UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 9, 2020

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

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION STAFF REVIEW OF THE U.S. DEPARTMENT OF ENERGY'S RADIOLOGICAL MONITORING SUMMARY FOR THE SECOND QUARTER 2019 FOR THE MEXICAN HAT UTAH, DISPOSAL SITE (Docket No. WM-00063)

Dear Ms. Denny:

I am writing in response to your letter, dated November 20, 2019, providing the U.S. Department of Energy's (DOE's) second quarter 2019 radiological monitoring summary for the Mexican Hat, Utah, Disposal Site (Agencywide Documents Access and Management System [ADAMS] Accession Number ML191330D846).

On July 22, 2019, the U.S. Nuclear Regulatory Commission (NRC) staff provided the DOE staff with comments on the report for the fourth quarter 2018, first quarter 2019 sampling results and the Radiological Monitoring Plan (Monitoring Plan) for the Mexican Hat site (ADAMS Accession Number ML19198A139). In that letter the NRC staff raised concerns about the processes in the Monitoring Plan and conclusions in the sampling report. On October 16, 2019, during the DOE/Navajo/Hopi quarterly meeting NRC staff again raised questions about the Monitoring Plan processes and collusions in the report and DOE staff stated that the NRC staff concerns would be addressed in the next sampling report. However, the DOE staff did not address the NRC staff's comments in the second quarter 2019 report.

The NRC staff's comments on the fourth quarter 2018 and first quarter 2019 report and the Monitoring plan are included below. These comments are also applicable to the second quarter 2019 report, as indicated, and the Monitoring Plan provided with the fourth quarter 2018 and first quarter 2019 reports. Please provide your responses to the NRC staff's comments below as soon as you are able or provide the NRC staff with an estimate of when you will address the comments.

Please note that, due to the issues raised by the NRC staff with respect to the sampling processes used at the Mexican Hat site, we have concerns about the DOE's conclusions regarding the radiological status of the site using the Monitoring Plan and information developed by DOE.

1. The fourth quarter 2018, first quarter 2019 and second quarter 2019 report include a table listing the "mean on-site environmental dose" and the "mean off-site environmental dose." The methodology for determining these values should be explained in the report or the Monitoring Plan.

2. The first quarter 2019 results include a discussion of the variances between the fourth quarter 2018 and first quarter 2019 results. The second quarter 2019 report also includes the same reasons for the variances. However, it is not clear how the DOE interpreted the differences, especially considering the significant decrease in radon concentrations measured from the fourth quarter 2018 to the first quarter 2019. Please provide a discussion on how the DOE determined the variances.

3. Monitoring Plan, Figure 2, "Example of Natural Variation in Radon Progeny Isotope: ^{210}Pb Concentration," presents data by Yamamoto et al. (2006), which is monthly depositional flux of ^{210}Pb from 1991 to 2002 in Tatsunokuchi, Japan. As explained by Yamamoto, the cycles observed in his data are the result of seasonal changes in precipitation (i.e., peaks occur once per year during the wet winter season), not changes in barometric pressures and temperatures, as suggested in the first bullet above Figure 2. The NRC staff suggests the authors find an alternative citation for the statement that continuous radon gas monitoring accounts for natural variations in radon emanation over extended time periods.

4. Monitoring Plan, Table 1, "Measurement Device Specifications," states the "useful dose range" for the Radonova Rapidos HS Environmental Radon Monitor is a "daily" concentration of 0.02 pCi/L and a "total" concentration of "76 pCi/L, 10-28,000 pCi/L-days."

   The NRC staff believes that the description of these values is not correct. For example, the manufacturer's website states its Radtrak^2 long term measurement detector has a range of 15 to 25,000 Bq/m^3 (0.4 to 680 pCi/L) over 90 days. This is equivalent to 36 to 61,000 pCi/L-days. Please clarify the range of the Radonova detector and whether the lower bound of the 90-day range (i.e., a minimum detectable concentration of ~0.4 pCi/L) is sufficiently sensitive to meet the study objectives (see related comment below).

5. The NRC staff independently examined whether the proposed sample locations and methodology would meet the stated objectives of the study, which is, "…to determine the presence or absence of elevated radiological readings at the site compared to background conditions, and to obtain a robust data set that provides supporting evidence that the disposal cell remains protective of human health and the environment." (Ref: p. 2, Step 2 of the monitoring plan).

   The NRC staff used MILDOS v. 4.02 to model the concentration of radon-222 at each on-site and off-site sample location. The NRC staff modeled a hypothetical large breach in the radon barrier as an area source 10 meters wide by 100 meters long with a radon-222 flux of 1,000 picocuries per square meter per second (pCi/m^2-s). The NRC staff used a radon flux of 1,000 pCi/m^2-s to represent complete removal of the radon barrier in the affected area. The NRC staff assumed the modeled source is located at the area marked as "the surveyed outline of depression" in Figure 3, "Initial Planned Radiological Monitoring Locations at the Mexican Hat, Utah, Disposal Site," of the monitoring plan. The NRC staff modeled sample locations CRML-1 through CRML-18 as individual receptors. The NRC staff used the wind rose provided in Figure 4, "Mexican Hat Meteorological Station Wind Rose, July 2017-May 2018," of the monitoring plans, and assumed the atmospheric stabilities were distributed as follows: 70 percent Class D; 20 percent Class E; and 10 percent Class F.

The NRC staff's calculation indicates that monitoring locations CRML-5, CRML-4, and CRML-3 would have radon-222 concentrations marginally detectable above natural background (i.e., net concentrations of about 0.9 pCi/L, 0.4 pCi/L, and 0.1 pCi/L, respectively) in the event of a large breach of the radon barrier. However, radon concentrations at all other onsite and offsite sample locations would be indistinguishable from natural background concentrations. This means that, in the event of a large breach, the average of 9 on-site measurements, 6 of which would be indistinguishable from natural background concentrations, would not be expected to be statistically distinguishable from the average of 9 off-site measurements. As a result, the NRC staff questions whether the statistical test used is sufficient to meet the objective of providing supporting evidence that the disposal cell remains protective.

The NRC staff also used its MILDOS v. 4.02 model to determine that sample locations CRML-15, CRML-16, and CRML-17, would be least affected by a large breach on the eastern toe of the tailings pile. For this reason, the NRC staff believes a more appropriate statistical test would involve comparing the results from each on-site sample to an average of one or more upwind background sample locations. For example, a measured value 0.9 pCi/L at CRML-5 would be statistically different than an average background concentration at CRML-15, CRML-16, and CRML-17 of 0.4 pCi/L, thus reliably indicating the presence of a large breach near CRML-5.

In accordance with10 *Code of Federal Regulation* 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's ADAMS. ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

If you have any questions concerning the NRC comments please contact me at 301-415-6749 or at Dominick.Orlando@nrc.gov.

Sincerely,

Dominick Orlando, Senior Project Manager
Uranium Recovery and Materials
Decommissioning Branch
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Docket No.: WM-00063
cc: MexicanHat Listserv

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