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Date: MAR 0 6 2015
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Locates Action No.: N/A

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 Combined Groundwater Monitoring Well R-67 and CrCH-6

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the Drilling Work Plan for Combined Groundwater Monitoring Well R-67 and CrCH-6.

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@nnsa.doe.gov).

Sincerely,

Alison M. Dorries, Division Leader
Environmental Protection Division
Los Alamos National Laboratory

Sincerely,

Peter Maggiore, Assistant Manager
Environmental Projects Office
Los Alamos Field Office

AMD/PM/DJM/SFS:sm

Enclosures: Two hard copies with electronic files – Drilling Work Plan for Combined Groundwater Monitoring Well R-67 and CrCH-6 (EP2015-0035)

Cy: (w/enc.)
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Drilling Work Plan for Combined Groundwater Monitoring Well R-67 and CrCH-6

Primary Purpose	Los Alamos National Laboratory (LANL or the Laboratory) is installing a single-screen regional aquifer groundwater monitoring well, R-67, as required by the New Mexico Environment Department's (NMED's) approval with modifications of the Phase II Investigation Report for Sandia Canyon, dated February 19, 2014 (NMED 2014, 524467). Coring conducted during drilling of R-67 will also meet the objectives for Corehole 6 (CrCH-6), as stated in the July 2014 Drilling Work Plan for Chromium Project Coreholes (LANL 2014, 259151), specifically to characterize the upgradient portion of the primary chromium plume. Data derived from analysis of core and groundwater samples from R-67 will be used to characterize the upgradient portion of the chromium (and associated contaminants) plume and vadose-zone pathway. LANL and NMED collaboratively selected the location for R-67, shown in Figure 1. The approval with modifications from NMED (2014, 524467) states the objective of the well is to "fully constrain the nature and extent of chromium contamination in the regional aquifer west and upgradient of R-62." Another objective is to collect core to provide important information regarding the upgradient extent of the infiltration pathway(s) for chromium and related contaminants. The target monitoring zone for the well is generally planned to be located near the water table. An initial well design is provided in Figure 2. The design, including screen length and screen position, 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 its approval before construction begins.
Drilling Approach	Drilling will be conducted with methods selected to optimize the collection of representative groundwater samples as soon after completion as possible. A combination of open-hole and casing-advance methods with air-rotary fluid assist will be used. Each interval of open hole or casing advance will be optimized to meet well objectives. Casing will be used to advance the borehole when open-hole drilling is not possible and to secure the borehole through unstable zones or any perched groundwater horizons. A down-the-hole (DTH) hammer, with or without casing advance, may be used to penetrate the lavas, if they are present at this location. Drilling foam may be used to condition the borehole, lift cuttings, and reduce the volume of compressed air needed to clean the borehole but will be terminated at least 100 ft above the regional aquifer. Select intervals will be cored within the same borehole as the proposed well. Options for core collection include drive sampling, conventional diamond-bit coring, and use of a DTH hammer to advance a core barrel. The most effective method for coring with a rotary drill rig at this location is not known; therefore, flexibility in the method selected is needed, with a variety of tooling available on-site during drilling.
Potential Drilling Fluids, Composition, and Use	Fluids and additives will be used to facilitate drilling and well development. Fluids and additives previously approved for use by NMED include • Potable water, municipal water supply, to aid in delivery of other drilling additives and cool the drill bit; • QUIK-FOAM, a blend of alcohol ethoxy sulfates, used as a foaming agent; and • AQF-2, an anionic surfactant, used as a foaming agent. During core collection operations, fluid use will be kept to a minimum and usage will be modified in a graded manner. The drive sampling and core barrel advance methods should not require the addition of fluids during collection, but advancing the borehole down to and between core runs may require the use of potable water with or without the addition of drilling foam. If conventional coring methods are required to effectively collect core, then potable water will be used. If water alone is not sufficient, bentonite may be added to the potable water to clear the cuttings and aid in collecting the core.

Potential Drilling Fluids, Composition, and Use (continued)	Complete records will be maintained detailing the type, amount, and volume of fluid and additives used; depth where fluids or additives are added to the borehole; and recovery volume of fluids and additives. No drilling fluids will be used within 100 ft of the regional aquifer, except potable municipal water and compressed air, unless otherwise discussed with, and approved by, NMED.
Groundwater Occurrence	It is not known whether perched water will be encountered at the planned location for R-67. If perched water is encountered, attempts will be made to collect groundwater sample(s) by air-lifting or bailing methods. Drilling methods used to advance the borehole through potential perched zones may affect the representativeness of the water samples collected. Water-level data from wells in the area indicate regional saturation should be encountered at a depth of approximately 1224 ft below ground surface (bgs) within the pumiceous sedimentary deposits of Miocene age (Figure 2).
Core Sampling	Collection of core will be targeted for the following depths: 210–230, 565–595, 1150–1200, and 1235–1255 ft bgs (Figure 2). The 210–230-ft section will target the Cerro Toledo interval, which lies at an elevation just below the nearby Sandia Canyon channel. The Guaje Pumice Bed–Puye Formation contact will be interrogated through coring in the 565–595-ft interval. The base of the Puye Formation will be cored over a 50-ft interval within the 1150–1200-ft-depth range just above the regional water table. The top of the regional aquifer will be targeted by coring the Miocene pumiceous unit at the depth of 1235–1255 ft bgs. Drill cuttings will be collected at 10-ft intervals in portions of the borehole where core is not collected. The cuttings and core will used to prepare a lithologic log for the well.
Geophysical Testing	A full suite of Schlumberger geophysical logs may be collected after the borehole is drilled to total depth (TD). In open-hole sections of the borehole, this logging may include the following tools or their equivalent: accelerator porosity sonde (neutron porosity), array induction, combined magnetic resonance, natural and spectral gamma, elemental capture, and formation microimager logs. In cased portions of the borehole, neutron porosity, elemental capture, natural gamma, and spectral gamma logs may be collected. Additionally, LANL-owned natural gamma, array induction, and video tools may be run. These logs will be used to resolve lithologic contacts, identify the top of regional saturation, and characterize the hydrologic properties of the vadose zone and regional aquifer. The decision to run geophysics and tools to be run will depend on both observations made during drilling and borehole conditions.
Well Completion Design	An initial design for the well is provided in Figure 2. The final well design, including screen length and screen position, 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. A proposed well design will be submitted to NMED for its approval before construction begins.
Well Development	Development will proceed in a graded manner and may include both mechanical and chemical means. Mechanical means include swabbing, bailing, jetting, and pumping. Chemical means include the use of additives to remove clays and/or chlorination to kill bacteria introduced during well completion. After initial swabbing and bailing, a submersible pump will be used to complete the development process. The pump intake will be set at multiple depths within the screen to distribute flow energy throughout.

Well Development (continued)	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). If LANL is unable to bring the water-quality parameters to within the limits specified below, jetting will be employed. Jetting may require the introduction of potable water to prevent pumping-level drawdown into the screen. If jetting and subsequent pumping cannot bring the water-quality parameters to within the limits specified below, chemical well development may be discussed with NMED. No chemicals will be added without NMED's approval. Chemical means that may be used include AQUACLEAR PFD to remove clays and/or chlorination. Well development will be considered complete when target water-quality parameters are met and a volume of water equivalent to twice what was introduced into the aquifer during drilling, construction, and development is removed. The target water-quality parameters are turbidity <5 nephelometric turbidity units, TOC <2 ppm, and other parameters stable.
Hydraulic Testing	Hydraulic testing will be conducted following well completion and development. The most likely test will be a 24-h constant-rate pump test.
Investigation-Derived Waste Management	Investigation-derived waste (IDW) will be managed in accordance with Standard Operating Procedure (SOP) EP-DIR-SOP-10021, Characterization and Management of Environmental Program Waste (available at http://www.lanl.gov/community-environment/environmental-stewardship/plans-procedures.php). This SOP incorporates the requirements of applicable U.S. Environmental Protection Agency, NMED regulations, DOE orders, and LANL 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 Notice of Intent (NOI) 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 NOI Decision Tree for Drilling, Development, Rehabilitation, and Sampling Purge Water (November 2006). Initially, drill cuttings and drilling water 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). The contents of the pits will be characterized with direct sampling following completion of drilling activities and/or via use of a composite of subsamples collected during drilling, 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 water, 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.
Investigation-Derived Waste Management (continued)	Development water, purge water, and decontamination water will be containerized separately at their 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 of the media with which it came in contact.
Schedule	Well R-67 is proposed to be installed by September 30, 2015.

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.

NMED (New Mexico Environment Department), February 19, 2014. "Approval with Modifications, Phase II Investigation Report for Sandia Canyon," New Mexico Environment Department letter to P. Maggiore (DOE-LASO) and J.D. Mousseau (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2014, 524467)

LANL (Los Alamos National Laboratory), July 2014. "Drilling Work Plan for Chromium Project Coreholes," Los Alamos National Laboratory document LA-UR-14-24829, Los Alamos, New Mexico. (LANL 2014, 259151)

NMED (New Mexico Environment Department), February 19, 2014. "Approval with Modifications, Phase II Investigation Report for Sandia Canyon," New Mexico Environment Department letter to P. Maggiore (DOE-LASO) and J.D. Mousseau (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2014, 524467)

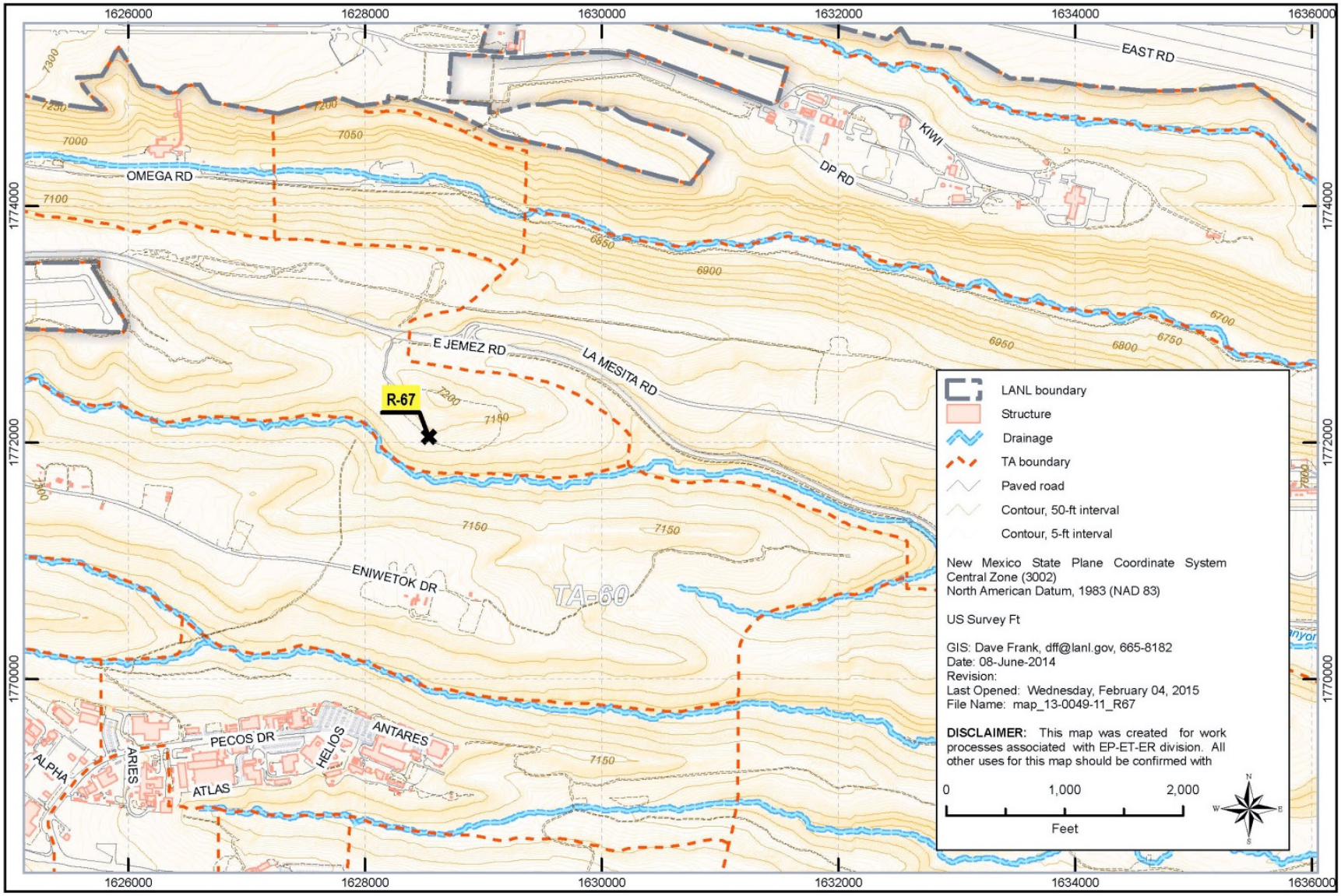
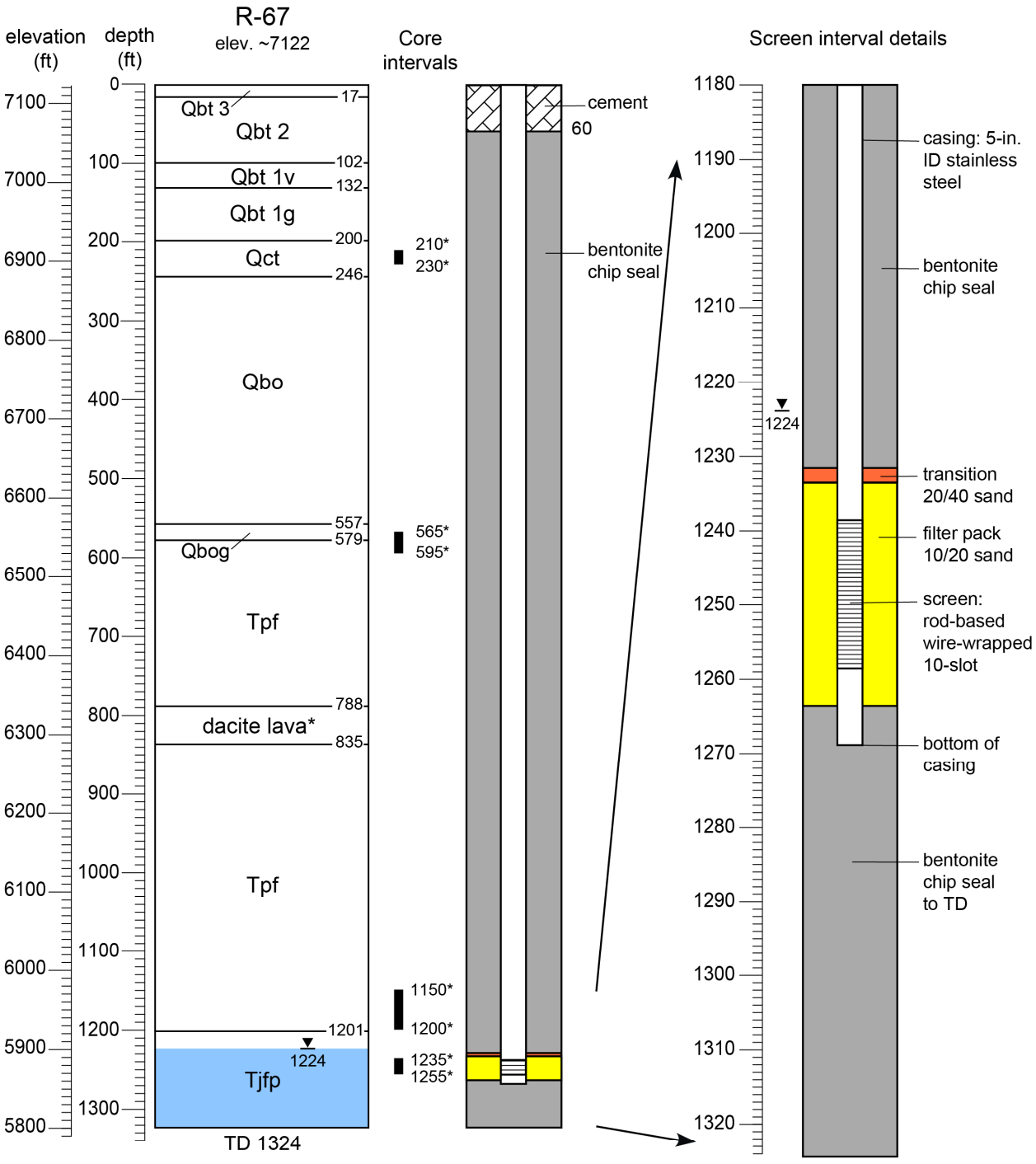


Figure 1 Proposed location of groundwater monitoring well R-67



* Core interval locations are based on predicted geology and therefore are approximate; top of core intervals will be adjusted based on field identification of geologic unit contacts during drilling.

Note: the well location is near the margins of the dacite lava. Consequently, the predicted geologic contacts for this unit are highly uncertain.

Figure 2 Predicted geology, target coring intervals, and conceptual well design for well R-67