



June 29, 2022

Arturo Duran
Designated Agency Manager
Department of Energy-EM
1200 Trinity Drive, Suite 400
Los Alamos, New Mexico 87544

Re: Approval with Modifications
Drilling Work Plan for Groundwater Regional Aquifer Monitoring Well R-76 (Replacement of Groundwater Regional Aquifer Monitoring Well R-28), Revision 1
Los Alamos National Laboratory
EPA ID#NM0890010515
HWB-LANL-22-019

Dear Mr. Duran,

The New Mexico Environment Department (NMED) has received the United States Department of Energy (DOE) *Drilling Work Plan for Groundwater Regional Aquifer Monitoring Well R-76 (Replacement of Groundwater Regional Aquifer Monitoring Well R-28), Revision 1* (Revision 1) dated and received on June 10, 2022 and referenced by EM2022-0340. DOE submitted Revision 1 in response to the informal technical comments issued by NMED in April 2022 (Comments). The Comments were issued by NMED to DOE following NMED's review of DOE's *Drilling Work Plan for Groundwater Regional Aquifer Monitoring Well R-76 (Replacement of Groundwater Regional Aquifer Monitoring Well R-28)* (Work Plan) and were issued in general accordance with the process outlined in Section XXIII of the 2016 Order on Consent (CO). The Work Plan was submitted to NMED by DOE on March 17, 2022 in fulfillment of Fiscal Year 2022 (FY2022) Milestone No. 8.

NMED has reviewed Revision 1 and approves the revision with modifications. The required modifications that DOE must implement for the approval of FY2022 Milestone No. 8 to be valid are provided in the following narrative.

1. Drilling Approach, Page 2.

DOE Statement: *"Because the deeper portion of the borehole is expected to encounter potentially unstable Tcar sediments, the drilling subcontractor may use various techniques to maintain borehole stability and eventual placement of a well screen. Specific techniques that may be used to manage conditions in the Tcar are not provided in this work plan. DOE and the selected drilling subcontractor will have the responsibility to use drilling and well-completion methods that are best suited for the conditions encountered."*

NMED Modification: As stated in the Comments, the potential for encountering flowing sands in the

Chamita formation are a concern, especially considering those encountered at the recent drilling of R-73. All drilling operations must conform to Appendix F of the CO regardless of DOE's position that *"DOE and the selected drilling subcontractor will have the responsibility to use drilling and well completion methods that are best suited for the conditions encountered"*. This statement is unacceptable considering the agreed upon drilling requirements established between NMED and DOE in the CO.

2. Geophysical Testing, Page 2.

DOE Statement: *"The geophysical data will be used in conjunction with drill cuttings and driller's observations to identify intervals within the aquifer that are suitable for screen placement."*

NMED Modification: The field screening water-quality samples that will be collected by DOE and NMED during drilling operations (See NMED Modification No. 4) will also be used for screen placement.

3. Step-Drawdown Testing, Page 3.

DOE Statement: *"Step-drawdown testing will be performed to investigate and record each well screen interval's performance under controlled discharge conditions. Initial specific capacity will be determined for each screen interval, and the data will be used to help select a suitable permanent pump for the dedicated sampling system. Specific pumping rates for each step test will be determined in the field."*

NMED Modification: As instructed in the Comments, reference to conducting any hydraulic testing from Revision 1 should have been removed because such activities require a separate, detailed work plan and/or Standard Operating Procedure. NMED and the CO do not require well specific capacity. As a result, there will be no hydraulic testing associated with R-73 without the submittal of a work plan that discusses the planned method in detail.

Conducting a step-drawdown pumping test is not necessary to size the sampling pump. DOE should be able to select the sampling pump for R-76 using the performance of the sampling pump used at R-28 and other nearby monitoring wells, performance during development of R-73, and pump curves of suitable pumps based on this information.

The step-drawdown test is better suited to provide an understanding of well hydraulics, such as well efficiency and yield, and the adequacy of well development. Additionally, a step-drawdown test involves pumping a well at successively increasing constant rates over time periods of the same time duration. Consequently, DOE will not obtain one specific capacity value, but one for each step because both the pumping rate and the drawdown will be different for each step. Specific capacity is also dependent upon the time the measurement is selected to calculate specific capacity because the longer pumping continues, the more drawdown increases. This results in lower specific capacity at greater pumping times even in the same time step.

NMED will not accept any calculation of well or aquifer hydraulics from any pumping test, including a step-drawdown test, without an approved work plan. To submit a step-drawdown test work plan for NMED review, DOE must show that it will maintain a constant rate throughout each step i.e., the pump will be constantly adjusted to maintain a constant rate because of the loss in pump efficiency as drawdown increases. Additionally, the successive pumping rate increases with each step and be at increments that are in a similar order (e.g., 10, 20, 30, 40...). Each step must have equal time duration, typically 30 minutes each up to 120 minutes each or longer – but each step must be of equal duration. In the case of calculating

specific capacity from pumping tests, refer to ASTM D 5472 – 93 *Standard Test Method for Determining Specific Capacity and Estimating Transmissivity at the Control Well*.

4. Water Quality Sampling, Page 4.

DOE Statement: *“Water-quality samples will be collected at 20-ft intervals during advancement through the regional aquifer. Borehole water will be air lifted to the surface while each new section of 20-ft drill casing section is welded at the surface. Each sample will be collected from the air-lifted water just before continuing advancement of the casing string. These screening-level samples will be analyzed with fast turnaround at Los Alamos National Laboratory’s Geochemistry and Geomaterials Research Laboratory (GGRL) for anions and metals. This practice may not be conducted within the Tcar if circulation borehole water during the welding phase causes borehole instability.*

After achieving total depth at approximately 185 ft into the regional aquifer, a series of “temporary wells” will be constructed in the 10-in. borehole. A well string with a 5-ft stainless steel screened interval will be lowered into the drill casing to total depth, and the annular space around the well screen will be filled with 10/20 filter-grade silica sand (adjacent to screen slots) extending 1 ft to 2 ft above and below the screened interval and with 20/40 transition sand emplaced 5 ft above and below the primary filter pack interval. The 10-in. drill casing will then be retracted to expose the screen interval to the native formation.”

NMED Modification: As instructed in the Comments, Revision 1 should have included a passage that states that screening water-quality samples splits will be collected at 20-ft intervals during advancement through the regional aquifer and will be provided to NMED under NMED chain of custody protocol or that DOE will make the drill site safe and accessible for two NMED personnel at a time to collect their own screening-level groundwater samples during active drilling operations. Revision 1 does not include this very important condition. As with the recent drilling at R-73, DOE must allow for the collection of screening groundwater samples after each run during drilling, including through the Chamita formation, and for NMED to collect their own groundwater samples, or for DOE to do so under NMED chain-of-custody protocol. In addition, split samples of groundwater sampled collected using DOE’s *series of “temporary wells”* must also be provided to NMED under NMED’s chain-of-custody protocol.

NMED comments and DOE responses are attached with this letter. If you have any questions regarding this letter, please contact Mike Petersen (505) 690-5107.

Sincerely,

Rick Shean

Digitally signed by
Rick Shean
Date: 2022.06.29
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Rick Shean
Chief
Hazardous Waste Bureau

Attachment: NMED Comments and DOE Responses

cc:

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File: 2022 LANL, Drilling Work Plan for Groundwater Regional Aquifer Monitoring Well R-76 (Replacement of
Groundwater Regional Aquifer Monitoring Well R-28), Revision 1
June 10, 2022
LANL-22-019

**U.S. Department of Energy Responses to New Mexico Environment Department Draft Comments
on “Drilling Work Plan for Groundwater Regional Aquifer Monitoring Well R-76”
(Replacement of Groundwater Regional Aquifer Monitoring Well R-28),
Dated March 2022**

INTRODUCTION

To facilitate review of this response, the New Mexico Environment Department’s (NMED’s) comments are included verbatim. The U.S. Department of Energy (DOE) Environmental Management Los Alamos Field Office responses follow each NMED comment.

SPECIFIC COMMENTS

NMED Comment

1. Primary Objectives and Purpose, Page 1.

DOE Statement: “Characterization and monitoring within Tcar will help address uncertainties of whether the Tcar is a preferential pathway for chromium contamination that might originate within the plume centroid. ...The deeper screen at R-76 will complement a series of wells, including R-77 and R-73 that will characterize the Tcar from west to east along the groundwater flow path.”

NMED Comment: This last statement of this paragraph needs some clarification, specifically the last five words. NMED interprets this portion of the statement to either indicate that the Tcar may behave as a potential preferential pathway between the chromium plume centroid and PM-3 as previously mentioned or that a groundwater flow path i.e., vector flow along the deeper hydraulic gradient between these two points is believed to be present. Preliminary mapping of the deeper heads in the chromium plume by NMED indicates a groundwater flow path between CrEX-4 and R-28 is present but does not extend to R-70 and PM-3. If the statement was meant to read “preferential pathway” as previously mentioned instead of “groundwater flow path”, then NMED concurs with the statement. The statement should be clarified in a revision to the Drilling Work Plan for Groundwater Regional Aquifer Monitoring Well R-76 (Replacement of Groundwater Regional Aquifer Monitoring Well R-28) (Workplan) to indicate whether a flow path or a preferential pathway may exist.

DOE Response

1. The wording has been changed to “along the general direction of groundwater flow” to address NMED’s comment.

NMED Comment

2. Drilling Approach, Page 2.

DOE Statement: “The proposed drilling approach for R-76 will use fluid-assisted air-rotary with casing-advance methods. Telescoping casing sizes between 24 in. and 10 in., and dual-rotary methods will be used to advance the borehole to a depth within the upper 185 ft of the regional aquifer. This approach will produce a borehole that can accommodate an approximate 3-in. annular filter pack around the 5-in.-diameter well screen.”

NMED Comment: *Revise the Workplan to include a description on how DOE plans to address the potential for encountering flowing sands that have occurred during past deeper drilling operations at the Los Alamos National Laboratory (LANL). In the Workplan revision, also provide the centralizer specifications that will be used to ensure a sufficient annulus that complies with the State engineer's specifications and whether the driller will "hang" the well to aid in well plumbness to further ensure that a 3-inch annulus develops for emplacement of filter pack, bentonite seal and cement grout. This is crucial to ensure that an adequate seal is installed between the two well screens for subsequent vertical hydraulic gradient and geochemical profiling evaluations.*

DOE Response

2. DOE and the drilling subcontractor will be prepared to deal with the potential for borehole instability during drilling and well completion in the Tcar as such conditions arise. Language in the work plan has been changed to describe this perspective but does not include specific approaches that a drilling subcontractor may use. Additionally, the final well design will conform with applicable New Mexico Office of the State Engineer requirements, as noted in the Drilling Approach section.

NMED Comment

3. Potential Groundwater Occurrence and Detection, Page 2.

DOE Statement: *"Although perched-intermediate groundwater was not observed during drilling of nearby wells R-28 and CrEX-3, perched-intermediate groundwater is known to be present in the vicinity of the proposed location for R-76."*

NMED Comment: *In the revision, clarify this statement because it contradicts itself i.e., justify how perched-intermediate groundwater can be 'known to be present' in the vicinity of proposed monitoring well R-76 but was not observed during drilling of nearby R-28 and CrEX-3. If perched-intermediate groundwater is encountered with a sufficient quantity and yield (i.e., 250 milliliter per minute or more at three well volumes) while drilling R-76, NMED will require that a separate perched-intermediate aquifer monitoring well be installed at the R-76 location.*

DOE Response

3. The text in the work plan has been changed to "Although perched-intermediate groundwater was not observed during drilling of nearby wells R-42 and CrEX-4, perched-intermediate groundwater may be present in the vicinity of the proposed location for R-76."

NMED Comment

4. Geophysical Testing, Page 2.

DOE Statement: *"Geophysical logging will be conducted through the saturated interval in the regional aquifer when the borehole has been drilled to total depth. Logging data will be used to refine estimates of the top of regional saturation and to characterize the hydraulic properties of strata beneath the water table."*

NMED Comment: *Provide in the revision to the Workplan the specific geophysical logs that DOE will run, and the information DOE expects to obtain from each log to achieve the stated hydrogeological characterization.*

DOE Response

4. Additional detail has been provided on the specific logs (gamma and neutron) and their purpose.

NMED Comment

5. *Cuttings Characterization, Page 2*

DOE Statement: *“Cuttings will be collected from the length of the borehole.”*

NMED Comment: *Revise the Workplan to include that DOE will provide NMED with split samples of all cuttings collected during the drilling of R-76.*

DOE Response

5. The work plan has been revised to include a statement to that effect.

NMED Comment

6. *Hydraulic Testing, Page 3.*

DOE Statement: *“Both screened intervals will be hydraulically tested following development.”*

NMED Comment: *Hydraulic testing must be removed from the Workplan revision. Appendix C, Appendix E Section II and Appendix F Section I.B.6.c of the 2016 Order on Consent (CO) provides the appropriate investigations, standards, and reports where hydraulic testing are to be conducted and presented. NMED requires a specific workplan for all aquifer and well hydraulic tests that are in accordance with the CO and provides the rationale for the test including the purpose, goals, objectives, needs, methods, and the intended use for the acquired data including the proposed hydraulic test at R-76. If NMED concurs with the need, DOE shall provide a separate workplan prepared in accordance with NMED HWB’s Aquifer Testing Guidance Document (pending) and is conducted as part of an RCRA Facility Investigation (RFI) or Interim Measure (IM) in accordance with the CO and subject to NMED review, comment, and approval. NMED stresses the value in a singular, large-scale, long-term, multi-well aquifer performance test at the chromium plume over the individual limited tests typically performed at LANL. NMED will not accept any data derived from, or report that contains the hydraulic testing methodology, rationale and analyses used at monitoring well R-70.*

DOE Response

6. The hydraulic testing section has been replaced by a section on step-drawdown testing for the purpose of sizing the pump in the dedicated sampling system and determining the specific capacity of the well.

NMED Comment

7. *Water-Quality Sampling, Page 3.*

DOE Statement: *“If perched-intermediate groundwater is encountered, attempts will be made to collect screening-level samples using air-lifting or bailing methods. During drilling of the well, an investigation method (not yet determined) will be used to collect discrete-interval samples to help identify vertical extent of contamination. Such data may provide useful estimates of the vertical extent*

of chromium and, along with other lines of evidence, will be used for the well-design package submitted to NMED for review and approval.

The first groundwater samples from the completed well will be collected at the end of the hydraulic test in each of the two screens.”

NMED Comment: *Include in the revision to the Workplan that screening-level samples will also be collected from the regional aquifer and that split samples will be provided to NMED under NMED chain of custody protocol or that DOE will make the drill site safe and accessible for two NMED personnel at a time to collect their own screening-level groundwater samples during active drilling operations. Revise the Workplan to provide a detailed suitable investigation method. NMED would like to point out the method used during drilling of both R-35a and R-35b be considered to collect these groundwater samples during the drilling operation to install R-76. NMED analyte suites for collected groundwater samples shall consist of major cations and anions, fluoride, metals, tritium, low-level perchlorate, and nitrate. If groundwater is not encountered in the perched intermediate aquifer, NMED will not request to be on site until regional aquifer groundwater is encountered. All groundwater quality data collected by DOE shall be provided to NMED upon receipt from the laboratory.*

See NMED specific comment no. 6 regarding hydraulic testing. Refrain from referring to DOE's post development extended purging and collection of “first samples” as a hydraulic test as it does not conform to standard hydraulic well testing methods that are accepted and understood worldwide.

DOE Response

7. DOE response: A description of the sampling and characterization process has been added to the document, along with a statement (in the Cuttings Characterization section) affirming NMED’s access to split samples. References to “hydraulic tests” have been removed throughout the document.