ADDENDUM H

Final Remedial Action Plan
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March 2024

Field Demonstration Plan for Construction of the ET Cover Surface Admixture Layer

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Crescent Junction Disposal Site

Field Demonstration Plan
for Construction of the
ET Cover Surface Admixture Layer

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Revision 00

Executive Summary

The Crescent Junction, Utah, uranium tailings impoundment shall be closed with an evapotranspiration (ET) cover system. The ET cover system is the replacement cover for the originally approved UMTRCA cover for the impoundment. The ET Cover consists of from bottom to top: (1) interim cover composed of 1-foot-thick soil; (2) radon barrier composed of 4-feet thick clay soil; (3) 28.5-inch-thick frost protection layer composed of cover soil; and (4) 10-inch surface admixture layer composed of rock mixed with cover soil. The surface admixture layer is designed to mitigate the formation of rills or gullies and minimize soil loss due to erosion; to provide for a rooting medium for seeded native vegetation; allow for infiltration of meteoric water and the subsequent removal of this water via ET; discourage the burrowing of small mammals; and maintain conductivity that allows unsaturated moisture movement across its boundary with the underlying frost protection soil layer. This field demonstration plan describes the planned effort to develop the most efficient means to construct the surface admixture layer. This plan will also be utilized to develop a method specification for the installation of the surface admixture layer and for quality assurance (QA) approval of the layer during full scale deployment.

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1.0 Purpose:

A field demonstration shall be performed to develop the most efficient means to construct the surface layer of the evapotranspiration (ET) Cover referred to as the surface admixture layer (Figure 1). The demonstration will also be utilized to develop a field method specification for installation and quality assurance (QA) requirements for field approval of this surface admixture layer. Results of the demonstration will be formally documented and submitted to the Department of Energy (DOE) and Nuclear Regulatory Commission (NRC) for concurrence.

Figure 1. ET Cover Profile with Surface Admixture Layer

Successful completion of the field demonstration and subsequent development of the applicable method specification and QA approval requirements shall be completed prior to commencement of full-scale construction of the surface admixture layer.

2.0 Technical Requirements

The surface admixture layer of the ET Cover shall be 10-inches thick composed of a mixture of 60% rock to 40% soil by volume. The rock shall have a D50 of 2-inches. The cover soil shall be that from the approved borrow source designated as alluvial soil. The rock and soil shall be mixed uniformly from top to bottom. The density of the layer shall be uniform.

This Field Demonstration Plan will be utilized to demonstrate the Remedial Action Contractor's (RAC) most efficient construction methodology. During the implementation of this plan, the RAC

and design engineer, will establish and document the process(es) of construction for key components of the admixture layer, to develop method specifications:

- the ratio of soil to rock;
- homogeneous distribution of the rock within the entire depth of the admixture layer; and
- appropriate and uniformity of density of the layer following construction.

3.0 Demonstration

Multiple test pads may be constructed to develop the most efficient method to install the surface admixture layer. Myriad techniques may be evaluated to determine the most efficient construction method. Initial techniques include layering the required volume of rock and cover soil and then mechanically mixing them in place.

3.1 Rock to Soil Ratio

The rock to soil ratio is 60/40 by volume and the depth of the admixture layer is 10 inches. To achieve the appropriate ratio, rock and soil will be spread out in layers prior to mixing. The top of the first layer of material will be compared to the elevation of the frost protection barrier. Each material layer thickness will be measured prior to mixing by survey, physical staking or machine elevation control. Once the first layer elevation is verified and meets the intended elevation, the second layer of material will be placed directly on the first layer and separately verified that it meets the intended thickness.

Since the material will be mixed it is irrelevant whether the soil or the rock is placed first. However, applying lessons learned from similar projects, it is understood that the process will be slightly different depending upon which layer is the upper or lower layer. This is due to the void space between the rocks. If soil is applied on top of the rock, some of the soil will fill some of the voids between the rocks prior to mixing. This minimizes the shrink after the mixing process. When rock is applied on top of the soil, no soil fills any of the voids during placement and therefore when the two layers are blended the resulting layer has significantly more shrink than when constructed in the reverse order. When shrink occurs, the layer thickness is no longer 10 inches and must be adjusted so that the design thickness is achieved.

3.1.1 Rock over Soil Placement

Demonstration 1 will include a layer of rock placed and then a layer of cover soil placed directly on top of it. Rock will be placed and verified at a minimum depth of 6 inches (60% of 10 inches). Directly on top of the rock, a layer of soil will then be placed for a total depth of 10-inches, as shown in Figure 2. The combined layers will then be mechanically mixed to produce a homogenous mixture 10-inches thick.

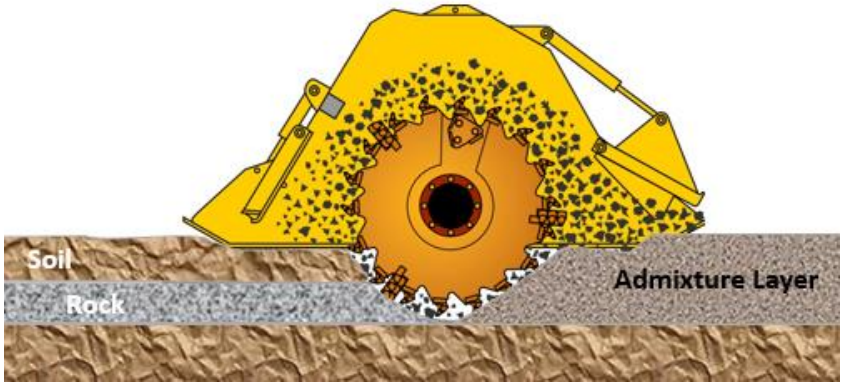

Figure 2 - Rock/Soil Placement

3.1.2 Soil over Rock Placement

Demonstration 2 will include a layer of cover soil placed and then a layer of rock placed directly on top of it. Soil will be placed and verified to a determined uniform thickness. Initially, 5-inches of cover soil will be placed (the extra inch of soil is estimated shrinkage expected from filling of the rock voids). Rock will then be placed to a total depth of 11 inches, as shown in Figure 3.

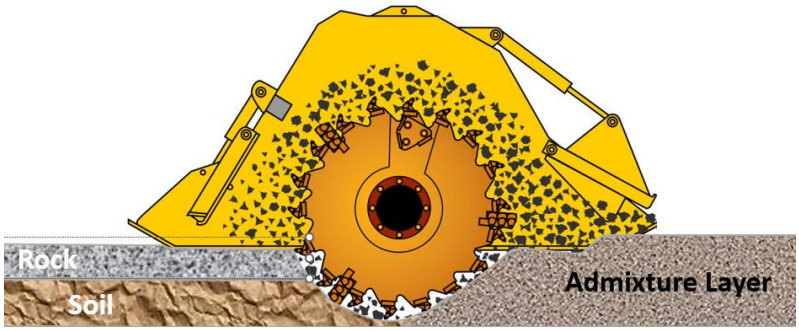

Figure 3 – Soil/Rock Placement

The initial depth of layers may require multiple iterations in each demonstration described above to determine the appropriate thickness of rock and soil to get the 60% rock to 40% soil 10-inch-thick layer desired. This will be field determined during the demonstration process by field inspections and appropriate field measurements.

3.2 Mechanical Mixing

From prior experience on similar projects, a reclaimer (also known as a roto-mill, rotary mixer, or soil stabilizer) will be utilized to mix the rock and cover soil layers. The reclaimer will be set to a depth of 10 inches to enable mixing the rock and soil layers. That is, the circular tiller portion shown above in Figures 2 and 3 (colored orange) will be set to extend 10-inches beneath ground surface. Settings of the reclaimer will be documented during the demonstration to determine if limitations are required for the reclaimer to reproduce desired results. Settings may include

depth, travel speed, position of the front and rear mix doors, and direction of travel. In the event a reclaimer is not available; alternative mixing methods may be developed.

3.3 Compaction

The surface admixture layer goal density is about 85% of the maximum dry density (MDD) per ASTM D698. This is the approximate density of the cover soil borrow source in an undisturbed setting. Over compaction is not desired because the layer will be drill seeded and the vegetation establishment may be delayed by too high a density. A low density likely produces non-uniformity and thus preferential flow of meteoric water. Previous experience has illustrated that a reclaimer deposits material at approximately 75% of the MDD post mixing, however variations in rock size, rock to soil ratio, admixture depth may affect this density. Following reclaimer mixing, the resultant admixture layer will be observed by the design engineer to determine if further compaction is required. If further compaction is required, a variety of conventional equipment may be utilized to determine the type of equipment, and number of passes necessary to achieve the desired density of the admixture layer.

4.0 Quality Assurance (QA) Requirements

Following completion of each surface admixture layer test pad(s), inspection and verification by the design engineer will be conducted to ensure adherence to the design criteria. The following techniques will be used to evaluate the construction of the test pad and develop the method specifications.

Multiple reference areas will be selected at the discretion of the design engineer to evaluate the construction of the admixture layer. Locations and number of areas to be inspected will be based on the size of the test pads and consistency of the results as inspections are conducted. QA shall emphasize the following issues meet the design intent:

1. material requirements for both cover soil and rock;
2. material placement methods;
3. volumetric ratio mixture of 60% rock to 40% soil;
4. layer thickness of 10-inches;
5. uniformity of mixture;
6. compaction requirements and uniformity of density; and
7. moisture and density requirements for frost protection soil layer surface prior to placement of surface admixture layer.

The acceptable tolerances of these items shall be defined by the design engineer during implementation of this plan.

4.1 Soil/Rock Volume Ratio

A unit volume of the surface admixture cross section will be extracted. The volume extracted will be determined. The soil and rock will be segregated in containers by hand or with the aid of a

sieve. Following segregation, the volume of each material type will be measured to ensure the desired ratio has been met.

4.2 Material Uniformity

Visual inspection by the design engineer of the reference area will be utilized to determine if the rock and soil distribution is adequate. The inspection will consist of visual observation of the material extracted, cross-sections of exposed side walls of the remaining admixture layer, and observation of the bottom of the reference area will be conducted to ensure rock is not significantly distributed below the 10-inch admixture layer depth.

4.3 Compaction

The compaction method (e.g.: type of equipment, number of equipment passes, moisture content of soil) will be visually inspected to ensure consistency for future full-scale deployment. The design engineer will visually inspect the area(s) that the admixture layer has been constructed and compacted. Details of the compaction method that produces satisfactory results will be documented and included in the method specification intended for full-scale construction of the surface admixture layer.

4.4 Material Density

The density of the removed materials shall be determined. A method similar to ASTM D1556 (Standard Test Method for Density and Unit Weight of Soil in Place by sand-Cone Method) or other as field determined by the design engineer shall be used to determine the field density of the admixture after compaction. This will be performed in multiple locations to evaluate the uniformity of density of the installed layer.

5.0 Method Specification

A specification will be developed based on results of the demonstration of the surface admixture layer for full-scale deployment of the cover system. The purpose of the specification is to ensure construction of the surface admixture layer for the ET cover system meets all performance criteria.

The specification will describe the surface admixture layer installation requirements to meet the following:

1. material requirements for cover soil and rock;
2. material placement requirements;
3. volumetric ratio mixture of 60% rock to 40% soil;
4. layer thickness of 10-inches;
5. uniformity of mixture;
6. compaction requirements and uniformity of density; and
7. moisture and density requirements for frost protection soil layer surface prior to placement of surface admixture layer.

The acceptable tolerances of these items shall be defined in the method specification. Multiple method specifications may be developed to accommodate multiple variations for construction.