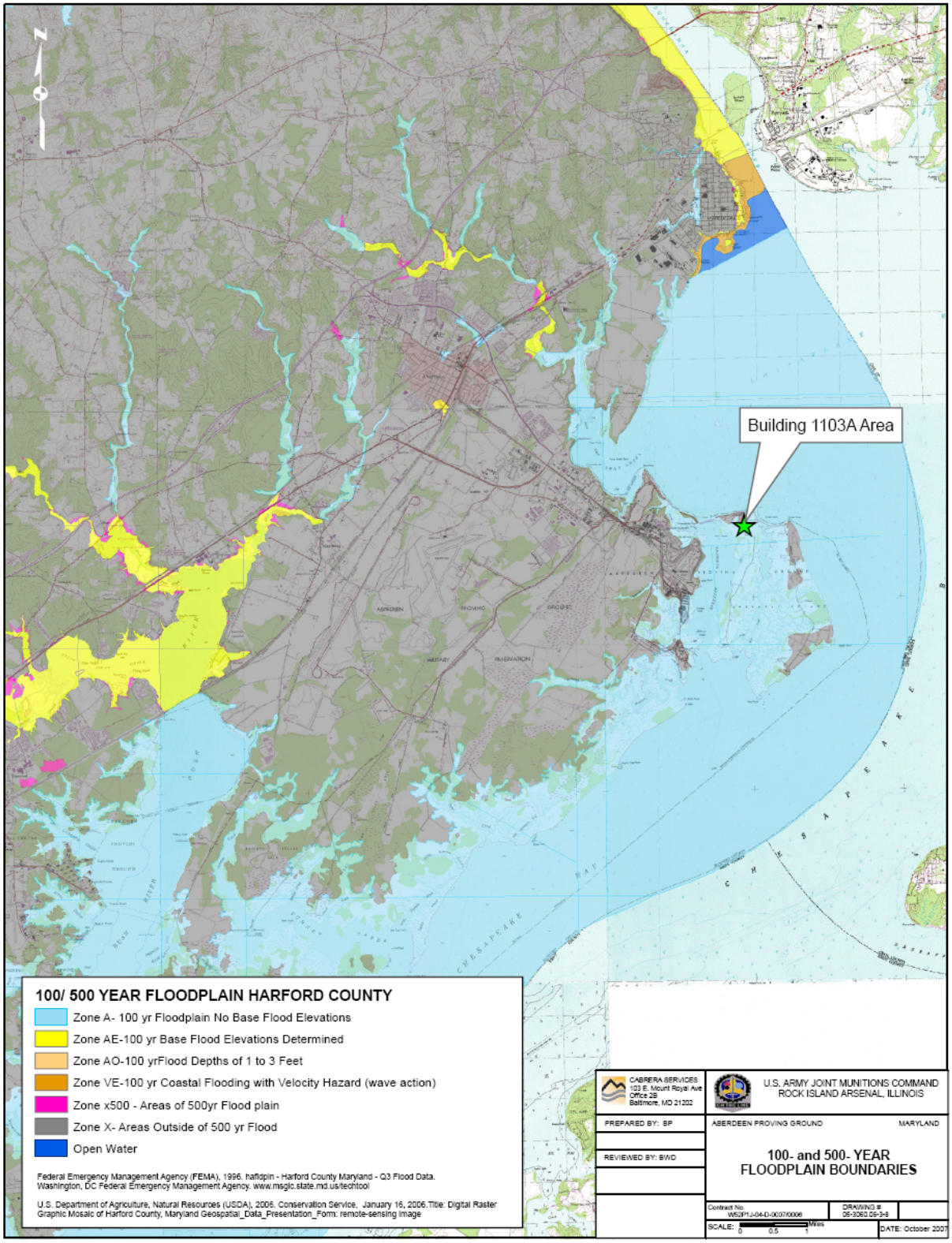

Figure 3-8: Boundaries of 100-Year Floodplain at APG

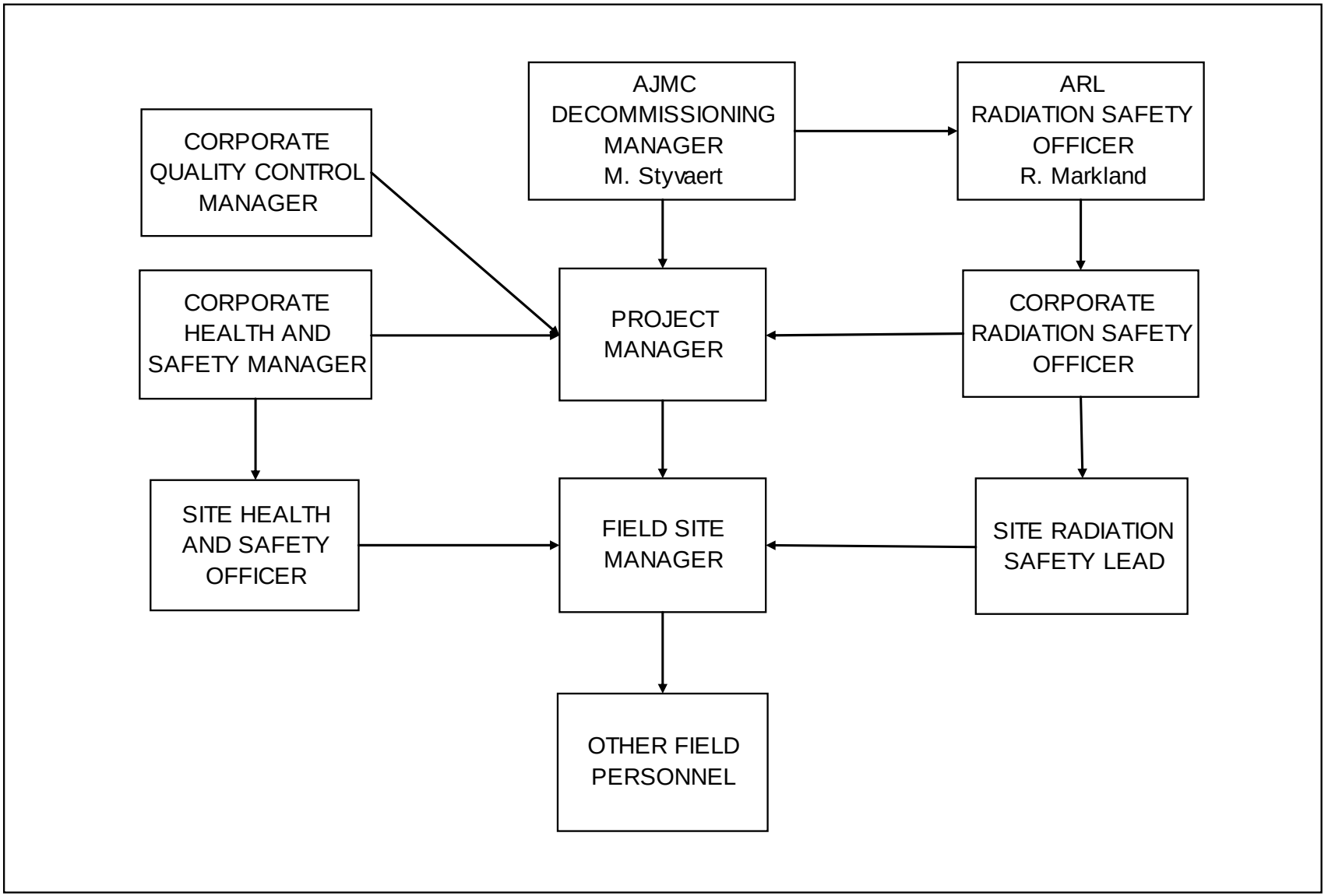

Figure 7-1: Project Organizational Chart

APPENDIX A

ARL NUCLEAR MATERIALS LICENSE (NRC LICENSE NO. SMB-141)

APPENDIX B

BUILDING 1103A AREA CHARACTERIZATION SURVEY REPORT

APPENDIX C

DETERMINATION OF DCGL FOR BUILDING 1103A AREA SOILS

APPENDIX D

BUILDING 1103A AREA DECOMMISSIONING FINAL STATUS SURVEY PLAN