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January 25, 2024

Arturo Duran, Designated Agency Manager
U.S. Department of Energy
Environmental Management
Los Alamos Field Office
1200 Trinity Drive, Suite 400
Los Alamos, NM 87544

RE: CORRECTION: APPROVAL WITH MODIFICATIONS
PROPOSED WELL DESIGN FOR REGIONAL AQUIFER MONITORING WELL R-76
LOS ALAMOS NATIONAL LABORATORY
EPA ID#NM0890010515
LANL-22-019

Dear Arturo Duran,

The New Mexico Environment Department (NMED) has received the United States Department of Energy (DOE) *Proposed Well Design for Regional Aquifer Monitoring Well R-76* (Well Design) dated and received on December 22, 2023 and referenced as EM2023-0861.

NMED reviewed DOE's proposed well design for the regional aquifer groundwater monitoring well R-76 and issued an approval with modification on January 17, 2024. NMED included an error in the approval with modification letter and is issuing this correction. The approval with modifications letter stated that cement should be used to seal from the top of the 5-foot bentonite pellet seal interval to the surface. The correction to the letter will clarify that cement should be used to seal from the top of the 5-foot bentonite pellet seal interval to the top of the Puye formation. NMED approved the screen placement with the following modification:

> NMED requires that the screen be set from 940 – 960 ft below ground surface (bgs), which is 5 feet deeper than the DOE proposed design.

This interval was selected based on review of drill cuttings, geophysical logs, and particle size analysis from the well design proposal. The modified placement focuses the screen within the zone showing highest permeability and evidence of Molasses injection in cuttings from 950-955.

NMED requires that the 14-inch drive casing be extended to the total depth of the well, approximately 995 ft bgs. The casing shoe must be cut at total depth and the remaining casing and shoe must be sealed with cement. The current location of the 14-inch drive casing and shoe would be located within 20 feet of the developed well screen, which can cause reducing conditions in the nearby aquifer resulting from the carbon steel.

NMED notes that according to Figure 2, Stratigraphy encountered at R-76 and proposed well design, indicates that bentonite chips will be used to seal from the Puye formation to approximately 60 ft bgs.

NMED cites NMAC 19.27.4.7.G, used by the New Mexico Office of the State Engineer (NMOSE), to define hydrogeologic units. This defines a hydrogeologic unit as any soil or rock unit or zone which by virtue of its porosity or permeability, or lack thereof, has a distinct influence on the storage or movement of groundwater. Additionally, NMOSE stated in the response to the Well R-80 Monitoring Well Permit Application that the use of bentonite as a seal where multiple hydrogeologic units will be penetrated and where contamination is present, does not comply with the sealant guidelines. NMED recommends revising the well design to include 5 feet of 20/40 transition sand at the top of the screen and also 5 feet of the bentonite pellet seal above the transition sand. This will support geochemical and physical separation of the filter screen and the required cement column. Cement should be used to seal from the top of the 5-foot bentonite pellet seal interval to the top of the Puye formation.

NMED is also providing comments on the lithological characterization of the borehole included as Attachment 1.

If you have any questions regarding this letter, please contact Kylian Robinson (505) 231-5423.

Sincerely,

Rick Shean
Designated Agency Manager
Director, Resource Protection Division
New Mexico Environment Department

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Attachment 1: NMED Lithological Characterization Comments

File: 2024 LANL, Approval with Modifications, Proposed Well Design for Regional Aquifer Monitoring Well R-76

Attachment 1
NMED Lithological Characterization Comments

DOE describes the lithology at the contact of Cerros del Rio Basalt and Puye as Puye at first contact (675-680 ft bgs). At this location NMED's evaluation demonstrates that the neutron count remains high and a composition of approximately 80% Basalt and 20% Puye (Table 1). NMED advises that the change of formation should be called when the Puye indicator clast dominates the sample, rather than when it first appears in trace amounts. From NMED evaluation, it is not apparent until reaching depths of 720-725 ft bgs that the Puye clast count exceeds Basalt, and this corresponds with a drop in the neutron count indicating sedimentary porosities.

It may also be beneficial to designate a contact lithology for this interval, given that thin basalt flows on cold clastics would likely result in different hydrogeological characteristics than either a thick basalt flow or the Puye beneath it.

 *Figure 1: R-76 670-675 CDR Basalt.*	 *Figure 2: R-76 675-680 CDR Basalt with Puye clasts.*	 *Figure 3: R-76 720-725 Top of Puye-dominated lithology.*

Table 1: Selected photographs of the Cerros del Rio (CDR) and Puye contact chip record at 8x magnification.

NMED's evaluation, based on clast percentages and the presence of tan fines (silt and clay) that remains adhering to the surface of clasts, also logs Pumicious Puye from 915-995 ft bgs and Miocene Pumicious from 995-1000 ft bgs. The Miocene Pumicious formation is composed of nearly pure pumice and is only 6-10 feet thick at the reference outcrop. The overlying Pumicious Puye includes Puye with sand and fines as matrix to the pumice clasts and is 60-70 feet thick at the reference bed (Table 2). This is where the loss of fines in the sample method is important because it may change the apparent percentage of the remaining clasts.

		
Figure 4: R-76 910-915, Puye.	*Figure 5: R-76, 915-920' BGS, Pumicious Puye.*	*Figure 6: R-76 995-1000, Miocene Pumicious*

Table 2: Selected photographs of the Puye Pumicious and Miocene Pumicious contact at 8x magnification.

Miocene Pumicious (Table 3) is a thin indicator bed suggesting close proximity to the Chamita and extreme caution is required during drilling operations to maintain control over inter-aquifer flows which may occur under confined conditions. The means of delineating the boundaries of these units is important, and NMED would like to engage in dialogue regarding why EM-LA did not map any Pumicious Puye at this location.

	
Figure 7: Typic appearance of unsaturated Miocene Pumicious at Guaje canyon outcrop. This is the pure deposition which occurred in the Miocene. It may be completely absent in some areas and is only 10' thick at the indicator outcrop.	*Figure 8: Typic appearance of unsaturated Puye Pumicious at the reference outcrop. Pumice Clasts appear to occupy only 10% of the groundmass. This unit is much thicker, 60' at the reference outcrop. The unit's deposition proceeded well into the Pliocene.*

Table 3: Typic clasts and peds from the Pumicious units at the base of the Puye formation.

NMED supports accurate determination of the difference between Pumicious Puye and Miocene Pumicious units, reflecting known distribution of the units and upholding safe exploration of contamination in the Chamita formation.

NMED recognizes that valid differences of opinion or site methodology may exist on this question, and that no differences in well design for R-76 hinge upon either of these last two descriptive differences.