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**DEPARTMENT OF ENERGY**
Environmental Management Los Alamos Field Office (EM-LA)
Los Alamos, New Mexico 87544

OCT 30 2018

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Mr. John E. Kieling
Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Dear Mr. Kieling:

Subject: Submittal of the Drilling Work Plan for Chromium Groundwater Project Regional Aquifer Monitoring Well R-70

Enclosed please find two hard copies with electronic files of the "Drilling Work Plan for Chromium Groundwater Project Regional Aquifer Monitoring Well R-70." This work plan reflects the approach agreed upon by the U.S. Department of Energy; Newport News Nuclear BWXT – Los Alamos, LLC (N3B); and the New Mexico Environment Department during a pre-submission meeting held on September 19, 2018.

If you have any questions, please contact Steve White at (505) 309-1370 (steve.white@em-la.doe.gov) or Cheryl Rodriguez at (505) 665-5330 (cheryl.rodriguez@em.doe.gov).

Sincerely,

Arturo Q. Duran
Designated Agency Manager
Environmental Management
Los Alamos Field Office

Enclosures:
1. Drilling Work Plan for Chromium Groundwater Project Regional Aquifer Monitoring Well R-70 (EM2018-0068)

cc (letter with electronic enclosure[s]):
L. King, EPA Region 6, Dallas, TX
R. Martinez, San Ildefonso Pueblo, NM

D. Chavarria, Santa Clara Pueblo, NM
S. Yanicak, NMED
E. Evered, N3B
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PRS Database

EM-LA-40AD-00335

## Drilling Work Plan for Chromium Groundwater Project Regional Aquifer Monitoring Well R-70

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| **Primary Purpose** | This work plan provides the objectives, drilling approach, and conceptual design for a new performance groundwater monitoring well (R-70) for the Chromium Plume Control Interim Measure (IM). The well was recommended in the "Evaluation of Chromium Plume Control Interim Measure Operational Alternatives for Injection Well CrIN-6" (CrIN-6 Evaluation) (LANL 2018, 603032), which was subsequently approved by the New Mexico Environment Department (NMED) letter dated June 6, 2018 (NMED 2018, 700011).<br><br>The CrIN-6 Evaluation concluded that continuous extraction, rather than injection, at CrIN-6 provides the highest probability that the IM objectives for the eastern part of the plume will be met. The CrIN-6 Evaluation considered the need for additional monitoring downgradient of CrIN-6 to verify that the IM actions of extraction, treatment, and injection were successful at meeting the IM objectives of hydraulic control. Presently, there are no monitoring points located within the estimated footprint of the chromium plume east of CrIN-6 that can be used to monitor the actual plume response to the IM actions. The proposed location for R-70 is shown in Figure 1.<br><br>R-70 has two primary objectives. The first objective is to monitor the plume response to CrEX-5 in a timely manner in order to guide adaptive management of the IM operational approach in that area. The second objective is to further characterize the lateral and vertical extent of the chromium contamination in the northeastern portion of the plume. The proposed location for R-70 was selected to achieve those two goals and was based on modeling results and drilling accessibility. The proposed R-70 location is closest to modeling run location P-2 described in the CrIN-6 Evaluation report and shown in Figure 1 (LANL 2018, 603032).<br><br>The R-70 monitoring well will be completed with two screens in the upper portion of the regional aquifer. The well will be constructed like nearby chromium IM infrastructure wells to enable potential repurposing as an extraction or injection well if necessary to meet the IM objective of hydraulic control of the plume. Because of terrain constraints, angled drilling will be used to achieve the target location in the aquifer. The initial design for the well consists of an 8-in.-diameter casing with two 40-slot screens. The final well design will be based on data obtained during drilling, including information from lithologic logs of cuttings, water-level measurements, video logs, geophysical logs, and field-team observations. Specific well-design recommendations will be submitted to NMED for review and approval before construction. |
| **Drilling Approach** | The proposed drilling approach for the monitoring well will use fluid-assisted air-rotary with casing-advance methods. Telescoping casing sizes between 24 in. and 14 in. and dual-rotary methods will be used to advance the borehole to a depth within the upper 100 ft of the regional aquifer. This approach will produce a borehole that can accommodate an approximately 3-in. annular filter pack around the 8-in. well screen. |
| **Drilling Fluids, Composition, and Use** | Fluids and additives will be used to facilitate drilling and may include those previously authorized for use by NMED, including the following:<br><br>• Potable water, municipal water supply, to aid in delivery of other drilling additives and to cool the drill bit;<br>• QUIK-FOAM, a blend of alcohol ethoxy sulfates, used as a foaming agent to lift cuttings; and<br>• AQF-2, an anionic surfactant, used as a foaming agent to lift cuttings.<br><br>Fluids may be used for the entire length of the borehole including within the regional aquifer. Complete records will be maintained detailing the type, amount, and volume of fluid and additives used and the depth at which fluids or additives were added to the borehole. |

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| **Potential Groundwater Occurrence and Detection** | Based on drilling observations at wells in the area, perched water is not expected at this location. The top of the regional aquifer is projected to occur at 900 ft below ground surface. |
| **Geophysical Testing** | Geophysical logs may be collected 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 saturated strata beneath the water table.<br><br>Location surveys will be made for the angled borehole at several points during drilling (e.g., just below the top of basalt and at prescribed depths within the basalt) to ensure aquifer intersection targets are met. |
| **Well Completion Design** | The R-70 monitoring well is planned with two screens in the upper portion of the regional aquifer. Final well screen placement(s) and length(s) will depend upon the geophysical logs, water levels, and field observations. A proposed well design will be submitted to NMED for approval before well construction.<br><br>Figure 2 presents a geologic cross-section between nearby wells in the chromium group that will be considered when designing R-70. In addition to geologic units, well screen positions for nearby wells are also depicted. |
| **Well Development** | The well may be developed by both mechanical and chemical means. Mechanical means include swabbing, bailing, and pumping. Chemical means include the use of additives to remove clays and/or chlorination to kill bacteria that may be introduced during well completion.<br><br>• After initial swabbing and bailing, a 6-in. submersible pump will be used to complete the development process. A 6-in. pump will be capable of removing significantly higher volumes of water than the 4-in. pump that will be part of the final sampling system.<br>• Water-quality parameters will be measured in a flow-through cell. The parameters to be monitored are pH, specific conductance, dissolved oxygen, temperature, turbidity, oxidation-reduction potential, and total organic carbon (TOC).<br>• If Newport News Nuclear BWXT – Los Alamos, LLC (N3B) is unable to bring the water-quality parameters to within the target values specified below, the use of chemical well development may be discussed with NMED. No chemicals will be added without NMED's approval.<br><br>Chemical development methods that may be used include sodium acid pyrophosphate and AQUA-CLEAR PFD to remove clays, and/or chlorination with sodium hypochlorite.<br><br>Well development will be considered complete when target water-quality parameters are met and a volume of water equivalent to that which was introduced into the aquifer during drilling and construction is removed. The target water-quality parameters are turbidity <5 nephelometric turbidity units, TOC <2 ppm, and other parameters stable. |
| **Hydraulic Testing** | Both screened intervals will be hydraulically tested following development. Limited step-drawdown tests and 24-hr constant rate testing will be the most likely tests. The well screens will be isolated from one another and tested discretely. A 6-in. pump and submersible motor will be used for testing. Data from these tests will provide additional information to refine the knowledge of the hydrology in the northeastern portion of the plume. |
| **Water-Quality Sampling** | Groundwater samples used for the purpose of meeting the Compliance Order on Consent (Consent Order) Appendix B milestone will be collected at the end of the aquifer tests in each of the two screens. These samples will be analyzed for the suite of constituents identified in the Interim Facility-Wide Groundwater Monitoring Plan for monitoring year 2019 for the Chromium Investigation Monitoring Group. Follow-on samples will be collected from the dedicated sampling system described below. |

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| **Sampling System Installation** | A dual access port valve sampling system will be designed and installed in the well. The system will be capable of delivering water to the surface from either screen interval. The system will use a typical 4-in. pump and motor in order to maintain sampling purge rates at or near 5 gal. per minute. An inflatable packer will be part of the system to achieve zonal isolation between the screen intervals. |
| **Investigation-Derived Waste Management** | Investigation-derived waste will be managed in accordance with Standard Operating Procedure (SOP) 10021, "Characterization and Management of Environmental Program Waste." This SOP incorporates the requirements of applicable U.S. Environmental Protection Agency and NMED regulations, U.S. Department of Energy orders, and N3B requirements. The primary waste streams will include drill cuttings, drilling water, drilling fluids and additives, development water, purge water generated during hydraulic testing, decontamination water, and contact waste.<br><br>Drill cuttings will be managed in accordance with the NMED-approved Decision Tree for the Land Application of Drill Cuttings (April 2016). Drilling, purge, and development waters will be managed in accordance with the NMED-approved Decision Tree for Land Application of Drilling, Development, Rehabilitation, and Sampling Purge Water (November 2016). Initially, drill cuttings and drilling fluids will be stored in a lined pit. Representative samples of the drill cuttings and drilling fluids will be collected and analyzed, and waste determinations will be made from validated data. If validated analytical data show these wastes cannot be land-applied, they will be removed from the pit, containerized, and placed in accumulation areas appropriate for the type of waste.<br><br>Decontamination water will be containerized separately at the point of generation, placed in an accumulation area appropriate to the type of waste, and directly sampled. Contact waste will be containerized at the point of generation, placed in an appropriate accumulation area, and characterized using acceptable knowledge or the media with which it came in contact.<br><br>Water generated from future injection well maintenance activities will be managed with applicable permits. |
| **Schedule** | The drilling and installation of R-70 is anticipated to start in January 2019 and be completed by late spring of 2019. The first groundwater samples will be collected on a schedule to meet the proposed fiscal year 2019 Consent Order Appendix B milestone that requires a letter submitted by May 31, 2019, documenting that the first samples have been collected from R-70. |

## REFERENCES

*The following reference list includes documents cited in this work plan. Parenthetical information following each reference provides the author(s), publication date, and ERID, ESHID, or EMID. This information is also included in text citations. ERIDs were assigned by the Los Alamos National Laboratory's (Laboratory's) Associate Directorate for Environmental Management (IDs through 599999); ESHIDs were assigned by the Laboratory's Associate Directorate for Environment, Safety, and Health (IDs 600000 through 699999); and EMIDs are assigned by N3B (IDs 700000 and above). IDs are used to locate documents in N3B's Records Management System and in the Master Reference Set. The NMED Hazardous Waste Bureau and N3B maintain copies of the Master Reference Set. The set ensures that NMED has the references to review documents. The set is updated when new references are cited in documents.*

LANL (Los Alamos National Laboratory), April 2018. "Evaluation of Chromium Plume Control Interim Measure Operational Alternatives for Injection Well CrIN-6," Los Alamos National Laboratory document LA-UR-18-23385, Los Alamos, New Mexico. (LANL 2018, 603032)

NMED (New Mexico Environment Department), June 6, 2018. "Evaluation of Chromium Plume Control Interim Measure Operational Alternatives," New Mexico Environment Department letter to D. Hintze (DOE-EM-LA) and J. Legare (N3B) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2018, 700011)

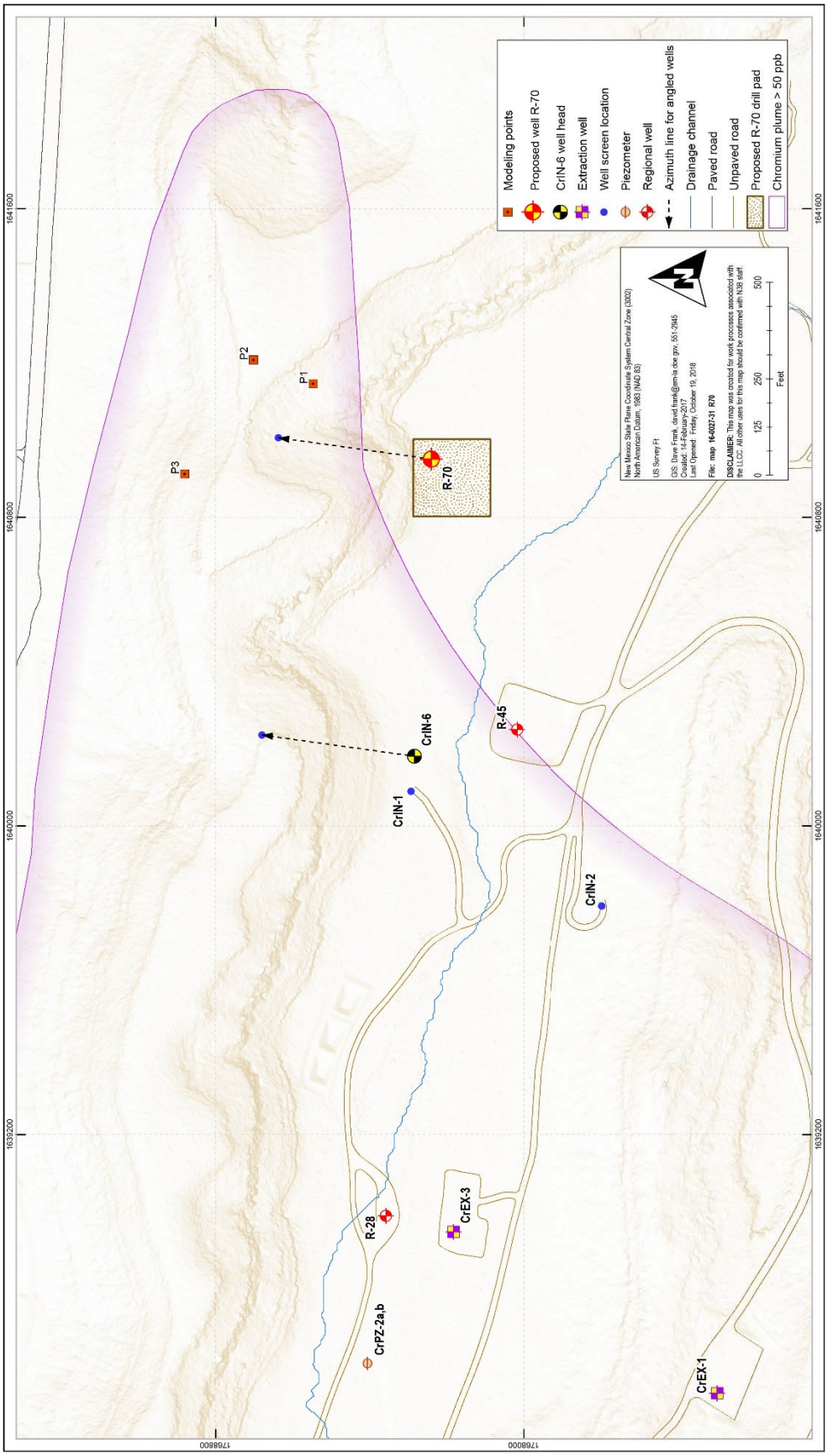


**Figure 1 Proposed location for R-70**

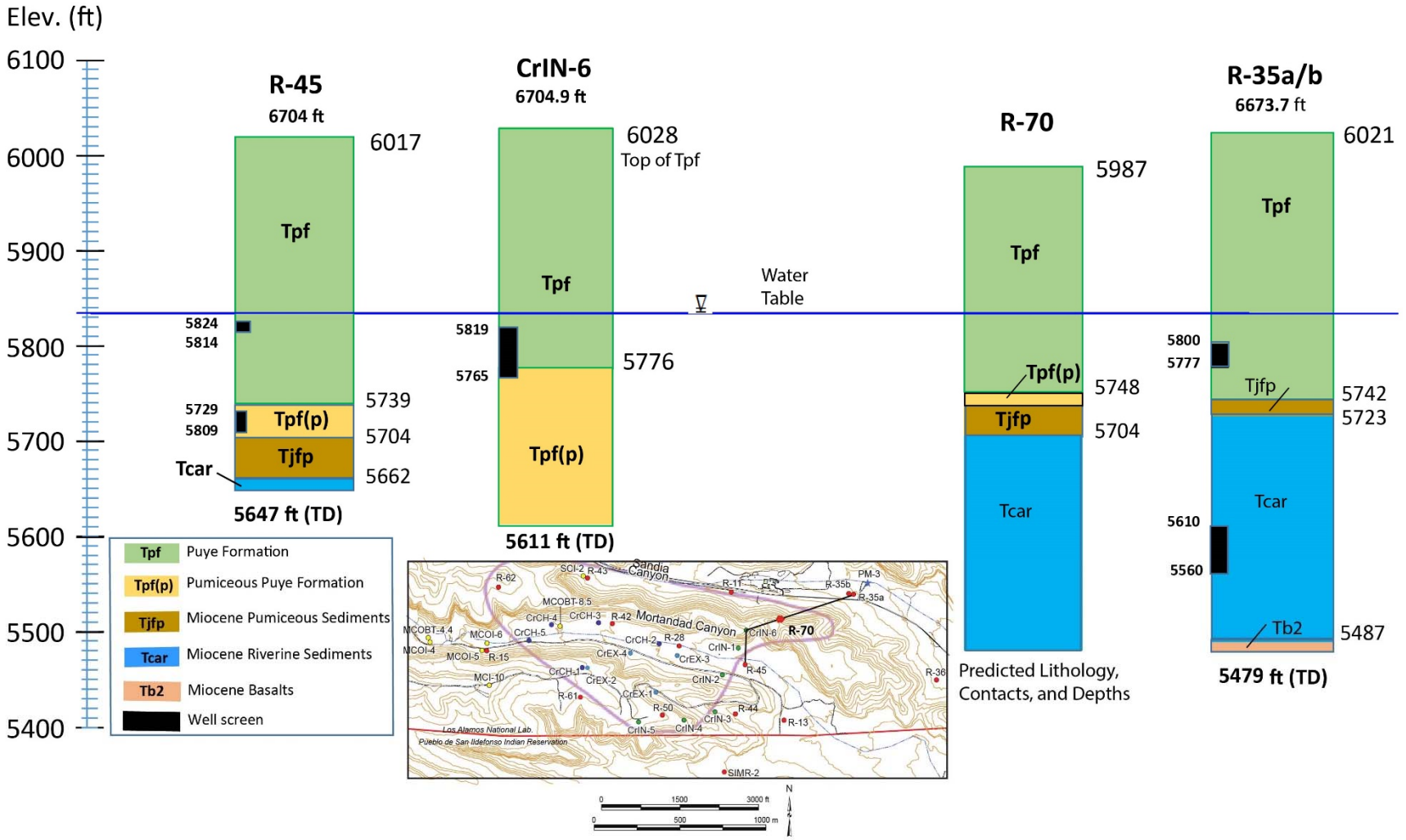


**Figure 2** **Geologic cross-section between nearby wells in the chromium group**