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Los Alamos
NATIONAL LABORATORY
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Environmental Programs
P.O. Box 1663, MS K788
Los Alamos, New Mexico 87545
(505) 606-2337

RECEIVED

JUN 20 2014

NMED
Hazardous Waste Bureau

National Nuclear Security Administration
Los Alamos Field Office, MS A316
Environmental Projects Office
Los Alamos, New Mexico 87544
(505) 667-4255/FAX (505) 606-2132

Date: JUN 20 2014
Refer To: EP2014-0251

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 an Investigation Borehole beneath the Sandia Canyon Wetland

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the Drilling Work Plan for an Investigation Borehole beneath the Sandia Canyon Wetland. The work plan presents the objectives, location, methods, and sampling proposed for the borehole.

This work plan fulfills a requirement of the New Mexico Environment Department in its approval with modification for the Phase II Investigation Report for Sandia Canyon, dated February 19, 2014, to submit a work plan for a core hole by June 20, 2014.

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,

Jeff Mousseau, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

Cheryl L Rodriguez for

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

36356

JM/PM/DM/SS:sm

Enclosures: Two hard copies with electronic files – Drilling Work Plan for an Investigation Borehole beneath the Sandia Canyon Wetland (LA-UR-14-24377)

Cy: (w/enc.)
Cheryl Rodriguez, DOE-NA-LA, MS A316
Stephani Swickley, EP-CAP, MS M996
Public Reading Room (hard copy)
RPF (electronic copy)

Cy: (Letter and CD and/or DVD)
Laurie King, EPA Region 6, Dallas, TX
Steve Yanicak, NMED-DOE-OB, MS M894
Danny Katzman (w/ MS Word files on CD)
PRS Database with ER ID

Cy: (w/o enc.)
Tom Skibitski, NMED-DOE-OB (date-stamped letter emailed)
lasomailbox@nnsa.doe.gov
Annette Russell, DOE-NA-LA (date-stamped letter emailed)
David Rhodes, DOE-NA-LA (date-stamped letter emailed)
Craig Douglass, EP-CAP (date-stamped letter emailed)
Dave McInroy, EP-CAP (date-stamped letter emailed)
Jeff Mousseau, ADEP (date-stamped letter emailed)

Drilling Work Plan for an Investigation Borehole beneath the Sandia Canyon Wetland

Primary Purpose	This work plan describes the purpose and approach for drilling an investigation borehole that includes collecting and analyzing core and pore water from beneath the Sandia Canyon wetland. The boring will be called Sandia Wetland Boring (SWB) 1. Results from the direct current– (DC-) resistivity survey conducted by Los Alamos National Laboratory (LANL or the Laboratory) in the Sandia Canyon wetland area (LANL 2012, 228624) indicate multiple low-resistivity anomalies beneath the wetland. The largest and most pronounced anomaly is located below the eastern end of the wetland. This relatively high-conductivity (low-resistivity) zone appears to be coincident with mapped faults in the area and may represent a current or historically active infiltration area for surface water contaminated with chromium. To further investigate the resistivity anomaly, the New Mexico Environment Department (NMED) has directed the Laboratory to drill a borehole and collect core to 400 ft depth at the location in Figure 1. This work plan fulfills the June 20, 2014 submittal date requirement in NMED's approval with modifications for the Phase II Investigation Report for Sandia Canyon, dated February 19, 2014 (NMED 2014, 524467). The boring will be located on the eastern end of the Sandia Canyon wetland, within the inferred resistivity anomaly discussed above. The proposed location for the well is shown in Figure 1. The borehole will be advanced at 20 degrees from vertical, in a northwesterly direction. This vector targets the center of the anomaly and is orthogonal to the trend of a mapped fault in the area. The borehole is expected to penetrate Units 1 and 2 of the Tshirege Member of the Bandelier Tuff, the Cerro Toledo, the Otowi Member of the Bandelier Tuff, the Guaje Pumice Bed, and into the top of the Puye Formation, reaching total depth at a position approximately 173 ft to the northwest of the drill rig (Figures 1, through 3). The target borehole depth is approximately 475 vertical ft (505 linear ft) below ground surface (Figures 2 and 3). The boring will be plugged and abandoned upon completion.
Drilling Approach	The Laboratory plans to use drilling methods that do not require use of additives or other fluids to optimize data quality from the borehole. Both auger and sonic drilling methods can collect core in angle borings; however, there might be limitations on the ability to achieve the target depth with either method successfully penetrating Unit 2 of the Tshirege Member of the Bandelier tuff, which is densely welded.
Drilling Fluids, Composition, and Use	In the event that the drilling objectives cannot be met without use of drilling additives, the following fluids and additives may be used to facilitate borehole penetration and core recovery. If additives including water are used, a tracer will be added to enable estimation of dilution from mixing of drilling fluids with pore water. These fluids and additives may include those previously authorized for use by NMED: • Potable water, municipal water supply, to aid in delivery of other drilling additives and cool the drill bit • Baroid QUIK-GEL bentonite-based drilling mud, or Laboratory-approved equivalent • QUIK-TROL, PAC-L, or PAC-R filtration control, or Laboratory-approved equivalent • Soda ash pH adjuster • Compressed air Fluids will be applied in a graded approach, with each fluid type and quantity adjusted to optimize the integrity of pore water and core recovery. Complete records will be maintained detailing the type, amount, and volume of fluid and additives used, and depth where fluids or additives are added to the borehole.

Groundwater Occurrence	Based on hydroGEOPHYSICS, Inc. (HGI) DC-resistivity survey results, a highly conductive feature is present at this location (Crook et al. 2011, 210306). HGI's three-dimensional rendering of the data suggest this anomaly extends to approximately 450 ft below ground surface. Because this anomaly is coincident with mapped faults in the area, it may represent a current or historically active infiltration pathway for chromium-contaminated surface water. Therefore, perched groundwater or residual chromium-contaminated pore water may be encountered throughout the borehole.
Core Sampling	This borehole will be continuously cored and samples will be submitted for analysis based on the following criteria. Samples will be collected from core every 20 ft for analysis of metals on solid phases in the core and metals and anions in pore water extracted from core. Additional samples will be submitted for analysis at key stratigraphic contacts, from fracture-fill material, and from perched or highly saturated zones. Percent saturation will be determined for all samples.
Geophysical Testing	Borehole geophysics data may be collected in this borehole if conditions allow. The suite selected will be biased toward evaluation of groundwater (saturated and unsaturated) occurrence.
Plug and Abandonment	Upon completion, the borehole will be plugged and abandoned in accordance with the New Mexico Office of the State Engineer regulations (New Mexico Administrative Code 19.27.4).
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 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 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. 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	Borehole SWB-1 will be completed by June 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. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the 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.

Crook, N., B. Cubbage, G. Noonan, and M. McNeill, October 17, 2011. "Final Report, Geophysical Survey of the Wetland Area of Upper Sandia Canyon," report prepared for TerranearPMC by hydroGEOPHYSICS, Tucson, Arizona. (Crook et al. 2011, 210306)

LANL (Los Alamos National Laboratory), September 2012. "Phase II Investigation Report for Sandia Canyon," Los Alamos National Laboratory document LA-UR-12-24593, Los Alamos, New Mexico. (LANL 2012, 228624)

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)

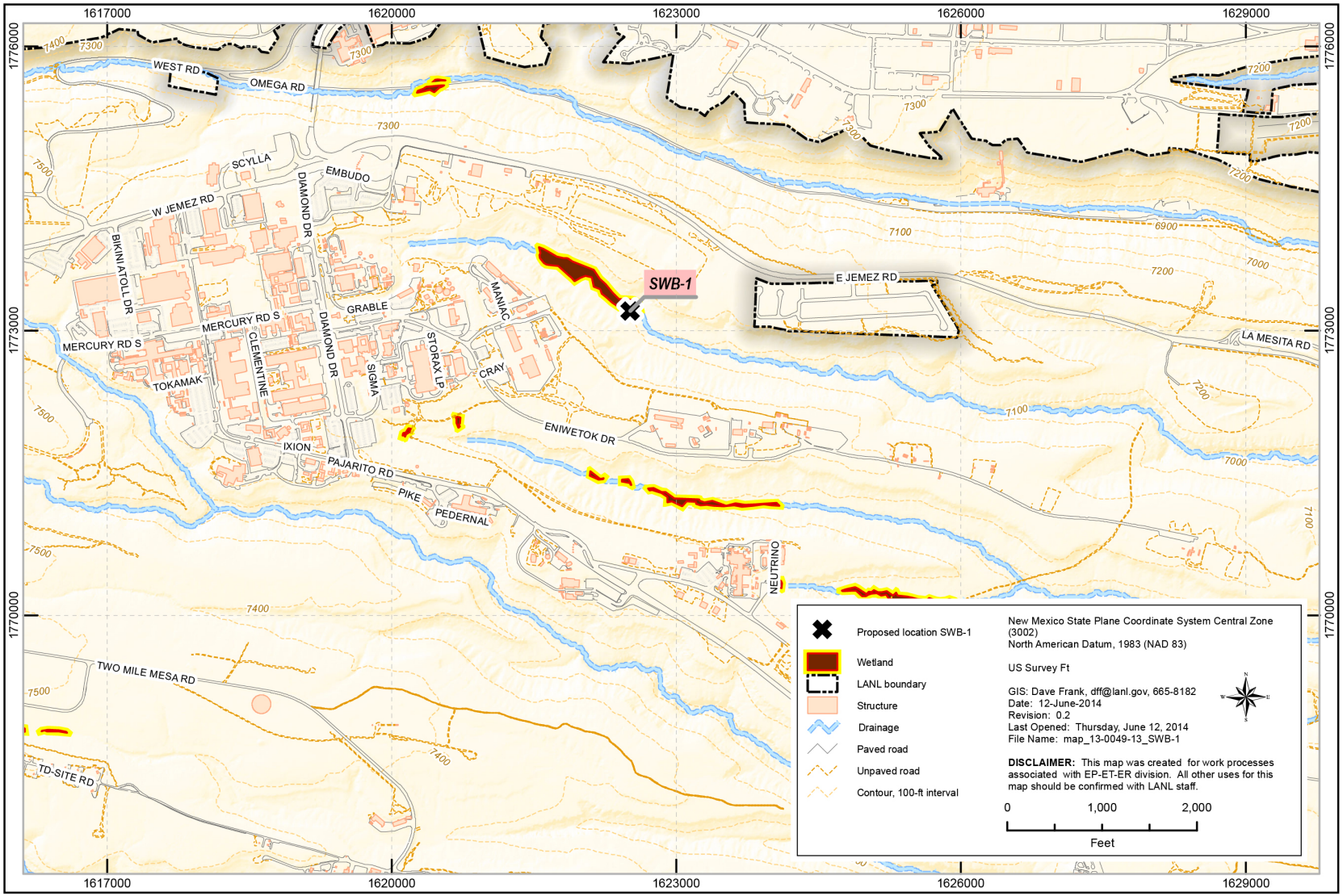

Figure 1 Location of borehole SWB-1

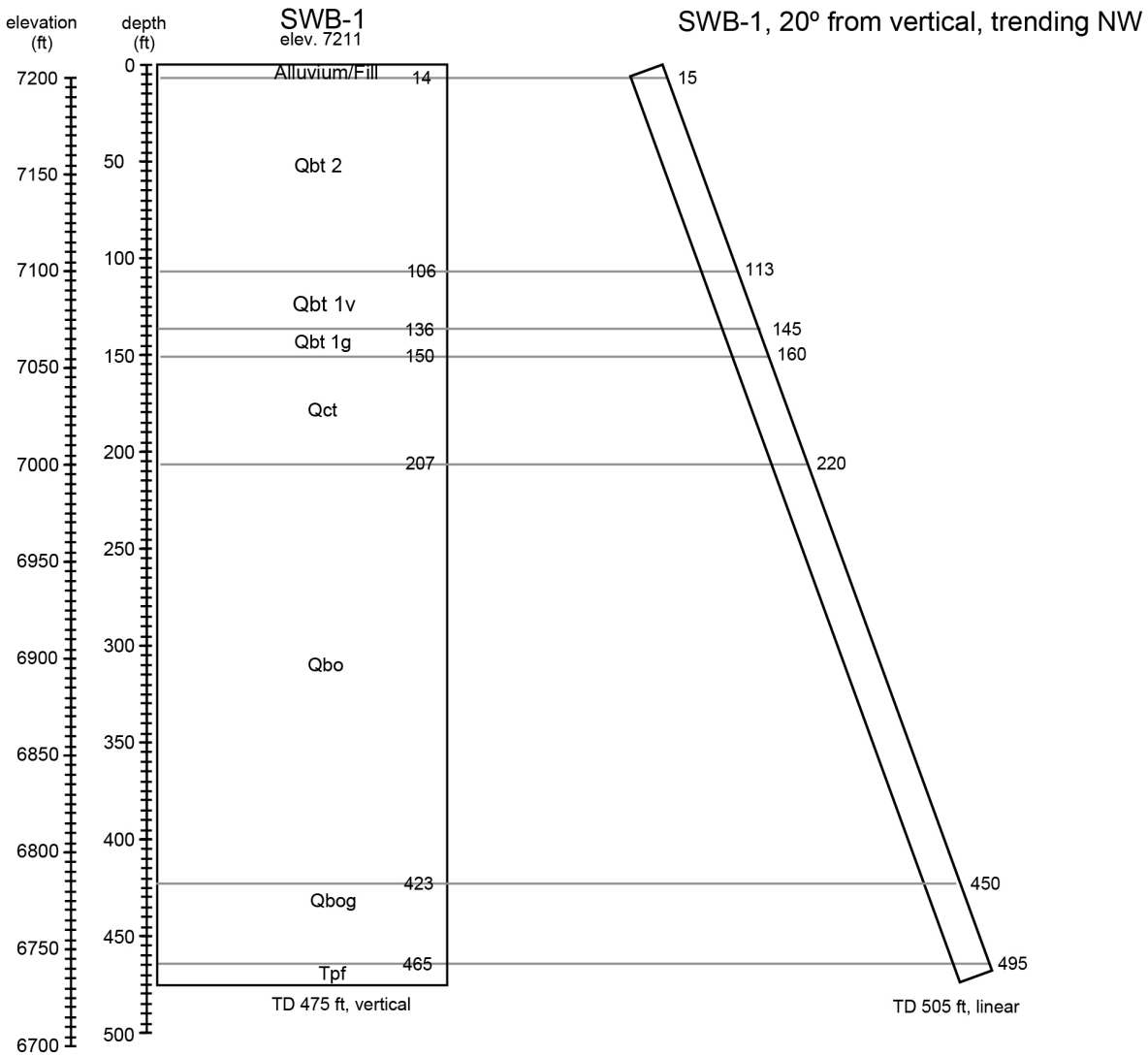

Figure 2 Predicted geology and conceptual borehole design for borehole SWB-1

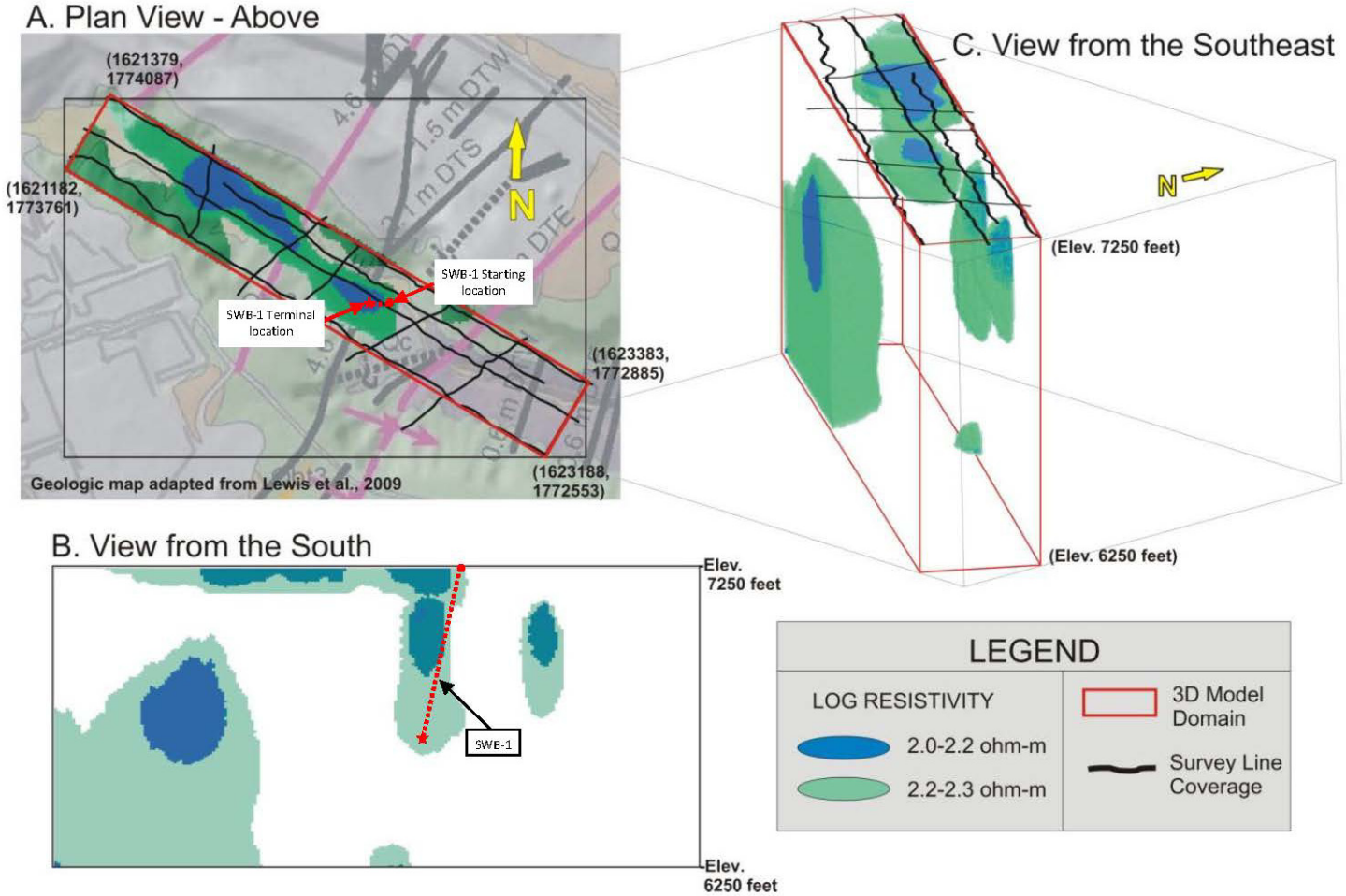

Figure 3 **Excerpt from October 17, 2011, HGI report showing the targeted conductivity anomaly and an approximated depiction of the angled boring (SWB-1)**