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NMED
Hazardous Waste Bureau

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

Subject: Submittal of the Drilling Work Plan for Groundwater Extraction Well CrEX-3

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the Drilling Work Plan for Groundwater Extraction Well CrEX-3. The work plan summarizes the methods Los Alamos National Laboratory proposes to use in drilling and constructing the extraction well in Mortandad Canyon.

This submittal fulfills a requirement of the New Mexico Environment Department in its approval with modifications for the Work Plan for Plume Center Characterization, dated October 15, 2015, to submit a drilling work plan for the installation of CrEX-3 no later than November 25, 2015.

If you have any questions, please contact Stephani Swickley at (505) 606-1628 (sfuller@lanl.gov) or Cheryl Rodriguez at (505) 665-5330 (cheryl.rodriguez@em.doe.gov).

Sincerely,

Bruce Robinson, Program Director
Environmental Remediation Program
Los Alamos National Laboratory

Sincerely,

David S. Rhodes, Supervisor
Environmental Management
Los Alamos Field Office

BR/DS/SS/SW:sm

Enclosures: Two hard copies with electronic files – Drilling Work Plan for Groundwater Extraction Well CrEX-3.

Cy: (w/enc.)
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Drilling Work Plan for Groundwater Extraction Well CrEX-3

Primary Purpose	In accordance with the New Mexico Environment Department's (NMED's) approval with modifications for the work plan for chromium plume center characterization, dated October 15, 2015 (NMED 2015, 600958), Los Alamos National Laboratory (LANL or the Laboratory) proposes the following specific location, drilling, and preliminary design information for extraction well CrEX-3. As stated in the work plan for chromium plume center characterization, dated July 2015 (LANL 2015, 600615), the purpose of the extraction well is to investigate the potential for optimizing removal of chromium from the plume center (Figure 1). The location, south of R-28 (Figure 1), is within a zone of expected high hydraulic conductivity that appears to be relatively continuous from R-11 southward towards CrEX-1 and possibly the deeper zone monitored by R-50, screen 2. The primary objective of pumping at CrEX-3 is to obtain key information regarding chromium mass removal, including the orientation and size of the capture zone established from an extended period of pumping and chromium transients during pumping and rebound, to support assessments of mass removal. The overall goal of the well is to explore the operational approach that achieves the greatest rate of chromium mass removal. Results and findings from pumping in 2016 will also be used to recommend potential further characterization activities. CrEX-3 is proposed for a location in Mortandad Canyon, as shown in Figure 1. The borehole is expected to penetrate the top of regional saturation at a depth of approximately 900 ft within sediments of the Puye Formation. The target borehole depth is approximately 1000 ft. The well is planned to be completed with a single screen set near the top of regional saturation. The initial design for CrEX-3 consists of an 8-in.-diameter casing with a 40-slot screen placed within 35–40 ft of the water table. Data from sampling conducted during sonic drilling in CrCH-2 and from piezometers CrPZ-2a and CrPZ-2b, installed within the CrCH-2 corehole, indicate contamination in the proposed CrEX-3 area is primarily within an interval approximately 40 ft below the water table (LANL 2015, 600615). Thus, the extraction well is proposed to be screened in that same zone near the water table to optimize removal of the contaminant source. Figure 2 shows the predicted geology and conceptual well design. The final 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. Well-design recommendations will be submitted to NMED for approval before construction.
Drilling Approach	The proposed drilling approach for CrEX-3 will utilize fluid-assisted air-rotary with casing-advance methods. Telescoping casing sizes between 24 in. and 16 in. and dual-rotary methods will be used to advance the borehole to a depth just above the regional aquifer. The remainder of the borehole will be advanced with 14-in. casing and an underreaming bit. This approach will produce a borehole that can accommodate an approximately 3-in. annular filter pack around the 8-in. well screen. The final details of drilling method will be included in the drilling work plan provided by the selected drilling subcontractor.
Drilling Fluids, Composition, and Use	Fluids and additives will be used to facilitate drilling. These fluids and additives may include those previously authorized by NMED for use, including the following: • Potable water, municipal water supply, to aid in delivery of other drilling additives and to cool the drill bit; • QUIK-FOAM, a blend of alcohol ethoxy sulfates, used as a foaming agent to lift cuttings; and • AQF-2, an anionic surfactant, used as a foaming agent to lift cuttings. Complete records will be maintained detailing the type, amount, and volume of fluid and additives used, and the depth where fluids or additives were added to the borehole.

Groundwater Occurrence	Based on wells in the area, perched water is not anticipated at this location. If perched water is encountered during drilling, NMED will be notified and options to characterize the water quality will be considered. Water-level data from the immediate area around the proposed location of CrEX-3 indicate that regional saturation should be encountered at a depth of 900 ft within sediments of the Puye Formation.
Core Sampling	No core collection or sampling is planned. Drill cuttings will be collected at 10-ft intervals and used for lithologic description.
Geophysical Testing	Geophysical logs may be collected when the borehole has been drilled to total depth. The suite of geophysical logs will depend on conditions in the borehole and whether logs are run in an open hole or inside the casing. 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.
Well Completion Design	Figure 2 shows the conceptual well design of CrEX-3. Screen placement and length will be based on lithology, water-level, geophysical logs, and field observations. A proposed well design will be submitted to NMED for approval before well construction.
Well Development	The well will be developed by mechanical means, and chemical means will be used only if necessary. Mechanical development includes swabbing, bailing, jetting/air-lifting, and pumping. Chemical methods may include chemicals to disperse bentonite, which is used as annular seal, or other methods. Chemicals that may be used to aid in the development and disinfection of the well screen and filter pack include • Sodium hypochlorite and • AQUA-CLEAR PFD. Water-quality parameters will be measured in a flow-through cell during the pumping phase of development. The parameters to be monitored are pH, specific conductance, dissolved oxygen, temperature, turbidity, and oxidation-reduction potential. Samples will be collected daily for total organic carbon (TOC) and analyzed at the Laboratory's Geology and Geochemistry Research Laboratory. Well development will be considered complete when target water-quality parameters are met, sand content averages less than 5 mg/L over a 2-h pumping period, and specific capacity is no longer increasing. The target water-quality parameters are turbidity <5 nephelometric turbidity units (NTUs), TOC <2 ppm, and other parameters stable.
Hydraulic Testing	A step-drawdown test will be conducted on the well to determine the sustainable yield for the well. Once the optimum pumping rate is identified, the pump will be positioned at 10-ft intervals within the screen. Hydraulic data from these two sets of sampling series will be used to select the optimal pumping system for project objectives.
Pumping System Installation	A pumping system will be designed based on the hydraulic testing results and installed in the well.

Investigation-Derived Waste Management	Investigation-derived waste (IDW) will be managed in accordance with standard operating procedure (SOP) 10021, Characterization and Management of Environmental Program Waste (http://www.lanl.gov/community-environment/environmental-stewardship/plans-procedures.php). This SOP incorporates the requirements of applicable U.S. Environmental Protection Agency and NMED regulations, U.S. Department of Energy orders, and Laboratory 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. Drill cuttings with residual additives will be managed in accordance with the NMED-approved Decision Tree for Land Application of IDW Solids from Construction of Wells and Boreholes (November 2007). Drilling, purge, and development waters will be managed in accordance with the NMED-approved Decision Tree for Drilling, Development, Rehabilitation, and Sampling Purge Water (November 2006). Initially, drill cuttings and drilling fluids will be stored in lined pits. The cuttings may or may not contain residue of drilling/well completion additives (e.g., drilling foam and bentonite clay). 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. Cuttings, drilling fluids, development water, and purge water that cannot be land-applied and are designated as hazardous waste will be sent to an authorized treatment, storage, or disposal facility within 90 d of containerization. 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.
Schedule	Well CrEX-3 will be completed by April 30, 2016.

REFERENCES

The following list includes all documents cited in this plan. Parenthetical information following each reference provides the author(s), publication date, and ER ID or ESH ID. This information is also included in text citations. ER IDs were assigned by the Environmental Programs Directorate's Records Processing Facility (IDs through 599999), and ESH IDs are assigned by the Environment, Safety, and Health (ESH) Directorate (IDs 600000 and above). IDs are used to locate documents in the Laboratory's Electronic Document Management System and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the ESH Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), July 2015. "Work Plan for Chromium Plume Center Characterization," Los Alamos National Laboratory document LA-UR-15-24861, Los Alamos, New Mexico. (LANL 2015, 600615)

NMED (New Mexico Environment Department), October 15, 2015. "Approval with Modifications, Work Plan for Chromium Plume Center Characterization," New Mexico Environment Department letter to D. Hintze (DOE-NA-LA) and M. Brandt (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2015, 600958)

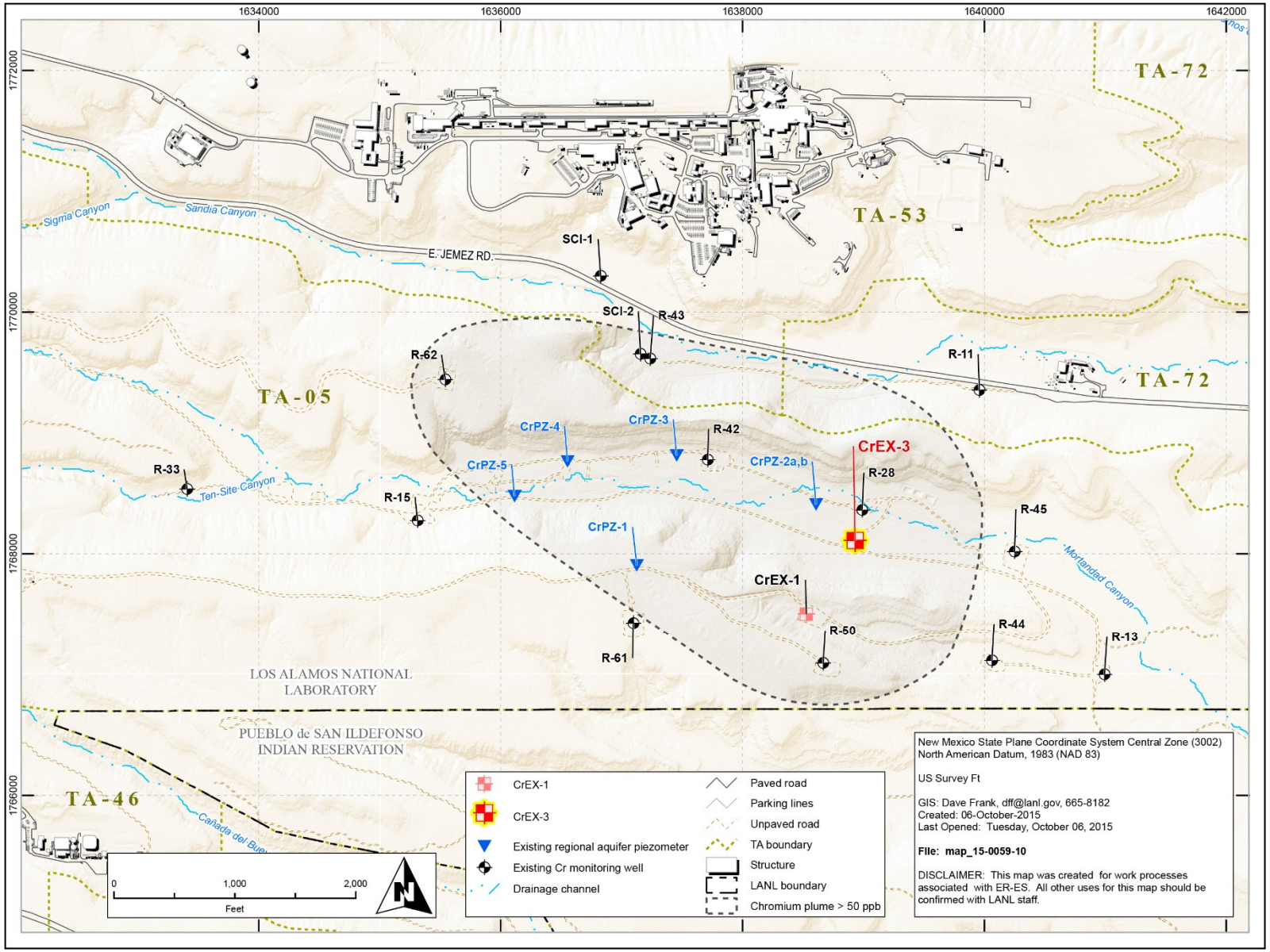

Figure 1 Proposed location for well CrEX-3

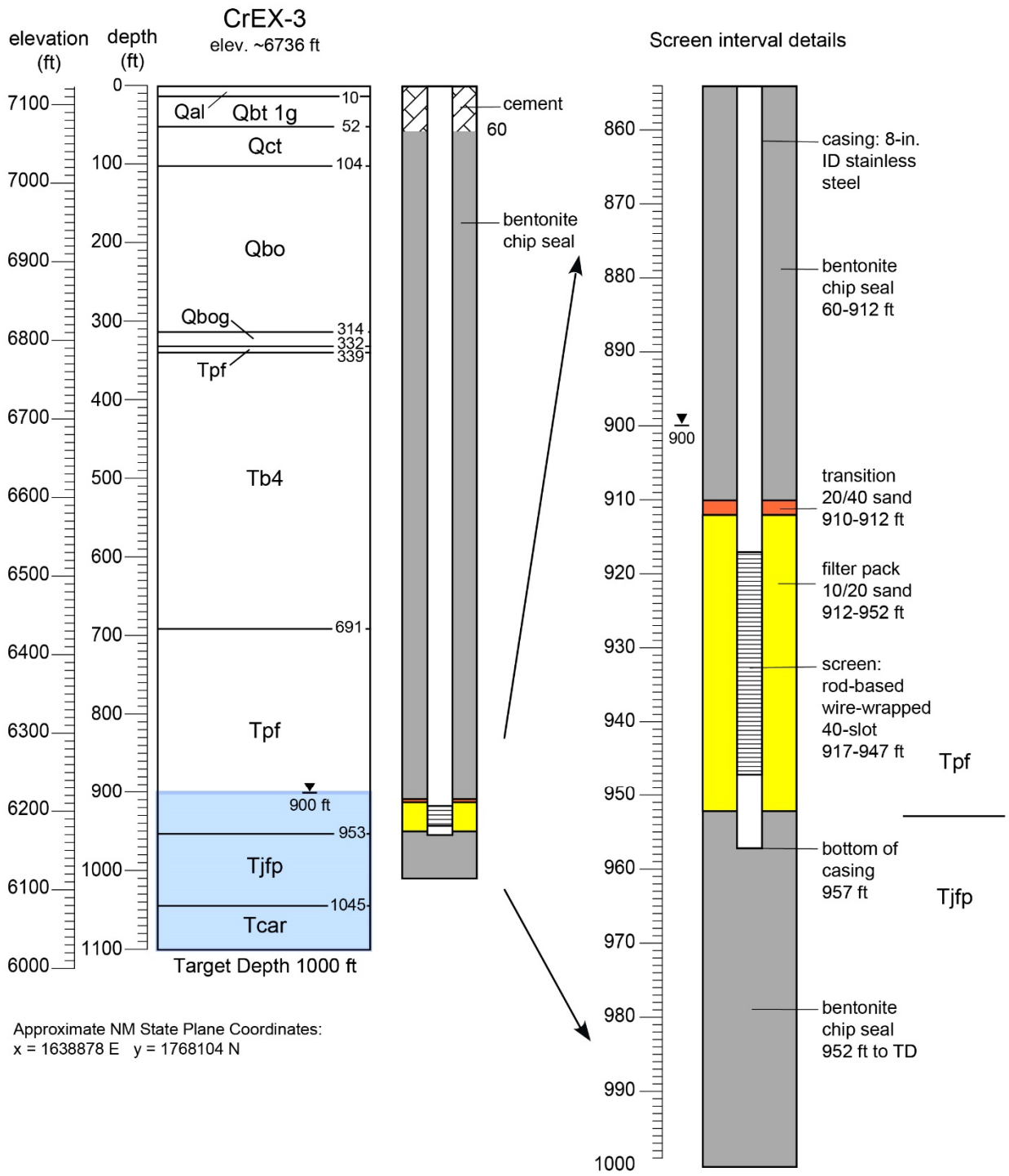

Figure 2 Predicted geology and conceptual well design for well CrEX-3