REV. 2

WASTE MANAGEMENT, TRANSPORTATION AND DISPOSAL (WMTD) PLAN

SHALLOW LAND DISPOSAL AREA

FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM (FUSRAP)

SITE REMEDIATION

PARKS TOWNSHIP

ARMSTRONG COUNTY, PENNSYLVANIA

January 2011

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
BUFFALO DISTRICT
Buffalo, New York
PITTSBURGH DISTRICT
Pittsburgh, Pennsylvania

Contract Number W912P4-07-D-0002

Prepared by:

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WASTE MANAGEMENT, TRANSPORTATION, AND DISPOSAL (WMTD) PLAN SLDA FUSRAP SITE, PARKS TOWNSHIP, ARMSTRONG COUNTY, PENNSYLVANIA

Contract Number (No.) W912P4-07-D-0002

WMTD PLAN APPROVALS

By their specific signature, the undersigned certify that this Plan is approved for use during remediation of the SLDA FUSRAP Site, Parks Township, Armstrong County, Pennsylvania.

APPROVED BY:

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John Eberlin – Project Manager Date
Cabrera Services, Inc.

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Kim Nelson, P.G. – Vice President of Operations Date
Cabrera Services, Inc.

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ACRONYMS, ABBREVIATIONS, AND SYMBOLS

1,1-DCA	1,1-Dichloroethane
1,1,1-TCA	1,1,1-Trichloroethane
8-OH	8-Hydroxyquinoline
Ra-228	Radium-228
Th-232	Thorium-232
U-234	Uranium-234
U-235	Uranium-235
U-238	Uranium-238
Pu-239	Plutonium-239
Am-241	Americium-241
Pu-241	Plutonium-241
ARCO	Atlantic Richfield Company
B&W	Babcock and Wilcox, now BWXT
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CABRERA	Cabrera Services, Inc.
CFR	Code of Federal Regulations
CSP	Criticality Safety Plan
CQC	Contractor Quality Control
DAW	Dry Active Waste
DOT	U.S. Department of Transportation
DU	Depleted Uranium
EM	Engineering Manual
EPA	U.S. Environmental Protection Agency
EU	Enriched Uranium
FID	flame ionization detector
FOL	Field Operations Lead
FSP	Field Sampling Plan
ft^3	Cubic Feet
FUSRAP	Formerly Utilized Sites Remedial Action Plan
g	Gram
GC	Gas Chromatograph
GTCC	Greater Than Class C
Haz Cat	Hazard Categorization
HEPA	High Efficiency Particulate Air
HPGe	High Purity Germanium
IP-1	Industrial Packaging-1
IP-2	Industrial Packaging-2
IP-3	Industrial Packaging-3
LLRW	Low Level Radioactive Waste
LDR	Land Disposal Restrictions
LSA	Low Specific Activity
µCi	microCurie
MBA	Material Balance Area
MC&A	Material Control and Accounting
MLLRW	Mixed Low Level Radioactive Waste
MPB	Material Processing Building
NIST	National Institute of Standards and Technology
NMMSS	Nuclear Materials Management and Safeguards System
NRC	U.S. Nuclear Regulatory Commission
NUMEC	Nuclear Materials and Equipment Corporation
PCB	Polychlorinated Biphenyl
pCi	picocurie
PADEP	Pennsylvania Department of Environmental Protection
Pa. Code	Pennsylvania Code
PCP	Process Control Plan or Procedures
PFLT	Paint Filter Liquid Test
PID	photoionization detector
PM	Project Manager
PSP	Physical Security Plan
QA	Quality Assurance
QAPP	Quality Assurance Program Plan
QC	Quality Control
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
RPP	Radiation Protection Plan
REGe	Reverse Electrode Germanium
SAP	Sampling and Analysis Plan
SSHP	Site Safety and Health Plan
SLDA	Shallow Land Disposal Area
SOP	Site Operations Plan
SNM	Special Nuclear Material
SRSL	Site Radiation Safety Lead
SVOC	Semi-Volatile Organic Compound
TBP	Tri-butyl Phosphate

TCE	Trichloroethene
ThC	Thorium Carbide or Thorium Monocarbide
ThO_2	Thorium Dioxide
ThO_2-UO_2	Thorium Dioxide-Uranium Dioxide
Trans-1,2-DCE	Trans-1,2-Dichloroethene
U	Uranium
UC	Uranium Carbide or Uranium Monocarbide
UC_2	Uranium Dicarbide
UF_6	Uranium Hexafluoride
UO_2	Uranium Dioxide
U.S.	United States
USACE	U.S. Army Corps of Engineer
UTS	Universal Treatment Standards
VC	Vinyl Chloride
VOC(s)	Volatile Organic Compound(s)
WAC	Waste Acceptance Criteria
WMTD	Waste Management, Transportation and Disposal

1.0 INTRODUCTION

1.1 Purpose and Objectives

Cabrera Services Inc. (CABRERA) has been selected by the United States (US) Army Corps of Engineers – Buffalo District (USACE) under Contract Number W912P4-07-D-0002/0001 to remediate the Shallow Land Disposal Area (SLDA) Site in Armstrong County Pennsylvania, hereafter referred to as the "SLDA Site" or "Site."

The overall objective of this project is to remove waste from the existing burial trenches, as well as contaminated soil in and around the waste, and process, package and transport the waste to an offsite disposal facility. Waste and contaminated soil removal will be sufficient to support the next phases of the project which include Final Status Survey and ultimate termination of the U.S. Nuclear Regulatory Commission (NRC) license for the SLDA Site, SNM-2001.

The purpose of this Waste Management, Transportation and Disposal (WMTD) Plan is to establish requirements for the following:

- Remove waste previously disposed (buried) at the SLDA Site, as well as soil mixed with and around the waste;
- Process this waste to meet the disposal site waste acceptance criteria (WAC); and
- Package and ship this waste for off-site disposal at an appropriate, licensed and permitted disposal site.

Waste will be appropriately characterized to identify radiological contaminants and contaminant concentrations to address the requirements in Title 10 Code of Federal Regulations (10 CFR) Part 61, as well as non-radiological hazardous waste characteristics as required by the U.S. Environmental Protection Agency (EPA) in Title 40 CFR (40 CFR), Parts 262 and 265, and Pennsylvania Department of Environmental Protection (PADEP) in Pennsylvania Code (Pa. Code), Title 25, Chapters 260 to 270. Characterization of waste for radiological and non-radiological hazardous constituents will assure waste is acceptable for acceptance and disposal off-site. The designated off-site disposal facility for the SLDA Site waste is EnergySolutions in Clive, Utah (hereafter referred to as EnergySolutions).

Waste will be prepared, packaged, marked, labeled and transported in accordance with applicable U.S. Department of Transportation (DOT) requirements in Title 49 CFR (49 CFR), Subchapter C, NRC requirements in 10 CFR Parts 20, 61 and 71, and the EnergySolutions Waste Acceptance Criteria (WAC), provided in Appendix A. Engineering Manual (EM) 1110-35-01, *Management Guidelines for Working with Radioactive and Mixed Waste,* requires that USACE verify that the facility regulator (in this case, the State of Utah) has been contacted to ensure that the waste proposed for shipment and disposal meets the waste acceptance criteria. The State of Utah has deferred such responsibility to EnergySolutions under the facility license. Therefore, the review of the WAC and subsequent notification to transport by EnergySolutions will serve to meet the EM requirement for this project.

1.2 Site Information

The SLDA site was formerly owned by Nuclear Materials and Equipment Corporation (NUMEC), which also operated the Apollo Nuclear Fuel Fabrication Facility. In the 1960s and 1970s, the site was used by NUMEC to dispose of radioactive waste (contaminated primarily with uranium and thorium) in accordance with the regulations found in the now rescinded 10 CFR 20.304. During this period, NUMEC also disposed of non-radioactive wastes on the site. The Atlantic Richfield Company (ARCO) purchased all of the NUMEC stock in 1967. In 1971, ARCO then sold the stock to Babcock and Wilcox (B&W), who later became BWX Technologies (BWXT).

Waste materials were placed into a series of trenches, including nine trenches in a topographically elevated area in the eastern/central part of the site (Trenches 1 through 9) and one in a topographically lower area about 305 meters (1,000 feet) northwest of the upper trenches (Trench 10). The upper and lower trench areas occupy approximately five acres, with an estimated total trench surface area of approximately 1.2 acres. The disposal trenches were numbered 1 through 10 based on their respective assumed dates of construction, with 1 being the oldest trench and 10 being the most recently constructed.

Wastes placed within the SLDA trenches consisted of process wastes (slag, crucibles, spent solvent, unrecoverable sludges, organic liquids, debris, etc.); laboratory wastes (sample vials, reagent vials, etc.); old or broken equipment; building materials; protective clothing; general maintenance materials (paint, oil, pipe, used lubricants, etc.); solvents (trichloroethene, methylene chloride, etc.); and trash (shipping containers, paper, wipes, etc.). Some of the wastes were placed in cardboard and metal drums, some were bagged, and some, particularly pieces of equipment and building materials, were placed in trenches with no special packaging or containers.

Between 1961 and 1970, the trenches at the SLDA site were excavated in the order of their numbering and reportedly capped with four feet of soil once disposal operations ceased. The estimated average waste thickness in Trenches 1 through 9 reportedly ranged from 2.6 to 4.8 meters (8.5 to 15.8 feet). The estimated waste thickness in Trench 10 is 5.5 meters (18.1 feet). The total estimated volume of potentially contaminated waste and soil in the ten trenches is between 17,970 and 27,520 cubic meters (23,500 and 36,000 cubic yards).

The wastes placed in the disposal trenches were generated primarily from activities conducted under NUMEC's Apollo Facility license. The Apollo Facility processed uranium and, to a much lesser extent, thorium. Processing operations included conversion of uranium hexafluoride (UF_6) to uranium dioxide (UO_2) by the ammonium diuranate process, and subsequent metallurgical and ceramic processes to produce uranium compounds and nuclear fuel components. The entire UF_6 conversion process resulted in uranium-235 (U-235) enriched uranium-bearing nuclear fuel compounds such as uranium metal, UO_2, uranium monocarbide (UC), and uranium dicarbide (UC_2). A corollary process for thorium produced thorium dioxide (ThO_2), ThO_2-UO_2, and UC-thorium monocarbide (ThC) as sintered pellets, powder, and other particulate forms. Process wastes, including off-specification products and incinerated high-efficiency particulate air (HEPA) filters and rags, were recycled at the Apollo facility in a nitric acid solvent extraction scrap recovery process to recover usable uranium. The Apollo plant processed uranium at a capacity of 350 to 400 metric tons/year.

The uranium-contaminated materials placed in the trenches are present at various levels of enrichment, ranging from depleted to highly enriched uranium. Activity percentages indicate levels of enrichment from less than 0.2 percent U-235 (by weight) to greater than 45 percent U-235.

Non-radiological contaminants buried in the disposal trenches were not specifically documented as were radionuclides. The Nuclear Material Discard Reports (NMDRs) that comprise the bulk of the waste disposal documentation list only the radiological materials of interest (U-235, total U, and thorium). Any other information, such as the presence of specific metals or compounds, or the waste origin process, was qualitative. Raffinate (waste aqueous phase from the solvent extraction step) was treated prior to discharge into a local stream outfall, although NUMEC records indicate that some raffinate may have been disposed of at the SLDA. Recoverable used solvent was recycled.

Fuel fabrication and other metal working operations used lubricants, solvents (e.g., trichloroethene [TCE], methylene chloride, etc.), and acids that may have been disposed of in the SLDA. Spent equipment disposed of in the SLDA may have contained lubricants and hydraulic fluids. The process control and research and development (R&D) laboratories were also sources of wastes disposed of at the SLDA. Spent solvent, unrecoverable sludges and filtration media, and other process wastes were disposed of in the SLDA but are not quantified in the records.

In general, the solvents disposed of in the SLDA consisted of tributyl phosphate (TBP), TCE and other chlorinated solvents, and kerosene. Review of the historical database and compounds detected at the SLDA indicates that volatile organic compounds (VOCs) of concern include TCE; trans-l,2-dichloroethene (trans-1,2-DCE); vinyl chloride (VC); 1,1,1-trichloroethane (1,1,1-TCA); 1,1-dichloroethane (1,1-DCA); chloromethane; and benzene, toluene, ethylbenzene, and xylenes (BTEX). Trans-1,2-DCE and VC are possible degradation products of TCE, and l,l-DCA may be a degradation product of 1,1,1-TCA. BTEX are common constituents of fuels and solvents.

The historical records did not indicate the burial of metallic compounds other than those directly associated with Apollo operations. Metals processed at the Apollo facility include beryllium, zirconium, and beryllium and zirconium compounds or alloys. In addition, the scrap recovery process utilized nitric acid, which forms soluble nitrate salts with most metals. This may have resulted in the inadvertent disposal of small amounts of other metallic compounds. If acids were also disposed of in the trenches, they may have leached and mobilized various naturally-occurring metals in the site soils. The Apollo process also used basic compounds such as ammonium hydroxide; lime was used to neutralize hydrofluoric acid waste prior to disposal.

Two semivolatile organic compounds (SVOCs) are known to be associated with operations at Apollo: TBP and 8-hydroxyquinoline (8-OH). Other potential SVOCs present at the site include phthalates (from the disposal of gloves and other plastic materials) and kerosene constituents.

The primary radiological contaminants of concern (RCOC) in soil and buried waste include americium-241 (Am-241), plutonium-239 (Pu-239), plutonium-241 (Pu-241), radium-228 (Ra-228), thorium-232 (Th-232), uranium-234 (U-234), U-235 and uranium-238 (U-238). Uranium isotopes are present in various enrichments, ranging from depleted uranium (DU) to highly enriched uranium (uranium enriched to 20 percent or greater in the isotope U-235).

As a result of the historical review, interviews with personnel and past characterization efforts, the estimate of waste and soil contained in each of the disposal trenches is identified in Table 1-1.

Table 1-1: Waste Description and Estimated Volumes

Source of Waste	Waste Description	Estimated Volume (ft^3)	Primary Contaminant(s)
Disposal Trench 1	Drums and bags of waste, miscellaneous debris.	125,000	Uranium, beryllium
Disposal Trench 2	Drums of organic liquids, powders, sand, leached solids (ash and residue).	110,000	Uranium, enriched uranium, organic liquids
Disposal Trench 3	Contaminated soil	5,000	Uranium (enrichment unknown)
Disposal Trench 4 and 5	Uranium-beryllium scrap solutions, empty shipping containers, various process waste, debris, equipment, demolition debris and DAW	85,000	Uranium (enrichment unknown), beryllium
Disposal Trench 6	Drums, 2-quart bottles, leached ashes and solids, scrap metal, glass, debris and process waste.	110,000	Uranium, enriched uranium, thorium
Disposal Trench 7	Drums, boxes, 2-quart bottles, spent organic solutions, other liquid waste, contaminated oil, zirconium-beryllium, scrap recovery waste, misc. scrap, vacuum chamber.	100,000	Uranium, enriched uranium, beryllium, organic solutions
Disposal Trench 8	Drums, leached residues and scrap, contaminated soil, DAW	30,000	Uranium and enriched uranium
Disposal Trench 9	Contaminated soil, equipment, scrap wood.	55,000	Uranium (enrichment unknown), plutonium
Disposal Trench 10	Laboratory waste, building demolition debris, equipment and scrap metal, contaminated truck.	370,000	Uranium, enriched uranium, thorium

2.0 ORGANIZATIONAL STRUCTURE

Key project personnel are described in Section 3 of the *Site Operations Plan* (SOP) (CABRERA, 2010a). This description includes the organizational structure of the project team, personnel responsibilities and authority, lines of reporting, phone numbers of key project personnel, a table of key project personnel, and an organizational chart.

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3.0 WASTE MANAGEMENT

The process for initial screening of trench waste *in situ*, waste removal and initial segregation of waste, waste processing, and preparation of waste for disposal are discussed in the following sections.

3.1 Nuclear Criticality Safety and Material Control and Accounting

The contaminants at the SLDA site include radionuclides that are considered special nuclear material (SNM). The U.S. Nuclear Regulatory Commission (NRC) defines SNM as:

> *(1) Plutonium, Uranium- 233, Uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission, pursuant to the provisions of section 51 of the act, determines to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing but does not include source material.*

Of these radionuclides, Uranium-235 is the primary constituent in SNM at the SLDA site. As indicated in the SLDA Remedial Investigation (RI) and Feasibility Study (FS), the Uranium-235 enrichment (equivalent to the weight percent of Uranium-235 in the mix of primary Uranium isotopes: Uranium-234, Uranium-235 and Uranium-238) in waste within the disposal trenches has a range of approximately 0.2 to greater than 40 percent.

Fissile material, although sometimes used as a synonym for fissionable material, is any material fissionable by thermal (slow) neutrons. The three primary fissile materials are Uranium-233, Uranium-235, and Plutonium-239. The NRC defines fissile material as:

> *Materials that contain Plutonium-238, Plutonium-239, Plutonium-241, Uranium-233, Uranium-235, or any combination of these nuclides. Unirradiated natural uranium and depleted uranium, and natural uranium or depleted uranium that have only been irradiated in thermal reactors are not included in this definition.*

Since the primary SNM in SLDA waste is Uranium-235, which is fissile, it is necessary to incorporate requirements into project plans to assure the material is handled safely from the time it is removed from the disposal trenches until transported for offsite disposal. Of particular importance is the need to manage SNM such that the mass and configuration of fissile material are maintained in accordance with control limits to prevent an inadvertent nuclear chain reaction, i.e., nuclear criticality.

Although the SNM at the SLDA site are in low concentrations, with a limited mass of enriched uranium available, and the potential for a nuclear criticality incident is extremely low, it is necessary to establish precautionary controls to ensure these conditions are maintained throughout all project activities.

Because of the inherent properties of SNM discussed above, the NRC also has specific regulations regarding SNM control and accountability in 10 CFR 74. To assure compliance with these regulations, the SLDA project has developed a *Material Control and Accounting (MC&A) Plan* (CABRERA, 2011). This Plan tracks the quantities of SNM removed from the trenches through receipt of the material at the offsite disposal site and maintains records of these “material transactions.”

3.2 *In Situ* Screening and Visual Observation of Trench Material

Following removal of the upper 3 feet of cover soil in each trench (overburden soil), additional soil will be carefully excavated until indications of buried waste are observed. Once this point is reached, further soil and waste removal will be guided by field radiological measurements using portable survey instruments, visual observation for drums, other containers or objects, and oversized debris, and sampling of soil/waste mateerial. A gamma walkover survey will be performed over 100% of each lift of material and supplemented by samples obtained from the lift area. The sample analysis analysis result will be used to estimate the concentration, SNM mass and Uranium enrichment in the soil/waste. This information will then be used to determine if there is a mass of soil, or an object, that needs to be segregated from the bulk waste. The results of the visual observations (and flame ionization detector/photoionization detector (FID/PID) screening) will be used to determine if potential mixed waste should be segregated from the bulk waste. The visual observations will also identify drums, containers, and large debris for removal from the bulk waste.

3.3 Waste Removal and Initial Segregation

The FOL and the Waste Manager will use the screening results and visual observations to plan the excavation of each one foot lift of waste material. The *in situ* screening and visual observation results coupled with FID/PID screening will be used to initially screen the waste to determine if the material should be managed as potential low level radioactive waste (LLRW) or mixed low level radioactive waste (MLLRW).

3.3.1 Management of Waste Based on Initial SNM Mass Estimate

Once the initial *in situ* screening sample analyses are complete, the Nuclear Material Accountability Officer (NMAO) or designee will review the results, estimate the U-235 mass and determine the maximum volume or mass of waste allowed to be removed from the trench. This will include a review of the current inventory of waste present in all MBAs, either in temporary storage or being processed. The NMAO is responsible for monitoring the SNM inventories in all MBAs to ensure that the total exhumed inventory will not exceed the SLDA project SNM inventory limits shown in the *MC&A Plan* (CABRERA, 2011).

The Waste Manager and FOL will direct removal of the volume of waste based on the NMAO's determination of SNM allowance. If a larger object is observed during removal of the waste volume and removal of the object requires excavation to depth greater than the one foot lift, the Site Radiation Safety Leader (SRSL) will coordinate any additional screening surveys that will be required to estimate the SNM content and comply with the nuclear criticality safety requirements. The NMAO will assess the SNM mass in or on this object against the current SNM inventory. If the SNM mass will result in exceeding the allowed above ground SNM inventory if the object is removed, the object will be set aside within the trench, with removal pending available SNM inventory. In order to maintain a smooth work flow, SNM in the later stages of processing and packaging will be expedited for shipping.

If the initial SNM screening indicates that the SNM enrichment is ≥ 20%, the mass of the suspect material will be evaluated to ascertain if a Category II condition (> 1 kg) exists. If so, the material must be transferred to the designated Category II SNM storage area. Up to 5 kg of ≥20% enrichment material may be stored in the Category II storage area, provided all conditions in the MC&A Plan are met. The NMAO will track the inventory of the Category II storage area and inform the Corporate Radiation Safety Officer and Project Manager when the inventory approaches 80% of the limits provided in the MC&A Plan.

3.3.2 Mixed Waste Segregation

In order to minimize the generation of potential mixed waste (MLLRW), field crews will attempt to identify and segregate potential MLLRW early in the process. This practice will minimize the inadvertent combination of MLLRW with LLRW, in order to minimize the added costs for managing large amounts of MLLRW. Potential MLLRW will be identified from the FID/PID headspace and on-site Gas Chromatography (GC) analysis that is described in the *Sampling and Analysis Plan* (SAP) (CABRERA, 2010c). The analysis is expected to identify potential waste issues from solvent like liquids in containers and sludge from broken containers including leaking drums. These potential mixed wastes are assumed to exceed the EnergySolutions WAC and will require treatment prior to disposal. The WAC limits are based on RCRA Land Disposal Restrictions (LDR) from EPA, shown in 40 CFR Part 268.

Intact containers and drums will be removed using the drum handling requirements specified in Attachment D of the SSHP, which is Appendix A of the *Accident Prevention Plan (APP)* (CABRERA, 2010b). The lids of intact drums will be punctured to allow gases in the drum headspace to vent prior to drum movement. Each drum will be removed individually in accordance with nuclear criticality safety requirements and placed in close proximity to the excavation for initial screening to determine the potential U-235 mass and uranium enrichment. Liquid leakage into surrounding waste materials from ruptured drums will be minimized through the use of absorbent materials. Each drum will then be placed in an overpack for transport to the Material Processing Building (MPB). Small intact containers will be collected as efficiently as practicable using mechanical or hand methods, following nuclear criticality safety requirements. Absorbent material will be used to help managed the spread of liquid chemicals from broken containers.

Potential mixed waste will be excavated directly from the trench and placed into either an Articulated hauler (or a lined intermodal container if the waste is wet) for transport to the MPB for further hazard categorization (Haz Cat) characterization.

3.3.3 Debris Segregation

The decision to segregate large debris is at the discretion of the excavation crew. Large debris will be segregated and gathered at the edge of the excavation. The debris will be loaded into an articulated hauler for transport to the MPB when a sufficient quantity of debris is gathered to warrant transport. It is unlikely that debris will be found that will require sizing at the trench rather than the Material Sorting and Processing Facility.

3.3.4 Bulk Excavation

The remaining waste will be bulk excavated. The waste will be loaded into an Articulated Hauler for transport to the Material Sorting and Processing Facility.

3.4 Waste Processing

Waste will be processed to meet the requirements specified in the EnergySolutions WAC provided in Appendix A. Waste that cannot be processed to meet these specifications will be set aside for determination of an appropriate alternate disposal option. All soils with radiological constituents below the DCGLs, and which have been identified as RCRA characteristic, will be set aside and stored in accordance with its RCRA characteristics in a designated location pending determination of the appropriate method of disposal. Soil and soil-like material, as defined in the EnergySolutions WAC, will be processed as indicated in Appendix E, Chart 1. Solid debris will be processed as indicated in Appendix E, Chart 2. Other solid waste will be processed as indicated in Appendix E, Chart 3. Liquid waste will be processed as indicated in Appendix E, Chart 4.

3.4.1 Material Sorting and Processing Facility

A temporary structure has been erected on a paved (asphalt and/or concrete) surface to accept, sort, process, and package waste for transport. As indicated in the SOP, in order to provide sufficient space for material sorting and processing operations the temporary facility is a sprung type structure 150 feet by 400 feet by 40 feet high. The structure is equipped with an air extraction system, which will enable the air to be HEPA filtered to remove dust particulates and carbon treated to remove VOC vapor. The floor of the building is paved, made impermeable to contamination migration, and constructed with a sump to allow the collection of water from seepage of wet waste material. Water collected in the sump will be pumped to the onsite water treatment plant.

A design package for the MPB including the structural design, the floor design, and the air handling/treatment has been engineered and the specifications developed reviewed and approved by USACE.

3.4.2 Bulk Waste

The waste will arrive from the trench in an Articulated Hauler and unloaded at the receiving portion of the Material Sorting and Processing Facility. A Wheeled Loader will transfer the waste from the receiving area to the Screen Plant equipped with a vibratory screen (i.e., grizzly) with four-inch openings to separate soil (four-inch minus) from debris (four-inch plus). Material not passing through the grizzly will be deposited in a temporary (debris waste stream) stockpile to the side of the screen plant. Material passing through the grizzly will discharge to a conveyor that will deposit soil in a separate (screened waste stream) stockpile. The screened waste will be assessed for compliance with the disposal facility WAC definitions of a compactable soil like material and a moisture content near optimum. If appropriate, the soil will be screened further to remove additional debris using finer mesh screens and to reduce moisture content. Decisions to further process the soil will be coordinated between the Waste Manager, FOL, and USACE.

<u>Process Sampling and On-Site Laboratory Analyses</u>

The waste will be sampled after screening for VOC headspace and SNM characterization at the on-site laboratory. The headspace results are used as a qualitative indicator to determine if VOCs are present in the soil. If VOCS are detected during headspace analysis, a sample may be obtained for GC analysis at the on-site laboratory. The results of the GC analysis will be used to assist with waste handling and segregation determinations. Based on the GC results, the waste will be combined with similar wastes from one of the following waste streams:

- VOCs below RCRA characteristic limits and the waste is managed as LLRW
- VOCs above RCRA characteristic limits (but less than LDR/Universal Treatment Standards (UTS) limits defined in 40 CFR 268.48) requiring the waste to be managed as a mixed waste
- VOCs above RCRA LDRs requiring the waste to be managed as a mixed waste. The waste will require treatment (to below LDR/UTS limits) prior to disposal. The disposal facility's WAC has the same LDR limits.

<u>Waste Characterization Sampling and Laboratory Analysis</u>

The soil and debris waste streams will be temporarily staged in 250-CY stockpiles (or a smaller sized stockpile as appropriate to meet requirements defined in the disposal facility waste acceptance criteria) using the Loader. One composite sample will be collected from each of these stockpiles and laboratory analysis performed to verify compliance with the waste profile accepted by the disposal facility WAC. Radiological and chemical analyses for disposal characterization are described in the Field Sampling Plan (FSP) portion of the SAP. Soil and debris waste streams will be loaded into lined intermodal containers using the Loader following receipt of disposal characterization laboratory results verifying LLRW disposal classification.

Stockpiles of soil and debris exhibiting RCRA hazardous waste characteristics will be divided into five smaller (approximately 50 CY) piles using the Loader and samples will be collected from these new stockpiles for laboratory analysis. These lab results will be used to further segregate these stockpiles into LLRW and MLLRW soil and debris waste streams for the purpose of minimizing off-site disposal cost. The project SAP provides a more detailed description of waste sampling and laboratory analysis.

All soils with radiological constituents below the DCGLs, regardless of RCRA characteristic limits, will be stockpiled appropriately on-site, as required by USACE.

3.4.3 Potential Mixed Waste Processing

Potential mixed wastes suspected to be RCRA hazardous that were excavated in bulk at the trench due to leaking drums or sludge like material will be delivered to the same dedicated area of the MPB used for the containers and drums discussed above. Absorbent material may be added to the waste to remove free liquids.

The waste material will then be processed through the screening plant to remove debris larger than four inches. If possible, the screened waste may be further screened down to a ¾ inch mesh if necessary to achieve a WAC waste classification of a compactable soil like material. The screened waste will be sampled at the end of the conveyor for VOCs headspace (and potential GC analysis) and SNM characterization at the on-site laboratory. The sample results will be used to determine the appropriate disposal waste stream (defined above). The waste material will be placed into a stockpile area for that waste stream and characterized for waste profile compliance with the disposal facility WAC as defined in the SAP. TCLP analyses will be performed at an off-site laboratory for the analytes defined in the FSP. Waste determined to be MLLRW above LDR/UTS will be evaluated for treatment using either on-site or off-site options.

3.4.4 Debris Processing

Oversized debris delivered directly from the trenches or debris separated at the screening plant will be sized to comply with size restrictions in the disposal facility WAC. Disposal cost is higher for oversized debris (dimensions greater than 12 feet by 10 inches by 10 inches) than LLRW debris smaller than those dimensions at that facility. Smaller-sized debris also facilitates more efficient use of waste packages (containers), reducing waste transport cost.

Large pieces of LLRW debris will be reduced in size (i.e., sized) to below the above-reference dimensions to achieve cost savings. An excavator equipped with a hydraulic shear will be used to reduce large pieces of debris to a more manageable size. Cutting torches may also be used for sizing select debris. Some debris will be further reduced in size for blending with the soil waste stream using a mechanical shredder. Four-inch plus material rejected by the Screen Plant will also be processed through the shredder for size reduction. Some of the sized (i.e., less than four-inch diameter material) debris will be blended into the soil waste stream using the loader.

3.4.5 Processing of Containers and Drums

Containers and drums delivered to the MPB will be managed in an area of the facility dedicated to the sampling, hazardous categorization, VOC characterization, treatment (if required), and packaging for disposal. The dedicated area will include appropriate ventilation to prevent the accumulation of hazardous or radioactive fumes and secondary containment for potential spills. The area will also be equipped to facilitate container and drum sampling. The SSHO, SRSL, Waste Manager and FOL will coordinate waste processing to ensure safe and efficient operations. The remainder of this section provides the process flow of containers and drums to packaging and disposal.

Container and Drum Sampling

Container samples will be obtained as described in the Field Sampling Plan (FSP). Each container will be assessed for Haz Cat following the procedure in Appendix F of this WMTD Plan. The Haz Cat will evaluate the contents of the containers and drums for the following categories:

- Air Reactivity;
- Phase Determination;
- Flame Ignitability;
- Beilstein's Test;
- Water Solubility and Reactivity;
- Hexane Solubility;
- Inorganic Oxidizers;
- Peroxides;
- PH;
- Sulfide and Cyanide

Compatible container contents will either be combined into a drum or packaged separately in a lab pack type package depending on the volume of containers generated. The characterization samples from the compatible containers will be composited and analyzed for waste profiling. Treatment and disposal options will be evaluated and a cost effective solution selected. The Waste Manager will be responsible to arrange manifesting and shipping papers for the container treatment and disposal. The container will be stored in a RCRA compliant storage area pending transportation.

3.5 Processed Waste Sampling Profile and Disposal Facility Acceptance

Each waste stream will be sampled and the waste confirmed to meet the criteria in 10 CFR 61 for Class A waste, the only classification of LLRW accepted at EnergySolutions. Sampling will be performed, as specified in the SLDA SAP, to:

- Identify and quantify radioactivity in waste to properly classify the waste in accordance with 10 CFR 61 and the EnergySolutions WAC.
- Determine the U-235 mass and uranium enrichment to verify the waste meets the EnergySolutions WAC and determine the appropriate waste packaging for transport and disposal in accordance with DOT regulations and 10 CFR 71, if applicable.
- Determine the hazardous characteristics of the waste to guide further processing of the material and verify the waste meets the EnergySolutions WAC.
- Address each of the parameters listed on the EnergySolutions Waste Profile Record.

EnergySolutions cannot accept the following waste:

- Waste that is determined to be greater than Class A, i.e., Class B, Class C or greater than Class C (GTCC).
- Waste containing special nuclear material in excess of the concentrations or quantity specified in the WAC.
- Non-radioactive hazardous waste.
- Mixed waste that contains hazardous materials not identified in the RCRA Part B permit.

Waste that falls into any one of the previously listed categories cannot be shipped to EnergySolutions for disposal. This waste, if any, will be set aside and stored in accordance with its characteristics in a designated location pending determination of the appropriate method of disposal.

Waste streams or packaged waste that is not Class A waste, e.g. Class B or Class C waste, will be set aside for determination of the appropriate disposal option. Each waste stream will also be sampled to determine the U-235 mass per disposal package and uranium enrichment. Waste that does not meet the disposal site SNM limitations as indicated in the EnergySolutions WAC will also be set aside for determination of the appropriate disposal option.

A waste profile will be completed for each waste stream using the EnergySolutions Radioactive Waste Profile Record, form EC-0230, provided in Appendix B. For waste containing SNM, the EnergySolutions SNM Exemption Certification, form EC-0230-SNM, provided in Appendix C shall be completed. For waste containing polychlorinated biphenyls (PCBs), the EnergySolutions PCB Certification, form EC-98279, provided in Appendix D shall be completed. Prior to completing these forms, the preparer shall verify the forms used are the most recent revision.

3.6 Waste Packaging

Waste will be packaged to assure compliance with the EnergySolutions WAC and assure compliance with the DOT and 10 CFR 71, if applicable, for transportation. This includes selection of the appropriate shipping container, verification the container meets the specified design criteria as evidenced by the certification documents, loading waste in the designated packages, and marking and/or labeling each package in accordance with regulatory and disposal site requirements.

If the waste contains fissile material, it is necessary to determine if the material is “fissile excepted” per DOT and if the material is subject to the requirements in 10 CFR 71.

Waste will be packaged for shipment as follows (see Notes below):

- Waste that is “fissile excepted”, solid and meets the definition of low specific activity (LSA)-I will be shipped in an Industrial Packaging-1 (IP-1).
- Waste that is “fissile excepted”, liquid, meets the definition of LSA-I and shipped exclusive use will be shipped in an IP-1.
- Waste that is “fissile excepted”, liquid, meets the definition of LSA-I and shipped non-exclusive use will be shipped in an IP-2.
- Waste that is a solid and meets the definition of LSA-II will be shipped in an IP-2.
- Waste that is a liquid, meets the definition of LSA-II and shipped exclusive use will be shipped in an IP-2.
- Waste that is a liquid, meets the definition of LSA-II and shipped non-exclusive use will be shipped in an IP-3.
- Waste that meets the definition of LSA-III and shipped exclusive use will be shipped in an IP-2.
- Waste that meets the definition of LSA-III and shipped non-exclusive use will be shipped in an IP-3.
- Waste that does not meet the definition of LSA and the radionuclide activity does not exceed the A_2 activity limit, or for multiple radionuclides, the sum of the A_2 fractions does not exceed unity, will be shipped in a Type A package.
- Waste that does not meet the definition of LSA and the radionuclide activity does exceed the A_2 activity limit, or for multiple radionuclides, the sum of the A_2 fractions exceeds unity, will be shipped in a Type B package.

Note 1: For waste meeting the definition of LSA, a Type A package may be used in lieu of an IP-1, IP-2 or IP-3.

Note 2: Waste containing fissile material subject to the requirements in 10 CFR 71 shall be shipped in a Type A or Type B package as specified in the regulation.

3.7 Waste Transportation

3.7.1 General Waste Transportation Requirements

The requirements in this section apply to all shipments of waste from the SLDA Site.

3.7.1.1 Preparation for Conveyance Loading

Prior to conveyance waste package loading, the Waste Manager will:

- Verify the SLDA Site has the most recent copy of the EnergySolutions license, including amendments.
- Verify the waste has been prepared for shipment in accordance with the EnergySolutions license and WAC, as well as applicable DOT and NRC regulations, and is acceptable for receipt by the consignee.
- Verify the package has been loaded to minimize the potential for exceeding the gross vehicle road weight limit for highway transport.
- For bulk packages, verify that the USACE required disposal marking is applied to at least two sides of the package.
- Verify all additional package markings/labeling are in place and correct.
- Verify the SLDA Site has a copy of package certification records and packaging has been performed in accordance with requirements specified in the certification, if applicable.
- Obtain the completed DOE/NRC Form 741 for each package.
- Verify all waste packaging records are complete.
- Verify a tamper indicating device (TID) with unique identifier has been applied to the closure mechanism on each package containing SNM such that evidence of possible tampering will be evident upon future inspection of the TID.
- Ensure all prior EnergySolutions pre-shipment notifications are complete and authorization to ship has been obtained from the receiving facility.

3.7.1.2 Conveyance Loading

The Waste Manager will prepare a loading plan prior to arrival of the transport vehicle and loading waste containers. The loading plan will consider the type of waste to be transported, all modes of transport, waste characterization and survey data generated during waste processing and packaging. The Waste Manager will oversee transport vehicle loading and ensure the following are performed:

- Conduct and document a visual inspection of the transport vehicle and ensure any discrepancies are corrected prior to loading. This inspection shall include all vehicle safety devices, brakes, and tie-down devices, as applicable, as well as the general condition of the vehicle.

- Inspect all packages as they are loaded to ensure the packages are in full compliance DOT and NRC regulations, as applicable, and requirements for shipment to EnergySolutions, and the package TID is intact.
- Upon completion of loading, visually verify that all packages are loaded.
- Verify the proper use of blocking, bracing, dunnage, and tie-down, as appropriate.
- Verify the conveyance is properly marked, labeled and placarded, as applicable.
- If using a closed transport vehicle, a TID is applied to the vehicle cargo area closure.
- A contamination and radiation survey of the waste conveyance has been performed and documented and the results are in compliance with DOT and other applicable requirements.

3.7.1.3 Post Loading Activities

The Waste Manager shall perform the following:

- Verify completion of the following:
  - NRC Uniform Low Level Radioactive Waste Manifest (540/541 forms) for each SLDA waste container.
  - RCRA Uniform Hazardous Waste Manifest and Land Disposal Restriction Notification and/or Certification for each shipment of low level mixed waste, if applicable.
  - DOE/NRC Form 741 for each package containing SNM and/or source material, if required by the MC&A Plan.
  - Additional records and/or certifications required by the receiving facility for acceptance of the waste.
  - Review all paperwork to ensure legibility and verify all required records are present.
- Verify the weight of the conveyance does not exceed the gross weight limit for highway transport.
- Verify the conditions in the SLDA Transportation Security Plan and shipper's Transportation Security Plan are understood and shipment will be performed in accordance with Plan requirements. Ensure transportation routes selected minimize the time in transit and are the most direct and safest routes available.
- Verify that the transporter's representative understands all special instructions such as maintenance of the conveyance, transportation routes and in-route notification requirements including expected transit update status frequency and actual or potential delays. Ensure the transporter has appropriate means of communications (phone, radio, etc.) with the SLDA Site, receiving facility and local law enforcement, as necessary.

- Have the transporter's representative and USACE sign all required forms. The USACE signature block must be marked “on behalf of the USACE”. Note: Final shipping documents will be submitted to a USACE representative for review and approval a minimum of five calendar days prior to the first shipment of waste, and seven calendar days for subsequent shipments.
- Make any additional pre-shipment notifications, to include pre-notifications required by individual states, as applicable, or corrections to information already provided in previous notifications. Forward copies of the Radioactive Shipment Manifest cover sheets to the conveyance recipient, as applicable.
- Arrange for regularly scheduled in-transit updates from EnergySolutions until the conveyance reaches the destination facility, and immediate notification upon arrival at the destination facility.

3.7.1.4 Post Shipment Activities

Following release of the shipment from the SLDA Site, the Waste Manager shall perform the following:

- Verify all records are complete for the shipment and copies filed at the SLDA Site.
- Notify the SLDA Nuclear Material Accountability Officer if the shipment contains SNM to assure that the completed DOE/NRC Form 741 for each waste package is transmitted to the Nuclear Materials Management and Safeguards System (NMMSS) as specified in the MC&A Plan.
- Provide routine updates to the SLDA Project Manager for all conveyances in-transit.
- Immediately notify the SLDA Project Manager if there is a delay in-transit beyond the estimated date and time of arrival at the destination location of 6 hours or more, or any package containing SNM that may be missing. For the latter, a trace investigation shall be immediately initiated to locate the missing package and the USACE and NRC Operations Center notified within 1 hour after discovery of the loss, as well as within 1 hour after recovery of package.
- Verify receipt notification is obtained once the shipment arrives at the final destination and shipment records updated, as necessary.
- Resolve any shipment discrepancies that may be identified as a result of inspections of the conveyance and/or waste package upon arrival at Energy Solutions. If the discrepancy involves the potential loss of or tampering with a waste package containing SNM, immediately notify the SLDA Project Manager who will initiate an investigation in accordance with the MC&A Plan.
- Obtain the Disposal Certification Form from Energy Solutions, compare to the shipment records for accuracy and retain with the shipment file.

3.7.2 Additional Requirements for Shipment of Waste Not Exceeding a Category III Quantity of SNM

It is expected that a majority of waste prepared for shipment from the SLDA Site will contain no more than a Category III quantity of SNM. As there is no on-site rail access, these waste packages (intermodal containers) will be transported by truck to the Alaron rail transload facility in Wampum, PA for transport by rail to EnergySolutions. The following requirements, in addition to those in Section 3.7.1, address the requirements for shipment of a Category III quantity of SNM.

The Waste Manager shall perform the following:

- Ensure advance notification to the receiver includes the estimated date and time of departure from the SLDA Site, modes of transport, estimated date and time of arrival at the destination facility, name of carrier and transport identification.

3.7.3 Additional Requirements for Shipments of a Category II Quantity of SNM In A Large Volume of Waste

In the event that a Category II quantity of SNM in a large volume of waste is inadvertently accumulated at the SLDA Site the following requirements, in addition to those in Sections 3.7.1 and 3.7.2, address the requirements for shipment.

The Waste Manager shall perform the following:

- If possible and with assistance from the Nuclear Material Accountability Officer package the waste in individual containers such that no single package (IMC) contains greater than a Category III quantity of SNM.

  Note: If it is not possible to manage shipments of this material as specified in this section, the requirements in Section 3.7.4 will apply.

- Arrange for exclusive use highway shipment of the packages from the SLDA Site to the destination facility.
- Prepare individual conveyances such that there will be no more than one shipment of this waste in transit at any one time, i.e. the next shipment cannot commence until the previous shipment has been received and accepted at the destination facility.
- Complete the shipments as indicated above until all waste containing a Category II quantity of SNM has been removed from the SLDA Site.

3.7.4 Additional Requirements for Shipment of a Category II Quantity of SNM In A Discrete/Small Volume of Waste

In the event that a Category II quantity of SNM in a discrete/small volume of waste is inadvertently accumulated at the SLDA Site the following requirements, in addition to those in Sections 3.7.1 and 3.7.2, address the requirements for shipment.

The Waste Manager shall perform the following:

- Arrange for exclusive use highway shipment of the package(s) from the SLDA Site to the destination facility.

- Verify written confirmation is obtained from the receiving facility indicating they will be ready to accept the shipment at the planned time and location and acknowledge the specified mode of transport.
- Check the integrity of the container and seals (TID's) prior to shipment.
- Assist the SLDA Project Manager in preparation of written notice to the NRC Director, Division of Security Policy, Office of Nuclear Security and Incident Response, of the intent to ship a Category II quantity of SNM. Information contained in the written notice shall include:
  1. Name(s), address(es), and telephone number(s) of the shipper, receiver, and carrier(s).
  2. Physical description of the shipment.
  3. Elements, isotopes, enrichment and quantity.
  4. Mode(s) of shipment, transfer point(s), and route(s) to be used.
  5. Estimated time and date that the shipment will commence.
  6. Estimated time and date of arrival of the shipment at the destination.

The SLDA Project Manager, with approval from USACE, shall:

- Transmit the written notification to assure receipt at least 10 days prior to the anticipated shipment.
- Notify the NRC Headquarters Operations Center at least 2 days before commencement of the shipment at (301) 816-5100.
- Following commencement of shipment, notify the NRC Headquarters Operations Center of schedule changes greater than ± 6 hours.

3.7.5 Additional Requirements for Shipment of a Category I Quantity of SNM

In the event that a Category I quantity of SNM is accumulated at the SLDA Site, the *Safeguard Contingency Plan*, an appendix to the *Physical Security Plan* (PSP) (USACE, 2011) shall be followed for packaging and removal of the waste.

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4.0 HEALTH AND SAFETY

The SLDA APP and RPP describes the health and safety and radiological guidelines and controls that will be used at the SLDA Site during site development, waste processing, and waste loading and shipping activities. These guidelines were developed to protect onsite personnel, visitors, and the public from physical harm and exposure to hazardous materials during these activities.

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5.0 QUALITY ASSURANCE / QUALITY CONTROL

5.1 Equipment Calibration and Quality Control

5.1.1 Radiological Instrumentation Calibration/QC Requirements

Equipment and instruments used in the SLDA Site waste processing operation will be maintained and calibrated to manufacturer's specifications. A project file will be kept for all equipment used in field analyses. Current calibration/maintenance records will be kept onsite for review and inspection of all instruments used during the survey. The records will include, at a minimum, the following:

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

Instrumentation will be maintained and calibrated to manufacturers' specifications to ensure that required traceability, sensitivity, accuracy and precision of the equipment/instruments are maintained. Instruments will be calibrated at a facility possessing appropriate NRC and/or Agreement State licenses for its calibration sources, which shall be NIST-traceable. Field instruments will be source checked daily in order to ensure that the calibration is current. Written records of daily checks will be maintained in the project file.

5.1.2 Instrumentation Quality Control and Trending

Instruments will be quality control (QC)-checked by comparing the instrument's response to ambient background and to appropriate alpha, beta, or gamma radiation sources before daily use. More frequent checks may be required at the discretion of the SRSL. The results of the ambient background and source checks will be recorded in a field instrument logbook, instrumentation logs, and/or electronically.

Source checks will consist of counts for a pre-determined time with the designated source position in a reproducible geometry and performed at a designated location. Instrument response to the designated QC check source will be plotted on control charts and evaluated against the average established at the start of the field activities. A performance criterion of ± 20% of this average will be used as an investigation action level. The SRSL will investigate results exceeding this criterion and will make appropriate corrections to instrument readings if response variation is due to factors beyond personnel control, such as large humidity or temperature changes. The SRSL has authority to decide whether or not the instrument is acceptable to use or must be removed from service.

During QC checks, instruments used to obtain radiological data should be inspected in accordance with applicable protocols for physical damage, current calibration, and erroneous readings. The individual performing these tasks shall document the results in accordance with the associated instrument protocol. Instrumentation that does not meet the specified requirements of calibration, inspection, or response check will be removed from operation. If the instrument fails a QC response check, any data obtained up to that point, but after the last successful QC check will be considered invalid due to faulty instrumentation.

5.1.3 Instrumentation Decontamination

All instruments shall be decontaminated, as necessary, and according to the specifications presented in the SSHP and/or RPP following measurement activities and shall be protected from contamination until they are ready for use.

5.2 Reporting

A Contractor Quality Control (CQC) Report shall be prepared each day that personnel are on the SLDA Site. When waste is in transport, the CQC shall indicate the status of the shipment. This information shall be included until the shipment is received and accepted by EnergySolutions. The CQC shall identify the current location of the waste, any unanticipated delays or occurrences, communications with EnergySolutions, and the anticipated arrival date.

5.3 Record Keeping

5.3.1 SNM Records

Requirements for SNM recordkeeping are provided in the MC&A Plan.

5.3.2 Shipment Records

Records of all waste shipments shall be maintained for the duration of the SLDA project. Following completion of the project, or as specified by USACE, records of shipments completed shall be turned over to USACE. Package certification records shall be maintained as specified by DOT and NRC regulations, as applicable.

5.3.3 Logbooks

Field records shall be maintained sufficient to document waste processing and shipping activities. Information shall be recorded with indelible ink in a permanently bound notebook with sequentially numbered pages.

A Project Field Logbook will be kept for the duration of the project. The information contained in the Field Logbook will be recorded as in the above paragraph and of sufficient quality to allow for cross-referencing of work tasks with the required forms and paperwork. Entries will be made as close as possible to real time, and always on the day of occurrence.

5.3.4 Analytical Records

Analytical records, including on-site and off-site analytical records, field instrument survey records, and quality assurance/quality control records for laboratory and field instruments shall be maintained at the Site for the duration of the project. Field analytical records will include field data forms for recording results and measurements and the QA/QC checks for field surveys.

5.3.5 Field Performances and System Audits

As necessary, site project audits and evaluations will be conducted in accordance with CABRERA OP AP-004, *Radiological Compliance Audit* (see SAP).

5.3.6 Electronic Data

Electronic data files created during project activities will be backed up daily. The backup copy will be stored in a location separate from the original data file to avoid the potential loss of project data.

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6.0 REFERENCES

CABRERA, 2010a, *Site Operations Plan, Rev. 1, SLDA FUSRAP Site*, Cabrera Services, Inc., May 2010.

CABRERA, 2010b, *Accident Prevention Plan, Rev. 1, SLDA FUSRAP Site*, Cabrera Services, Inc., May 2010.

CABRERA, 2010c, *Sampling and Analysis Plan, Rev. 1, SLDA FUSRAP Site*, Cabrera Services, Inc., May 2010.

CABRERA, 2011, *Material Control & Accounting Plan,* Cabrera Services, Inc., January 2011.

DOT, US Department of Transportation, Title 49, Code of Federal Regulations.

EPA, US Environmental Protection Agency, Title 40, Code of Federal Regulations, Chapter 1, Parts 262, 265, and 268.

NRC, US Nuclear Regulatory Commission, Title 10, Code of Federal Regulations, Parts 0 to 199.

PADEP, Pennsylvania Department of Environmental Quality, Title 25, Pennsylvania Code, Article VII, Chapters 260-270.

USACE, US Army Corp of Engineers, Engineering Manual (EM) 1110-35-01, *Management Guidelines for Working with Radioactive and Mixed Waste.* July, 2005.

USACE, 2011, U.S. Army Corps of Engineers, *Physical Security Plan (PSP)*, January 2011.

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APPENDIX A

EnergySolutions Utah Waste Acceptance Criteria

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APPENDIX B

Radioactive Waste Profile Record

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APPENDIX C
Special Nuclear Material Exemption Certification

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APPENDIX D
PCB Waste Certification

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APPENDIX E
Waste Management Flow Charts

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APPENDIX F
Hazard Categorization Procedure

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