Department of Energy
Washington, DC 20585

August 31, 2011

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Deputy Director
Mail Stop T8F5
Washington, DC 20555-0001

Subject: Proposed Evaluative Monitoring Work Plan for the Bluewater, New Mexico, Disposal
Site to Determine Cause of Uranium Alternate Concentration Limit Exceedance

References:
1) U.S. Department of Energy Letter to U.S. Nuclear Regulatory Commission, May 24, 2011 "Uranium Concentrations in Monitoring Well T(M) at the Bluewater, New Mexico, Disposal Site"

2) U.S. Department of Energy Letter to U.S. Nuclear Regulatory Commission, May 26, 2010, "Concentrations in Monitoring Well T(M) at the Bluewater, New Mexico, Disposal Site"

3) U.S. Department of Energy letter to U.S. Nuclear Regulatory Commission, March 1, 2011, "Concentrations in Monitoring Well T(M) at the Bluewater, New Mexico, Disposal Site

To Whom It May Concern:

The purpose of this letter is to transmit for U.S. Nuclear Regulatory Commission (NRC) staff review the enclosed evaluative monitoring work plan to address the exceedance of the alternative concentration limit (ACL) for uranium at the Bluewater, New Mexico, Uranium Mill Tailings Radiation Control Act, Title II, disposal site. In a letter to the NRC dated May 24, 2011 (Reference 1), the U.S. Department of Energy (DOE) informed NRC that an evaluative monitoring work plan would be developed to propose actions to determine the cause of exceedance of the uranium ACL in alluvium point-of-compliance (POC) monitoring well T(M) at the disposal site. DOE had expected that the ACL would be exceeded (Reference 2) and informed NRC of the exceedance on March 1, 2011 (Reference 3).

The alluvium point-of-exposure well X(M) is dry and DOE has been unable to collect samples as required by the Long-Term Surveillance Plan (LTSP). POC well T(M) is nearly dry. Therefore, as discussed at the site field trip on April 25, 2011, and reported to you previously (Reference 1), DOE is proceeding with the monitoring program. DOE installed two new alluvium wells at the site in July 2011 to allow continued downgradient sampling of the alluvial aquifer. Well 22(M) was installed downgradient of well T(M). Well 21(M) was drilled near the southeast corner of the site. Figure 3 in the enclosure is a map of well locations. These wells are being sampled and added to the regular sampling network.

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The LTSP for the site requires development of the work plan and NRC review prior to initiating the evaluative monitoring program to address the uranium ACL exceedance. Per the LTSP, results of the monitoring program will be used, in consultation with NRC, to determine if corrective action is necessary. We are available to discuss the contents of the work plan to facilitate your review.

Please call me at (970) 248-6020 if you have any questions. Please send any correspondence to:

U.S. Department of Energy
Office of Legacy Management
2597 Legacy Way
Grand Junction, CO 81503

Sincerely,

April Gil

April Gil, Ph.D.
Site Manager

Enclosure

cc w/enclosure:
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File: BLU 410.02 (rc grand junction)

Gil/Bluewater/8-30-11 Proposed Evaluative Monitoring Work Plan NRC.doc

LMS/BLU/S08130

U.S. Department of Energy
Office of Legacy Management

Proposed Evaluative Monitoring Work Plan for the Bluewater, New Mexico, Disposal Site to Determine the Cause of Uranium Alternate Concentration Limit Exceedance

August 2011

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Abbreviations

ACL	alternate concentration limit
ARCO	Atlantic Richfield Company
DOE	U.S. Department of Energy
EMWP	evaluative monitoring work plan
LTSP	Long-Term Surveillance Plan
MCL	maximum concentration limit
mg/L	milligrams per liter
NMED	New Mexico Environment Department
NRC	U.S. Nuclear Regulatory Commission
POC	point-of-compliance
POE	point-of-exposure

1.0 Introduction

Analytical results from the November 2010 groundwater sampling event indicated that alluvium point-of-compliance (POC) well T(M) exceeded the alternate concentration limit (ACL) for uranium. As specified in the site Long-Term Surveillance Plan (LTSP), the ACL for uranium is 0.44 milligrams per liter (mg/L). The November 2011 sample result for uranium was 0.557 mg/L. In accordance with the LTSP, this exceedance was reported to the U.S. Nuclear Regulatory Commission (NRC). A confirmatory sample collected in April 2011 had a uranium concentration of 0.525 mg/L, thus confirming that the groundwater at well T(M) exceeds the ACL for uranium.

As stipulated in the LTSP (Section 3.7.1, page 42), the U.S. Department of Energy (DOE) is required to develop an evaluative monitoring work plan (EMWP) for review by NRC if confirmatory sampling verifies an ACL exceedance.

2.0 Background

Monitoring well T(M) is completed in alluvial gravels of the former Rio San Jose. The ancient river channel was filled with basalt from successive flows from a nearby volcano northwest of the site. The multiple basalt flows, collectively known as the Bluewater Basalt, consist of very hard basalt but are also highly jointed and fractured. Collapse features around the site suggest that lava tubes were also present to an unknown extent. At well T(M), the basalt is approximately 128 feet thick. The underlying alluvium, consisting mostly of sand and gravel, is only 5 feet thick. The river channel had cut into the Chinle Formation, so the alluvium overlies claystone in this formation.

The water level in well T(M) has dropped nearly 11 feet since DOE began monitoring the site in 1997 (Figure 1). Difficulty in developing the well in fall 2010 suggested that the well was corroded and potentially compromised. To verify its condition, a downhole video was taken in spring 2011. The video indicated that well construction is sound, but that groundwater was entering the well at the very bottom of the slotted casing because the water level had dropped to that elevation. Because the bottom of the slotted casing was set at the contact between the alluvium and underlying Chinle Formation, it is apparent that the alluvium at well T(M) is nearly dry.

The LTSP requires sampling of the point-of-exposure (POE) well if a constituent in a POC well exceeds an ACL. Well X(M) is the alluvium POE well; it is near the site boundary east and downgradient of well T(M). DOE attempted to sample the well beginning in 2008 to support a regional groundwater investigation being conducted by the New Mexico Environment Department (NMED), but the well has been dry, and no samples have been collected. Consequently, DOE has been unable to comply with the POE sampling requirements.

The uranium concentration in well T(M) has been trending upward since DOE acquired the site in 1997 (Figure 2). Consequently, DOE suspected that the ACL might be exceeded during the November 2010 sampling event, and notified NRC of this possibility in a letter dated May 26, 2010. Well T(M) is the only well in the site groundwater monitoring network that has a constituent that exceeds an ACL; no other concentrations for constituents of concern

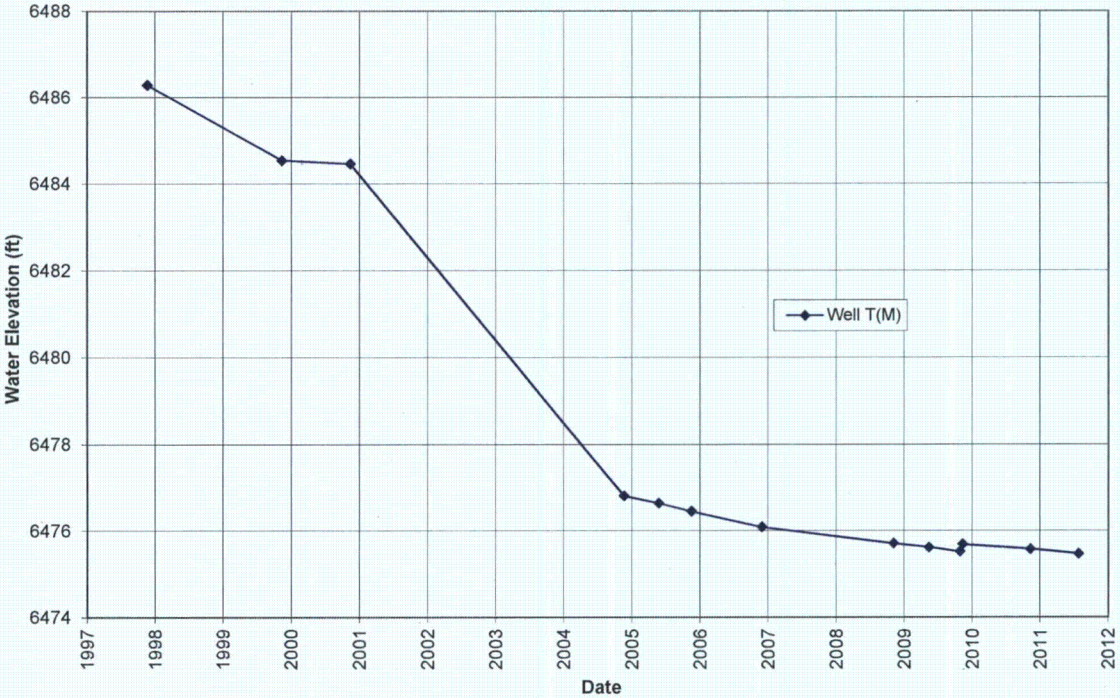

Figure 1. Hydrograph at Alluvium Well T(M)

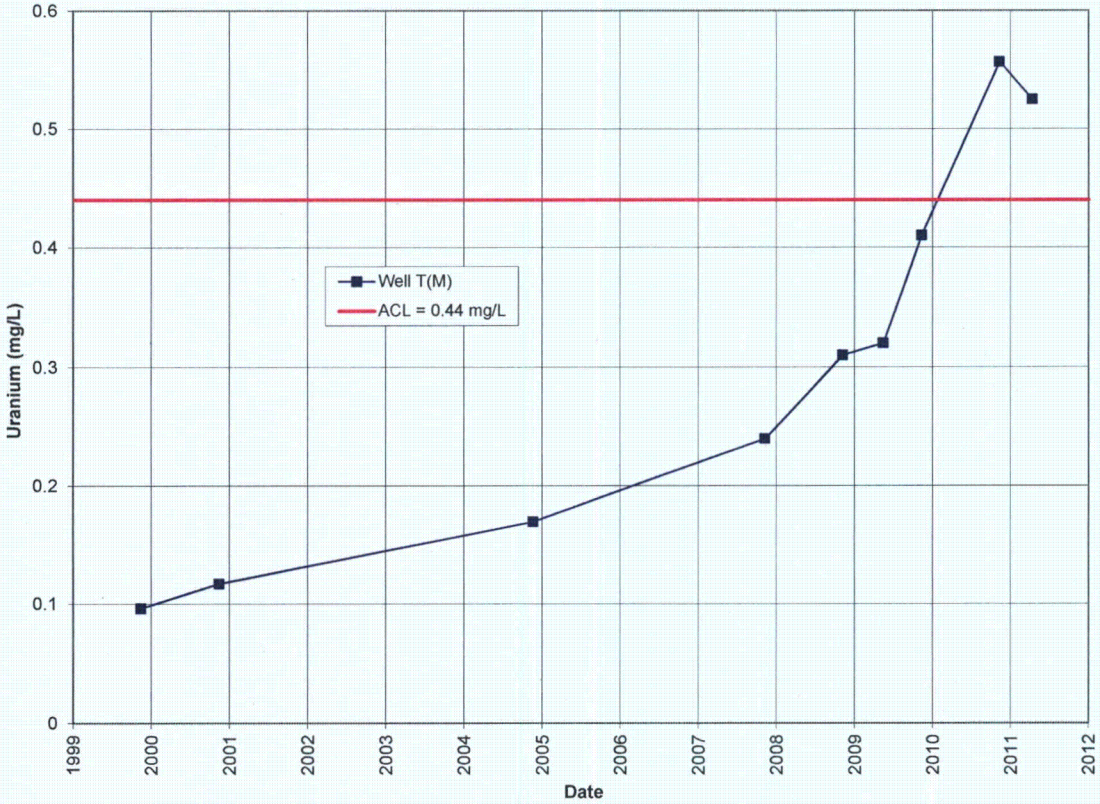

Figure 2. Uranium Concentrations at Alluvium Well T(M)

(molybdenum, selenium, and uranium) exceed U.S. Environmental Protection Agency maximum concentration limits (MCLs). However, DOE began monitoring nitrate concentrations in 2008 to support the NMED groundwater investigation. Well T(M) also has nitrate concentrations in excess of the MCL, ranging from 48 to 66 mg/L. Nitrate concentrations in all other wells in the monitoring network are substantially below the MCL of 10 mg/L.

The cause of the elevated uranium and nitrate concentrations in well T(M) has not been determined. However, the well is downgradient of the disposal cells, and it is possible that a contaminant plume is migrating past the well. Decreasing water levels in all of the site wells may indicate that drainage from the cells has decreased or ceased, and that the contaminant concentrations in well T(M) may be legacy milling contaminants. Further investigation is needed to understand the cause of the elevated uranium and nitrate concentrations.

ACLs were developed by the former licensee and approved by NRC based on an aquifer model prediction that if contaminant concentrations remained below their respective ACLs at the POC wells, then contaminant concentrations would not exceed their respective MCLs at the site boundary. The site boundary is considered to be the POE. However, because POE well X(M) is dry, it is not possible to verify that contaminant concentrations in the alluvial aquifer are below MCLs at the site boundary.

3.0 Work Plan

The proposed EMWP to address the ACL exceedance for uranium in POC well T(M) is summarized as follows:

1. Add a monitoring well downgradient of T(M) at a location where a thicker sequence of saturated alluvium is expected to be present.
2. Add a monitoring well downgradient of T(M) and near the site boundary where the thickest sequence of saturated alluvium is expected to be present.
3. Monitor all site alluvium wells twice per year, and evaluate the sample results to determine if contaminants are leaving the site.
4. Evaluate whether the disposal cells are leaking into the alluvial aquifer.

3.1 New Monitoring Wells

The first two items have already been completed because of the potential that POC well T(M) will dry up soon, and because of the need to acquire groundwater quality data at the site boundary. Former licensee data were reviewed to determine well locations that would have the greatest potential for being completed in saturated alluvium. Based on limited information, Atlantic Richfield Company (ARCO) projected where the main channel of Rio San Jose, and thus potentially the thickest sequence of alluvium, could have been before the ancestral river valley was filled with basalt.

New well 21(M), completed in July 2011, was sited on this projected channel line near the southeast site boundary. Drilling of well 21(M) encountered 25 feet of alluvium between the bottom of the basalt flows and the old erosional surface of the Chinle Formation, and the entire

thickness is saturated. A 10-foot section of slotted PVC screen was installed, with the bottom of the screen at the contact between the alluvium and the Chinle Formation.

Because of the uncertainty of the ARCO data, the location of well 22(M) was chosen based on former ARCO well U(M), which was decommissioned prior to site transfer to DOE. The log for well U(M), located between well T(M) and the site boundary, indicated an alluvium thickness of 15 feet, with the entire thickness being saturated. Consequently, well 22(M) was sited near the former location of well U(M) and completed in July 2011. Well 22(M) encountered 19 feet of alluvium with a saturated thickness of 9 feet. A 10-foot section of slotted PVC screen was installed in this well also, with the bottom of the screen at the contact between the alluvium and the Chinle Formation.

The well locations at the Bluewater site are shown in Figure 3. Monitoring wells with a suffix of "(M)" are completed in the Rio San Jose alluvium under the Bluewater Basalt, which is locally known as "El Malpais." Wells with a suffix of "(SG)" and well OBS-3 are completed in either the San Andres Limestone or the Glorieta Sandstone, which are hydraulically connected and comprise the San Andres/Glorieta aquifer.

3.2 Groundwater Monitoring

The groundwater monitoring requirement for the site, as stipulated in the LTSP, is once every 3 years (annual monitoring was required through 2001). However, DOE reinitiated annual sampling in 2008 and, in 2011, increased it to twice per year in support of NMED's regional groundwater study. DOE proposes to continue this frequency at least through 2015.

The first sampling event for 2011 was scheduled for May but was delayed until late July so that the new wells could be sampled. Typically, the well network will be sampled in May and November each year. Sample analysis, data validation, and electronic entry of the results into DOE's database usually take about 3 months.

DOE will evaluate the data on an ongoing basis to determine if contaminants in the alluvial groundwater are leaving the site, or if they are projected to leave the site. This effort will include the acquisition and review of groundwater data and groundwater model predictions developed by ARCO. If there is evidence that contaminant concentrations in excess of their respective MCLs are leaving or may leave the site, then DOE will evaluate options that may include one or more of the following courses of action:

- Monitor offsite private wells that are completed in Rio San Jose alluvium.
- Install offsite alluvium wells to define the extent of the contaminant plume.
- No action.

DOE does not anticipate replicating or validating the ARCO models, or conducting new groundwater modeling, for the site. Many of the former wells ARCO used were decommissioned prior to site transfer to DOE, and the current well network has too few wells to develop a representative model. Also, because of the need to drill through the hard basalt flows, adding a large number of new wells is cost-prohibitive.

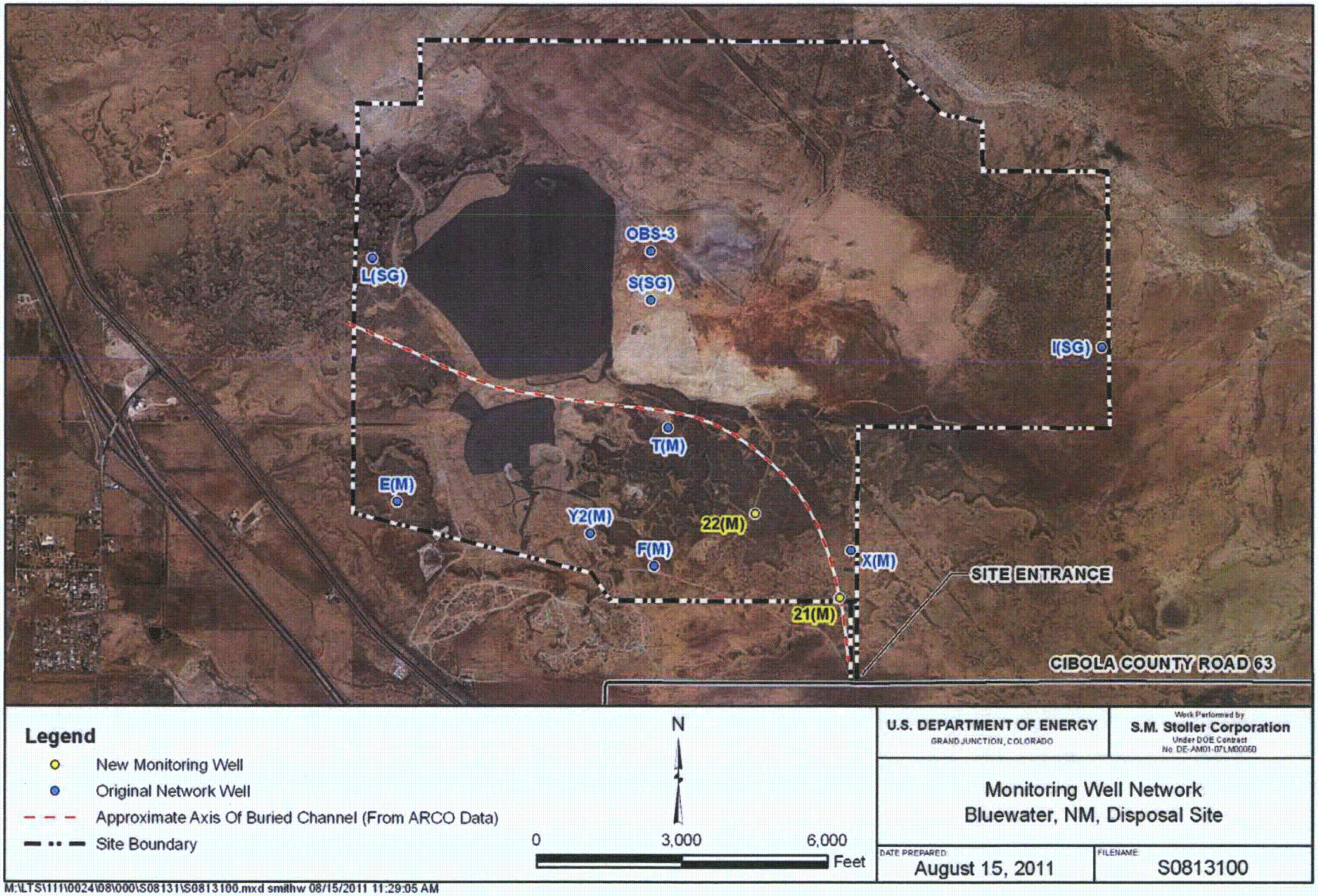

Figure 3. Monitoring Well Network at the Bluewater, New Mexico, Disposal Site

3.3 Disposal Cell Evaluation

As mentioned previously, groundwater levels in the well network, consisting of both alluvial aquifer wells and bedrock aquifer (San Andres/Glorieta aquifer) wells, have declined since DOE acquired the site in 1997. Mill operations artificially recharged the aquifers as tailings were slurried to locations that are now occupied by the carbonate tailings disposal cell and the main tailings disposal cell. The carbonate tailings were deposited directly on the basalt surface, and the tailings fluids apparently infiltrated the highly jointed and fractured basalt down to the Rio San Jose alluvium. A substantial portion of the main tailings pile also overlies the basalt, and those fluids likely recharged the alluvium.

The mill tailings were capped in place, so transient drainage from the encapsulated tailings was expected to occur for an undetermined amount of time. However, the disposal cell covers were designed to shed surface runoff from rainfall and snowmelt so that new water was not introduced into the cells. This design was intended to effectively remove the mill tailings as a continuing source of groundwater contamination.

The effectiveness of the disposal cell covers in preventing infiltration is unknown. Settling has occurred in the north portion of the main tailings disposal cell, and precipitation tends to temporarily pond in shallow depressions on the cell cover. Also, deep-rooted vegetation is establishing on the cell cover, suggesting a sustainable water source in the upper part of the cell.

As part of this EMWP, DOE proposes to evaluate whether the disposal cells are continuing to drain and if the covers are preventing infiltration of water as designed. This proposed effort would include the following activities.

- Research the cover design, using ARCO information (e.g., rock cover thickness, radon barrier thickness, and radioactivity of tailings underlying the radon barrier).
- Evaluate historical data concerning the water balance after cell completion and the potential residual water in the tailings.
- Conduct and evaluate cover infiltration tests.
- Evaluate bio-uptake of contaminants into deep-rooted plants on the cell covers and associated risk.
- Develop a report with the findings that includes a recommendation for cover modification if it is determined that the cell covers are not functioning as designed.