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

July 22, 2019

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 SUMMARIES FOR THE FOURTH QUARTER 2018 AND FIRST QUARTER 2019 FOR THE MEXICAN HAT UTAH, DISPOSAL SITE (Docket No. WM-00063)

Dear Ms. Denny:

I am writing in response to your two letters, both dated June 3, 2019, providing the U.S. Department of Energy's (DOE's) radiological monitoring summaries for the Mexican Hat, Utah, Disposal Site (Agencywide Documents Access and Management System (ADAMS) Accession Number ML19161A142). The first letter provides the results for the fourth quarter 2018 and the Radiological Monitoring Plan for the site dated September 2018. The second letter provides the results for both the fourth quarter 2018 and the first quarter 2019 and the Radiological Monitoring Plan. Both letters state that no radiological limits were exceeded and that this supports the DOE's conclusion that residual radioactive material has not been exposed at the depressions on the disposal cell. The second letter also indicates that there are variances between the fourth quarter 2018 and first quarter 2019 results and provides a discussion of the potential reasons for the variances.

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the letters and radiological monitoring plan (Monitoring Plan) and has the following comments and suggestions:

1. The June 3, 2019, letters for both the fourth quarter 2018 and first quarter 2019 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 June 3, 2019, letter providing the first quarter 2019 results includes a discussion of the variances between the fourth quarter 2018 and first quarter 2019 results. 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% Class D; 20% Class E; and 10% 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* (10 CFR)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 feel free to contact me at 301-415-6749 or at Dominick.Orlando@nrc.gov.

Sincerely,

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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

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R. Evans RIV H.Grepford, RIV, M. Posten-Brown, RIV

Adams Accession No ML19198A139 ***via email**

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