LMS/BAR/S37469

Applied Studies and Technology Disposal Cell Cover Sampling Field Work Plan, L-Bar, New Mexico, Disposal Site

May 2022

Work performed under DOE contract number 89303020DLM000001
for the U.S. Department of Energy Office of Legacy Management.

This document has been designed for online viewing.

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Attachment

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
AS&T	Applied Studies and Technology
ASTM	ASTM International
B	boron
Ca^{2+}	calcium
$CaCO_3$	calcium carbonate (calcite)
C&D	construction and demolition
CEC	cation exchange capacity
CFR	*Code of Federal Regulations*
CH	high plasticity clay
CL	low plasticity clay
Cl^-	chloride
CO_3^{2-}	carbonate
CXE	Categorical Exclusion Evaluation
D_{50}	mean diameter
DOE	U.S. Department of Energy
ECPOC	Environmental Compliance point of contact
EFA	Erosion Function Apparatus
ERF	*Environmental Review Form*
ESL	Environmental Sciences Laboratory
ESP	exchangeable sodium percentage
HCO_3^-	bicarbonate
HET	Hole Erosion Test
ISEA	International Safety Equipment Association
IWCP	Integrated Work Control Process
JET	Jet Erosion Test
JSA	job safety analysis
K	potassium
kPa	kilopascal
LM	Office of Legacy Management
LMS	Legacy Management Support

LTS&M	long-term surveillance and maintenance
Mg^{2+}	magnesium
Na^{+}	sodium
NEPA	National Environmental Policy Act
NH_4-N	ammonium as nitrogen
NHPA	National Historic Preservation Act
NO_3-N	nitrate as nitrogen
NRC	U.S. Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
PAE	Project or Activity Evaluation
^{210}Pb	lead-210
PBZ	personal breathing zone
pcf	pounds per cubic foot
*p*ERRS	*preliminary* Erosion Risk Ranking System
PIC	person in charge
PPE	personal protective equipment
RCT	radiological control technician
RPPP	LMS Radiation Protection Program Plan
RWP	*Radiological Work Permit*
SAR	sodium adsorption ratio
SDS	Safety Data Sheet
S&H	Safety and Health
SHPO	State Historic Preservation Office
SO_4-S	sulfate as sulfur
SP	saturated paste extract
SWCC	soil water characteristic curve
TLV	threshold limit value
UMTRCA	Uranium Mill Tailings Radiation Control Act
UTV	utility task vehicle
XRD	X-ray diffraction

Forms Referenced in This Work Plan

LMS forms are accessible on the **Document Management** homepage > **LMS Forms**.

10 CFR 851, Fit For Duty Evaluation	LMS 2115
Fueling Plan	LMS 2623 CON
Penetration Permit	LMS 1064
Plan of the Day/Plan of the Week	LMS 2130
Pre-Job Brief/Safety Meeting Attendance Record	LMS 1554
Project Construction and Demolition Material and Debris Tracking Form	LMS 1105
Project or Activity Evaluation (PAE)	LMS 1005
Radiological Work Permit	LMS 1588
Site Visitor Safety Briefing	LMS 1090
Supplemental Emergency Response Information (SERI)	LMS 1415

LM forms and templates are accessible at
LM Portal > **Services** > **Controlled Documents > LM-Federal Controlled Documents**.

Environmental Review Form	LM-Form-4-20.3-4.0
NEPA Categorical Exclusion Determination Form	LM-Form 4-20-2.0
NEPA Categorical Exclusion Evaluation (CXE)	LM-Form-4-20-5.0

1.0 Introduction

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) is responsible for the long-term surveillance and maintenance (LTS&M) of disposal cells for uranium mill tailings at more than 100 sites in the United States and the territory of Puerto Rico. RSI EnTech, LLC, is the Legacy Management Support (LMS) contractor for LM operations. The long-term protectiveness of disposal cells relies on cover systems that are engineered to limit radon releases, rainwater percolation, and erosion. Natural ecological, geomorphic, and soil-forming processes are slowly changing the as-built engineering properties of disposal cell covers in ways that could alter protectiveness and increase LTS&M costs. This study is one of several ongoing Applied Studies and Technology (AS&T) projects designed to (1) evaluate the effects of natural processes on the performance of disposal cell covers, (2) investigate options for improving the LTS&M of covers, (3) systematically categorize risk and prioritize LTS&M activities across the portfolio of LM sites, and (4) inform LM managers of their responsibilities to comply with applicable laws and regulations, maintain long-term protectiveness, and reduce long-term costs.

An LMS Core Team was formed to facilitate and assist the AS&T program with the implementation of this study to include preparing this *Applied Studies and Technology Disposal Cell Cover Sampling Field Work Plan*, *L-Bar, New Mexico, Disposal Site*, hereafter called the Field Work Plan. Implementation of this study will follow guidelines and direction set forth in the LMS *Integrated Work Control Process Manual* (LMS/POL/S11763).

LMS Core Team:

- Dr. Morgan Williams, technical project lead
- Aaron Tigar, project manager
- Jordan Cario, site lead
- Jon Luellen, environmental scientist
- Anthony Martinez, Safety and Health (S&H)
- Melvin Madril, Engineering
- Connor Mueller, Engineering
- Annette Barndt, Environmental Compliance
- Michael McDonald, S&H (Radiological Control manager)
- Lisa Eckardt, Contract Services
- Linda Tegelman, Quality Assurance
- Ryan Dailey, Industrial Hygiene

The study at the L-Bar, New Mexico, Disposal Site is the subject of this Field Work Plan. A map showing the location of the L-Bar site and the general vicinity is provided in Figure 1. This site is one of several selected for the project study, which covers a range of cover types, climates, site conditions, erosional features, and vulnerabilities to change. Relationships between cover design and setting (e.g., slope, aspect, climate) with observed erosional features (e.g., rills, gullies, internal erosional pipes, depressions, zones of sediment collection) will be evaluated in test pits in cover systems.

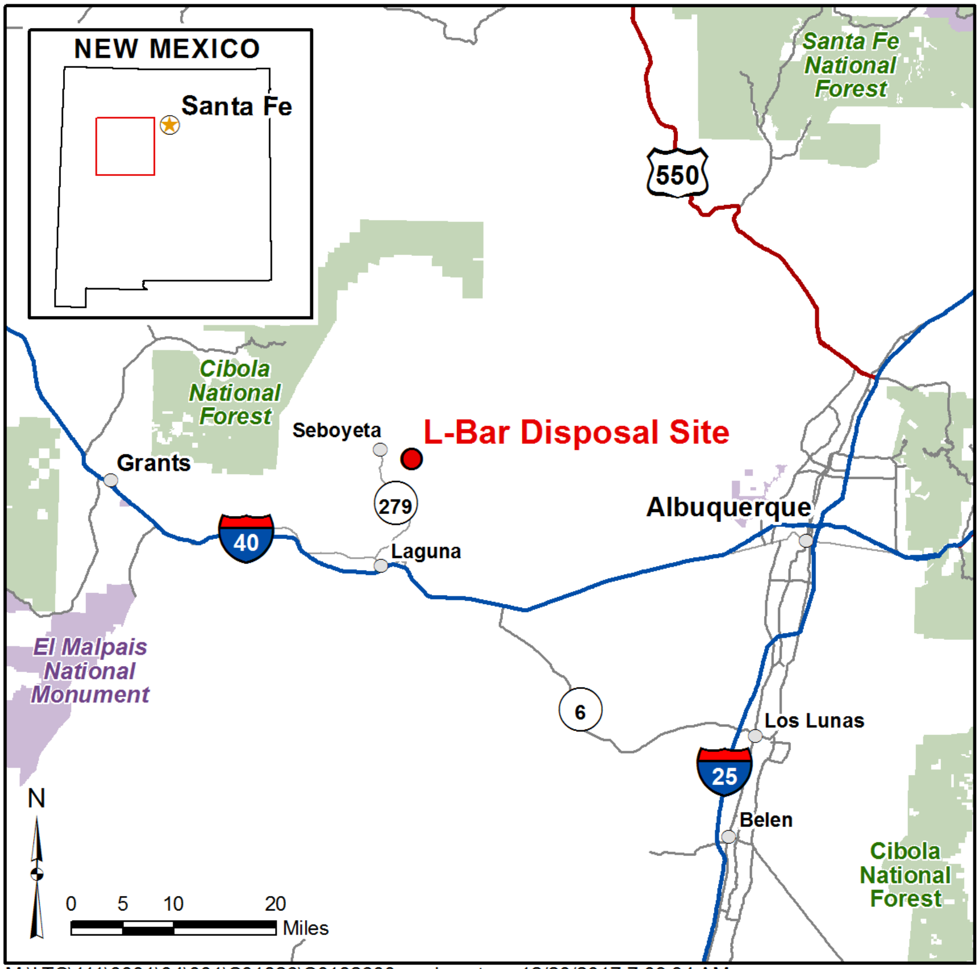

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Figure 1. Vicinity Map of the L-Bar, New Mexico, Disposal Site

This L-Bar site study is designed to (1) characterize the morphology of disposal cell cover soils in areas of observed erosional features to better understand the processes responsible for changes in cover material properties and to project the degree of change over decades and millennia, (2) collect representative samples of cover materials for laboratory testing of erosion-related parameters, (3) confirm as-built conditions of cover materials including riprap and bedding layer gradations and thicknesses and overburden and radon barrier material properties relevant to geomorphic stability and hydraulic properties for comparison with the original construction specifications, (4) determine how changes in cover properties vary with depth, (5) characterize the areal extent of erosional features, with an emphasis on side slopes, (6) determine if such erosional features have compromised the radon barrier, and (7) provide guidance for continued LTS&M activities based on study findings.

With regard to LM strategic objectives, the project will record and analyze data on long-term performance, collaborate with organizations that conduct scientific research and development in support of LTS&M objectives, explore and advance innovative technical approaches that improve LTS&M quality and inform remediation strategies, help develop changes to LTS&M plans to maintain compliance objectives and reduce costs, work with regulators to share lessons learned, and expand the operating experience and knowledge pool (DOE 2016).

1.1 Erosion Protection on Uranium Mill Tailings Radiation Control Act (UMTRCA) Covers

The U.S. Nuclear Regulatory Commission (NRC) regulation codified in Title 10 *Code of Federal Regulations* Section 40 (10 CFR 40), "Domestic Licensing of Source Material," requires that UMTRCA cover designs provide long-term erosion protection in addition to providing radon attenuation and minimizing meteoric water percolation. Development of erosion protection measures for achieving long-term erosion protection of UMTRCA disposal cells includes analyzing hydraulic properties and engineering parameters that control slope stability and settlement (DOE 1989; NRC 1993). While several differences in guidance for erosion assessment exist between Title I (e.g., NRC 1993) and Title II (e.g., DOE 1989) designs, these differences are beyond the scope of this summarized description.

Significant effort has been invested in the development of numerical models and completion of flume studies to provide information and data for estimating surface water and interstitial flow velocities for side slope covers of disposal cells as a function of rock riprap and bedding specifications (Abt et al. 1988; Maynord et al. 1989; Abt et al. 1991a; Abt et al. 1991b; Abt and Johnson 1991; Johnson 2002). NRC Final Standard Review Guidance (NRC 2003) also stipulates that all soils used for cover construction believed to be unstable because of their physical and chemical properties must be adequately evaluated, and that dispersive characteristics should be investigated, as applicable. Additional guidance is provided for the assessment of suffusion of fines in radon barriers made of sand-bentonite mixtures (Bennett 1991; NRC 2003). Most of the guidance for erosion protection emphasizes mechanisms responsible for surface erosion (e.g., Johnson 2002, Appendixes A and B; Temple et al. 1987; Chow 1959; Thornton and Abt 2008). The mechanisms responsible for controlling subsurface erosion (e.g., piping) received less attention, and the state of science has improved considerably since the 1980s and 1990s when the bulk UMTRCA portfolio was being built out (e.g., Bernatek-Jakiel and Poesen 2018). Given the historical emphasis on surface erosion, the following section provides a short summary on subsurface erosion.

1.2 Factors Contributing to Subsurface Erosion

Subtle depressions, indicative of subsurface erosion have been identified on portions of several UMTRCA disposal cell covers beginning in 2016, and recent investigations have explored root cause(s) (e.g., DOE 2021a). Several types of subsurface erosion have been observed at these sites, namely suffusion, subsurface contact erosion, and piping. Suffusion is a form of internal erosion occurring as result of internal instability in those soils whose grain size distribution does not meet the requirements of self-filtering conditions such as poorly graded soils (Wan and Fell 2004). Subsurface contact erosion is due to sheet flow and is the transportation of fine particles that are in contact with coarser particles. Piping is the transportation of soil particles by water moving through cracks or voids in the soil system. Principal mechanisms of pipe formation include, but are not limited to, backward erosion, dispersive tunneling, internal erosion, suffusion, and contact erosion (Bryan and Jones 1997; Richards and Reddy 2007; USBR 2019). From the perspective of geotechnical engineering, several of the most destructive forms of erosion to earthen structures can be attributed to soil piping (Richards and Reddy 2007), and a review by Foster et al. (2000) found that 46% of dam failures were associated with erosional piping. Engemoen (2017) examined U.S. Bureau of Reclamation dam failure incidents and estimated that 80% of all documented cases of erosional piping in embankments are associated

with soils with no or low plasticity (plasticity index < 7). Low plasticity soils have low cohesion and contain few fines or a high percentage of non-expansive clay minerals, or both. A more detailed review of subsurface erosional piping mechanisms relevant to a rock riprap-based UMTRCA cover system is presented in DOE (2021a). Erosional piping is influenced by a combination of site factors including individual storm events and long-term climate; the physical, chemical, and biological properties of soils; landform topography; vegetation type and age; and land use (Figure 2).

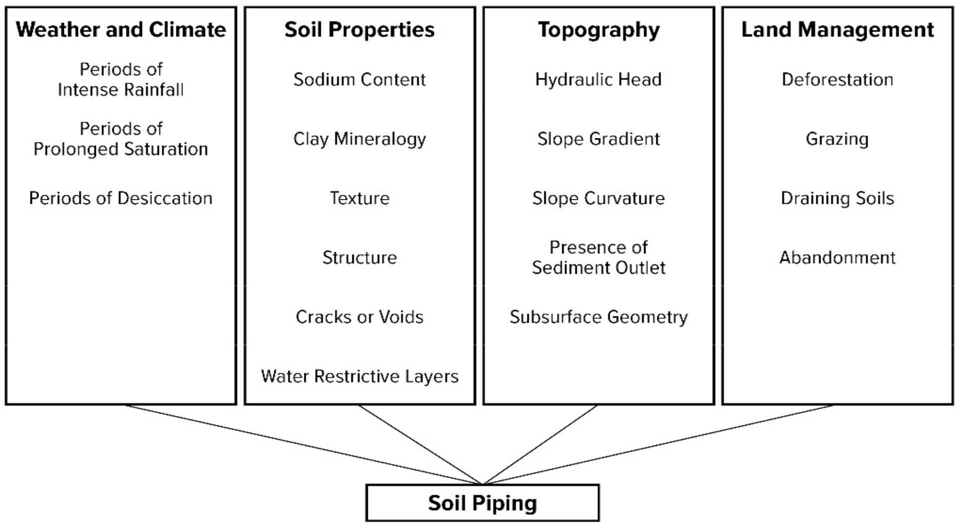


Figure 2. Factors Contributing to Erosional Piping (Bernatek-Jakiel and Poesen 2018)

1.3 Soil Erodibility Testing

Erodibility is a relationship between the soil erosion rate and fluid velocity or hydraulic shear stress (NASEM 2019). In addition to the performance of physiochemical tests for soil dispersivity (e.g., ASTM International [ASTM] Standards D4221, D4647 and D6572), several laboratory test methods (e.g., Hanson et al. 2011; Shewbridge 2016) have been developed for explicitly quantifying soil erodibility parameters (erodibility coefficient, distribution coefficient, and critical shear stress).

Common soil erodibility tests include small flume tests with small samples of soil inserted in the bottom of flumes (i.e., an Erosion Function Apparatus [EFA] test), a submerged Jet Erosion Test (JET), and a Hole Erosion Test (HET).

In the EFA test, the rate at which the soil sample erodes as a function of water impingement rate is measured, and the shear stress imposed by the water on the soil is calculated. The EFA test results in a plot of erosion rate versus shear stress, with resulting data indicating the critical shear stress at which erosion starts and the rate of erosion above that threshold shear stress value (Briaud et al. 2001).

The HET (Wan and Fell 2004) and JET (Hanson and Cook 2004) can be used to evaluate the critical shear stress needed to initiate erosion (detachment of particles). A detachment rate coefficient can be calculated that relates the change in erosion rate to the change in applied excess stress.

The U.S. Bureau of Reclamation has adopted the HET as one means of classifying soils in embankment dams with respect to evaluation of risks of internal erosion and piping failure. The HET method is used as a piping risk toolbox in this context. In the HET, water flows through a hole created in the sample under a hydraulic head that is incrementally increased until erosion occurs. When the threshold for erosion is reached, head is held constant, and the test is continued for as long as flow can be maintained. The change in the flow rate during the test is measured as the hole erodes and enlarges. Measurements of the initial and final diameter of the erosion hole are used to compute the time history of the applied shear stress and the erosion rate. The collected data enable calculation of a detachment rate coefficient. Erosion index categories determined from the HET method include: (1) extremely rapid, (2) very rapid, (3) moderately rapid, (4) moderately slow, (5) slow, and (6) very slow.

The JET consists of placing the JET testing device on the soil surface and allowing a submerged water jet to impinge on and scour the soil surface. The scoured hole depth is then measured as a function of time, and analytical procedures are used to measure the soil erodibility parameters. The U.S. Department of Agriculture's Agricultural Research Service Hydraulic Engineering Research Unit has relied upon the JET as a means of characterizing the erodibility of soils used in embankment breach tests.

1.4 Technical Study Basis

In response to the observations of erosion features at several UMTRCA sites as mentioned in Section 1.2 and described in DOE 2021a, AS&T is performing a portfolio-wide erosion risk assessment of LM disposal cells (called the Erosion Risk Project) inclusive of both surface and subsurface erosional processes driven by water. Erosion by wind is not presently considered. This project was formed (in part) due to a suggestion by NRC in a follow up to early work on the disposal cell erosional issues at the Mexican Hat, Utah, Disposal Site (NRC 2018). The Erosion Risk Project will investigate disposal cell cover performance and improvements in LTS&M to ensure that these covers remain protective for the duration of their design life.

Based on a review of site completion reports, annual inspections, and supplementary site data, the L-Bar disposal cell ranks high in the AS&T *preliminary* Erosion Risk Ranking System (*p*ERRS) (see following sections for more detail). In response to the L-Bar disposal cell *p*ERRS score, AS&T performed a Phase I field survey of the L-Bar disposal cell in September 2020. During this field survey, a series of features were observed on the tailing's embankment slope that have subsequently been found to correspond to subsurface erosional features detected at some other UMTRCA disposal cells. These features include potential upslope inlets for water to enter the subsurface, midslope ribbon-shaped depressions, and downslope sediment deposits at water discharge outlet locations. During a site inspection on March 16, 2021, LM and LMS personnel further investigated these features. The location of these features is presented in Figure 3, while Figure 4 through Figure 8 show photographs of these features.

Additionally, in August 2021, during the annual vegetation and erosion monitoring activity, a series of depressions were observed on the top slope. Additional observations were made in December 2021 and February 2022. These depressions are referred to in this document as top slope erosional features. The location of these features is also presented in Figure 3, and Figure 9 and Figure 10 show photographs of these features.

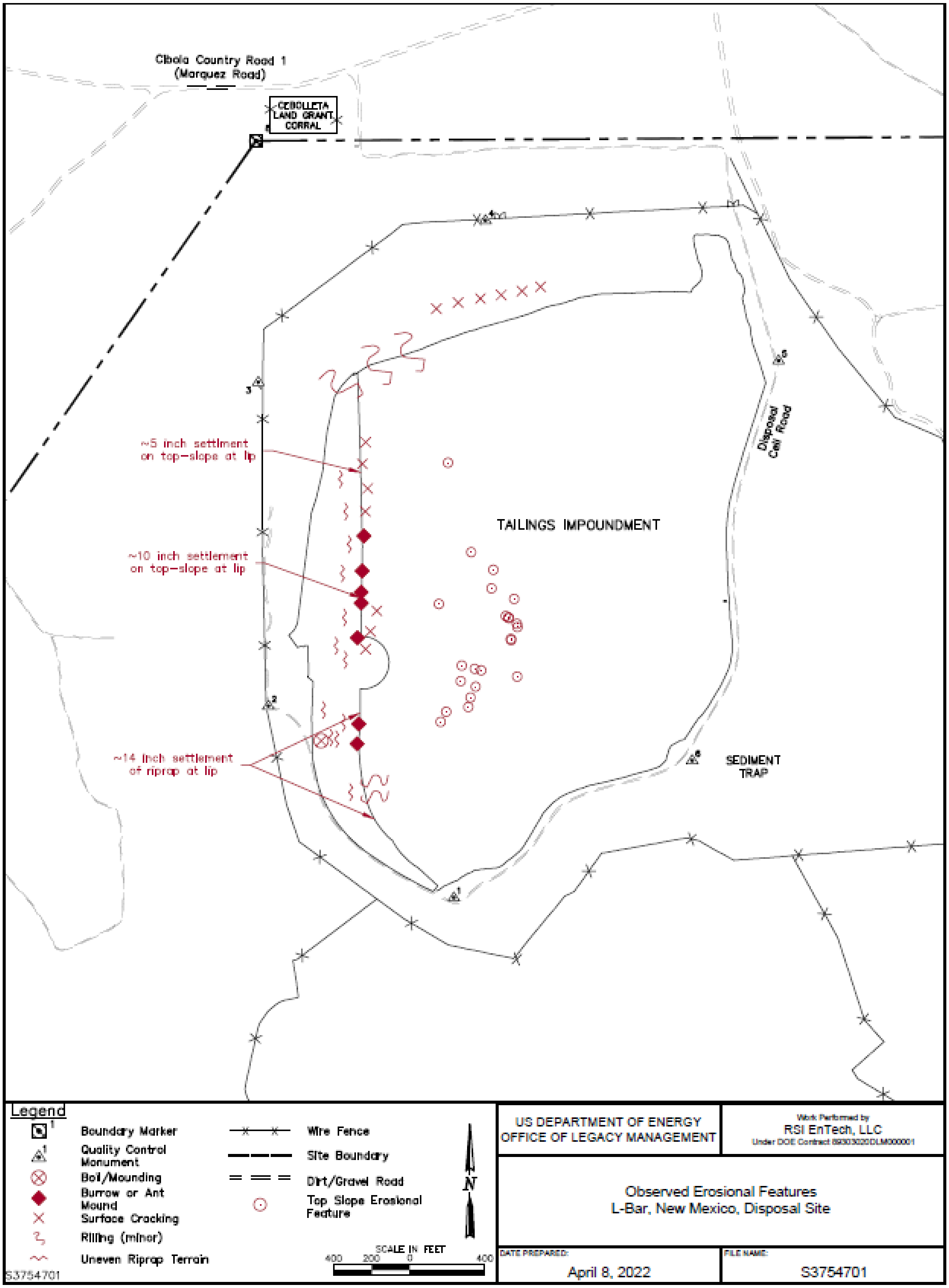
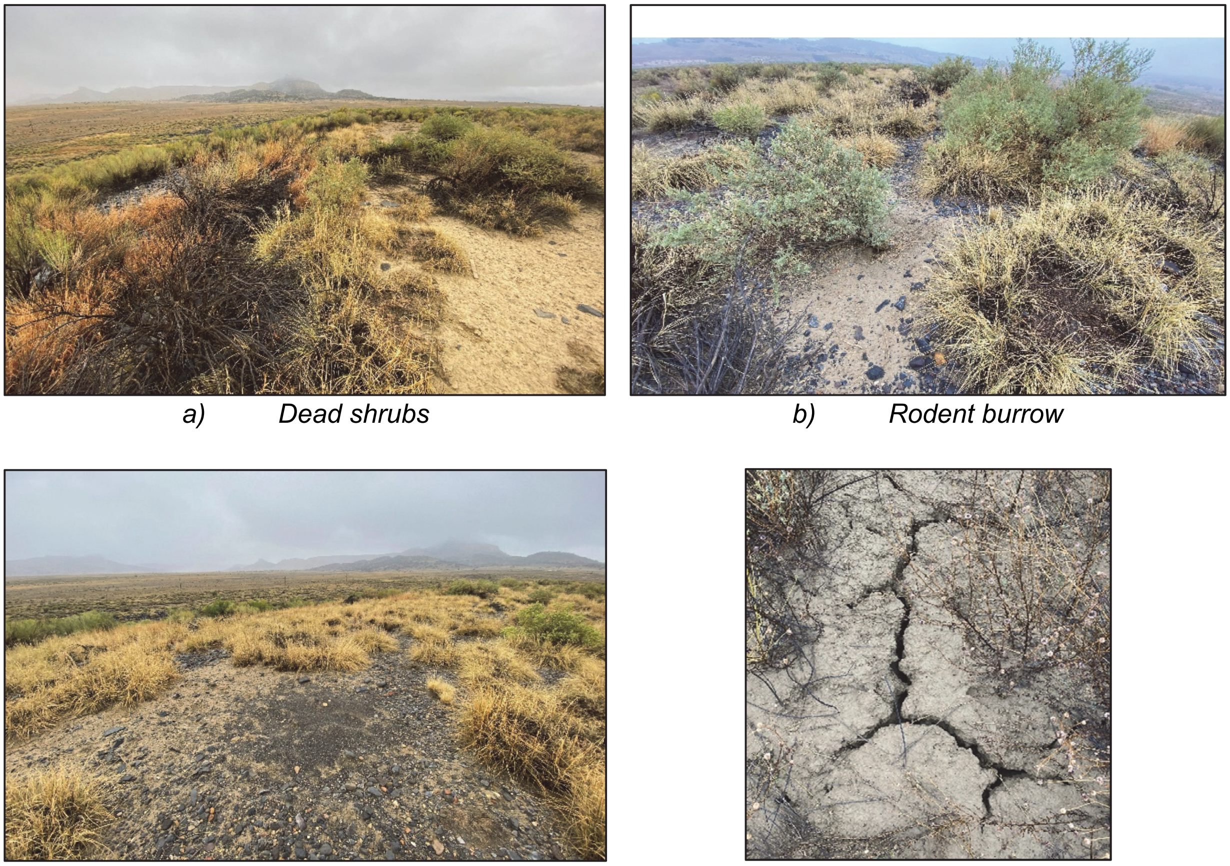


Figure 3. Observed Erosional Features at the L-Bar, New Mexico, Disposal Site



a) Dead shrubs

b) Rodent burrow

c) Ant mound

d) Desiccation crack

Figure 4. Potential Upslope Inlets for Water to Enter the Subsurface

Figure 5. Midslope Linear Depressions

Figure 6. Midslope Linear Depressions and Downslope Mound

Figure 7. Downslope Sediment Collection

Figure 8. Downslope Sediment Collection

Figure 9. Example of a Top Slope Erosional Feature

Figure 10. Top Slope Erosional Features Showing Depth

1.5 *Preliminary* Erosion Risk Ranking System

A *p*ERRS was developed based on review of site completion reports, annual inspection reports, remedial action plans, closure plans, long-term surveillance plans, NRC technical evaluation reports, and other site-specific reports. Historical data from the L-Bar site reports indicate that pinhole and crumb tests were performed on a subset of borrow pit materials (BP America 1989). Both tests indicated that the materials are nondispersive, though no indication of the number of tests or numerical results are presented. The proposed Phase II field investigation described in this Field Work Plan will include a detailed forensic investigation and sample collection of cover materials (in the areas of interest) to better determine the nature and severity of previously observed features, investigate their causes, provide data inputs to refine the portfolio wide *p*ERRS assumptions and final risk ranking for the L-Bar disposal cell and to inform further monitoring or maintenance efforts (if required) at the L-Bar site.

A weighted points system (Table 1) was used to facilitate the determination of a site's vulnerability to erosion by adding up the points assigned from each category. Sites with a score between 0 and 9 are ranked "low," between 10 and 19 are "moderate," and greater than or equal to 20 are "high." Based on the risk ranking and uncertainties due to identified data gaps, geotechnical investigations will be conducted at a collection of representative UMTRCA sites. The uncertainty in the cover soils vulnerability to piping or internal erosion is an important risk category that this study aims to inform.

Table 1. Preliminary Erosion Risk Ranking System

Risk Category	Points Available in *p*ERRS	L-Bar Points
Are radon barrier, overburden, or frost protection materials vulnerable to piping or internal erosion?	0–10[a]	Unknown[a]
Has erosion or threat of erosion been reported on the cover and required additional management action?	6	6
Is the radon barrier made of a sand-bentonite mixture?	6	0
What is the projected severity of changes to radon barrier hydraulic properties since construction?	0–4[b]	3[b]
What is the severity of rock riprap breakdown?	0–4	0
What is the severity of erosion at the cell perimeter?	0–4	2
What is the severity of sediment accumulation on toe-slopes or in drainage aprons?	0–4	2
What is the severity of erosion in borrow areas or landscapes in proximity to covers?	0–4	4
Have linear, dendritic, or arc-shaped depressions been observed on the cover?	4	4
Is ephemeral ponding or prolonged saturation of cover materials occurring on the cover or drainage apron?	4	4
Is there a slope with grade >20% or side slope with length > 350 feet?	2	0
Is the radon barrier $\leq$ 1.5 feet from ground surface?	2	2[c]
TOTAL	**54**	**27**

Notes:

[a] Based on ICOLD (2015) and Sherard (1953) ranking. Data are lacking and current uncertainty is high.
[b] Modified from AS&T study "Soil Forming Processes."
[c] Radon barrier depth on the side slope is ≤1.5 feet from ground surface.

2.0 L-Bar, New Mexico, Disposal Site

Study sites for further investigation are selected based on several criteria including the *p*ERRS, cover design criteria, vulnerability to future climate extremes, regulatory drivers, and if any erosional features have already been observed at the site. The L-Bar site was chosen due to its high preliminary score in the *p*ERRS and because erosional features have been observed on the disposal cell and in the surrounding area (Sections 1.3 and 1.4). The following sections detail the L-Bar site's cover design stratigraphy, the proposed sampling plan, and any site-specific considerations for this project.

The L-Bar site is an UMTRCA Title II site is approximately 47 miles west of Albuquerque, New Mexico (Figure 1). It is on the site of the former uranium mill site owned and operated by the SOHIO Western Mining Company. The site is now managed by LM.

2.1 Cover Design Stratigraphy

The cover design on the top slope of the L-Bar disposal cell (Figure 11) is relatively simple and consists of two layers over contaminated material. The slope of the top is predominately 0.1% grade increasing to 1% grade at the transition of the top slope to the side slope. The first layer overlaying tailings is a 4.1-foot-thick radon barrier composed of compacted clay and silt materials. The top slope of the cell is capped by a layer of cover soil that ranges from 2 to 6 feet thick that is sparsely vegetated at this time.

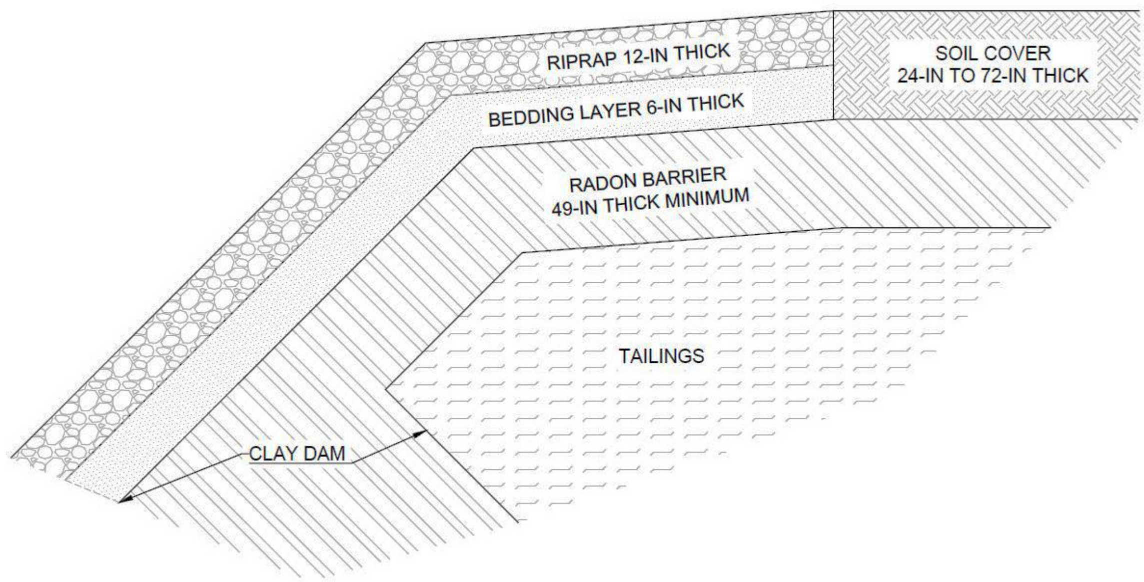


Figure 11. Profile for the Final Cover Design of the L-Bar Disposal Site Cover

The western side slope of the disposal cell (Figure 11) consists of a containment dam of compacted clean fill material. The top half of the containment dam includes 4.1 feet of radon barrier, but the bottom half is clean fill. The dam is built at a 20% slope and is armored with erosion protection materials consisting of (1) a 6-inch-thick bedding layer of sandy gravel; and (2) an overlying 12-inch-thick layer of rock riprap (BP America 1989; SOHIO 2000).

2.2 Site-Specific Details

As mentioned in Section 2.1, the total thickness of the top slope portion of the cover ranges in thickness from approximately 6 to 10 feet. The average thickness is just over 6 feet (DOE 2004; DOE 2021b). On the top slope, the layer immediately over the contaminated material, is a compacted radon barrier that is a minimum of 4.1 feet thick and is composed of materials with the following specifications that can be found in Section 5.0 of the L-Bar Reclamation and Closure Plan (BP America 1989).

- **Grain Size:** Minimum of 69% passing the No. 200 sieve and no rock fragments greater than 3/4 of the lift thickness.
- **Soil Classification:** Atterberg limits that would classify the material as high plasticity (CH) or low plasticity (CL) clay.
- **Density:** Compacted to a maximum dry density of at least 102 pounds per cubic foot (pcf) giving a dry density of 97 pcf at 95% of maximum, which is the compaction specification.
- **Moisture Content:** ± 2% of optimum.
- **Lift Thickness:** 8 to 12 inches compacted.

The above specifications are those that must be met for soil that is used for restoration of the radon barrier after sampling; however, project engineers have determined that a few

specifications should have tighter tolerances, namely materials shall not contain rock fragments greater than ¼ of the lift thickness and the radon barrier will be restored in thinner compacted lifts. This is covered in Section 3.4.

Hydraulic conductivity testing and dispersivity testing was also performed on soil test pit material intended to be used for the radon barrier, but neither of these tests were specified for the material used for construction. Borrow pit testing on composited clay materials showed the compacted clay having permeabilities of 8.0E-09 centimeters per second or less, and dispersivity testing concluded that the soils were nondispersive (BP America 1989).

Overlaying the radon barrier on the top slope is a layer of cover soil composed of weathered Mancos Shale. This layer ranges from 2–6 feet thick. The L-Bar Reclamation and Closure Plan completion report classifies this material as common fill which is defined as "any site soil, excluding organic material" with a compaction specification of 90% of maximum dry density per ASTM Standard D698 (BP America 1989).

On the side slope of the disposal cell there is an embankment dam that is overlain by 6 inches of granular bedding materials. The specifications for the bedding layer are listed in Table 2.

Table 2. Specifications for Bedding Material

Coarse Filter	
Sieve Size	**Percent Passing by Weight**
3 inch	70%–100%
2 inch	60%–95%
1 inch	35%–70%
½-inch	20%–45%
No. 4	0%–20%

Overlying the coarse bedding layer on much of the side slope is a 12-inch-thick layer of riprap with a mean diameter (D_{50}) of 6 inches. The riprap at the toe of the slope varies with location but is generally larger with a D_{50} ranging from 6 inches to 12 inches. The specifications for the riprap materials are listed in Table 3.

Table 3. Specifications for Riprap Material

Riprap Side Slope		
D_{25}	**D_{50}**	**D_{100}**
4.1–6.9 inches	6–6.9 inches	7.6–10.3 inches
Riprap Toe Slope (Maximum)		
D_{25}	**D_{50}**	**D_{100}**
8.2–13.7 inches	12–13.7 inches	15.1–20.5 inches

Specific Gravity: Average specific gravity of not less than 2.5
Sodium Sulfate Soundness: Average loss not more than 1.3%

3.0 Project Workflow

Site observations and material sampling will be conducted at selected locations at the L-Bar site. Acquired samples will be packaged and sent to various laboratories for analysis. The project scope includes several field and laboratory tasks as presented below.

The research group and the LMS team will share responsibility for the following fieldwork activities listed below; they are further detailed throughout this section:

- Procure the required equipment and materials
- Locate and flag test sites
- Remove riprap or rock and soil matrix with vegetation at designated locations on the side slope and drainage apron
- Remove layers overlying the radon barrier at designated locations
- Perform sampling of bedding, and soil layers above radon barrier
- Perform direct push sampling to obtain continuous cores (PVC liners) of all layers below riprap and bedding through the radon barrier
- Perform large block sampling of the radon barrier for hydraulic properties analysis
- Perform sampling with thin wall sampling tubes (e.g., Shelby Tubes) of soil layers overlying the radon barrier or the barrier itself on the side slope
- Perform soil morphology sampling of the test pit areas
- Investigate and sample the areas where the top slope erosional features have been observed
- Restore the radon barrier from sampling activities
- Restore the soil layers above the radon barrier from sampling activities
- Restore riprap and bedding layers on areas of side slope and drainage apron disturbance
- Reseed disturbed areas on the top slope and the cover soil borrow area

3.1 Required Equipment and Materials

Before intrusive work, the following equipment and materials will be on hand:

- Survey equipment including GPS
- Stakes, pin flags, or marking paint to mark test area boundaries and tarps to cover test areas and for excavated materials to be placed on
- Hand auger
- Measuring tapes to measure and document test pit dimensions and layer and sample depths from surface reference points
- Rakes, shovels, or other equipment to clear and repair cover material layers
- Generators
- Track-mounted Geoprobe (Model 7822DT) and tooling for continuous core sampling to a depth of up to 12 feet

- Plywood for Geoprobe positioning
- Gasoline (5 gallons) and diesel fuel (5 gallons)
- Spill kit
- Shelby Tubes for core sampling and other attachments to drive and extract tubes
- Block sample collection frames
- Soil morphology characterization and sampling equipment
- Radon barrier materials from an approved borrow source, as needed
- Cover soil layer materials from approved borrow source, as needed
- Bedding or filter material from an approved source, as needed
- Compaction equipment and mobile water tank
- Erosion control mats

3.2 Field Work Sequence

The sampling plan for the L-Bar site is multifaceted as described in the following sections. Before excavation, a walking field survey will be performed to geolocate any features of interest and identify potential test locations. A sample collection effort will then be undertaken, followed by restoration.

3.2.1 Walking Field Survey

In the areas where erosional features have already been identified on the top slope and side slope, a detailed visual assessment and delineation of existing erosional features will be undertaken. In addition, a handheld GPS will be used to document feature locations before disturbance. In Figure 12, the gray-shadowed area outlined with a red dashed line shows the limits for the area of potential investigation for this study.

3.2.2 Locate Test Sites

Up to 25 test pit locations will be chosen for study on the disposal cell cover. The actual number tested will depend on the time required to compete and restore each test pit. Test pit locations will be selected that represent a range of observed cover conditions. Examples of preferred test conditions are presented in Figure 4 through Figure 10. Test locations will be delineated with flagging or stakes (plastic or wooden) and photographed before sampling.

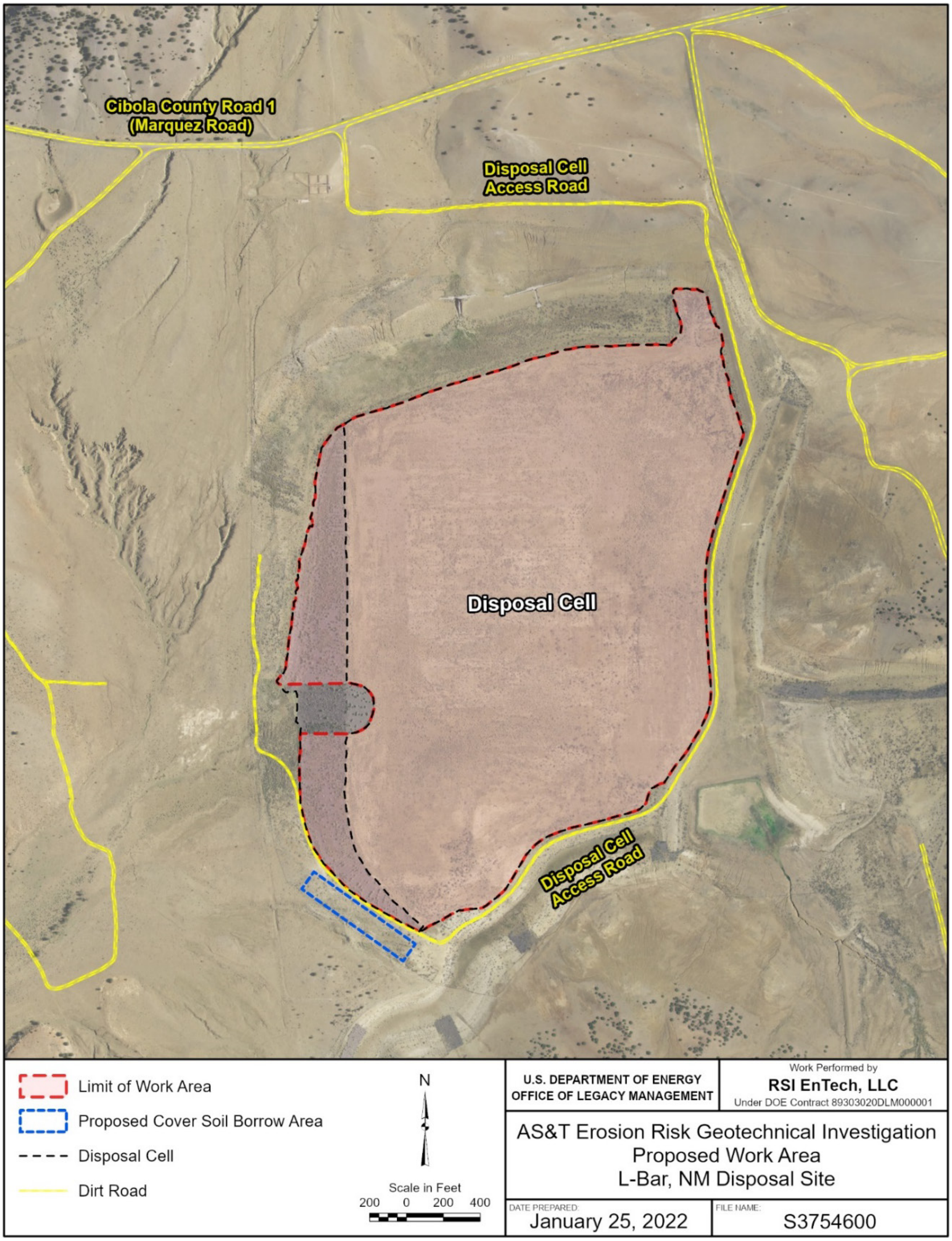


Figure 12. Proposed Work Area at the L-Bar, New Mexico, Disposal Site

3.2.3 Sampling Workflow

3.2.3.1 Side Slope

For up to 20 select features, 8-foot × 8-foot areas will be exposed by hand to investigate the features and the materials will be sampled as needed as described in Section 3.3. The exact locations will be determined based on in-field conditions to ensure that the features of interest are adequately captured.

In all cases, the riprap materials will be removed by hand. Hand removal of the rock allows for more careful dissection of these features that may be lost if using heavy equipment.

At each of the 20 locations described above, after hand removal of riprap and bedding materials, the Geoprobe will be used to collect samples as described in Section 3.3.3. Geoprobe sampling will involve coring the cover from the surface to the bottom of the radon barrier. In addition to Geoprobe sampling, Shelby tube samples will be collected as described in Section 3.3.2. Shelby tubes extend to a maximum depth of 36 inches from the surface. Up to two Shelby tube samples may be collected from each location and could include both cover soil and radon barrier materials.

At up to 12 of these locations, after hand removal of riprap and bedding materials, block samples will be collected from the cover soil and or radon barrier for laboratory analysis of soil hydraulic properties.

3.2.3.2 Top Slope

At several locations on the top slope, where the top slope erosional features have been identified (Figure 3), depths of the cover soil and radon barrier will be determined by hand augering. Depths of the existing features will be determined to extent possible using a rigid measuring device and an endoscope.

In areas nearby up to five of these locations, samples will be collected as described in Section 3.3.3, and conducted in a similar manner to what is prescribed for the side slope using hand tools and the Geoprobe.

Restoration of the cover system after sampling is covered in Section 3.4.

3.3 Sampling Methods

Sampling methods for this study are variable (Figure 13) and will likely change between the sampling locations based on the types of features being investigated and the sample types needed. The sampling method chosen for each location will be determined in the field and will be the method most likely to safely provide the necessary amount of each material needed. The three main sampling methods are described below in Section 3.3.1 through Section 3.3.3. In some cases, all three methods will be employed at a specific sampling location.

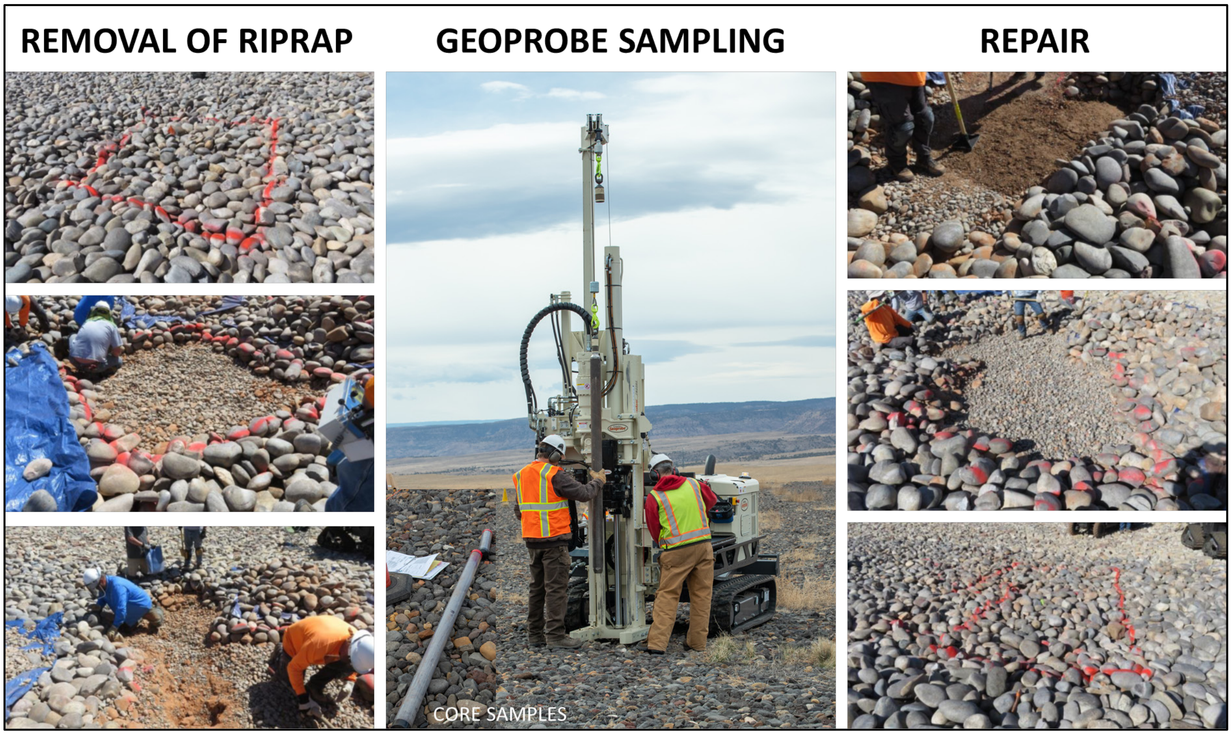


Figure 13. Examples of Sampling and Repairing the Cell

3.3.1 Sampling Using Hand Tools and Power Tools

The use of hand tools and handheld power tools may be necessary for a variety of reasons. Investigation of large erosional features will require the careful dissection of the cover materials by hand to expose the individual layers and sample them as needed. In addition, there are features that may preclude the use of the Geoprobe in collecting samples. These include materials that the Geoprobe is ill-suited to get through (large rock) or slopes where the Geoprobe is incapable of operating safely. The use of the Geoprobe in any of these locations will be at the discretion of the Geoprobe operating crew and the S&H representative.

Where the Geoprobe cannot be used, sampling with hand tools and handheld power tools will be employed. These include shovels, picks, hammer drills with various attachments, and hand augers. LMS staff may use a variety of sampling methods using these tools including, moving or collecting materials by hand, digging small test pits, or coring holes using the hand auger.

3.3.1.1 Removal and Sampling of Riprap

Riprap will be removed along the extent of the sample area and placed on an adjacent tarp to maintain material segregation, leaving the bedding layer in the entire sample area exposed. During removal of the riprap layer, samples will be taken of any interstitial material deposited within the riprap material and labeled with sample area number, type of material, and sample number and sealed in Ziploc-type bags, or sample jars. Record the sample on the sample log sheet and document the depth of the riprap layer and the conditions of the bedding layer surface in a field book and collect photographic documentation. All riprap will be replaced during restoration, and no riprap will be removed from the cover for outside analysis.

3.3.1.2 Removal and Sampling of Bedding

Bedding will be removed along the extent of the sample area and placed on an adjacent tarp to maintain material segregation leaving the radon barrier surface exposed. Samples of the bedding layer will be taken and labeled with sample area number, type of material, and sample number and sealed in Ziploc-type bags, sample jars, or 5-gallon buckets. Record the sample on the sample log sheet. If it is necessary to manually remove the remaining bedding layer with hand tools, place the removed bedding material on a separate tarp from the riprap to maintain material segregation or move the remaining material to the edges of the sample area with hand tools. Document the thickness of the bedding layer and the conditions of the radon barrier surface in a field book and collect photographic documentation.

3.3.1.3 Removal of Radon Barrier

Samples of the radon barrier layer will be collected and labeled with sample area number, type of material, and sample number, and sealed in Ziploc-type bags, sample jars, or 5-gallon buckets. Record the sample on the sample log sheet and document the thickness of the layer and the conditions of the radon barrier surface in a field book and collect photographic documentation.

3.3.1.4 Removal of Cover Soil

Samples of the cover soil layer will be collected and labeled with sample area number, type of material, and sample number, and sealed in Ziploc-type bags, sample jars, or 5-gallon buckets. Record the sample on the sample log sheet and document the thickness of the layer and the conditions of the radon barrier surface in a field book and collect photographic documentation.

3.3.1.5 Large Block Sampling for Hydraulic Properties Assessment

Under some conditions, large diameter block samples of the cover soil or radon barrier will be collected using *Standard Practices for Obtaining Intact Block (Cubical and Cylindrical) Samples of Soils* (ASTM D7015). Block sampling will involve the placement of a ~14 inch diameter PVC pipe ring on the top surface of the soil layer and the incremental hand excavation of the surrounding soil material, gradually moving the PVC ring down over the block monolith. The resulting block monolith will have a maximum depth of 24 inches and will be removed from the site for laboratory analysis. The samples will be carefully sealed with plastic after being trimmed into the PVC ring, packed in individual protective pallets, and shipped to a laboratory for testing.

The thickness of the radon barrier (from the top of the radon barrier to contact with potentially contaminated materials below) is expected to be approximately 49 inches on the cover top slope and side slope. Care will be taken not to excavate beyond the radon barrier and into any underlying potentially contaminated materials (uranium mill tailings) directly below by closely monitoring and scanning for radioactivity in the soil boring and test pit. Indicators of contaminated material contact including soil color, texture, moisture content, and other indicators observed by the soil morphologist will also be actively monitored. Before excavation and sampling, the radon barrier thickness at each test location will be checked against the small core, as described in Section 3.3.3.

3.3.2 Shelby Tube Collection

Shelby tubes are thin-walled steel tubes that can be used to collect relatively undisturbed samples of cohesive soils. Shelby tube samples are typically collected for determining parameters such as in situ bulk density and moisture content. Samples can also be used for HET and EFA testing as described in Section 1.3. Shelby tubes will be used to collect samples that are 3–5 inches in diameter and up to 36 inches thick. Shelby tube samples will be taken of the cover soil and the radon barrier on the top slope of the disposal cell. Radon barrier materials will be sampled on the side slope of the disposal cell. The Shelby tubes will be pushed in and removed with the Geoprobe. The Shelby tubes will be capped on either end to preserve in situ moisture and will be labeled with a sample area number, type of material, sample number, and sample depth interval.

3.3.2.1 Riprap and Bedding

Shelby tubes cannot be used to sample riprap or bedding material. When coring on the tailings dam of the cell or on the top slope apron where there is riprap, the riprap and bedding layer will be moved by hand and the Shelby tube sampling will begin on the top of the first layer of consolidated material.

3.3.3 Geoprobe Core Collection

The Geoprobe will be used to obtain intact core from the cover soil layer and the radon barrier layer. The Geoprobe MC7 tooling system (a steel probe rod 4–6 feet long and 4.5-inches in outside diameter with a 3-inch sample sheath and PVC liner) will be used to push through the soil profile and capture material in the liner and remove it, resulting in a 3-inch diameter core that is 4–6 feet long.

Researchers will determine the exact locations of the samples in the field based on surface observations and review of the reclamation and closure plan and completion reports. In each Geoprobe sampling location, where feasible, the MC 7 tooling system will be used to collect cores from the top surface of the disposal cell to the bottom of the radon barrier. The cores will be observed in the field for material properties and capped on each end. Cores will be transported to the Environmental Sciences Laboratory (ESL) in Grand Junction for discrete sampling.

The Geoprobe is capable (based on its orientation on the slope) to operate on slopes of 32% to 36%. The tailings dam at the L-Bar site is a maximum of 20% slope. When on the side slope, the machine will be positioned with its tracks parallel to the slope and the drive head pointed uphill or downhill based on the conditions at the discretion of the Geoprobe operator. The head will then be positioned to core, perpendicular to the ground surface. Care will be taken when maneuvering the Geoprobe to minimize pivoting to prevent material displacement on the surface. If material is displaced, it will be replaced by LMS staff. Plywood may also be used to prevent material displacement during Geoprobe positioning.

At each location where Geoprobe coring is to be conducted and before coring with the Geoprobe, an adjacent hole will be made using a hand auger to determine layer thicknesses and to provide additional sample material. Information from this hand-augered hole will help guide the operator to determine how deep to push in with the Geoprobe so that any contact with uranium mill tailings is minimized.

All material removed from the radon barrier will be scanned for radioactive material. If any is found, it will go back in the hole. More detail on scanning the material and the plan for incidental contact are in Section 5.5.

3.3.3.1 Riprap and Bedding

The Geoprobe is incapable of sampling riprap. When coring on the tailings dam of the cell or on the top slope apron where there is riprap, the riprap and bedding layer will be moved by hand and the Geoprobe coring will begin on the top of the first layer of consolidated material.

3.3.3.2 Contingencies

The Geoprobe MC7 tooling system is the one slated for use. However, if this provides challenges to sampling, the smaller DT325 tooling system may be implemented. The steel rods for the DT325 system are 5 feet long, have an outside diameter of 3.25 inches, and will provide a core 2 inches in diameter.

3.4 Cover Restoration

In all cases, the disturbances to the earthen materials of the disposal cell caused by sampling whether by the Geoprobe, or by hand will be restored as closely as possible to the as-constructed condition of the disposal cell upon arrival, all while using appropriate materials and methods. The Grand Junction, Colorado, Disposal Site is the proposed source of restoration material for the radon barrier and bedding layers. The Grand Junction disposal site has stockpiles of clay and bedding onsite that can be used provided it meets the specifications detailed in Section 2.2 and as verified by the testing procedures below. If it does not meet the specifications, the material will be sourced from an approved area onsite, or commercially. Materials for the restoration of the cover soil on the top slope will be sourced on the L-Bar site, which is the original source of the cover material. The location of this borrow area is shown on Figure 12.

3.4.1 Materials Testing

Restoration of the fine-grained soils (clay, silt, fine sand) in the core holes in the cover will be completed with materials that are verified to meet the specifications for cover materials described in the L-Bar Reclamation and Closure Plan (BP America 1989) and are found in Section 2.2.

For radon barrier material, a sample of the soil to be used for restoration will be tested by a soils engineering firm for *Laboratory Compaction Characteristics of Soil Using Standard Effort* (ASTM D698), *Particle Size Analysis of Soils* (ASTM D422), *Liquid Limit, Plastic Limit and Plasticity Index of Soils* (ASTM D4318) and be classified by *Standard Classification of Soils for Engineering Purposes* (ASTM D2487), before use. The material will then be moisture conditioned to the optimum moisture content (+2 % to -2%) provided by ASTM Standard D698 and stored in sealed containers until used for restoration.

For the cover soil, a sample of the soil to be used for restoration will be tested by a soils engineering firm for *Laboratory Compaction Characteristics of Soil Using Standard Effort* (ASTM D698).

Coarse materials (sand and gravel) used for restoration will also be verified to meet the specifications for cover materials described in the L-Bar Reclamation and Closure Plan or design documents and contained in Section 2.2. The materials will be tested by a soils engineering firm by *Sieve Analysis of Fine and Coarse Aggregates* (ASTM C136).

3.4.2 Revegetation

Project personnel will hand-broadcast a native seed mix in areas that have been disturbed by the project, including the top slope and the borrow area. The seed mix identified in Table 4 will be scattered across the surface and then the seed will be incorporated into the soil with a rake or by driving a utility task vehicle (UTV) over the area. The objective will be to create a rough, uneven surface that can capture precipitation within its microtopography. At the borrow area (Figure 12) after seeding, erosion control matting will be placed on the surface where material was removed and staked into place with wooden stakes.

Table 4. Seed Mix and Broadcast Rates

***Scientific Name*/Common Name**	**Variety**	**Pure Live Seed Pounds per Acre**
Achnatherum hymenoides/Indian ricegrass	Star Lake or Paloma	4
Elymus elymoides/Bottlebrush squirreltail	Pueblo or Toe Jam Creek	4
Sporobolus cryptandrus/Sand dropseed	Western	0.2
Sporobolus contractus/Spike dropseed	Cochise	0.2
Eriogonum umbellatum/Sulphur flower buckwheat	NA	0.5
Helianthus annuus/Annual sunflower	NA	4
Heliomeris multiflora/Showy goldeneye	NA	0.1
Oenothera pallida/Pale evening primrose	NA	0.1
Spharalcea coccinea/Scarlet globemallow	NA	0.5
Spharalcea parvifolia/Nelson globemallow	NA	0.5
Atriplex canescens/Fourwing saltbush	NA	2
Krascheninnikovia lanata/Winterfat	NA	0.5
Total		16.6

Abbreviation:
NA = not applicable

3.4.3 Restoration Methods

3.4.3.1 Bedding Materials

Bedding materials will be replaced to the correct thickness and consolidated with a hand tamper.

3.4.3.2 Boreholes and Small Areas Sampled by Hand

Moisture-conditioned material will be poured in the hole in loose lifts not to exceed 4 inches for the radon barrier and 6 inches for cover soil. Compaction of the material in the core hole will be accomplished by hand compaction with a tamping rod. Compacted lift thicknesses will be measured and recorded before the next lift. Because of the small size of the restorations, testing of the compaction will not be feasible, but every effort should be made to obtain the required

compaction specification which is generally 95% of maximum dry density for the radon barrier and 90% of maximum dry density for the cover soil as determined by ASTM Standard 698. Compaction will continue until no further deflection of the material is observed. Each layer of the cover will be restored to the thickness specified in the design as referenced in the completion report (SOHIO 2000).

3.4.3.3 Large Block Sample Areas

Moisture-conditioned material will be poured in the hole in loose lifts not to exceed 8 inches. Compaction of the material in the hole will be accomplished with a rammer compactor. Compacted lift thickness will be measured and recorded before the next lift. The compaction and moisture content of each lift will be verified as meeting the specifications of 95% of maximum dry density for the radon barrier and 90% of maximum dry density for the cover soil by use of a nuclear density gauge following *Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)* (ASTM D2922) and *Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)* (ASTM D3017). Each layer of the cover will be restored to the thickness specified in the design (radon barrier) or that is measured in the field at that location (cover soil with varying thickness) as referenced in the completion report (SOHIO 2000).

3.5 Sample Analysis for Physical and Chemical Properties

Once bulk samples are collected by the methods described in Section 3.3, discrete samples will be collected from the bulk material for laboratory analysis. Discrete sampling of the cover materials will be at the discretion of LMS scientists based on observations of the material and the determination of what data are needed to meet study objectives. Any excess material left after discrete sampling will be archived at the ESL in Grand Junction, Colorado.

3.5.1 Sample Analysis

Soil samples will be analyzed for some or all of the physical and chemical tests outlined in Table 5 and Table 6, respectively. Physical tests will be performed at a licensed testing lab such as Daniel B. Stephens of Albuquerque, New Mexico. HET and EFA tests may be performed at the discretion of LMS staff, by the U.S. Army Corps of Engineers, or Texas A&M University. Chemical tests will be performed by testing labs such as the University of California–Davis and Mineralogy, Inc. Lead-210 (^{210}Pb) and radium-226 tests will be performed by Eberline Analytical. This list of tests or testing laboratories is not all inclusive and may be modified at the discretion of LMS scientists.

Many of the tests listed in Table 5 and Table 6 that are to be performed on the soils aim to assess whether the soils exhibit dispersive characteristics. The results of the double hydrometer, pinhole, crumb, EFA, JET and HET tests, taken together will help determine whether the soils are vulnerable to piping and to categorize (help quantify) the internal soil erodibility and help establish a score value for the *p*EERS. As mentioned in Section 1.5 (row 1 in Table 1), the vulnerability of the cover soils to piping and internal erosion is an unknown and these tests will help to inform this risk category.

Table 5. Physical Tests to Be Performed on Soil Samples

Test	Test Code
USCS Classification	ASTM D2487
Sieve Analysis	ASTM D6913 or D7928
Atterberg Limits	ASTM D4318
Dry Density	ASTM D7263
Proctor Density	ASTM D698 or ASTM D1557
Double Hydrometer	ASTM D4221
Pinhole Test	ASTM D4647
Crumb Test	ASTM D6572
Soil Expansion Index	ASTM D4829
1-D Swell or Collapse of Soils	ASTM D4546
Erosion Function Apparatus Test	*Performed by Texas A&M University or U.S. Army Corps of Engineers*
Jet Erosion Test	*Performed by Texas A&M University or U.S. Army Corps of Engineers*
Hole Erosion Test	*Performed by Texas A&M University or U.S. Army Corps of Engineers*

Table 6. Chemical Tests to Be Performed on Soil Samples

Test	UC Davis CODE	Reference ID
Soil Salinity Group 1 (SP, pH, EC, Ca, Mg, Na, Cl, B, HCO3, CO3)	G-SALIN	
Potassium (K) – Saturated Paste Extract	K-SOLS	235
Sulfate-Sulfur (SO4-S) – Saturated Paste Extract	SO4-SP	235
Sodium Adsorption Ratio (SAR)	SAR-S	240
Exchangeable Sodium Percentage (ESP)	ESP-S	240
Nitrate & Ammonium Group (NO3-N, NH4-N)	G-NAF-S	312
Phosphate – Bray Extraction (Bray-P)	BRAY-P	355
Cation Exchange Capacity – Barium Replacement Method (CEC)	CEC	430
Calcium Carbonate ($CaCO_3$)	$CACO_3$	440
Organic Matter – Walkley-Black Method	OM	410
Organic Carbon (Calculated from W-B OM)	CORG	410
XRD – whole fraction (<2.00mm)	*Performed by Mineralogy, Inc.*	

3.5.2 ^{210}Pb

Lead-210 will be measured to assess radon attenuation capacity of the radon barrier (Fuhrmann et al. 2019). Samples for ^{210}Pb will be taken from discrete intervals from the radon barrier and cover soils in the cores collected by the Geoprobe. Discrete sampling of the cores will occur in the ESL. Samples will be analyzed for ^{210}Pb using a modified EML Pb-01 method (Eberline Services, Oak Ridge, Tennessee). Radium-226 will be analyzed in a subset of samples to estimate background radon-222 fluxes from the barrier material using a modified EPA 903.0 method (EPA 1980a).

3.5.3 Large Block Samples for Hydraulic Properties

Large-scale block samples will be collected from the cover profile using the procedure described in ASTM Standard D7015. Saturated hydraulic conductivity of each block sample will be measured in a large-scale flexible wall permeameter using the *Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter* (ASTM D5084) at an outside lab such as the University of Wisconsin–Madison. Test specimens will be trimmed from the samples by hand to a diameter of 305 millimeters and aspect ratio of 1. Testing will be conducted using an effective stress of 21 kilopascal (kPa), backpressure of 280 kPa, and hydraulic gradient of approximately 10. Permeation will continue until the hydraulic conductivity is steady and inflow equals outflow, as defined in ASTM Standard D5084.

Soil water characteristic curves (SWCCs) will be conducted on a subset of the hydraulic conductivity test specimens after permeation is complete. Specimens for SWCC testing will be trimmed to a thickness of 25 millimeters from specimens used for hydraulic conductivity testing. All SWCC tests will be conducted following the *Standard Test Methods for Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge* (ASTM D6836). The wet end of the SWCC is measured in large-scale (300 millimeters in diameter) pressure plate extractors like those described in Benson et al. (2011) following Method B in ASTM Standard D6836. The dry end of the SWCC will be determined using a chilled mirror hygrometer following Method D in ASTM Standard D6836.

4.0 Safety and Health

This section provides a discussion of the safety and health policies and requirements associated with the planning and implementation phases of this work. All work will be conducted in accordance with DOE regulations and LMS procedures that are contained or referenced in the *LMS Safety and Health Program* (LMS/POL/S20043). The *Safety and Health Program* defines the safety and health requirements for all work performed by the LMS contractor at sites administered by LM.

The requirements for the *LMS Safety and Health Program* are identified in the following:

- 10 CFR 835, “Occupational Radiation Protection”
- 10 CFR 851, “Worker Safety and Health Program”
- 29 CFR 1910, “Occupational Safety and Health Standards”
- 29 CFR 1926, “Safety and Health Regulations for Construction”

The *LMS Safety and Health Program* incorporates the requirements outlined in the *Integrated Safety Management System Description* (LMS/POL/S14463) and *Worker Safety and Health Program (10 Code of Federal Regulations 851 Implementation)* (LMS/POL/S14697). Additionally, all work will be performed in accordance with the *Integrated Work Control Process Manual*. The following subsections provide an overview of the Integrated Work Control Process (IWCP), training, first aid, CPR, fit-for-duty, JSA, and PPE requirements and provide a discussion on select hazards, controls, pause/stop work policy, and radiological monitoring and controls.

4.1 Integrated Work Control Process

Complete and efficient planning and control of work activities is fundamental to safe, environmentally protective work execution. The IWCP is applicable to all work activities managed and performed by the LMS contractor and subcontractors. It describes the policies, procedures, and requirements for planning, initiating, authorizing, performing, and conducting work at LM sites and facilities. The IWCP utilizes processes and tools established in the *Integrated Safety Management System Description*, *LMS Safety and Health Program*, and the LM/LMS *Environmental Management System Description* (LM-Procedure-3-20-12.0, LMS/POL/S04346) and in other LMS procedures and manuals.

The IWCP defines LMS work types, provides guidance for determining when each work type is applicable, and defines the work planning and control requirements for each work type. The work described in this work plan constitutes a Type 4 work activity. Type 4 work activities are planned using a *Project or Activity Evaluation (PAE)* form (LMS 1005) and consist of activities that:

- Are complex or involve higher risk.
- Require significant work planning to ensure safe and efficient performance.
- Require significant subject matter expert input and review to ensure a comprehensive operational envelope.
- Are planned to involve multiple related activities.

IWCP requirements for Type 4 work include the following:

Project or Activity Evaluation: The PAE form is used as a planning tool, and completion of the form is an iterative workflow process that culminates in a project or activity that is ready to be authorized by site leads. Key elements of the PAE workflow process are work scope definition, work planning, hazard identification and mitigation, environmental compliance planning, work authorization, performance of work, and project closeout.

Readiness Review: A readiness review is a systematic and documented review before the start of work or an activity ensuring that planning is complete, and that people, equipment, and procedures are available and adequate. Additionally, readiness reviews are conducted to provide objective evidence that appropriate planning has occurred to allow the project, task, or operation to proceed safely and effectively. The level of rigor and formality of review varies depending on the complexity and risk of the work. Before the start of work on a task assignment, project, or other significant activity, the LMS project lead determines the level of review and associated documentation needed to ensure that planning is complete. During the readiness review, the PAE form for the planned work will be provided and a *Readiness Review Checklist* will be completed. The *Readiness Review Checklist* is used as a tool to identify pre- and poststart items and hold points that need to be addressed to adequately perform the planned work in accordance with the IWCP. Participation and input by relevant LMS contractor core team members and applicable approvals are required prior to initiating Type 4 work activities.

Plan of the Day/Plan of the Week: The *Plan of the Day/Plan of the Week* form (LMS 2130) is an IWCP tool that is used to define and authorize planned work at LM sites and facilities. The form is used to indicate the date(s) the work is authorized, work type, activity description and work control reference, applicable JSA(s), and identify a person in charge (PIC). It is signed by

the LMS site lead to formally authorize the work. Authorized work containing different work types (e.g., skill-based activity, PAE) is listed on separate rows of the form with a corresponding reference to the applicable JSA(s) by name or identifier. Requirements for incorporating emergent work (i.e., any work not covered in the activity description or work control reference section) are identified in Section 4 of the *Plan of the Day/Plan of the Week* form.

Initial Prejob Briefing: All field personnel will attend an initial prejob briefing conducted by the LMS line supervisor on the first day of work before conducting any fieldwork. The JSA and other field forms will be covered and signed at this time. If circumstances require the use of personnel who did not attend the initial site briefing, these personnel will receive briefings from the LMS line supervisor before they may begin fieldwork.

Prejob Brief/Safety Meetings: At the beginning of each day's work and before specific tasks with significant or modified safety considerations, the LMS contractor team will conduct an operations safety and health meeting for all onsite personnel. Work authorized by the LMS site lead through the *Plan of the Day/Plan of the Week* form will be reviewed, and the hazards associated with those activities will be identified along with the safety implications and controls to mitigate the hazards as identified in the applicable JSA. Relevant safety documentation associated with the upcoming work will be reviewed. In addition, issues or concerns noted from the previous days' activities will be discussed. This briefing will be documented with a required sign-in sheet (i.e., *Pre-Job Brief/Safety Meeting Attendance Record* [LMS 1554]) to identify the topics discussed and the personnel in attendance. A separate briefing with sign-in on the *Pre-Job Brief/Safety Meeting Attendance Record* will be conducted for any worker(s) who requests to be onsite and cannot attend the daily meeting. All personnel are required to participate and sign in or they will not be allowed to participate in activities at the site.

Visitors who may be on site for observational purposes only and will not be involved in the work will be given the *Site Visitor Safety Briefing* (LMS 1090).

4.2 First Aid, CPR, and Fitness for Duty

The LMS contractor team will provide a person who is certified in first aid and CPR to be onsite at all times while work is being performed. The LMS contractor team will ensure that an AED and first aid that meets the requirements of American National Standards Institute (ANSI)/ International Safety Equipment Association (ISEA) Standard Z308.1-2009, "American National Standard for Minimum Requirements for Workplace First Aid Kits and Supplies," are always onsite when personnel are present. All personnel performing field work exceeding 120 hours annually will be required to complete a *10 CFR 851, Fit For Duty Evaluation* (LMS 2115), have a subsequent medical physical and be cleared by an LMS occupational medicine provider to perform work at this site.

4.3 Job Safety Analysis

All LMS personnel present will read, sign, and adhere to the hazard controls specified in the approved JSA. Personnel will not perform any work not addressed by the JSA. In accordance with the *Job Safety Analysis Development* procedure (LMS/PRO/S16030), if hazards are encountered that are not addressed in the JSA, the designated S&H representative can modify the JSA to reflect changed conditions or equipment as needed or as requested by a worker as a field change.

4.4 Personal Protective Equipment (PPE) Within the Work Zone

The requirement for specific PPE, including when to wear it, will be determined in the JSA. PPE required for radiological hazards will be determined by the RCT covering the work and as identified in the project *Radiological Work Permit* (LMS 1588) also called the RWP, if implemented (see Section 5.5 below). S&H reserves the right to adjust PPE requirements to protect personnel from hazards. Depending on the work being performed, PPE requirements may include the following:

- Appropriate clothing for outdoor work includes long pants, boots, hats, sunglasses, and t-shirts (short or long sleeve). No tank tops or shorts will be permitted onsite.
- Hard hats: Hard hats meeting the specifications of ANSI Standard Z89.1, "American National Standard for Industrial Head Protection," for Class G (general) helmets will be worn consistently in areas where overhead hazards are present or anticipated, in work areas and as specified by a JSA, RWP, or other S&H procedure.
- Eye and face protection: Eye protection and face protection (if applicable) meeting the specifications of ANSI Standard Z87.1, "American National Standard for Occupational and Educational Eye and Face Protection Devices," will be worn consistently whenever personnel run a reasonable probability of eye or face injury resulting from work being performed and as specified by a JSA, the RWP, or other S&H procedure. Personnel must use appropriate eye or face protection when exposed to hazards from flying particles, liquid chemicals, acids or caustics, chemical gases or vapors, or potentially injurious light radiation.
- High-visibility outerwear: For daytime work, the shirt, jacket, or coveralls will be orange, yellow, strong yellow-green, or fluorescent versions of these colors. High-visibility outerwear will be worn consistently in work areas and when specified by a JSA, RWP, or other S&H procedure.
- Safety-toed footwear: Safety toe shoes will be worn in work areas when a foot crush hazard exists and when specified by a JSA, the RWP, or other S&H procedure.
- Coats, gloves, and hats as ambient weather conditions warrant.
- Work gloves when handling rock cover components, when using tools, and during material restoration operations that provide ample protection for the task being performed.
- Knee pads when moving rocks or kneeling on hard, uneven surfaces.
- Hearing protection, as warranted, with a noise reduction rating of at least 31 decibels for earmuffs and 33 decibels for ear plugs.

Minimum PPE for visitors is prescribed in the *Site Visitor Safety Briefing* and generally includes sturdy footwear, long pants and a shirt that covers the shoulders.

4.5 Radiological Monitoring and Controls

During LM mill tailing disposal cell cover investigations at the L-Bar site, uranium mill tailings material might be encountered by LMS workers. However, this is unlikely. Uranium mill tailings are identified as LM radioactive material in the LMS *Radiation Protection Program Plan* (LMS/POL/S04373) hereafter called the RPPP, and when encountered, must be appropriately

controlled. If encountered during the cover investigation work (as possibly identified by a change in soil color, an increase in radiological instrument readings, or other visual indications common of uranium mill tailings material), then the onsite LMS personnel, who is an LM-qualified radiological control technician (RCT), will implement the necessary and appropriate radiological controls as identified in and required by the RPPP, the LMS *Radiological Control Manual* (LMS/POL/S04322), and the multiple LMS Radiological Control organization implementing procedures. Such necessary and appropriate radiological controls might include the development and issuance of a project-specific RWP, the implementation of radiological PPE, and the requirement for personal contamination monitoring (frisking). The onsite RCT will use a graded approach to implement necessary and appropriate radiological controls when they are deemed necessary (by the RCT or the LMS Radiological Control manager). Implementing necessary controls helps workers keep their occupational radiation doses as low as reasonably achievable and prevents the possible spread of radioactive contamination.

4.5.1 Radiological Monitoring

When excavations on the cell cover are performed and are likely to uncover or expose uranium mill tailings material, radiological monitoring shall be implemented in accordance with the project-specific RWP or as directed or performed by the RCT covering the work.

Radiological monitoring shall only be performed by a qualified RCT and may include collecting radiological information to determine the following:

- Radiation dose rates
- Surface contamination radioactivity

Radiological monitoring (surveying the excavation area) is also commonly used at LM uranium mill tailing disposal cells to make a positive determination of suspect mill tailings material. Elevated radiological instrument readings (roughly 2 to 3 times background or greater) are a sure indicator of the presence of uranium mill tailings material. In most cases, elevated instrument readings are obtained even when a thin layer of "clear" cover material still exists on top of the uranium mill tailings material. The RCT covering the work will help determine or identify when excavations into the disposal cell cover are nearing uranium mill tailings material, or if uranium mill tailings material has been uncovered or removed during the excavation activities.

4.5.2 Radiological Controls

Use of a hand auger and Geoprobe coring through the radon barrier material (part of the cell cover) will be used to collect samples and determine the thickness of the radon barrier material, which may expose minimal amounts of the underlying uranium mill tailings. Samples of uranium mill tailings will not be collected. Any uranium mill tailings encountered during these activities will be returned to the sample location.

4.6 Thermal Stress

Personnel could potentially be exposed to heat and cold stress conditions when working on an LMS project. Heat stress evaluation and monitoring is required when ambient temperatures are expected to exceed 80 °F and work will be performed outdoors for more than 15 minutes. The

preferred approach to heat stress monitoring is to use physiological monitoring (i.e., heart rate). Environmental monitoring may be performed as an alternative option. LMS personnel are issued physiological monitoring equipment (Polar A370 wrist monitor) to monitor their pulse rate; or heartrates may be manually monitored using a pulse oximeter. Refer to the *Heat Stress Evaluation and Monitoring Procedure* (LMS/POL/S15935) for additional information related to heat stress.

Cold stress conditions exist when the ambient temperature is below 60 ˚F. Cold stress is monitored by measuring environmental conditions. When the temperature is below 40 ˚F, a windbreaker garment should be worn during windy conditions and water repellant gear worn if a worker may become wet while performing work. Air temperature and wind speed should be monitored every 4 hours when temperatures are below 30 ˚F to ensure appropriate controls are utilized, and heated warming areas (such as a vehicle with a functioning heater) will be available to take breaks as necessary.

4.7 Silica Exposure Monitoring, Awareness, and Mitigation

The potential for exposure to respirable crystalline silica and dust exists when personnel are sieving bedding material, preparing radon barrier replacement material, and during mechanical excavation of the cell cover components. Travel along unpaved roads may also create airborne dust.

The activities mentioned above will be observed and will be monitored at the discretion of the S&H field representative. Personal breathing zone (PBZ) monitoring will be performed in accordance with the National Institute for Occupational Safety and Health Method 7400, "Silica, Crystalline, by XRD." Monitoring will be performed to ensure the controls identified in the JSA are sufficient in maintaining silica levels below the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value of 25 micrograms per cubic meter for an 8-hour work shift. PBZ monitoring will be focused on personnel sieving bedding material, mixing radon barrier materials and operating heavy equipment.

Respirable crystalline silica and dust awareness and mitigation will consist of the following:

- In addition to the silica awareness training, hazards, controls, and best management practices will be discussed before beginning work each day during safety tailgate meetings
- Personnel will be advised to work upwind of areas where airborne particulates are being generated, as applicable
- Work will be paused if excessive wind speeds generate a substantial volume of visible airborne particulates and personnel will be directed to an appropriate standby location

4.8 Noise Dosimetry, Awareness, and Mitigation

The potential for exposure to elevated noise levels exists during compaction activities with the jumping jack.

Noise dosimetry will be conducted during the worst-case scenario activity, compaction activities, if performed more than 2 hours by one individual. Compaction activities performed with the jumping jack should be limited to one person performing the activity 2 hours a day. Workers

performing this task should wear double hearing protection in the form of ear plugs and earmuffs. Activities mentioned above will be observed and will be monitored at the discretion of the S&H field representative.

Noise monitoring will be performed in accordance with the LMS *Hearing Conservation Program* (LMS/PRO/S16027). Noise monitoring using both ACGIH and the Occupational Safety and Health Administration (OSHA) hearing conservation settings will be utilized to collect noise data to ensure workers are not exposed to noise levels in excess of the ACGIH 8-hour time weighted average threshold limit value (TLV) of 85 decibels A-weighted. Noise dosimetry results will be compared to the ACGIH TLV.

Elevated noise awareness and mitigation consists of, at minimum, the following:

- Noise awareness will be discussed before beginning work each day during safety tailgate meetings
- Personnel will be advised to work a limited amount of time when performing jumping jack activities and advised on proper PPE

4.9 Pause/Stop Work Policy

All personnel working on LM sites have the responsibility and authority to stop work immediately, without fear of reprisal, if an employee believes the following:

- Conditions exist that pose a danger to the health and safety of workers or the public
- Conditions exist that, if allowed to continue, could adversely affect the safe operation of or could cause serious damage to a facility
- Conditions exist that, if allowed to continue, could result in the release from the facility to the environment of radiological or chemical contaminants that exceed applicable regulatory requirements or approvals

Employees have the authority and responsibility to stop dangerous work in accordance with the *Pause/Stop Work Procedures* (LMS/PRO/S20037). Personnel are responsible for identifying safety concerns, potential hazards, or unsafe conditions and immediately notifying line management. Everyone has the right, responsibility, and authority to report unsafe or environmentally unsound conditions or practices and to pause or stop work activities without fear of reprisal. All onsite personnel are required to immediately report to the line supervisor any unsafe activities, changed conditions, and safety and health incidents.

4.10 Sanitation

The LMS contractor will provide a chemical toilet and handwashing station at the worksite.

4.11 Drinking Water

Bottled drinking water will be provided and made available to all personnel by the LMS contractor. Proper hydration will be a focus during daily tailgate safety meetings.

4.12 Safety Data Sheets (SDSs)

A copy of the SDS is required for each chemical used on the jobsite (e.g., survey marking paint). A copy of each SDS will be kept on the jobsite and placed in a designated location for all personnel to access.

4.13 Specific Requirements During Geoprobe Operation

Geoprobe operations are covered under the *Procedure for Operation of the Geoprobe Model 7822DT* (LMS/PRO/S08578). During operation of the Geoprobe, an exclusion zone will be set up at a radius away (minimum of 30 feet) from the Geoprobe where noise levels are below 85 decibels. Below is a list of specific instructions for persons entering that zone while the Geoprobe is operating:

- Double hearing protection, hard hat, safety-toed shoes, high-visibility vests, and safety glasses must be worn. Outside of this area, employees are encouraged to wear hearing protection.
- Noise dosimeters may be required to be worn by the Geoprobe crew during drilling.
- Only those people required to be in the exclusion zone shall enter. This includes the project lead and other field personnel. The project lead may give authorization to others to enter as necessary. Only the Geoprobe crew can be in the exclusion area during drilling operations.
- Before entering, get the attention (make eye contact and hand signals) of someone on the Geoprobe crew to ensure they are aware you are entering the area and that drilling operations have stopped.

4.14 Penetration Permit

A *Penetration Permit* (LMS 1064) is required as part of the work scope and will be completed before any ground penetration work begins. Underground utility clearances are unnecessary for work on the disposal cell as the LMS contractor has the institutional knowledge that there are no buried utilities within disposal cells. It is assumed that no underground utilities exist in the cover soil borrow area. Verification of this will be performed by a qualified locator.

4.15 Emergency Response

Attachment 1 contains the completed *Supplemental Emergency Response Information (SERI)* (LMS 1415) including the location of the site and directions to the closest emergency facility.

5.0 Environmental and Regulatory Requirements

In accordance with the LMS contractor's Emergency Management, Environmental Compliance, and Safety and Health policies and the Environmental Management System, all LMS personnel performing work for LM will follow safe and environmentally sound work practices. Work will be conducted in a manner that protects personnel and the public; complies with DOE directives; and complies with applicable federal, state, and local requirements, agreements, and permits under the LM contract. In addition, work will be conducted in a manner that prevents pollution, minimizes

wastes, and conserves natural and cultural resources to the extent that such activities are technically and economically feasible. Additionally, the approach used for implementing this Field Work Plan and all personnel involved will strive to minimize land disturbances caused at this site as a result of conducting all work described in this document. Personnel are responsible for informing the PIC of any unsafe or environmentally unsound conditions and have the authority to pause or stop work activities without fear of reprisal if necessitated by such conditions.

5.1 Specifications for Environmentally Preferable Purchasing

LM is committed to managing its facilities in a manner that will promote a sustainable environment and protect the health and well-being of its federal employees, contractors, and subcontractors. In the performance of this Field Work Plan, best efforts shall be made to provide services in a manner that will promote or improve sustainability of the natural environment and protect the health and wellbeing of federal employees, contract service providers, and visitors at the site.

Products purchased and used under this Field Work Plan shall be environmentally preferable or sustainable products and equipment that meet one of the following requirements:

- Have recycled content
- Are BioPreferred or biobased
- Contain nontoxic or less toxic alternative substances
- Are water efficient
- Are energy efficient (Energy Star or Federal Energy Management Program-designated)
- Are not ozone-depleting (i.e., refrigerants)

For any of the above-described products required to be purchased under this Field Work Plan, the environmentally preferable type of product shall be purchased, unless that type of product:

- Is not available competitively either within a reasonable time frame or at a reasonable price.
- Is not life-cycle cost efficient, in the case of energy-consuming products.
- Does not meet reasonable performance standards.

Data on the amount of sustainable products (i.e., environmentally preferable, reused, recycled, or BioPreferred or biobased) and sustainable services (i.e., energy efficient, water efficient, not ozone-depleting) purchases shall be reported to the LMS Environmental Compliance point of contact (ECPOC) at the completion of the project and whether all products and services purchased met the sustainable acquisition requirements. When a designated product with either recycled content or bio preferred or biobased status cannot be purchased, a justification form shall be submitted (contact ECPOC for form).

5.2 National Environmental Policy Act

The work described in this Field Work Plan is being assessed to identify applicable environmental planning requirements and screen for potential environmental impacts (physical, cultural, social, and economic) of proposed actions early in the planning process. This

assessment includes completion of an *Environmental Review Form* (LM-Form-4-20.3-4.0), also called the ERF, to identify site-specific environmental requirements, including a need for National Environmental Policy Act (NEPA) documentation, specific resource management plans, regulatory permits, and regulatory consultations. and the associated *NEPA Categorical Exclusion Evaluation (CXE)*(LM-Form-4-20-5.0). Because the proposed action is not similar in nature, scale, and scope to activities previously evaluated for the site, a NEPA CXE will be warranted. Note that because existing Categorical Exclusions as listed in 10 CFR 1021.410 apply to the actions proposed in this Field Work Plan, the proposed study at the L-Bar site will not require an Environmental Assessment or Environmental Impact Statement. Once the ERF, CXE, and *NEPA Categorical Exclusion Determination Form* (LM-Form 4-20-2.0) are completed and signed, NEPA obligations for this planned work will be met.

5.3 Cultural Resources

Work described in this Field Work Plan occurring on the engineered cover of the disposal cell, and the associated materials, work equipment, and vehicles, will be staged in areas that have been surveyed in the past and found to be lacking in cultural resources that qualify as historic property in accordance with the National Historic Preservation Act (NHPA). However, because ground disturbance using mechanized equipment will be required at the borrow area location within the L-Bar site—but off the engineered disposal cell (Figure 12)—a NHPA Section 106 review will be required to obtain fill materials for the restoration of the cover soil on the top slope (see Section 3.4). The NHPA Section 106 review process for the proposed work will be initiated by mailing consultation materials with the LM determination of “no historic property subject to effect [36 CFR 800.4(d)(i)]” to the New Mexico State Historic Preservation Officer (SHPO). Once a response from the New Mexico SHPO is received, concurrence with the finding that no historic properties will be affected, concludes the Section 106 consultation process.

The unexpected discovery of cultural materials during the planned work would constitute a changed condition that has not been fully evaluated. Cultural materials are broadly defined as the physical objects and remnants of a culture. Implementation of a work pause order will be required in that immediate area if suspect cultural material is unexpectedly discovered during construction or excavation. Work in the area of the discovery shall stop immediately. The field team will notify the ECPOC for further instruction. The LMS contractor will notify LM of the inadvertent discovery. The cultural materials must be evaluated by an archaeologist or historian meeting the Secretary of the Interior’s professional qualification standards (36 CFR 61) before the work pause order can be lifted.

5.4 Migratory Bird Treaty Act

Personnel will not work in or travel in areas outside of the approved work areas or access routes without approval. Personnel will not harass or otherwise disturb or move active bird nests, eggs, or young birds, or “take” a migratory bird in any way. If an active nest or eggs are discovered in the work area, personnel will notify the ECPOC and resolve any Migratory Bird Treaty Act (Title 16 *United States Code* Sections 703–712) concerns before work can continue.

5.5 Endangered Species Act

Except for the cover soil material borrow location within the L-Bar site, all the work will take place on the disposal cell cover, which is a modern engineered feature that has no sensitivity with respect to biological resources. The borrow location is off the engineered disposal cell and will be used to obtain fill material for the restoration of the cover soil on the top slope (see Section 3.4). No federal- or state-listed threatened or endangered species or designated critical habitat is known to be present at the site. Several species of listed birds could occur as transients at the site but would not be affected by the work activities.

5.6 Waste Management

Personnel will properly manage all waste generated by project activities. No hazardous or radioactive waste materials are expected to be generated during field activities. The site will be kept clean and orderly. Personnel will clean up debris and waste material from the site daily. Construction debris and nonhazardous waste material are expected to be very minimal and will be disposed of in approved receptacles, dropped off by the team at a nearby licensed solid waste landfill, or transported back to the LM Field Support Center at Grand Junction, Colorado, for proper management and disposal. Personnel will immediately notify the line supervisor if any hazardous waste is suspected or generated outside the scope of the project and follow the ECPOC's directions to manage the waste. Hazardous waste, universal waste, and radioactive waste shall be managed, including storage, transport, and offsite disposal, in compliance with applicable federal, state, and local regulations, DOE orders, and specifications.

5.6.1 Waste Reduction and Recycling

As required by DOE directives, executive orders, and guidance, certain waste reduction and recycling targets must be met, including diverting a minimum of 50% of demolition and construction debris and material from landfills through composting, reuse, and recycling and diverting a minimum of 50% of solid waste from landfills through composting and recycling. In working toward these targets, all personnel are encouraged to minimize the waste generated and maximize the amount of material that is reused, salvaged, and recycled. Additionally, data on the amount of nonhazardous solid waste, excluding construction and demolition (C&D) material and debris, and the amount of C&D material and debris disposed, reused, recycled, or composted must be collected and provided to the ECPOC.

5.6.2 Waste Minimization, Water, and Fuel Use Reporting

At the completion of the project, information on all materials that were dispositioned, denoting the weight or volume of each material and whether it was reused, recycled, salvaged, or disposed of shall be provided to the ECPOC using the *Project Construction and Demolition Material and Debris Tracking Form* (LMS 1105). For each management category (reuse, recycle, and disposition), the information shall include the type of material (glass, metal, plastic, debris, and so on), weight of each material by type (or volume if weight cannot be obtained), the waste classification (hazardous, universal, radioactive, solid), the name of the receiving facility or custodian, and copies of disposition receipts (e.g., bill of lading, weight ticket, hazardous waste manifest, U.S. Department of Transportation shipping papers, certificates of disposal).

All water usage, including volume, cost, and source to be used for the duration of the project shall be tracked and submitted to the ECPOC (within 2 weeks of project completion).

All fuel usage, including volume, cost, and use (e.g., nonfleet equipment fuel) required by the project shall also be tracked and submitted to the ECPOC (within 2 weeks of project completion).

5.7 Spill Prevention and Response

Onsite oil or fuel storage associated with the planned field work shall be in approved tanks or containers 8 gallons or less in size with spill containment and a spill kit in place. Any fueling conducted onsite will be in accordance with a project *Fueling Plan* (LMS 2623 CON). If spills of any fluids from equipment operations or maintenance (e.g., fuel, hydraulic fluids, coolant, lubricants, cleaning solvents, used oil) occur, personnel will immediately notify the line supervisor, S&H, and ECPOC and follow their directions to clean up the spill. All spills will be managed in accordance with the *Environmental Instructions Manual* (LMS/POL/S04338). Equipment leaks and other types of spills will be diapered, contained, absorbed, or otherwise blocked to prevent ground surface, soil, or surface water contamination and the leak immediately stopped or the equipment replaced. Personnel will clean up and subsequently manage spilled materials and associated wastes (e.g., contaminated soils), including proper storage, until the ECPOC can arrange for offsite disposal of the material.

5.8 Driving on the Disposal Cell Cover

Driving on the disposal cell cover with a track-mounted Geoprobe, pickup truck, and a UTV will be required to perform the planned work. Access to the top slope of the cell will be from a single designated access point. If multiple trips to a single sample area are required, the equipment will be required to split the tracks from the previous trip so that the equipment is not tracking in the exact same path for each trip.

6.0 Training Requirements

Workers are responsible for performing tasks in accordance with provided training and may not perform tasks for which they have not been adequately trained.

6.1 Initial Project Briefing

All field personnel shall attend the initial project briefing on the first day of work before conducting any fieldwork. The briefing will be held when all personnel mobilize to the site. This briefing will include discussion of the Field Work Plan, the Plan of the Day/Plan of the Week, JSA, and in the *Pause/Stop Work Procedures* document. It will give all personnel the opportunity to ask questions or amend the JSA if needed to reflect actual field conditions.

6.2 Daily Safety Briefing

At the beginning of each day's work and before specific tasks with significant or changed safety and environmental considerations, the PIC shall conduct a S&H and Site Operations meeting for

all personnel. The scope of the upcoming day's operations and activities will be reviewed, and hazards associated with those activities will be identified along with the safety or environmental implications and procedures to mitigate the hazards. Relevant safety documentation associated with the upcoming work will be reviewed. In addition, issues or concerns noted from the previous days' activities will be discussed and documented, and the JSA may be modified to reflect changed conditions. This briefing will be documented to identify the topics discussed and personnel in attendance.

6.3 Training Requirements

All LMS personnel have the responsibility to maintain and provide documentation on the appropriate level of training and qualifications to perform activities associated with their position. Employees are encouraged to work with management to schedule appropriate training in a timely manner, which means before work and before the expiration of qualifications. Minimum training requirements for LMS personnel (depending upon the work being performed) may include the following training:

- Silica Awareness (HS763)
- Heat Stress (HS418 and HS418JPM)
- Hearing Conservation (MD105)
- UTV Safety (HS344)
- Trailer Towing Safety (HS276 and HS276JPM)
- General Employee Radiological Training (HS109)
- Radiation Worker II (HS113)
- Geoprobe operator training (GP100JPM)

Note — *UTV safety and trailer towing safety training is only required for LMS contractor personnel operating a UTV or towing a trailer, respectively.*

Additional training information is available within the *Learning and Development Policies and Procedures Manual* (LMS/POL/S15034).

7.0 References

10 CFR 40, "Domestic Licensing of Source Material," *Code of Federal Regulations*.

10 CFR 835. "Occupational Radiation Protection Program," *Code of Federal Regulations*.

10 CFR 851. "Worker Safety and Health Program," *Code of Federal Regulations*.

10 CFR 1021. "National Environmental Policy Act Implementing Procedures," *Code of Federal Regulations*.

29 CFR 1910. "Occupational Safety and Health Standards," *Code of Federal Regulations*.

29 CFR 1926. "Safety and Health Regulations for Construction," *Code of Federal Regulations*.

36 CFR 61. "Procedures for State, Tribal, and Local Government Historic Preservation Programs," *Code of Federal Regulations*.

36 CFR 800. "Protection of Historic Properties," *Code of Federal Regulations*.

16 USC 703–712. "Migratory Bird Treaty Act," *United States Code*.

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American National Standards Institute/International Safety Equipment (ANSI/ISEA) Standard Z308.1, "American National Standard for Minimum Requirements for Workplace First Aid Kits and Supplies."

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D422. "Standard Test Method for Particle Size Analysis of Soils"

D698. "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3))"

D1557. "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft^3 (2700 kN-m/m^3))"

D2487. "Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)"

D2922. "Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)"

D3017. “Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)”

D4221. “Standard Test Method for Dispersive Characteristics of Clay Soil by Double Hydrometer”

D4318. “Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils”

D4546. “Standard Test Methods for One-Dimensional Swell or Collapse of Soils”

D4647. “Standard Test Method for Identification and Classification of Dispersive Clay Soils by the Pinhole Test”

D4829. “Standard Test Method for Expansion Index of Soils”

D5084. “Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using Flexible Wall Permeameter”

D6572. “Standard Test Methods for Determining Dispersive Characteristics of Clayey Soils by the Crumb Test”

D6836. “Standard Test Methods for Determination of the Soil Water Characteristic Curve for Desorption Using Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, or Centrifuge”

D6913. “Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis”

D7015. “Standard Practices for Obtaining Intact Block (Cubical and Cylindrical) Samples of Soils”

D7263. “Standard Test Methods for Laboratory Determination of Density and (Unit Weight) of Soil Specimens”

D7928. “Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis”

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Environmental Instructions Manual	LMS/POL/S04338
Environmental Management System Description	LM-Procedure-3-20-12.0, LMS/POL/S04346
Hearing Conservation Program	LMS/PRO/S16027
Heat Stress Evaluation and Monitoring Procedure	LMS/POL/S15935
Integrated Safety Management System Description	LMS/POL/S14463
Integrated Work Control Process Manual	LMS/POL/S11763
Job Safety Analysis Development	LMS/PRO/S16030
Learning and Development Policies and Procedures Manual	LMS/POL/S15034
LMS Safety and Health Program	LMS/POL/S20043
Pause/Stop Work Procedures	LMS/PRO/S20037
Procedure for Operation of the Geoprobe Model 7822DT	LMS/PRO/S08578
Radiation Protection Program Plan	LMS/POL/S04373
Radiological Control Manual	LMS/POL/S04322
Worker Safety and Health Program (10 Code of Federal Regulations 851 Implementation)	LMS/POL/S14697

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Attachment 1

Completed *Supplemental Emergency Response Information (SERI)* for the L-Bar, New Mexico, Site

Supplemental Emergency Response Information (SERI)

L-Bar, New Mexico, Disposal Site

Date Issued: February 22, 2022

This document is to be implemented in conjunction with the *LM/LMS Worker Emergency Response EPIP* (LM-Procedure-3-20-21, LMS/POL/S37549) to provide emergency response information specific to the Office of Legacy Management (LM) center, facility, project, or site.

1. Address and GPS information. GPS information should be included for projects and sites that do not have a street address to help emergency responders locate workers.
2. Emergency contact information includes telephone numbers for site emergency coordinators (SECs) or persons in charge (PICs) and LM and Legacy Management Support (LMS) facility managers/leads, site managers/leads, project managers, or other directly affiliated managers/leads.
3. First responder contact information includes telephone numbers for responders nearest to the center, facility, project, or site.
4. Center and facility maps display locations for assembly areas, shelter-in-place locations, and emergency resource locations.
   OR
   Site or project maps display evacuation routes, shelter-in-place locations, and routes to the nearest medical facility.
5. Assembly area zones or designations for centers, facilities, projects, or sites that have more than one assembly area.
6. Building warden contact information includes all approved building warden names and telephone numbers.
7. Additional conditions include information unique to the center, facility, project, or site that may impact emergency response. This information cannot supersede any Emergency Management program procedure.

DIAL 911 IN AN EMERGENCY.
AFTER CALLING 911, CALL THE WATCH OFFICE AT 1-877-695-5322.

1. ADDRESS AND GPS COORDINATES

Site Address:

South of Cibola County Road 1,
3 miles east of the junction with Highway 279

Site GPS coordinates:

LAT: 35.18764533

LONG: -107.33471184

2. EMERGENCY CONTACT INFORMATION

No onsite phone; DOE 24 Hour Emergency: 877-695-5322

Position	Name	Phone	
Primary SEC or PIC	N/A	Office:	Cell:
Alternate SEC	N/A	Office:	Cell:
LM Facility or Site Manager	William Frazier	Office: 970.248.6041	Cell: 202.603.2721
LMSP Facility or Site Lead	Jordan Cario	Office: 970.248.6307	Cell: 724.255.7939
Building Owner	N/A	Office:	Cell:

AllOne Health (800) 350-4511 ***Call if worker is taken to healthcare facility.***

Supplemental Emergency Response Information (SERI)

L-Bar, New Mexico, Disposal Site

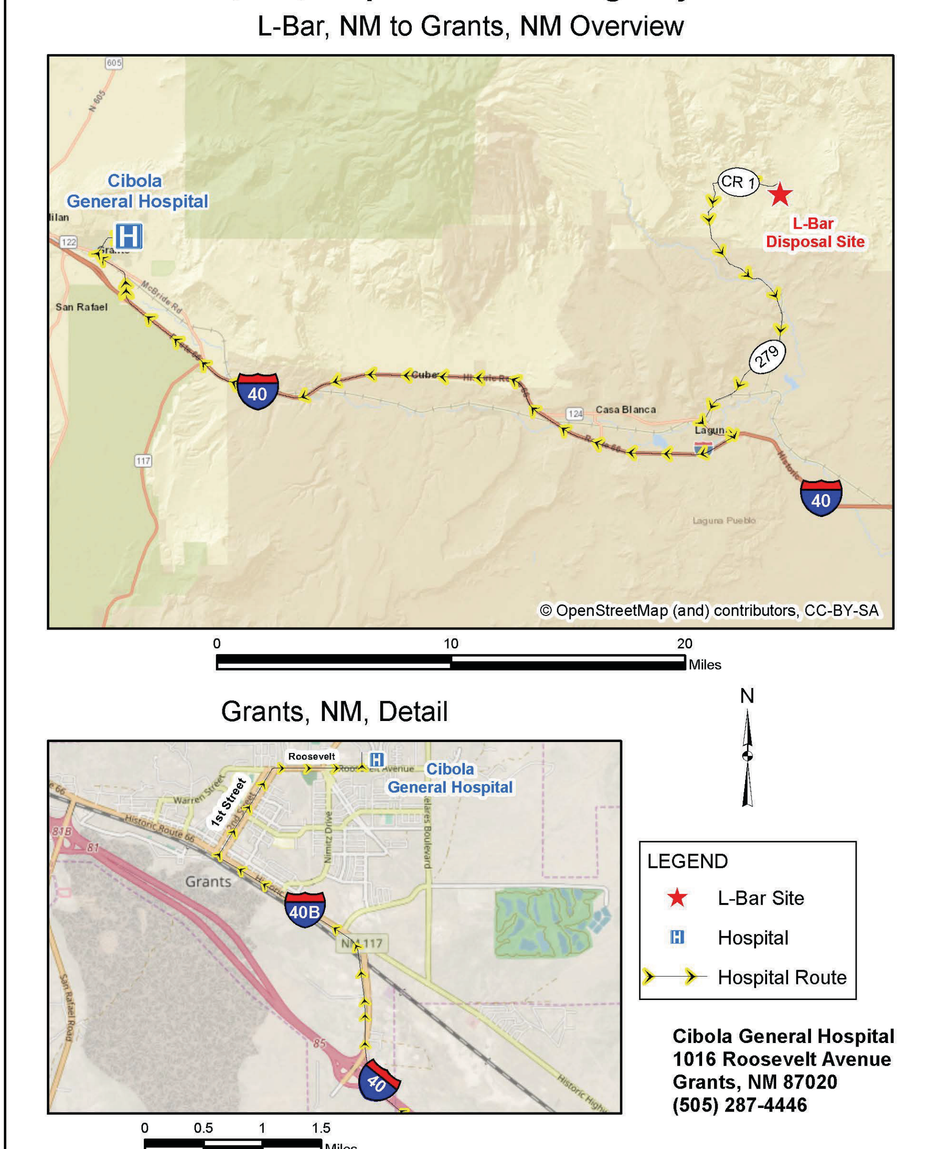
3. FIRST RESPONDER CONTACT INFORMATION			
Type	**Name**	**First Call**	**Direct Number**
Fire	Laguna Fire Department	**911**	505.552.1951 or 505.552.1108
Wildland Fire	Laguna Fire Department	**911**	505.552.1951 or 505.552.1108
Police or Sheriff	Cibola County Sheriff's Department New Mexico State Police, Grants, NM	**911**	505.876.2040 505.287.4377
Medical Facility	Cibola General Hospital	**911**	505.287.4446
Emergency Room	Cibola General Hospital 1016 Roosevelt Ave. Grants, NM 87020	**911**	505.287.4446

Supplemental Emergency Response Information (SERI)

L-Bar, New Mexico, Disposal Site

4. MAPS

L-Bar, NM, Disposal Site Emergency Route



Cibola General Hospital
1016 Roosevelt Avenue
Grants, NM 87020
(505) 287-4446

Supplemental Emergency Response Information (SERI)

L-Bar, New Mexico, Disposal Site

5. ACCOUNTABILITY AREAS

In case of emergency, unless another area is designated, all affected personnel should immediately proceed to vehicle parking area (locations will vary).

BUILDING	ZONE OR DESIGNATION	ASSEMBLY AREA
N/A	N/A	N/A

6. BUILDING WARDENS

N/A

NAME	ZONE OR DESIGNATION	PHONE
N/A	N/A	N/A

7. ADDITIONAL CONDITIONS

☒	No cellular service	☒	Rough terrain	☐	Public access to site
☒	Radiological hazards (describe): This site includes a disposal cell				
☐	Chemical hazards (describe):				
☒	Other (describe): Biological, heat/cold stress, grass/brush fires				

Methods available to communicate emergency messages to occupants/workers:

Site-specific briefing includes local method(s) for warning personnel of emergency conditions. Mobile phones, walkie-talkies, or vehicle horns will be used to warn personnel who may be beyond voice communication.

Emergency considerations:

Directions from site to emergency facility:

1. Leave the site by heading WEST on Cibola County Road 1 and follow for 3 miles to Highway 279.
2. Turn LEFT onto Highway 279 and follow for 13 miles to Highway 124 (Rte 66).
3. Turn LEFT onto Highway 124 (Rte 66) and follow for 1.5 miles to Exit 114 onto I-40 West.
4. Follow I-40 West for 29 miles to Exit 85 onto I-40 BUS (Santa Fe Avenue).
5. Continue on Santa Fe Avenue for 2.3 miles to First Street.
6. Turn RIGHT onto First Street at the Pizza Hut and proceed northeast for 0.9 miles to Roosevelt Avenue (Highway 547). First Street is a one-way street.
7. Turn RIGHT onto Roosevelt and go EAST for 0.7 miles to Bonita Street and turn LEFT to hospital.