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Date: AUG 07 2015
Refer To: ADESH-15-095
LAUR: 15-24545
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 Work Plan for Intermediate Groundwater System Characterization for Consolidated Unit 16-021(c)-99 in Technical Area 16

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the Work Plan for Intermediate Groundwater System Characterization for Consolidated Unit 16-021(c)-99 in Technical Area 16.

This work plan was prepared to advance our understanding of the perched-intermediate groundwater system in the vicinity of Technical Area 16 (TA-16). The data collected through the activities proposed in this work plan will provide a better understanding of the degree of hydraulic connection between perched groundwater zones at TA-16 and will be used to support the revised Groundwater Corrective Measures Evaluation for Intermediate and Regional Groundwater, Consolidated Unit 16-021(c)-99.

If you have any questions, please contact Stephani Swickley at 505-665-0953 (sfuller@lanl.gov) or Cheryl Rodriguez at (505) 665-5330 (cheryl.rodriguez@em.doe.gov).

Sincerely,

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

Sincerely,

Christine Gelles, Acting Manager
Environmental Management
Los Alamos Field Office

AD/CG/BR/SS:sm

Enclosures: Two hard copies with electronic files – Work Plan for Intermediate Groundwater System Characterization for Consolidated Unit 16-021(c)-99 in Technical Area 16 (EP2015-0109)

Cy: (w/enc.)
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Work Plan for Intermediate Groundwater System Characterization at Consolidated Unit 16-021(c)-99

Introduction	This work plan was prepared by Los Alamos National Laboratory (LANL or the Laboratory) to advance the understanding of the perched-intermediate groundwater system in the Technical Area 16 (TA-16) area in support of a revised corrective measures evaluation (CME). Direction to update the CME can be found in the New Mexico Environment Department's (NMED's) letter, "Notice of Disapproval Corrective Measures Evaluation Report, Intermediate and Regional Groundwater Consolidated Unit 16-021(c)-99," dated April 22, 2008 (NMED 2008, 101311). The work proposed in this plan supplements investigation and corrective actions already underway to address contaminated groundwater related to Consolidated Unit 16-021(c)-99 (inclusive of the TA-16 260 Outfall) in the vicinity of TA-16. Existing and pending perched-intermediate and regional groundwater wells at TA-16 comprise a network that is predominantly focused on high explosives contamination (Figure 1). The apparent limited areal extent and slow recharge rates observed in previous hydrologic testing conducted in wells CdV-9-1(i) and CdV-16-4ip will be further evaluated during this work.
Objectives	The scope of work presented in this plan is designed to evaluate the degree of hydraulic connectivity within and between the upper and lower perched groundwater systems (Figures 2–4) and to improve our understanding of transport pathways for RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) and other contaminants to the perched groundwater zones as part of the CME remedy selection process. The hydraulic connectivity will be evaluated to determine the impacts on groundwater flow and contaminant transport. The data collected during this investigation will further an understanding of vertical infiltration through the vadose zone and of lateral groundwater flow in perched-intermediate groundwater beneath Cañon de Valle. As discussed in the "Investigation Report for Water Canyon/Cañon de Valle" (LANL 2011, 207069), the current conceptual model for the source of deep perched groundwater at TA-16 includes (1) predominantly lateral groundwater flow from mountain-block recharge across the Pajarito fault system and (2) vertical groundwater flow from focused recharge along Cañon de Valle east of the fault system. Hydraulic connections and temporal variations in RDX concentrations during extended pumping within deep perched groundwater at TA-16 will be evaluated through pumping at CdV-9-1(i), CdV-16-4ip, and CdV-16-1(i). Vertical hydraulic connectivity between perched groundwater bodies will also be assessed using data from these tests. Well CdV-16-4ip was tested during two previous extended-duration pumping tests (LANL 2011, 203711; LANL 2014, 262526). However, installation of CdV-9-1(i) provides a new observation well north of Cañon de Valle to quantify the hydraulic connections over a larger area. Addressing the uncertainty of the extent of transverse hydraulic connectivity will improve the understanding of a secondary contamination source in the vadose zone and RDX inventory and distribution, both of which are essential for evaluation of potential remedies. Vertical hydraulic connectivity will be evaluated at CdV-9-1(i) by monitoring pressure responses in the two piezometers within the well during pumping from the main well screen and by conducting slug tests within the piezometers. A better understanding of the hydraulic connectivity across the Otowi-Puye Formation contact will be valuable in estimating the volume of RDX-contaminated groundwater and the role of hydrogeologic features in controlling the distribution and flow directions in deep perched groundwater.

Approach	Well CdV-9-1(i) is configured as a single-screen well with a nominal 4 gallon per minute (gpm) submersible pump and two piezometers installed within the annulus. Figures 2 and 3 are conceptual cross-sections that show the position of well and piezometer screens relative to hydrogeologic features in the area. A constant rate test will last up to 30 d in the primary screen or until the water level is drawn down to the pump intake. During the 30-d test period, the primary screen at CdV-9-1(i) may be dewatered several times to evaluate transient responses in water levels and in RDX-concentration profiles. Samples will be collected daily for RDX analysis and weekly for analysis of metals/anions, high explosives plus degradation products, and volatile organic compound (VOC) during pumping. Samples will be collected at a similar frequency during the recovery period of the test, with RDX sample collection reduced in frequency from daily based on data trends. Well CdV-16-4ip is configured as a single-screen well. Figure 3 is a conceptual cross-section that shows the position of the well screen relative to hydrogeologic features in the area. A constant-rate pumping test at approximately 6 gpm for up to 30 d will be conducted at CdV-16-4ip. During the 30-d test period, CdV-16-4ip may be dewatered several times to evaluate transient responses in water levels and in RDX-concentration profiles. Samples will be collected daily for RDX and weekly for metals/anions, high explosives plus degradation products, and VOC analysis during pumping. Samples will be collected at a similar frequency during the recovery period of the test, with RDX sample collection reduced in frequency from daily based on data trends. Well CdV-16-1(i) is a single-screen well completed in the Otowi Member of the Bandelier Tuff. Figure 2 is a conceptual cross-section that shows the position of the well screen relative to hydrogeologic features in the area. To evaluate the interconnectivity within the Otowi Member, a constant-rate pumping test at approximately 1.5 gpm will be conducted for up to 30 d. During the 30-d test period, CdV-16-1(i) may be dewatered several times to evaluate transient responses in water levels and in RDX-concentration profiles. Samples will be collected daily for RDX and weekly for metals/anions, high explosives plus degradation products, and VOC analysis during pumping. Samples will be collected at a similar frequency during the recovery period of the test, with RDX sample collection reduced in frequency from daily based on data trends. Multiple slug tests will be performed at the two piezometers installed in the CdV-9-1(i) well annulus. The types and duration of the tests will depend on piezometer performance and may include either rising (removing a slug of water from the piezometer) or falling (adding a slug of municipal water) head methods. Additionally, a constant-rate or constant head injection test using municipal water may be included to better evaluate the vertical interconnectivity of the perched saturated zone system. The following nearby wells will be used as monitoring points to detect pressure responses during testing: CdV-9-1(i), CdV-16-4ip, CdV-16-1(i), CdV-16-2i(r), R-25, R-25b, and R-63i.
Treatment and Disposal	Investigation-derived waste will be managed in accordance with EP-DIR-SOP-10021, Characterization and Management of Environmental Programs Waste. This standard operating procedure incorporates the requirements of applicable U.S. Environmental Protection Agency and NMED regulations, U.S. Department of Energy orders, and Laboratory requirements. Upon NMED Ground Water Quality Bureau (GWQB) approval, water generated as part of this characterization study will be treated and dispositioned in a manner consistent with the approach used during the 10-d test conducted in 2011 (LANL 2011, 203711, Appendix D) and the 60-d test conducted in 2014 (LANL 2014, 262526). The process that will be proposed to NMED-GWQB will include the use of dual granular-activated carbon units to treat pumped water to concentrations below the land-application criterion for all applicable constituents. Treated groundwater will be land-applied using either trucks with spray hoses or a sprinkler array.

Schedule and Reporting	Once the NMED Hazardous Waste Bureau approves this work plan, hydraulic characterization activities will begin upon receipt of a permit from the New Mexico Office of the State Engineer granting a "change in groundwater purpose of use" and "additional groundwater points of diversion once the work plan submitted under land application permit DP-1793 has been approved." Applicable permits for disposition of the water generated during this work plan will be submitted no later than August 31, 2015, to support this project. A report summarizing the results and making recommendations for the path forward will be submitted to NMED by December 15, 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), June 2011. "Hydrologic Testing Report for Consolidated Unit 16-021(c)-99," Los Alamos National Laboratory document LA-UR-11-3072, Los Alamos, New Mexico. (LANL 2011, 203711)

LANL (Los Alamos National Laboratory), September 2011. "Investigation Report for Water Canyon/ añon de Valle," Los Alamos National Laboratory document LA-UR-11-5478, Los Alamos, New Mexico. (LANL 2011, 207069)

LANL (Los Alamos National Laboratory), October 2014. "Interim Measures Report for Source-Removal Testing at Well CdV-16-4ip," Los Alamos National Laboratory document LA-UR-14-27065, Los Alamos, New Mexico. (LANL 2014, 262526)

NMED (New Mexico Environment Department), April 22, 2008. "Notice of Disapproval Corrective Measures Evaluation Report, Intermediate and Regional Groundwater Consolidated Unit 16-021(c)-99," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2008, 101311)

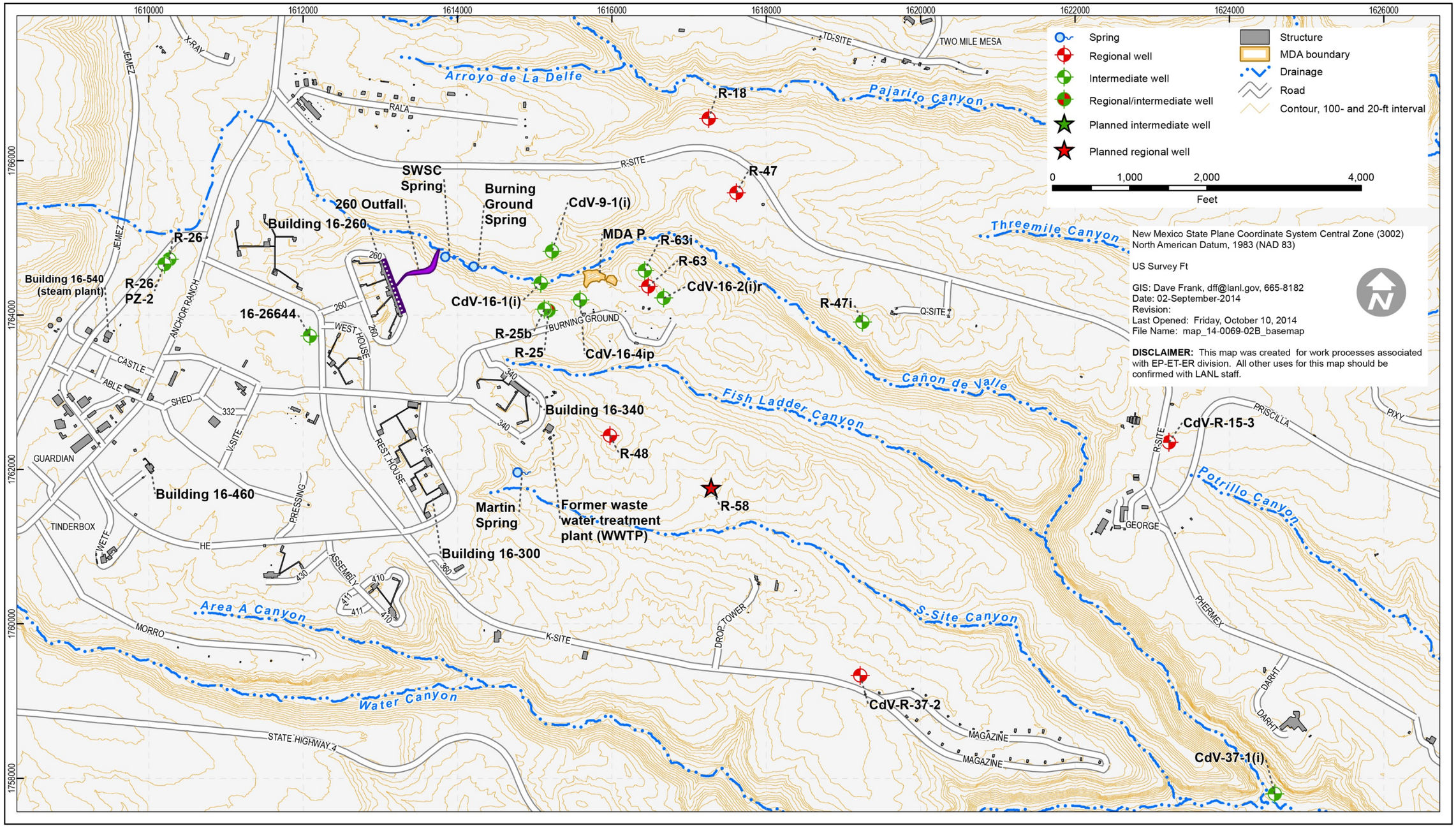

Figure 1 Intermediate and regional wells in the vicinity of TA-16

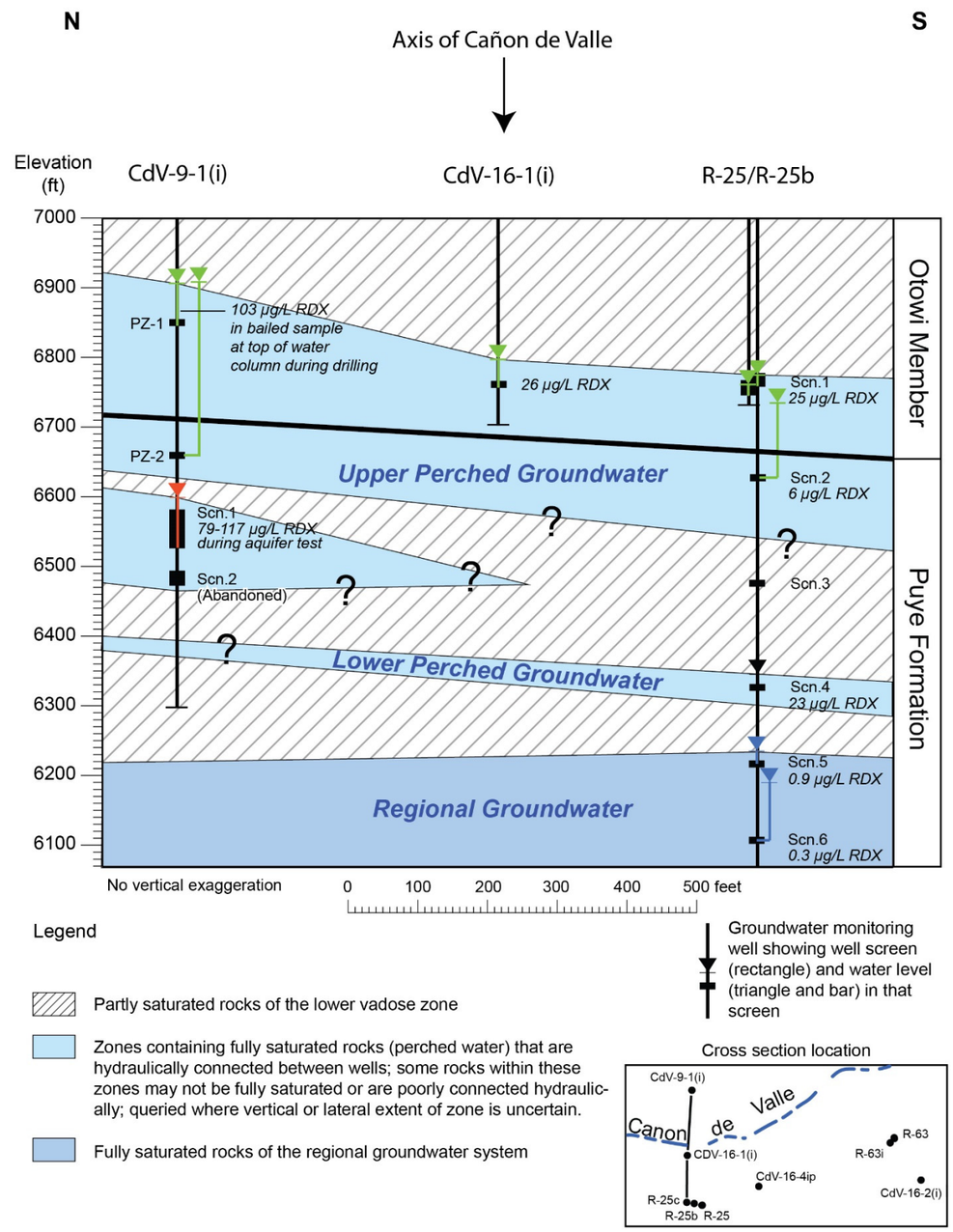

Figure 2 North-south geologic cross-section for the lower part of the vadose zone showing geologic contacts and groundwater occurrences in wells CdV-9-1(i), CdV-16-1(i), R-25b, and R-25

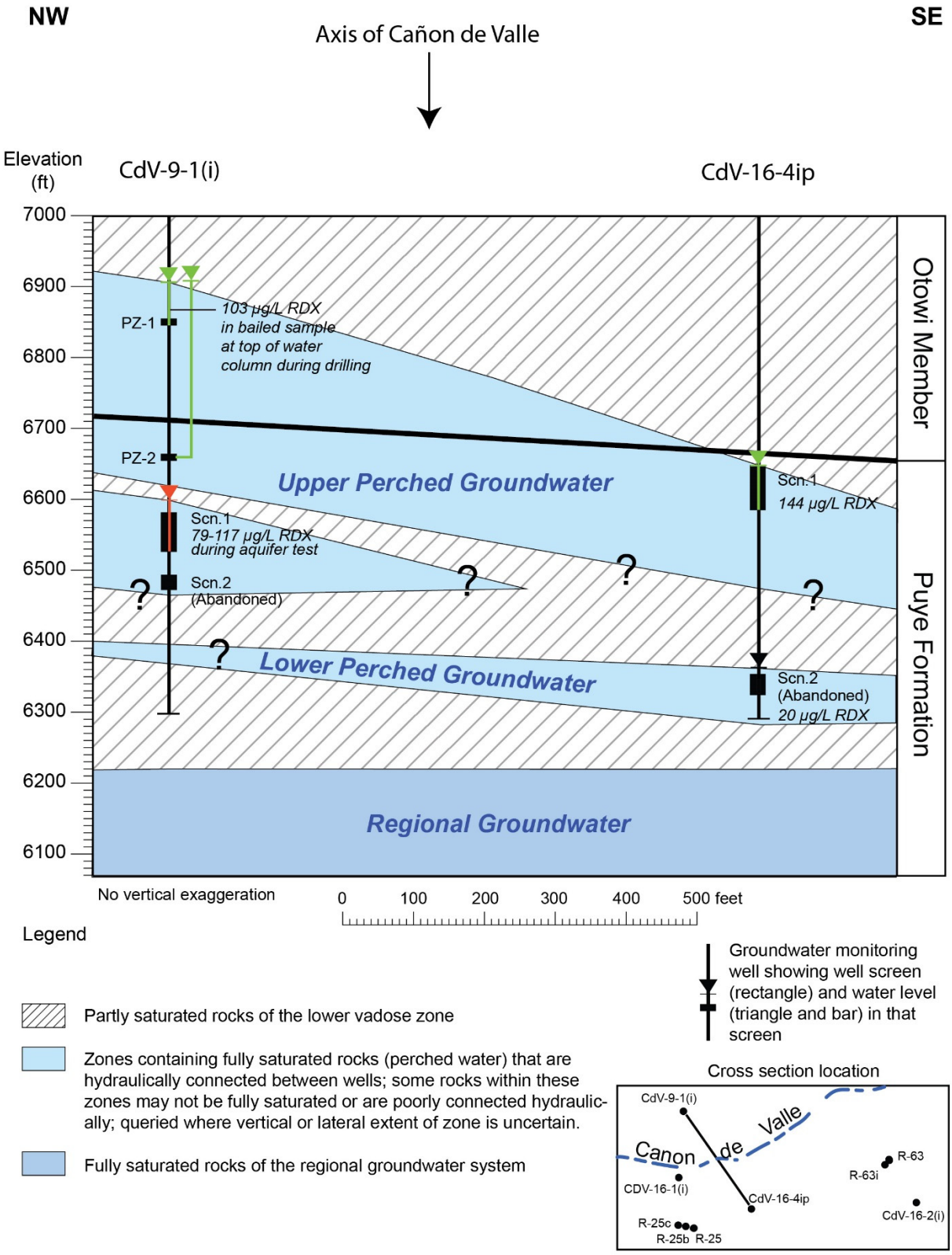

Figure 3 Northwest-southeast geologic cross-section for the lower part of the vadose zone showing geologic contacts and groundwater occurrences in wells CdV-9-1(i) and CdV-16-4ip

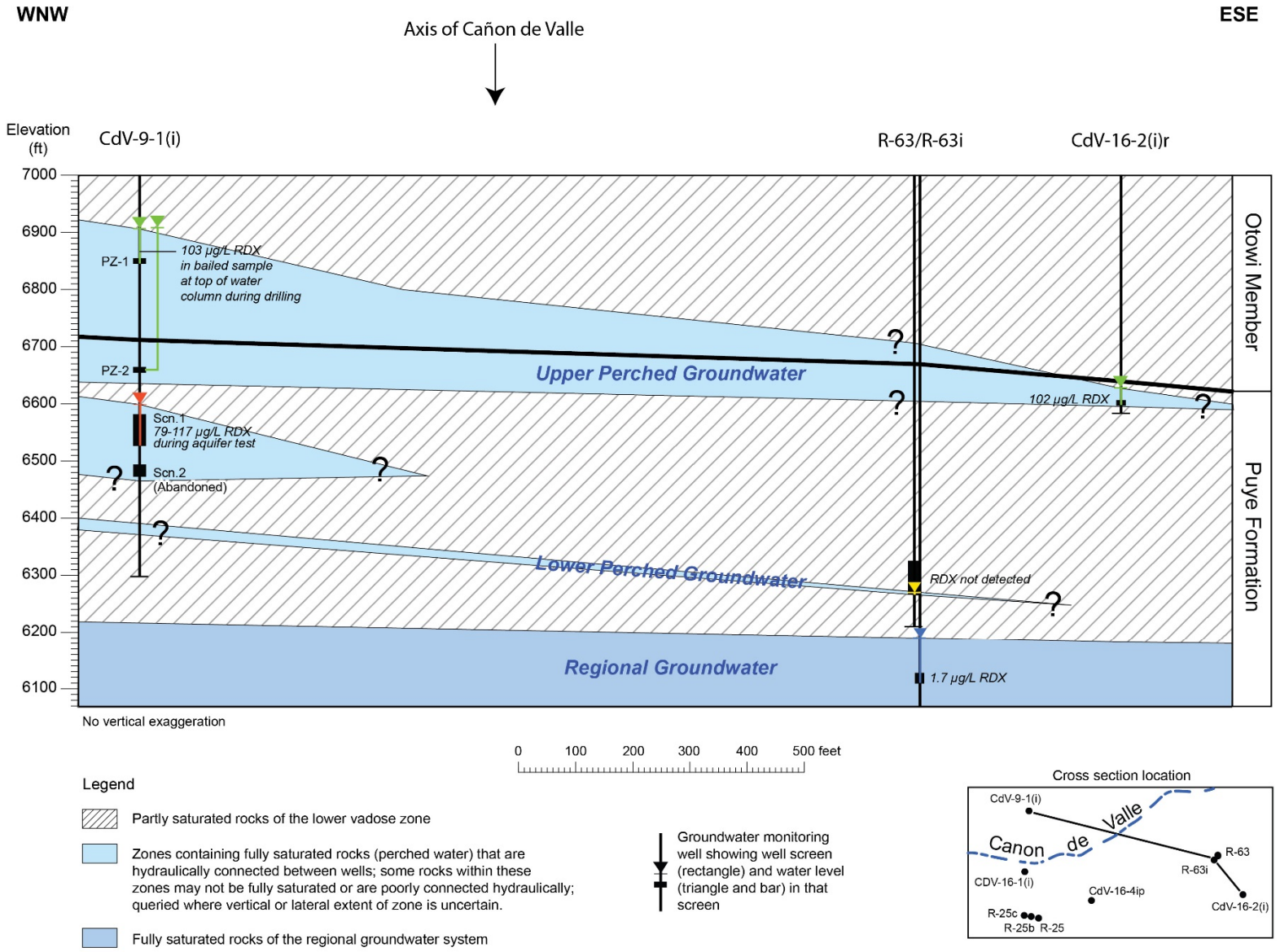

Figure 4 West-northwest to east-southeast geologic cross-section for the lower part of the vadose zone showing geologic contacts and groundwater occurrences in wells CdV-9-1(i), R-63i, R-63, and CdV-16-2(i)r