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Evaluation of the Suitability of Wells Near Technical Area 16 for Monitoring Contaminant Releases from Consolidated Unit 16-021(c)-99, Revision 1

Los Alamos
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Responsible project leader:

John McCann	[signature]	Project Leader	Environmental Programs	9-24-07
Printed Name	Signature	Title	Organization	Date

Responsible LANS representative:

Susan G. Stiger	[signature]	Associate Director	Environmental Programs	9-26-07
Printed Name	Signature	Title	Organization	Date

Responsible DOE representative:

David R. Gregory	[signature]	Project Director	DOE-LASO	9/27/07
Printed Name	Signature	Title	Organization	Date

EXECUTIVE SUMMARY

This report presents an analysis of the ability of wells in and around Technical Area (TA) 16 to detect and monitor contaminants released from Consolidated Unit 16-021(c)-99, the TA-16-260 Outfall, and other sites at TA-16. The 260 Outfall is a high explosives (HE) machining outfall that discharged HE-bearing water to Cañon de Valle for almost 50 yr. These discharges contaminated soils, sediments, surface waters, spring waters, and deep-perched and regional groundwaters at TA-16.

The wells evaluated in this report include downgradient regional groundwater wells CdV-R-15-3, CdV-R-37-2, R-17, R-18, R-19, R-25, and R-27; downgradient intermediate wells/boreholes CdV-16-1(i), CdV-16-2(i)r, CdV-16-3(i); and upgradient well R-26. These wells were drilled either as part of Los Alamos National Laboratory's (the Laboratory's) sitewide groundwater characterization program (the R-wells) or to support corrective actions associated with Consolidated Unit 16-021(c)-99 (the CdV wells). These wells will likely constitute part of the monitoring network for the corrective measures evaluation/corrective measures implementation (CME/CMI) for Consolidated Unit 16-021(c)-99.

A detailed evaluation of 26 functional screens in the wells identified above was completed following the methodologies described in the well screen analysis report the Laboratory submitted to the New Mexico Environment Department in February 2007. The evaluation uses a series of geochemical parameter tests, such as cation and anion concentration relative to background, total organic carbon concentrations, and concentrations of organic chemicals, such as acetone, to determine whether each well screen can accurately detect the concentrations of contaminants derived from sites at TA-16 (particularly RDX [cyclotrimethylenetrinitramine]) and abundances of indicators of monitored natural attenuation.

The most significant issue with the majority of the screens that do not provide reliable and representative (R&R) data for multiple constituents is residual organic compounds that produce reducing conditions in a screen. At least 18 of the well screens provide R&R data for RDX, which does not degrade easily in the environment. Nineteen screens provide R&R data for barium, another key contaminant associated with Consolidated Unit 16-021(c)-99. Eighteen screens provide R&R data for other HE (including HE-degradation products) and volatile organic compounds, significant contaminants at sites at TA-16. Most of the screens in the uppermost saturated (phreatic) zone (except Screen 2 of CdV-R-37-2), including the single-screen wells, provide R&R data for all the key contaminants associated with Consolidated Unit 16-021(c)-99.

Hydrologic evaluations of wells in the monitoring network were also completed. The majority of the well screens provide reliable head (pressure) data. An analysis of transients in these head data, particularly transients associated with pumping at downgradient production wells, supports a hydrogeologic conceptual model in which a narrow phreatic zone at the top of the regional aquifer is hydrologically isolated from deeper parts of the regional aquifer, the source of most of the water pumped from the water-supply wells.

Groundwater modeling results indicate that a contaminant plume impinging on the regional aquifer beneath Cañon de Valle (the most likely pathway for HE contamination in the deep perched and regional aquifer) has an east-northeast trend with a width of approximately 0.75 mi. A contaminant plume impinging on the regional aquifer in a more southerly portion of TA-16 (Martin Spring Canyon) has a similar width but travels in an east-southeasterly direction. The modeling suggests that the spacing of both the near-field (R-18, CdV-R-15-3, CdV-R-37-2) and far-field (R-17, R-19, R-27) downgradient wells is probably adequate to detect migration of contaminants off-site from TA-16. Wells R-18 and R-17 are located along the calculated east-northeast plume flow direction, so they are potentially important monitoring wells. Very low levels (<1 part per million) of RDX have been detected at R-18.

Statistical analyses of the ability of the monitoring network, as well as subsets of that network, to detect contaminants migrating downgradient in the regional aquifer were performed. The analyses indicate that a network consisting of both the near- and far-field wells has a greater than 95% chance of detecting TA-16 contaminants before they impinge on a production well. Analyses of a subnetwork consisting only of the near field wells [CdV-16-3(i), R-18, CdV-R-15-3, CdV-R-37-2] suggest that such a network has less than a 95% chance of detecting TA-16 contaminants long before (>20 yr) they impinge on a production well. The time frame of detection for these wells is approximately 10 yr, which is approximately 20 yr before the predicted impingement of any plume on the production wells.

Geologic structures such as faults, fractures, and deformation bands may perturb the flow of water and contaminants. The Puye Formation, the predominant geologic unit in the regional aquifer beneath TA-16, would deform cataclastically, producing deformation bands that would most likely retard east-west saturated flow comprising the regional aquifer. The Tschicoma dacite, also an important geologic unit within the regional aquifer at TA-16, would probably deform by fracturing; these fractures could either retard (if clay-filled) or facilitate (if open) the downward flow of water and contaminants.

Because of either the quality of the well screens in key localities or because of significant uncertainties in plume disposition or hydrologic gradients, this report recommends the following: (1) complete borehole CdV-16-3(i) as a regional monitoring well; (2) replace Screens 1 and 2 in R-25 with a new two-screen well; and (3) rehabilitate Screen 2 of well CdV-R-37-2 so it can produce R&R groundwater data. In addition, because the near-field well network detects contaminants with less than 95% confidence and a goal of the monitoring network is to be able to detect contaminant releases from TA-16 with >95% confidence long before such releases might impinge on the production wells, it is recommended that an additional well be drilled downgradient of TA-16 between R-18 and CdV-R-15-3 to increase the confidence level of contaminant detection in the near-field well network. The well-monitoring network will be evaluated periodically for confidence level in contaminant detection as additional wells are drilled and as more data are collected.

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1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by Los Alamos National Security, LLC. The Laboratory is located in north-central New Mexico, approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site covers approximately 40 mi^2 of the Pajarito Plateau, which consists of a series of fingerlike mesas separated by deep canyons that contain ephemeral and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 to 7800 ft. The eastern portion of the plateau stands 300 to 900 ft above the Rio Grande.

The Laboratory's Environmental Programs (EP) Directorate is participating in a national effort by the DOE to investigate and remediate sites formerly involved in weapons research and development. The goal of EP is to ensure that past operations under DOE do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, EP personnel are investigating sites potentially contaminated by past Laboratory operations.

Investigation and remediation actions at the Laboratory are subject to the Compliance Order on Consent (hereafter, the Consent Order) signed by the New Mexico Environment Department (NMED), DOE, and the Regents of the University of California on March 1, 2005. Pursuant to the Consent Order, this well evaluation supplements the recently approved "Investigation Report for 16-021(c)-99 Intermediate and Regional Groundwater" (LANL 2006, 093798) and will be used in the corrective measures evaluation (CME) in which remedial alternatives for intermediate and regional groundwater are evaluated.

This document is a segue into the corrective measures study (CMS) (LANL 1998, 062413) for Consolidated Unit 16-021(c)-99, as delineated in the CMS plan addendum and revision (LANL 1999, 064873; LANL 2003, 075986). The terms *CMS* and *CME* are used interchangeably in this document. The former term was used before the Consent Order was signed; the latter term is used in the Consent Order. This report describes the results of an evaluation of intermediate and regional groundwater wells in and around Technical Area (TA) 16 associated with Consolidated Unit 16-021(c)-99. This consolidated unit at TA-16 includes a former outfall (the TA-16-260 Outfall) for the discharge of process wastewater from building 260 and the associated drainage into Cañon de Valle (also referred to as CdV), an adjacent canyon. The primary hazardous constituents associated with this consolidated unit are high explosives (HE) and barium. The principal chemicals of potential concern (COPCs) for intermediate and regional groundwater include cyclotrimethylenetrinitramine (aka RDX), trinitrotoluene (TNT), and other HE and HE byproducts and degradation products. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

1.1 Purpose and Objectives of Report

The CME for intermediate and regional groundwater associated with Consolidated Unit 16-021(c)-99 will evaluate remedial alternatives for HE in the intermediate and regional groundwater at TA-16. Remedial alternatives likely to be considered include groundwater pump-and-treat using granular activated carbon (GAC) filter units; in situ technologies such as bioremediation, oxidation, and reduction of HE, and monitored natural attenuation (MNA). As part of any remedy or corrective action selected by NMED, the Laboratory must demonstrate that the groundwater wells along flow pathways downgradient of the 260 Outfall are capable of detecting contaminants for which the outfall may have been a source in a timely fashion (rapidly enough that remedies may be implemented before any plume had dispersed widely or come near the production wells). In other words, the principal objective of this document is to evaluate the adequacy of existing wells as a potential monitoring network for constituents of concern in groundwater at TA-16.

Specific questions that must be resolved to address these objectives and before a groundwater remedy can be implemented with the full confidence of stakeholders include the following:

- Are the well screens in these downgradient wells of adequate quality to detect contaminants released from the 260 Outfall, particularly those contaminants present in intermediate and regional groundwater at levels above water-quality standards? (section 3)
- Are the well screens in the downgradient wells of adequate quality to detect other constituents at levels needed to support remedies selected for intermediate and regional groundwater associated with the 260 Outfall? (section 3)
- Are the vertical locations of those well screens adequate to detect contaminants? Are the screens in appropriate hydrostratigraphic units? (section 3.4)
- Are the downgradient wells located where they will detect contaminants derived from operations at TA-16-260 in a timely fashion (less than ~10 yr from release)? (section 4.3 and Appendix E)
- Are regional and local structures such as faults and fractures likely to perturb the flowpaths in such a way that the downgradient wells would not detect contaminant releases from the 260 Outfall area? (section 5)
- Are there other issues associated with the downgradient wells that might limit stakeholder ability to support a remedy for intermediate and regional groundwater associated with the 260 Outfall? These other issues include well construction issues, such as excessive screen and filter pack lengths, damaged casings and screens, poor seal integrity, and influences from annular seal materials. (section 3.4)
- Are there uncertainties in the hydrologic conceptual model for TA-16 groundwater that reduce confidence that contaminant releases from the 260 Outfall will be detected? (section 4)

The answers to these questions will help optimize the interim groundwater monitoring network at TA-16. Thus, this document supports compliance with 20.4.1500 New Mexico Administrative Code (NMAC), incorporating 40 CFR, Part 264 Subpart F requirements, as outlined in Section IV of the Consent Order. This evaluation may result in a recommendation to rehabilitate specific wells or well screens, replace specific wells, or drill new wells. It is important to note that this document represents an interim evaluation of the groundwater monitoring network at TA-16; once NMED selects a CME remedy, a monitoring network specifically optimized to the selected remedy may need to be developed. However, the wells evaluated below should provide a strong framework for the monitoring network for any selected remedy.

The wells evaluated in this report include downgradient deep wells CdV-R-15-3, CdV-R-37-2, R-17, R-18, R-19, R-25, R-27; downgradient intermediate wells CdV-16-1(i), CdV-16-2(i)r, CdV-16-3(i); and upgradient well R-26 (Figure 1.1-1). CdV-15-3(i) is located in extremely tight Tschicoma dacites and has not been completed as a well. Thus, it has not been evaluated in section 3; however, its location as a potential part of the monitoring network is evaluated in section 4 and Appendix E. Groundwater modeling will be used to estimate plume behavior to evaluate whether the well sites and the vertical locations of the screens can detect contaminants moving from the TA-16 site (see section 4.0 and Appendix E). An important aspect of such modeling is incorporating uncertainties into the models, including conceptual model uncertainties. Geochemical analysis, including comparison to background and examination of indicator constituents are the principal methods for evaluating the quality of well screens for detecting contaminants (see section 3.0). The potential impacts of geologic structures are addressed, largely qualitatively, in section 5.0.

2.0 BACKGROUND

TA-16 is located in the southwest corner of the Laboratory (Figure 2.0-1). It covers 2410 acres or 3.8 mi^2. The land was acquired by the Department of Army for the Manhattan Project in 1943. TA-16 is bordered by Bandelier National Monument along State Highway 4 to the south and by the Santa Fe National Forest along State Highway 501 to the west. To the north and east, it is bordered by TAs 08, 09, 11, 14, 15, 37, and 49. TA-16 is fenced and posted along State Highway 4. Water Canyon, a 200-ft-deep ravine with steep walls, separates State Highway 4 from active sites at TA-16. Cañon de Valle forms the northern border of TA-16. Security fences surround the production facilities. A complete discussion of the TA-16 environmental setting is presented in the TA-16 Phase III Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) report (LANL 2003, 077965, Appendix B).

TA-16 was established to develop explosive formulations, cast and machine explosive charges, and assemble and test explosive components for the nuclear weapons program. Almost all the work has been conducted in support of developing, testing, and producing explosive charges for atomic weapons. Present-day use of this site is essentially unchanged, although the facilities have been upgraded and expanded as explosives and manufacturing technologies have advanced.

The administrative boundary for the CME is shown in Figure 2.0-2. The boundary runs along State Highway 501 to the west, follows a drainage divide (between Cañon de Valle and Water Canyon) across the TA-16 mesa to the south, and follows Cañon de Valle to its confluence with Water Canyon to the north and east. This area is referred to as the Cañon de Valle basin. The administrative boundary is intended to incorporate contaminant sources and fate and transport mechanisms within part of the Cañon de Valle drainage. The 260 Outfall is believed to be the major source of contaminants in the basin. Monitoring and data analysis performed at the basin scale will support decisions about remedial activities at other potential contaminant source locations as well. Other potential contaminant sources within this area are being addressed by other EP activities such as the Water Canyon/Cañon de Valle aggregate area investigation.

2.1 Site Description and Operational History

Since 1951, building 260, located on the north side of TA-16 (Figure 2.1-1), has been used for processing and machining HE. Water is used to machine HE, which is slightly water soluble, so wastewater from machining operations contains dissolved HE and may contain entrained HE cuttings. At building 260, wastewater treatment consists of routing the water to 13 settling sumps for recovering any entrained HE cuttings. From 1951 to 1996, the water from these sumps was discharged to the 260 Outfall, which drained into Cañon de Valle. In 1994, outfall discharge volumes were measured at several million gallons per year. The discharge volumes were probably higher during the 1950s when HE production output from building 260 was substantially greater than it was in the 1990s (LANL 1994, 076858).

During the late 1970s, the 260 Outfall was permitted to operate by the U.S. Environmental Protection Agency (EPA) as EPA Outfall No. 05A056 under the Laboratory's National Pollutant Discharge Elimination System (NPDES) permit (EPA 1990, 012454). The last NPDES-permitting effort for the 260 Outfall occurred in 1994. The NPDES-permitted 260 Outfall was deactivated in November 1996; it was officially removed from the Laboratory's NPDES permit by the EPA in January 1998. This waste stream is currently managed by pumping the sumps and treating the water at the TA-16 HE wastewater treatment plant.

As a result of the discharge, both the 260 Outfall and the drainage channel from the outfall are contaminated with HE residues and other chemicals, such as barium, associated with HE machining. The sumps and drainlines of this facility are designated as Solid Waste Management Unit (SWMU) 16-003(k), and the 260 Outfall and drainage are designated as SWMU 16-021(c), according to Module VIII of the Laboratory's Hazardous Waste Facility Permit (EPA 1990, 001585). Following Laboratory efforts to consolidate SWMUs, the two SWMUs are now collectively referred to as Consolidated Unit 16-021(c)-99. Before the Phase I and Phase II RFIs at SWMUs 16-003(k) and 16-021(c), the known contaminants were barium, RDX, TNT, and HMX (1,3,5,7-tetranitro-1,3,5,7-tetrazocine). Suspected contaminants included other HE compounds, additional inorganic chemicals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and uranium.

SWMU 16-021(c) consists of three portions: an upper drainage channel fed directly by the 260 Outfall, a former settling pond, and a lower drainage channel leading to Cañon de Valle. The former settling pond, which was removed during a 2000–2001 interim measure (IM) cleanup, was approximately 50 ft long, 20 ft wide, and located within the upper drainage channel, approximately 45 ft below the 260 Outfall. The upper drainage channel runs approximately 600 ft northeast from the 260 Outfall to the bottom of Cañon de Valle. A 15-ft near-vertical cliff is located approximately 400 ft from the 260 Outfall and marks the break between the upper and lower drainage channels. Both Cañon de Valle and Martin Spring Canyon are included in the CME/CMI for Consolidated Unit 16-021(c)-99.

The IM cleanup removed more than 1300 yd^3 of contaminated soil from the settling pond and channel. Approximately 90% of the HE in the Consolidated Unit 16-021(c)-99 source area was removed during the IM cleanup (LANL 2002, 073706, p. 72).

Other SWMUs located in the vicinity of the 260 Outfall are shown in Figure 2.1-2. The majority of SWMUs at TA-16 known or suspected to have had high levels of contamination are located adjacent to Cañon de Valle and hence may have contributed contamination to that canyon that could subsequently have been mobilized to deep groundwater. Several of these SWMUs are described below.

- Material Disposal Area (MDA) R (SWMU 16-019). MDA R is located north of the 260 Outfall area (see Figure 2.1-2). This MDA was constructed in the mid-1940s and was used as a burning ground and disposal area for waste explosives and possibly other debris. Potential contaminants at this MDA include HE, HE byproducts, and metals (particularly barium). Use of the site was discontinued in the early 1950s. Soil removal and related site investigations were conducted at MDA R following the Cerro Grande fire (LANL 2001, 069971).
- Burning Ground SWMUs [16-010(b), 16-010(c), 16-010(d), 16-010(e), 16-010(f), and 16-028(a)] and Consolidated Units [16-010(h)-99 and 16-016(c)-99]. In September 2005, SWMUs 16-010(e) and 16-010(f) were closed out as active RCRA treatment, storage, and disposal facilities. These sites are located on a level portion of the mesa in the northeast corner of TA-16. The burning ground was constructed in 1951 for HE waste treatment and disposal. Over the years, hundreds of thousands of pounds of HE and HE-contaminated waste material were destroyed by burning. After burning, the remaining noncombustible material was either placed in MDA P, north of the Burning Ground (through 1984), or taken to TA-54 for storage and treatment before it was disposed of off-site (1984 to present). Site investigations were conducted at several of these SWMUs during 1995 and later (LANL 2003, 076876). Information was also obtained from investigations conducted between 1997 and 2002 at Flash Pad 387 and Consolidated Unit 16-016(c)-99. Flash Pad 387 underwent clean closure, and the sites representing Consolidated Unit 16-016(c)-99 underwent a voluntary corrective action (VCA) (LANL 2003, 085530) concurrently with the MDA P clean closure (LANL 2003, 076876). NMED approved these SWMUs for no further action (NFA) (NMED 2006, 093249).
- MDA P (SWMU 16-018). This MDA contained wastes from the synthesis, processing, and testing of HE; residues from the burning of HE-contaminated equipment; and construction debris.

Disposal of HE waste at this site started in the early 1950s and ceased in 1984. The site is located on the south slope of Cañon de Valle. Under RCRA, MDA P underwent clean closure in which approximately 55,000 yd^3 of soil and debris was removed (LANL 2003, 076876). NMED approved the MDA P closure certification report in 2005 (NMED 2005, 093247).

- The 90s Line Pond portion of Consolidated Unit 16-008(a)-99. The 90s Line Pond is an inactive unlined settling pond located a few hundred feet west of building 260. The pond may have received HE, barium, uranium, and other inorganic and organic chemicals from machining operations discharges from TA-16-89, -90, -91, -92, and -93. As recently as 2002, HE solids were observed at the pond area. Further investigation of this area is ongoing in 2007, and a report will be issued in September 2007.

2.2 Historical Investigations

Numerous investigations into Consolidated Unit 16-021(c)-99 have been conducted, including a postremediation investigation of the outfall drainage channel following the IM removal of drainage channel soils. These investigations are summarized chronologically below.

A RCRA facility assessment (RFA) (LANL 1990, 007512) summarized soil and water sampling results dating from the 1970s for the outfall area.

The Phase I RFI site characterization (April 1995–November 1995) and Phase I RFI report (LANL 1996, 055077) concentrated on the drainage channel and its intersection with Cañon de Valle, including alluvial sediment, surface water, and groundwater. NMED approved the report in 1998 (NMED 1998, 093664).

The Phase II RFI site characterization (November 1996–November 1997) and the Phase II RFI report (LANL 1998, 059891) further delineated contamination in tuff surge beds beneath the drainage channel and in Cañon de Valle sediment and waters. The Phase II RFI included the sampling of surface and near-surface material within the drainage and the sampling of 13 boreholes (BHs) drilled to depths between 17 and 115 ft in and near the drainage. The Phase II RFI also included extensive field screening using immunoassay methods for RDX and TNT as well as sampling for HE and other chemicals. A risk characterization was also performed. NMED approved the report in September 1999 (NMED 1999, 093666).

An IM remedial excavation was conducted in the outfall drainage channel and settling basin in 2001. More than 1300 yd^3 of contaminated material containing approximately 8500 kg of HE was removed from these areas. The investigation results are presented in the IM report, which was approved by NMED (LANL 2002, 073706).

The Phase III RFI site characterization (October 1998–March 2002) and Phase III RFI report (LANL 2003, 077965) included analyzing water and sediment data collected since the Phase II RFI report (post-1998) in both Cañon de Valle and Martin Spring Canyon, studying of spring dynamics, studying a geomorphic alluvial sediment, conducting geophysical studies, and performing baseline risk assessments for the outfall source area and for selected reaches of Cañon de Valle and Martin Spring Canyon. In addition, a baseline ecological risk assessment was performed for Cañon de Valle. NMED approved the Phase III RFI report in June 2004 (NMED 2004, 093248).

An investigation of groundwater in and around TA-16 was conducted starting in 2000 and is ongoing. The results of this investigation are documented in the investigations report for intermediate and regional groundwater (LANL 2006, 093798). This study documented the installation of wells in and around TA-16 and evaluated the monitoring data for these wells and for additional wells drilled as part of the sitewide regional monitoring program. NMED approved the investigation report for groundwater in November 2006 (NMED 2006, 095026).

A more detailed chronology of Laboratory activities at Consolidated Unit 16-021-(c)-99 is presented in Table 2.2-1.

2.2.1 Results of Historical Investigations

Results from previous investigations contributed to the development of the conceptual site model, which presents a unified description of the local hydrogeological and contaminant transport systems. Important components of the model, roughly corresponding to depth, are the outfall source area, canyon alluvial system, intermediate zone (also called the mesa vadose zone), and regional aquifer. These components of the site model are shown in Figure 2.2-1. A description of the conceptual model for regional groundwater is included in section 4 of this document. The results of previous investigations are summarized below by conceptual model component.

2.2.1.1 Outfall Source Area

The RFA documented data collected for the 260 Outfall [SWMU 16-021(c)] since the early 1970s and showed substantially elevated HE contamination in the sediment, outfall, and sump water. Levels up to 27 weight percent (wt%) (270,000 mg/kg) of HMX and RDX had been documented in the area of the former settling pond. The data showed HE contamination extending from the discharge point to Cañon de Valle (Baytos 1971, 005913; Baytos 1976, 005920). The historical data have also been summarized in the Phase I and II RFI reports for SWMUs 16-003(k) and 16-021(c) (LANL 1996, 055077; LANL 1998, 059891).

Phase I and Phase II results showed elevated concentrations of HE and barium within the outfall drainage from the surface down to the soil/tuff interface. Phase I and II surface sampling showed surface contamination did not extend laterally beyond the reasonably well-defined drainage. Barium, HMX, RDX, and TNT were detected downgradient within the drainage and decreased rapidly beyond the settling pond, although substantial levels of HMX and barium were present at the base of the colluvial slope in Cañon de Valle.

Subsurface sampling indicated that HE concentrations also decreased rapidly below the soil/tuff interface. However, up to 1000 mg/kg of HE was found in tuff within the uppermost tuff unit (unit 4 of the Tshirege Member of the Bandelier Tuff, Qbt 4), beneath the upper part of the drainage, including in the former settling pond area. Almost 1 wt% (10,000 mg/kg) HE was reported in a saturated sample from a borehole at a depth of about 17 ft beneath the former settling pond (LANL 1998, 059891, p. 2-79). The sample was collected from a surge bed within unit 4 of the Tshirege Member of the Bandelier Tuff. Below the level of this surge bed, HE was detected sporadically and at much lower concentrations (less than 5 mg/kg). However, thin surge bed deposits were reported in BH 16-06370, drilled into the center of the former settling pond during the IM, at depths of 40 ft and 46 ft below ground surface (bgs), indicating multiple potential transmissive zones at depth (LANL 2002, 073706, p. 35).

HE and barium were the principal contaminants found at the 260 Outfall, although several other metals, including cadmium, chromium, copper, lead, nickel, vanadium, and zinc, were consistently detected above background levels in the drainage. Other organic compounds (SVOCs and VOCs) were also detected in multiple samples. Details and results from the Phase I and II RFIs are presented in the two RFI reports (LANL 1996, 055077; LANL 1998, 059891). Understanding contaminants in the outfall area is important in the context of this document, because the outfall settling pond contained standing water throughout much of its operational history and, therefore, probably represented a source-term for subsequent groundwater contamination.

The IM cleanup removed more than 1300 yd^3 of contaminated soil from the settling pond and channel. An IM report for SWMU 16-021(c) (LANL 2002, 073706, p. 72) detailing the postremoval sampling results indicated that approximately 90% of the HE at the source area had been removed by the IM.

The Phase III baseline risk assessment (LANL 2003, 077965, section 6) for the source area identified COPCs and assessed potential exposures to an on-site environmental worker, a trail user, and a construction worker. The cumulative excess cancer risk to the environmental worker from potential exposures to COPCs in soil and tuff is slightly above the NMED target level of 10^{-5}. The cumulative excess cancer risk for the other receptors is below the NMED target level of 10^{-5}. A noncancer hazard index (HI) greater than 1.0 is associated with exposure to the outfall source area COPCs for the construction worker scenario but not for the other receptors (HI<1.0).

2.2.1.2 Alluvial System

Phase II sampling in the Cañon de Valle alluvial system included collecting surface and subsurface sediment samples, three pairs of overbank-sediment samples, filtered and unfiltered surface water samples, and one quarterly round of filtered and unfiltered alluvial groundwater samples. These samples were collected during three different investigations conducted in 1994, 1996, and 1997–1998.

The Phase II investigation report included the following results.

- Barium was the most abundant inorganic chemical contaminant in sediment. For the surface samples, barium ranged from 6.3 mg/kg to 40,300 mg/kg. Other inorganic chemicals consistently above background levels included cadmium, chromium, copper, lead, nickel, vanadium, and zinc. Several types of HE were detected: the A-DNTs (amino-dinitrotoluenes), HMX, nitrobenzene, 3-nitrotoluene, RDX, TNB (1,3,5-trinitrobenzene), and TNT. The two HE compounds highest in abundance and concentration were HMX (170 mg/kg) and RDX (42 mg/kg).
- Surface water samples and alluvial groundwater samples from five alluvial wells and Peter Seep were collected in Cañon de Valle. Filtered/unfiltered sample pairs were collected during 1994 and 1997–1998; primarily unfiltered samples were collected in 1996. The inorganic chemicals identified as COPCs in water were antimony, barium, chromium, lead, manganese, mercury, nickel, vanadium, and zinc. Barium is the most abundant, with concentrations ranging up to 16,000 µg/L. As with sediment, HE appears to be the other major COPC in Cañon de Valle surface water and alluvial groundwater. The HE COPCs identified were A-DNTs, HMX, nitrobenzene, 2-nitrotoluene, RDX, TNB, and TNT. RDX is the HE with the highest concentration, with a maximum of 818 µg/L in surface water. Concentrations of COPCs generally decreased downgradient from Peter Seep to the confluence with Water Canyon (LANL 1998, 059891).
- The intermediate-depth perched aquifer investigation included drilling five wells (91 to 207 ft bgs) at locations likely to intersect the saturated zones at TA-16. The local trend of subunit/subunit contacts is to the north and east. When installed, two of these wells intersected ephemeral perched water, which disappeared in less than 1 month. Analysis of this perched water indicated the presence of HE.
- The springs investigation included quarterly sampling of Sanitary Wastewater Systems Consolidation (SWSC) plant, Burning Ground, and Martin Springs. The results showed detectable RDX and other HE in all three springs. Several major cations and anions, including calcium, magnesium, sodium, and boron, were detected. Boron is particularly elevated (1800 µg/L) in

Martin Spring. Aluminum, iron, barium, phosphate, and nitrate concentrations were also elevated. Although VOCs were detected in all three springs, the detections were sporadic.

- Time-series analysis of the springs data indicates extreme variability in the concentration of constituents (up to a factor of 20 in RDX concentration at Martin Spring). Similarities in element variability and flow-rate changes over time indicated that SWSC Spring and Burning Ground Spring are hydrogeologically related but that Martin Spring probably represents a different hydrogeological system.

The Phase III investigation (LANL 2003, 077965) added the following conclusions about the alluvial system.

- Sediments in Cañon de Valle and Martin Spring Canyon represent a secondary source for HE and barium that is potentially mobilized by surface water and alluvial groundwater. Moreover, the perennial reach of Cañon de Valle alluvial groundwater provides a high potential for subsequent infiltration of mobile contaminants to deeper groundwater.
- For the Cañon de Valle alluvial area, a trail user exposure scenario was assessed. This scenario was deemed to be the most likely exposure scenario for this remote canyon. The cumulative excess cancer risk to the trail user from potential exposure to all COPCs in sediment and surface water was below the 10^{-5} target risk specified by NMED. The noncancer hazard was below an HI of 1.0. NMED approved of use on this nonresidential risk scenario.
- The ecological risk assessment followed EPA guidance (EPA 1997, 059370); it was based on an empirical evaluation of effects on receptors as well as on extrapolations to a threatened or endangered species. For the terrestrial system in Cañon de Valle, elevated metals concentrations were found in small mammals but not at levels that are likely to cause adverse effects to the Mexican spotted owl. The numbers of species, population densities, and reproductive classes for those species indicated that the Cañon de Valle small-mammal community is not being adversely affected by contaminants. In Cañon de Valle, a viable benthic macroinvertebrate community is present, which is a meaningful indicator that site contaminants have caused minimal negative ecological effects.
- For Martin Spring Canyon, a trail user scenario was assessed. Cumulative excess cancer risk to the trail user from potential exposures to all COPCs in sediment and surface water is below the 10^{-5} target risk specified by NMED. The noncancer hazard was below an HI of 1.0.

The Cañon de Valle alluvial system is hypothesized to be the principal near-surface pathway for recharge of HE-contaminated waters into deeper groundwater.

2.2.1.3 Mesa Vadose Zone

The Phase III RFI (LANL 2003, 077965) reached the following conclusions about the mesa vadose zone.

- The isotopic differences in composition between mesa vadose zone groundwater (groundwater within tuff between the mesa top and canyon bottom) and Cañon de Valle alluvial groundwater (groundwater within the Cañon de Valle alluvial system in the canyon) indicated that mesa groundwater probably comes from local precipitation and snowmelt on the mesa top, whereas Cañon de Valle alluvial groundwater is at least partially derived from spring flow that is recharged at higher elevations.
- Borehole sampling in the mesa vadose zone indicated no contamination in the unsaturated depth intervals in any boreholes, except in the immediate vicinity of the former TA-16-260 settling pond.

These results indicate that mesa vadose zone contamination is concentrated beneath source-area SWMUs such as the former and current ponds and drainages (90s Line Pond, 30s Line Pond) on the mesa top. However, the ephemeral groundwater from mesa vadose zone wells not located in the vicinity of the former settling pond also showed contamination, indicating lateral movement (possibly through surge beds) of water and contaminants within the mesa subsurface. Based on the results of oxygen and deuterium stable isotope analyses, mesa vadose zone groundwater from wells near Martin Spring Canyon and the 90s Line Pond, as well as surface water from the 90s Line Pond, show evaporative signatures, but spring water does not. These results support the conceptual site model of a mesa vadose zone groundwater flow regime dominated by fractures and surge beds and, in general, the importance of hydrologic heterogeneity at TA-16 for infiltration of water to deep groundwater.

- In April 1997, a potassium bromide tracer was deployed at SWMU 16-021(c). In August 1997, a breakthrough of bromide ions was observed in SWSC Spring. The breakthrough may also have occurred at Burning Ground Spring in August 1997, but the effects were more subtle because the bromide was partially masked by the variability in all the anions (LANL 1998, 059891, p. 4-91). This finding indicates that the springs are hydrologically connected to the SWMU 16-021(c) source area and that fracture flow is important within the TA-16 vadose zone.
- Contaminant transport in the mesa vadose zone is dominated by a fracture or surge bed flow regime, of which contaminated springs are a known manifestation (see bullet above on tracer test). Since the IM source removal, a substantial source for this contamination is no longer present, although reductions in spring contaminant concentrations are not yet evident.

2.2.1.4 Deep Perched and Regional Aquifers

The groundwater investigation report of Consolidated Unit 16-021(c)-99 (LANL 2006, 093798) reached the following general conclusions about the deep perched and regional aquifers. More detail on the hydrogeologic conceptual model for the deep perched and regional aquifers is provided in section 4 of this document.

The deep perched and regional groundwater in wells R-25, CdV-16-1(i) and Cdv-16-2(i) are contaminated with RDX, TNT, other HE, tritium, organic chemicals (e.g., trichloroethene, tetrachloroethene), nitrate, perchlorate, and inorganic chemicals such as chromium, nickel, and other metals.

Downgradient wells (e.g., CdV-R-15-3, CdV-R-37-2, and R-19) have occasional detections of organic and inorganic constituents at levels greater than detection limits and background values but do not show consistent detections of HE (with the exception of R-18), as would be expected if the TA-16 HE plume had reached these wells. These detections may be the result of (1) localized fracture-zone transport originating at recharge sources near these well; (2) analytical artifacts (for organic chemicals) or detections slightly above the background range (for inorganic chemicals); or (3) residual effects of drilling fluids.

Several lines of evidence indicate it is unlikely these detections are from groundwater transport of contaminants derived from the 260 Outfall. Mixing/dispersion processes in the regional aquifer will damp out transient contaminant signatures resulting from temporally variable fracture flow. The farther downgradient in the regional aquifer the 260 Outfall-derived plume migrates, the less fracture-flow-induced transients will be significant. The 260 Outfall contaminant plume is consistently characterized by elevated RDX and tritium [see data for R-25 perched zone, CdV-16-1(i), and CdV-16-2(i) in Appendix D]. RDX and tritium are both conservative constituents and move rapidly in regional groundwater. The lack of correlation between these 260 Outfall plume indicators and the detections of other constituents in the downgradient wells suggests that these detections are not indicative of the 260 Outfall plume.

2.2.2 Nature and Extent of Contamination

TA-16 is a complex site in terms of geohydrologic behavior and contaminant fate and transport, and the conceptual site model has significant uncertainties concerning the explicit distribution of released constituents. The most thorough conceptual site model of nature and extent is presented in the Phase II (LANL 1998, 059891) and Phase III (LANL 2003, 077965) RFI reports. A summary is provided below.

The 260 Outfall discharges during the past 50 yr at Consolidated Unit 16-021(c)-99 served as a source of HE and inorganic element contamination found throughout the site (LANL 1998, 059891). The principal contaminants in 260 Outfall sediment were barium (up to 20,000 mg/kg) and HE (greater than 200,000 mg/kg). The source area consists of a well-defined upper drainage channel that was fed directly by the building sumps and drainline, a former settling pond, and a drainage channel leading to Cañon de Valle.

The former settling pond and associated soil were removed during the IM (LANL 2002, 073706). More than 1300 yd^3 of contaminated material containing approximately 8500 kg of HE was removed from this area. A surge bed located at approximately 17 ft below ground was not excavated during the IM. Results from surge bed borings installed during the IM (LANL 2002, 073706, p. 35) and the Phase III RFI indicate that substantial contamination (9700 mg/kg of HE) resides within this 17-ft surge bed. Lower surge beds showed a lower concentration of HE (less than 5 mg/kg).

Other mesa vadose zone tuff samples from the intermediate-depth well boreholes indicate no contamination in subsurface intervals; mesa vadose zone contamination is primarily concentrated beneath source areas such as the former and current ponds and drainages on the mesa top, with lesser inventories of contamination present elsewhere. Over 15 intermediate depth (>80 ft) boreholes have been drilled in and around TA-16 both in the 260 Outfall area (LANL 1998, 059891, Chapter 3), near the World War II HE wastewater ponds, and at the TA-16-340 Complex (LANL 2006, 091450). Data from these boreholes have shown large amounts of HE (e.g. RDX <0.1 cleanup levels) only directly beneath the TA-16-260 ponds and the World War II HE wastewater ponds. Detections of HE outside areas directly beneath these source ponds are at lower levels and tend to be concentrated in fractures and/or surge beds (LANL 1998, 059891, Chapter 3). The conclusion that the major portion of the mesa-top contaminant inventory occurs in the vicinity of these source areas is reinforced by water-content sampling results, indicating that much of the vadose zone away from the source areas is relatively dry (LANL 2003, 077965, section 4).

On the basis of borehole data, a saturated perched zone is present between approximately 750 ft and 1100 ft bgs, with the regional aquifer beginning at approximately 1300 ft bgs. Between these two saturated zones is an interval made up of alternating saturated zones and dry rock. The nature and degree of the connectivity between these two major zones is not known. Both major zones appear to contain HE constituents, including RDX, TNT, HMX, and A-DNTs. The two highest HE concentrations came from the middle of the perched zone and near the top of the regional aquifer, respectively.

The Phase II RFI report conceptual site model indicated that Cañon de Valle alluvial sediment is a continuing secondary source for HE and barium (LANL 1998, 059891) groundwater concentrations that are above New Mexico groundwater standards and EPA tap water screening limits. This component of the conceptual site model is hypothesized to be the most likely recharge source for contamination of deep groundwater. Sediment transport was identified as a key contaminant transport mechanism for barium, and this mechanism was characterized as a dynamic process governed largely by the frequency and magnitude of runoff and flood events.

Estimates of the total inventory of HMX and RDX in Cañon de Valle sediment before the Cerro Grande fire indicated that approximately 50 kg of HMX was present, 50% of which occurred in fine-grained sediment and 50% of which occurred in coarse-grained sediment. An inventory of approximately 5 kg of RDX was estimated, of which about 60% was found in fine-grained sediment. Postfire data showed generally lower RDX and HMX concentrations, indicating a substantial redistribution from postfire flooding (LANL 2003, 077965, section 3).

Barium and RDX are both present in Martin Spring Canyon but at much lower concentrations and with much smaller inventories than in Cañon de Valle. The estimated barium and RDX inventories in Martin Spring Canyon are approximately 820 kg and 0.2 kg, respectively. The source for RDX is groundwater discharge from Martin Spring, and the RDX probably first became adsorbed to organic matter and associated sediment in the stream bed. Subsequently, the sediment was suspended by scour during floods and redeposited on adjacent abandoned channels and floodplains.

In both Cañon de Valle and Martin Spring Canyon, the contaminant mass estimate is limited by the depth of the geomorphic sampling (a maximum of 2 ft bgs). While the results from boring sampling of the alluvial wells drilled during the Phase II and Phase III RFIs indicate minimal contamination at depth in the saturated alluvial/tuff contact, the vertical distribution of contaminants in the overlying saturated and unsaturated alluvial sediments is not known.

The presence of both RDX and barium upgradient from the outfall discharge point indicates that residual contamination at MDA R and the 90s Line Pond may also contribute to alluvial system contamination, which could subsequently be mobilized to deeper groundwater.

The data collected in the Phase III RFI indicate that the alluvial groundwater system in Cañon de Valle is heterogeneous in both contamination and hydrologic properties such as saturation. Contaminant concentrations in water do not represent a simple “plume,” with decreasing concentrations from the source or center of the plume (LANL 2003, 077965, section 3). Both RDX and barium increase and decrease in relative abundance in springs, surface waters, and alluvial groundwaters as a result of (1) variable exchange between surface and alluvial groundwaters that is dependent on the flow regime; (2) variable degrees of mobilization of vadose zone and alluvial sediments; (3) location of contaminant inventories; and (4) varying degrees of dilution from runoff, interflow, and vadose-zone discharge.

During 1999, well R-25 was drilled to a depth of 1942 ft from the mesa top above Cañon de Valle into the regional aquifer. Intermediate wells CdV-16-1(i) (683-ft depth) and CdV-16-2(i)r (874.4-ft depth) were drilled to the east of R-25 in 2003 and 2005, respectively, to delineate the nature and extent of groundwater contamination. Based on the groundwater elevation in well R-25, confined conditions may be present in groundwater. In 1999, HE contamination was detected in R-25 and continues to be detected (at a maximum detected concentration of 75 µg/L) in ongoing quarterly sampling (LANL 2003, 075986). Intermediate wells CdV-16-1(i) and CdV-16-2(i)r are also located within the same contaminant plume as R-25, and both have shown elevated RDX and other HE constituents during ongoing monitoring. The presence of HE contamination in the approximately 700-ft-deep perched aquifer (intermediate groundwater) in R-25, CdV-16-1(i), and CdV-16-2(i)r indicates that a transport pathway extends from the mesa (or canyon bottom) downward to intermediate groundwater. Barium has not been detected in R-25, CdV-16-1(i), or CdV-16-2(i)r above the New Mexico Water Quality Control Commission (NMWQCC) groundwater standard.

3.0 CONDITIONS OF WELLS NEAR TA-16

As part of any remedy or corrective action that NMED selects, the Laboratory must demonstrate that the groundwater monitoring network along flow pathways downgradient from the 260 Outfall is capable of detecting contaminants for which the outfall may have been a source. This section addresses the following the specific questions:

- Are the well screens in the candidate downgradient wells of adequate quality to detect contaminants released from the 260 Outfall, particularly those contaminants present in intermediate and regional groundwater at levels above water-quality standards? (section 3.3)
- Are the well screens in the candidate downgradient wells of adequate quality to detect other constituents at levels needed to support remedies selected for intermediate and regional groundwater associated with the 260 Outfall? (section 3.3)
- Are there other issues associated with the candidate downgradient wells that might limit stakeholders' ability to support a remedy for intermediate and regional groundwater associated with the 260 Outfall? (section 3.4)

The first two questions are addressed by applying the data qualification approach described in the "Well Screen Analysis Report, Revision 1" (LANL 2007, 095043). The third question is addressed qualitatively in section 3.4.

3.1 Candidate Monitoring Wells

Nine wells are downgradient of the 260 Outfall in the regional aquifer and are evaluated in this section as candidate monitoring wells, along with one well (R-26) upgradient of the outfall. The downgradient wells are deep wells CdV-R-15-3, CdV-R-37-2, R-17, R-18, R-19, R-25, and R-27, and intermediate wells CdV-16-1(i) and CdV-16-2(i)r (Figure 1.1-1). These ten wells contain 26 functional screens capable of providing water samples for chemical analysis. Nineteen of the 26 screens are completed in the regional aquifer, and 7 of the screens are completed in an intermediate perched zone of saturation. As of December 2006, at least four rounds of sampling had been completed at all but three screens.

Five of the 10 wells contain additional screens that are not evaluated in this section because they do not routinely provide water samples for chemical analysis. In four wells, six screened intervals have been consistently dry since well development are in: CdV-R-15-3 (Screens 1, 2, and 3); CdV-R-37-2 (Screen 1); R-19 (Screen 1); and R-25 (Screen 3). Screen 3 in R-25 was damaged during well construction. Screen 9 in R-25 was blocked off during well construction, and Screen 2 in R-26 in the regional aquifer does not yield water because the screen is clogged with bentonite. CdV-R-16-3(i) has not been completed as a well. None of the unsampled screens or wells described in this paragraph are evaluated in this section.

Table 3.1-1 summarizes additional information relevant to the evaluation of the functional screens for providing reliable and representative water-quality data. This table makes the following key points:

- All screened intervals were drilled using polymer-based drilling fluids.
- Drilling mud was used in drilling well R-26. However, mud was not used in the other wells discussed herein, other than a small quantity present in the lubricating slurry used in R-25 to assist in casing advance.
- One screen (Screen 5 in CdV-R-15-3) is partially obscured by bentonite-rich annular fill.

- Contamination is present in five of the seven screens in the perched intermediate zone and possibly in several screens near the top of the regional aquifer.

3.2 Analysis of Well Screen Conditions

Approach. The reliability and representativeness of groundwater chemistry data for 230 characterization and surveillance samples collected from the 26 screens as of the end of December 2006 were evaluated using the process described in the “Well Screen Analysis Report, Revision 1” (LANL 2007, 095043). The evaluation process involves comparing sample data against threshold levels for about 30 geochemical indicator species. The threshold levels are defined based on levels measured in background samples assumed to be representative of water quality in the regional aquifer, as reported in the “Groundwater Background Investigation Report, Revision 2” (LANL 2007, 094856). The test criteria are used to identify samples that appear to be unreliable and/or are not representative of predrilling groundwater chemistry because of the lingering effects of residual drilling fluids. The residual effects are classified into six categories following the “Well Screen Analysis Report, Revison 1” (LANL 2007, 095043).

- Category A—Residual inorganic components. Sodium, chloride, fluoride, sulfate, phosphate, and alkalinity are among the water-soluble constituents present in high concentrations in various drilling, construction, and development products. Even when greatly diluted at the time they are used, their presence is still manifest by concentrations that exceed natural background levels. Because these same constituents may be present in local contaminant plumes, it is important to be able to evaluate whether drilling fluids are the source of elevated concentrations.

  Example: See plot of sodium concentrations in Figure 3.2-1 (Category A, upper left-hand corner). The steady decrease in concentration with time is typical for indicators in this category, because these soluble constituents are flushed out of the screened interval.

- Category B—Residual organic components. Essentially all drilling products contain or are used with organic chemicals. The presence of these residual organic components is indicated by elevated concentrations of total organic carbon (TOC), total Kjehldahl nitrogen (TKN), ammonia, or acetone (derived from the breakdown of Quik-Foam). Although residual organic chemicals are not likely to be mistaken for indicators of a contaminant plume, they may fuel microbial growth and enhance the potential for developing reducing conditions in a screen.

  Example: See plot of ammonia concentrations in Figure 3.2-1 (Category B, upper right-hand corner). The indicators in this category do not always show such a smoothly decaying profile because they may have multiple organic sources that biodegrade at different rates under different geochemical conditions.

- Category C—Modification of in situ redox conditions. A common, easily recognized residual effect of drilling is the development of reducing conditions. Multiple indicators are available for this category, some of which generally increase in concentration as conditions become more reducing (e.g., iron and manganese), and some of which decrease under more reducing conditions (e.g., nitrate, perchlorate, and sulfate). Redox conditions affect water quality directly through controls on the oxidation state and speciation of dissolved constituents as well as indirectly through the modification of minerals and mineral surfaces.

  Example: See plot of dissolved iron concentrations in Figure 3.2-1 (Category C, middle row on the left). A steady decrease in concentration with time shown in this plot usually (but not always) signifies that the screened interval is trending toward more oxidizing conditions. The interpretation is less straightforward if sulfide concentrations are sufficiently high so as to precipitate metal sulfides, which also manifest as decreasing iron concentrations.

- Category D—Modification of surface-active mineral surfaces. Enhanced adsorption, such as onto drilling clays, is a hypothesized effect of residual drilling fluids that is difficult to evaluate in practice. No examples of this category of effects can be found in the wells evaluated in this report. Barium, strontium, uranium, and zinc are used as indicator species. However, low concentrations that might be interpreted as evidence of enhanced adsorption have a more probable explanation, such as reducing conditions (causing low uranium) or carbonate mineral disequilibria (see next category).
- Category E—Carbonate mineral disequilibria. Soluble carbonates and phosphates used downhole during drilling modify carbonate mineral equilibria, often leading to elevated barium and strontium concentrations. Calcium and magnesium concentrations often parallel these changes.

  Example: See plot of dissolved barium and strontium concentrations in Figure 3.2-1 (Category E, middle row on the right). These two indicators frequently show parallel behavior.

- Category F—Corrosion of stainless-steel well components. When steel is stressed to the point that microcracks or pits form, it may corrode upon exposure to water containing dissolved oxygen. This condition is manifest by highly elevated concentrations of the major components of steel: iron, chromium, and nickel. Because dissolved oxygen must be present for steel corrosion to occur, the high concentrations of iron are predominantly in colloidal or particulate form.

  Example: See plot of dissolved nickel concentrations in Figure 3.2-1 (Category F, bottom left-hand corner). The downturn in nickel concentrations may reflect a slowing of the corrosion rate from a buildup of a protective oxidized layer or to other kinetic or environmental factors.

- A seventh category includes general water-quality indicators—pH, carbonate alkalnity, and turbidity. Anomalous values commonly accompany other indicators of residual drilling effects, although these excursions often cannot always be attributed with confidence to any single cause.

  Example: See plot of alkalinity in Figure 3.2-1 (General Category, bottom right-hand corner). It is typically difficult to isolate unambiguously the cause of elevated alkalinity, which is one of the most common residual drilling effects. In the case of the example shown in the figure (Screen 2 in CdV-R-37-2), this screen also shows evidence for the presence of residual organic chemicals, sulfate-reducing conditions, carbonate mineral disequilibria, and elevated molybdenum.

Judgment calls must sometimes be made when interpreting outcomes such as those illustrated above. The guiding philosophy for the evaluation protocol is to assume that water-quality data from a screen are reliable and representative (R&R) of predrilling conditions unless clear and consistent evidence to the contrary is found. The approach is based on simple conceptual models of drilling-related impacts that exclude consideration of effects that are not likely to be significant. For example, the approach neglects postulated “domino effects” in which the presence of one condition is hypothesized as leading to another indirect effect.

One additional problem is the evaluation of data reliability for nondetects of very strongly adsorbing analytes because suitable indicator species or surrogates for these analytes are lacking. In keeping with the guiding philosophy that water-quality data are assumed reliable unless convincing evidence to the contrary is found, the protocol is to assume nondetects of very strongly adsorbing analytes are R&R if a screen does not show compelling evidence for the presence of any other residual drilling effect.

Data. Water-quality data for this evaluation were obtained from the Water Quality Database (WQDB), except as noted otherwise in the data tables in Appendix C. Table 3.2-1 summarizes the results of the evaluation. The raw data and outcomes for sample-by-sample evalutions are provided in Tables C-3 through C-6 and plotted in figures presented in Appendix D. Individual test outcomes are summarized in Tables C-7 through C-9.

Results. The earliest water-quality samples collected from a well screen commonly manifest residual drilling effects that subsequently clear up with time. The more relevant question than the reliability of each individual sample is the current condition of the screen and its prognosis for providing R&R data if the well were part of the monitoring network. This question is best evaluated by analyzing not only the water quality in the most recent sample but also the trends by which those indicators evolved to their present concentrations (e.g., are the concentrations increasing, decreasing, or stable with time). Examining trends also minimizes the potential for misinterpreting a spurious outlier as evidence of the presence of residual drilling effects. Samples through December 2006 are evaluated, and for some wells the most recent sampling was within 6 months of that date; for those cases where only earlier samples were used (e.g., R-25 screens), no recent samples are available for analysis. The residual effects of drilling are minor or altogether absent in the most recent sample from 13 of the 26 screens evaluated. In these screens, oxic conditions and all but at most one geochemical indicator have attained stable concentrations (Table 3.2-1; Figure 3.2-2). These 13 screens include all four single-screen wells and at least one screen from most of the wells with multiple screens.

Thirteen of the 26 screens show residual effects from drilling, including the development of reducing conditions in the screened interval (Table 3.2-1; Figure 3.2-2). In these screens, more than one geochemical indicator has not yet attained stable concentrations.

The frequency with which the different categories of drilling effects are present is plotted in Figure 3.2-3. Three categories are observed with equal frequency (35% of the 26 screens): anomalous pH/alkalinity, residual water-soluble inorganic drilling constituents, and reducing conditions. Elevated turbidity and residual organic chemicals are present with equal frequency (27% of the 26 screens). Indicators of carbonate mineral disequilibria are present in five screens (19% of the 26 screens). The least common condition identified is stainless-steel corrosion, which appears to be present only in the two top screens in R-25. None of the screens show indications of enhanced adsorption.

The prevailing redox condition in each screen is shown in Figure 3.2-4. Oxic conditions prevail in over half of the screens (58% of 26), including all four single-screen wells. Iron-reducing conditions are present in 7 of the remaining 11 screens. Two screens are sulfate-reducing, and one screen each is manganese- and nitrate-reducing.

A graphic summary of the number of geochemical conditions affecting each well screen is presented in Figure 3.2-5. This histogram plot tablulates the number of categories of residual drilling effects identified as being present in each well screen. The maximum number of categories possible is eight, as explained in the figure note. Despite the observation that a number of screens have multiple residual drilling effects, none of the impacted screens are completely stagnant; all show trends of improving conditions. Particularly dramatic improvements are evident in the following:

- Iron and manganese in CdV-R-15-3, Screen 6, CdV-R-37-2, Screen 4, and several screens in R-25, indicating a decrease in the severity of reducing conditions in these screens (see Appendix D, Figures D-10 and D-13);
- Oxidation reduction potential (ORP) increases toward the oxic zone in CdV-R-15-3, Screens 5 and 6, and CdV-R-37, Screen 4, also indicating a decrease in the severity of reducing conditions in these screens (see Appendix D, Figure D-17); and
- Phosphate, sulfate, and sodium decrease in screens in R-25, indicating a decrease in the amount of residual drilling fluids in those screens (see Appendix D, Figures D-21, D-22, and D-24).

However, at their present rates, some screens may require many more years to reach predrilling conditions through natural processes of dilution and restoration of native mineralogy and oxic conditions. This prognosis is particularly applicable when two conditions are present:

- A significant inventory of residual organic drilling fluids remains in hydrologic contact with the screened interval, and
- Sulfate- or iron-reducing conditions have persisted for a sufficiently long period of time so as to precipitate a significant inventory of reduced-iron minerals.

Both these conditions are present in the following five well screens, which are not likely to recover within a reasonable time period if left on their own:

- CdV-R-15-3, Screen 5
- CdV-R-37-2, Screen 2
- R-19, Screens 5, 6, and 7

3.3 Contaminants of Concern for 260 Outfall

Approach. Of particular interest is identifying which sampling events produced water-quality data that are R&R of predrilling conditions for relevant COPCs, although this evaluation looks at all classes of compounds (e.g., metals, VOCs, SVOCs, and HE and their degradation products) that could have been released at TA-16. Contaminant concentrations may be either increased (by geochemical reactions releasing constituents such as trace metals from the formation or by direct contamination with organic drilling-product constituents or their degradation products) or decreased (by sorption or precipitation reactions induced by drilling additives) by residual effects of borehole drilling and well construction.

A list of the most relevant COPCs for groundwater downgradient of Consolidated Unit 16-021(c)-99 was developed based on those identified for different environmental media in the Phase III RFI (LANL 2003, 077965), as summarized in Appendix B of the CMS report for Consolidated Unit 16-021(c)-99 (LANL 2003, 077965). Tables 3.3-1a and 3.3-1b list the identified inorganic and organic Phase III RFI COPCs. In those tables, a hierarchy for detection is assigned to each COPC based upon the first condition that is applicable in the following order:

- Tier 1 (highest)—CMS COPC (CMS report, Summary, p iii),
- Tier 2—Phase III RFI COPC for alluvial groundwater and/or springs, and
- Tier 3—Phase III RFI COPC only for surface water or sediment.

This prioritization focuses the discussion of contaminants presented in the figures and tables in this section, but is not intended to eliminate any potential COPCs from consideration. This approach resulted in a list of 57 analytes (Tables 3.3-1a and 3.3-1b). Six analytes are assigned to Tier 1 for detection capability: barium, manganese, RDX, dinitroso-RDX (DNX), mononitrosodimethylamine (MNX), and TNT. Of these, RDX is by far the most critical for requiring reliable detection capability because it is the dominant mobile constituent in the contaminant plume based on both its concentration and on its low health-based water-quality standards. Under oxic conditions, it is a conservative constituent, so it should move as rapidly as any constituent. The analytes in the second tier of relevant COPCs include 23 metals, 3 inorganic anions, and 3 organic species. Finally, 25 additional organic species are in the third tier. However, it is important to note that broad classes of contaminants (VOCs, SVOCs, and HE) are evaluated in this analysis; the COPC lists (above) are not used to remove analytes from consideration in the analysis that follows.

Analytical data for three of the Tier 1 COPCs are plotted in Figures 3.3-1 (RDX), 3.3-2 (barium), and 3.3-3 (manganese). Because RDX is not detected in background groundwater, its presence in a screened interval is a strong indication of the presence of a local contaminant plume at that location. Such is the case for intermediate wells CdV-R-16-1(i), CdV-R-16-2(i)r, and R-25 (Screens 1, 2, and 4) (Figure 3.3-1). Although also present in the deeper screens at R-25, the rapid dropoff in concentrations over time indicates either that its presence may be an artifact of contaminantion inadvertently introduced downhole from the contaminated perched water when the borehole was open or that RDX is degrading over time. Finally, RDX may be present in R-18 at very low levels (<1 part per billion [ppb]). This possibility is supported by the increasing nitrate levels in that well (Figure D-16), but the proportion of contaminated water involved must be small, based on the observation that tritium is not routinely detected in this well (Figure 3.3-4). Because of its widespread abundance, high concentrations relative to groundwater standards, and ease of analysis with low (<1 ppb) detection limits, RDX is by far the best indicator contaminant for the 260 Outfall plume, and thus is the most important constituent for the wells in the monitoring network to be able to detect. Tritium, which is present in surface waters across the Laboratory as a result of bomb-pulse effects and possibly from stack releases from the Weapons Engineering Tritium Facility (WETF), also appears to be a good indicator contaminant for the plume. It is present at elevated levels in all the screens that are highly contaminted (Figure 3.3-4), although its signature appears to diminish more rapidly than RDX, based on the low-level detections in R-18, which is contaminated with RDX at a low level.

The protocol used to assess whether or not a COPC is likely to be impacted by residual drilling effects parallels that used to evaluate whether or not a particular category of effects is present. This protocol is outlined below.

COPCs Impacted by Category A

If the evalution presented in section 3.2 concludes that residual inorganic components of drilling products are present in the screen interval, then a COPC is considered as possibly being impacted if (1) it is a constituent of a drilling product used in the well and (2) its release from the drilling product could be significant enough to increase concentrations above background levels and thereby obscure the COPC in a contaminant plume.

Inorganic constituents of drilling products are tabulated in Table A-10 of the “Well Screen Analysis Report, Revision 1” (LANL 2007, 095043). Several trace species listed as relevant inorganic COPCs in Table 3.3-1a are present in bentonite products and readily desorb in water. Although most of the wells considered in this report were not drilled using bentonite mud, granular bentonite is used routinely to backfill the annular space to isolate the well screens.

Based on this approach, both Tier 1 COPCs (barium and manganese) could be impacted. Tier 2 or 3 COPCs that may be affected (in the form of increased concentrations) are arsenic, boron, chromium, copper, lead, nickel, nitrate, rubidium, selenium, and vanadium (Table 3.3-2a, column labeled “Residual Inorganics”). It should be noted that the effective development of the screen interval usually removes these mobile species from the screen interval, if present.

COPCs Impacted by Category B

If residual organic components of drilling products are present in the screen interval, then a COPC is considered as possibly being impacted if

1. it is a constituent of a drilling product used in the well, and its release from the drilling product could be significant enough to increase concentrations above background levels and thereby obscure the COPC in a contaminant plume; and/or

2. the elevated concentration of an organic indicator is sufficiently high so as to suggest the presence of residual organic carbon in the solid phase, and the organic-carbon partition coefficient (K_{oc}) of the COPC is >300 such that it would be expected to partition into this immobile organic carbon phase.

None of the inorganic COPCs listed in Table 3.3-1a would be impacted by this category of drilling effects. Also, none of the organic COPCs listed in Table 3.3-1b are constituents of any drilling product used in the wells. However, several screens have elevated ammonia, TKN, and TOC concentrations, suggesting that a reservoir of residual organic drilling products in the solid phase in the vicinity of the screen interval. K_{oc} values for most of the organic COPCs of interest are tabulated in Table A-4 (HE products), Table A-7 (polyaromatic hydrocarbons [PAHs]), and Table A-8 (other SVOCs/VOCs) of the “Well Screen Analysis Report, Revision 1” (LANL 2007, 095043). Based on this approach, Tier 1 COPCs that may be impacted include TNT, and, because of the absence of K_{oc} data, DNX and MNX are also included as potentially impacted. None of the three Tier 2 organic COPCs would be affected. Finally, all but 7 of the 25 organic Tier 3 COPCs would be impacted (Table 3.3-2b, column labeled “Residual Organics”). Eleven COPCs would not be affected by this condition: RDX, 2-ADNT, 4-ADNT, benzoic acid, chloromethane, 1,3-dinitrobenzene, HMX, methylene chloride, nitrobenzene, pyridine, and trichloroethene.

COPCs Impacted by Category C

Analytes affected by the presence of reducing conditions are tabulated in Appendix A and Table 4-13 of the “Well Screen Analysis Report, Revision 1” (LANL 2007, 095043). This category of residual drilling effects encompasses the effects of reducing conditions on the speciation of redox-senstive analytes as well as adsorption and desorption of analytes from manganese- and iron-bearing minerals.

Among the inorganic COPCs listed in Table 3.3-1a, only nitrate would be affected by the presence of nitrate-reducing conditions. Under manganese-reducing and more reducing conditions, both of the two Tier 1 COPCs (barium and manganese) as well as several other trace species may also be impacted. Inorganic COPCs that adsorb onto bentonite (LANL 2007, 095043, Table 4-15) are assumed likely to adsorb onto iron- and manganese-bearing minerals as well. Following this protocol, affected COPCs are tabulated in Table 3.3-2a, in the four columns labeled sulfate-, iron-, manganese-reducing, and nitrate-reducing.

Under any reducing condition and in the absence of site-specific biodegradation data, it is assumed that all of the organic COPCs, including VOCs, SVOCs, and HE-degredation products, have the potential to be affected by enhanced biodegradation rates. RDX biodegradation pathways were recently reviewed by Crocker et al. (2006, 095581), and RDX biodegradationn under anaerobic conditions was reported by Beller (2002, 095589) and Bradley and Dinicola (2005, 095588). However, the many geochemical factors involved make it difficult to predict with confidence whether or not RDX biodegradation will be enhanced (relative to biodegradation rates in the native groundwater) in a particular screen in which reducing conditions have developed. In addition, adsorption or desorption from manganese- or iron-bearing minerals is not relevant to any of the organic COPCs because the primary mechanism for sorption for these neutral species is partitioning into the solid organic-carbon phase, as opposed to attraction to a charged mineral surface as in the case of inorganic ionic COPCs (LANL 2007, 095043, Section 3, fourth and fifth bullets).

COPCs Impacted by Category D

Analytes affected by adsorption onto residual drilling clays are tabulated in Appendix A and Table 4-15 of the “Well Screen Analysis Report, Revision 1” (LANL 2007, 095043). COPCs that may be affected by this category of residual drilling effects are tabulated in columns labeled “Sorption” in Tables 3.3-2a and 3.3-2b.

COPCs Impacted by Category E

Residual drilling effects on carbonate mineral stability primarily affect alkaline-earth and other trace species generally present as divalent cations or complexed with carbonate species under undisturbed conditions. Among the COPCs discussed in this report, those affected by carbonate disequilibria are barium, cadmium, copper, lead, manganese, nickel, uranium, and zinc. No organic COPCs are impacted by this category of effects.

COPCs Impacted by Category F

Corrosion of stainless steel elevates concentrations of metals present in steel, including the Tier 2 COPCs, chromium, and nickel. Other COPCs are affected through adsorption onto the iron colloids and particles that characterize corrosion products. This list is assumed to be the same as that for sorption onto iron-bearing minerals under Category C and is tabulated in Table 3.3-2a. None of the organic COPCs considered in this report are expected to be affected by steel corrosion or its products because corrosion occurs only under oxic conditions (i.e., in the presence of dissolved oxygen) (LANL 2007, 095043, Section 4.9.1).

Summary of Impacts

Tables 3.3-2a and 3.3-2b identify which of the COPCs can be significantly affected by the residual impacts of drilling fluids:

- Barium may not be reliable if residual inorganic chemicals are present, if reducing conditions have developed (other than nitrate-reducing), or if the carbonate mineral system is in disequilibria.
- The reliability of manganese concentrations may be in question if any of several residual drilling effects are present (pH/alkalinity excursions, residual inorganic chemicals, or reducing conditions other than nitrate-reducing) or if the carbonate system is in disequilibium.
- RDX may not be reliable if reducing conditions are present in the screen interval that enhance biodegradation beyond that which occurs under ambient conditions.
- Nondetects of other HE compounds, including their intermediate breakdown products, as well as most of the SVOC/VOCs listed in Table 3.3-1b, cannot be considered R&R of predrilling conditions if reducing conditions have developed as a residual drilling effect or if residual organic drilling polymers remain in the formation.

Results. The capability of each screen to provide R&R data for the COPCs (including broad classes of compounds such as the VOCs and SVOCs) is tabulated in Table 3.3-3 and shown graphically in Figure 3.3-5. The key conclusions of this evaluation are as follows:

- All four single-screen wells can provide R&R data for all Tier 1 COPCs.
- Eighteen (of 26) screens can provide R&R data for RDX.
- Nineteen (of 26) screens can provide R&R data for barium.
- Eighteen (of 26) screens can provide R&R data for other HE (including their intermediate breakdown products) and for SVOC/VOCs.
- Sixteen screens (of 26) can provide R&R data for manganese.
- In general, screens that are not reliable for one COPC are also not reliable for one or more of the others.

Another set of constituents for which it is potentially important to obtain high-quality data within the plume itself is the set that is useful for tracking the progress of MNA processes for HE (Pennington et al. 2001, 095267). To demonstrate that MNA is occurring, it is necessary to show that the COPCs are decreasing in abundance with time and that they are breaking down to expected breakdown products. This effect requires measurements of the contaminants themselves (e.g., RDX) and the MNA-breakdown products of those contaminants (e.g., MNX, DNX, TNX). In addition, a suite of geochemical parameters typically needs to be measured to support MNA remedies. These field parameters include pH, alkalinity, conductivity, dissolved oxygen, redox potential, sulfide, and turbidity as well as laboratory analyses such as TOC, ammonia, TKN, major cations, nitrate, sulfate, and chloride (for aerobic systems) (Pennington et al. 2001, 095267). Other constituents such as stable isotopes of carbon and nitrogen may be useful for tracking MNA processes in some situations (Pennington et al. 2001, 095267).

The majority of the screens that do not provide R&R data for a range of contaminants are in the wells in which Westbay systems were installed (R-25, CdV-R-15-3, CdV-R-37-2, and R-19). These consistently poor-quality screens include Screens 2 and 5 in R-25; Screen 5 in CdV-R-15-3; Screens 2 and 4 in CdV-R-37-2; and Screens 5, 6, and 7 in R-19 (Figure 3.3-5). Of these, CdV-R-37-2 and possibly Screen 5 in R-25 are water-table (phreatic zone) screens. Most are deep-aquifer screens. As discussed in sections 4 and 6, the water-table screens are the most important to provide R&R data for a wide range of COPCs based on the most likely conceptual model for contaminant transport in the regional aquifer.

3.4 Other Well Issues

Tables 3.4-1 and 3.4-2 provide details on well construction and development, borehole geophysics, hydrologic testing, and sampling characteristics of the well screens that may bear on the ability of the wells analyzed in this document to provide R&R data for monitoring purposes. All the wells discussed in this document were designed to sample water-producing zones based on geologic observations, geophysical data, and drillers' observations, and videos of water production. In most cases, the well designs were developed collaboratively between Laboratory, DOE, and NMED personnel.

Excessive Screen and Filter-Pack Lengths

If well screens and filter packs are too long relative to the mixing-length scales of contaminant-bearing, water-producing zones, then the sampling results may not be representative of contaminant maxima within a hydrostratigraphic zone.

The following screens are between 20 ft and 25 ft in length: CdV-R-37-2 (Screen 3); R-17 (Screen 1); R-18, R-25 (Screen 1); R-26 (Screen 2); and R-27 (Table 3.4-2). Several of these screens are 23 ft in length because two standard 10-ft screens with a 3-ft coupler are 23 ft long. Based on the borehole geophysics (primarily the combinable magnetic resistance (CMR) tool that provides information on water productivity), CdV-R-37-2 (Screen 3) and R-17 (Screen 1) both targeted approximately 10-ft productive zones next to the screens, and R-18, R-26 (Screen 2), and R-27 targeted relatively homogeneous producing zones. R-25 geophysical logging did not include the CMR tool.

The following screens are longer than 25 ft in length: CdV-R-15-3 (Screen 4), CdV-R-37-2 (Screen 2), and R-19 (Screen 3) (Table 3.4-2). All three screens are located at the regional water table and were designed to be longer than the average screen to guarantee that the water table remains above the sampled interval for the 50-plus-yr lifetime of each well, even if water-level declines occur because of drought, reduction in recharge, or other causes.

The following filter packs are longer than 50 ft: CdV-R-15-3 (Screen 4); R-19 (Screen 3, 4, and 6); and R-26 (Screen 1). CdV-R-37-2 (Screen 3), R-18, R-19 (Screen 5), R-26 (Screen 2), and R-27 all have filter packs greater than 40 ft in length. It is likely that most sampled water at a well screen (using low-flow techniques) is collected close to the filter pack but not from the filter pack. If substantial drawdown occurs during sampling, the sampled water is expected to be drained preferentially from the filter pack. In this case, the filter pack has much higher permeability and storativity than the formation. As a result, the water pumped during sampling events is expected to be drawn more from the filter pack.

In addition, the length of the filter packs might enhance the vertical mixing of contaminants (filter packs are high permeability zones that facilitate vertical mixing). This effect is expected to be of greater concern for the wells closer to TA-16. Farther from the source, naturally occurring vertical mixing is assumed to be a more dominant factor.

Hydrostratigraphic Units/Hydrologic Properties Potential Issues

Most of the hydrostratigraphic units targeted by the well screens in this document are productive units within the Puye Formation or transmissive units within the Tschicoma dacite (Table 3.4-1). Most wells targeted a screen at the phreatic zone near the top of the regional water table (Table 3.4-1). The phreatic zone is defined as the uppermost zone of unconfined regional saturation. Productive hydrostratigraphic units, identified by geophysical logging, borehole video observations, and drillers' observations, were typically targeted during well design and construction activities. A review of the geophysical logs (see Table 3.4-1) suggests that in most cases productive zones 10 ft or more in width were targeted.

The screens discussed in this report are adjacent both to productive units and nonproductive (tight) units. Saturated hydraulic conductivities range over an order of magnitude. Some units may have significant drawdown during pumping and sampling, which may yield samples not representative of formation contaminant concentrations. Screens that exhibit significant drawdown during sampling include CdV-16-1(i) (30-plus ft but does not drawdown into the screen), CdV-16-2(i)r (drawdown occurs into the screen), R-17 (Screen 1), and R-25 (Screens 5 and 8). Tight formations, based on hydrologic tests, inability to inject water into the screens, or inability to pump screens during development include CdV-R-37-2 (Screen 2), the screens in R-25, and R-26 (Screen 2). CdV-16-3(i) is not completed as a well but penetrates the regional aquifer in tight Tschicoma dacite.

Seal Integrity Issues

The following wells and screens have issues with seal integrity.

CdV-R-15-3 (Screens 1-3, 5): Because of a pipe tally error during well construction, bentonite is present next to a portion of this screen, causing a seal integrity problem because bentonite, which should be isolated from the well screen by the filter pack, is present next to the screen.

R-25: A dropped tremie pipe may have caused bentonite and the sand pack to mix in R-25 (Broxton et al. 2002, 072640) between Screens 5 through 8. At that time, Schlumberger logging of the borehole was unsuccessful in determining the location of the tremie pipe, most of which was subsequently removed from the borehole. This logging also suggests possible bridges at 1250 to 1256 ft, 1398 to 1404 ft, 1444 to 1446 ft, and 1668 to 1672 ft. The fact that pressure data for these screens are different suggests that these screens are not hydraulically connected and the seals are competent. Both Screens 1 and 2 appear to be deteriorating (nickel, chromium, and iron concentrations suggest stainless-steel corrosion). These elevated metals may result from corrosion of the screens themselves, from stress experienced by the screens during well completion, or from steel particulates derived from the reaming out of Screen 3.

R-26: Bentonite is present at Screen 2. The source of this bentonite is not known, but it was probably introduced during well completion. The presence of bentonite may result from a seal integrity problem or from the presence of residual drilling mud.

Two other wells [R-17 and CdV-16-2(i)r] both developed bridges [R-17 at 515 ft and CdV-16-2(1)r at 500 ft and 185 ft] at the time annular fill was emplaced. In each case, the bridges were breached using the tremie pipe and a slurry of bentonite chips, and water was successfully emplaced beneath the bridged zone.

Summary of Potential Impacts to the Monitoring Network

It is difficult to assess the specific effects of any of the conditions discussed in this section on the potential monitoring network for TA-16. Possible effects are dependent on unknown factors discussed below.

1. The thickness and degree of mixing of groundwater between hydrostratigraphic units. Thick well-mixed units will provide representative concentrations whether screens are long or short or whether drawdown occurs during sampling. If groundwater flux occurring through a given screen is vertically uniform, then the mixing of water from different zones will produce relatively small decreases in contaminant concentrations. Substantial mixing may occur only if a screen mixes waters from high-flux uncontaminated zone(s) and low-flux contaminated zone(s). Therefore, vertical mixing in screens with low permeability should be less of a concern than in screens with high permeability.

2. Whether the well screens and filter packs may be vertical conduits for groundwater flow and contaminant transport, causing cross-contamination/dilution between hydrostratigraphic units that were hydraulically separated before drilling.

3. Whether contaminant plumes are near field or far field. As plumes move downgradient, it is assumed that groundwater mixing would increase at greater distances and depths, and representative groundwater quality and contaminant data should be easier to obtain.

Further information related to items 2 and 3 above is provided in Table 3.4-3. This table summarizes the filter pack length below the water table, evaluates hydrogeologic heterogeneity at the screen, estimates possible dilution factors, and summarizes analytical modeling data that suggest the likely degree of aquifer mixing in each screen. This table indicates that Screen 4 of CdV-R-15-3, Screen 3 of R-19, and Screen 6 of R-19 are most likely to be subject to dilution effects from long screens. These longer screens are also more likely to detect contaminants that are limited to single, narrow hydrostratigraphic units.

Each of these units contains more than one producing zone within a long screen. If these screens are used as part of the monitoring network during CMI, more conservative monitoring trigger levels may be selected.

Tritium and RDX are both indicator constituents of the release to groundwater at TA-16-260 (see section 3.3). Because of the low detection limits for RDX (<1 ppb) and the reasonable correlation between tritium and RDX in the contaminated wells at TA-16, detecting (if not accurately quantifying) the impingement of the TA-16 plume at a specific well or screen is assumed not to be strongly impacted by the effects discussed in this section.

4.0 ANALYSIS OF SATURATED FLOW AND TRANSPORT AT TA-16

4.1 Conceptual Model of Groundwater Flow in the Regional Aquifer

The regional aquifer beneath the Pajarito Plateau, which is a subportion of the basin-scale aquifer associated with the Española Basin, is a complex heterogeneous system.

4.1.1 Alternative Conceptual Models for the Pajarito Plateau

The top of the saturated zone beneath the Pajarito Plateau is predominantly under phreatic (unconfined water table) conditions. The regional water table is located about 1000–1300 ft bgs across the Plateau. The water table is primarily in the Puye Formation (Puye fanglomerate and pumiceous Puye). Most of the regional wells have screens installed in the phreatic zone (the exception is R-26). The total thickness of the regional aquifer is not known. It can be assumed that at a minimum the aquifer encompasses the total thickness of the Española Basin fill. The thickness of the basin fill varies from approximately approximately 980 ft (300 m) at the basin edges to approximately 6500 (2000) m in the central portions of the basin. The amount of information concerning the hydrogeologic properties of the regional aquifer diminishes with depth because monitoring wells are not drilled deep into the aquifer. Most of the data relevant for the deep portion of the aquifer comes from the water-supply wells and deep monitoring wells (e.g., R-19 and R-25). Because of the great length of the supply well screens, information concerning the deeper aquifer is averaged over a large thickness of formation (for example, the water levels measured at supply wells represent an average pressure along the entire length of the screen).

The aquifer is composed of several sedimentary and volcanic hydrostratigraphic units. The sedimentary units consist of layers of varying thickness, lateral extent, and permeability. Relatively continuous horizontal zones of high permeability and low porosity are associated with coarse-grained materials of the Totavi Lentil (in the area between the Laboratory and the Rio Grande) and with the pumiceous Puye. The lateral continuity of low- and high-permeability layers within the sedimentary units is not known because they cannot be accurately mapped in the existing, widely spaced boreholes. However, the existence of multiple low-permeability layers in the Puye Formation and the Santa Fe Group potentially produces large-scale aquitards, which cause the observed large-scale confinement of the deeper portions of the aquifer. This type of heterogeneity also suggests that the medium is strongly anisotropic at larger scales, with high permeability along the layering and low permeability perpendicular to the layering (Broxton and Vaniman 2005, 090038).

Data concerning the effect of the Pajarito Fault zone on groundwater flow are limited. The fault may have an impact on the groundwater flow and recharge distribution (Dale et al. 2005, 095002). The fault zone may be a hydraulic conduit and/or barrier; that is, it may be a barrier for lateral flow and a conduit for vertical flow. More information on the potential impact of fault zones on groundwater flow may be found in section 5 of this report.

The groundwater flow medium may be defined as a complex multiaquifer-aquitard system. The existing groundwater flow has a complex three-dimensional structure. There are uncertainties in the conceptual model defining groundwater flow and contaminant transport in the regional aquifer. Currently, two alternative conceptual models address this uncertainty (Figure 4.1-1).

Conceptual Model A: No hydraulic separation exists between the shallow and deep (pumped) aquifer zones. Pumping drawdowns are manifest at the water table. Near the pumping wells, water-table hydraulic gradients are directly affected by pumping, and contaminants are drawn toward supply wells. The shallow and deep aquifer zones are not hydrodynamically distinct (i.e., they do not have different hydrodynamic properties). Potential contaminants in the regional aquifer are expected to be predominantly captured by water-supply wells. Both in the shallow and deep portion of the regional aquifer, flow directions are west (Jemez Mountain) to east (Rio Grande), and groundwater flow is predominantly discharged at the Rio Grande. This conceptual model is similar to the classical basin-scale flow structure (Figures 4.1-1b and 4.1-1c and Figure 4.1-2) suggested by numerous studies (Freeze and Cherry 1979, 088742, Chapter 5; Keating et al. 1999, 088746; Keating et al. 2000, 090188; Keating et al. 2001, 095399; Collins et al. 2005, 092028).

Conceptual Model B: A strong hydraulic separation occurs between the shallow (phreatic, water table) and deep (pumped) aquifer zones, which does not allow pumping drawdowns to reach the water table. Hydraulic gradients in the phreatic zone are unaffected or negligibly affected by water-supply well pumping. The deep portion of the regional aquifer is predominantly under confined conditions. Contaminants are expected to flow above the water-supply wells along the phreatic zone and to be captured by the springs near the Rio Grande. However, because of the substantial downward vertical hydraulic gradients between the shallow and deep aquifer zones, some contaminants may reach the water-supply wells by flow through hydraulic windows and/or along filter packs for the water-supply wells. In the shallow portion of the regional aquifer, flow directions are west (Jemez Mountain) to east (Rio Grande), and groundwater flow is predominantly discharged at the Rio Grande. In the deep portion of the regional aquifer, flow directions are not expected to be coincident with the flow directions in the phreatic zone. There is uncertainty, but the deep flow directions might have a more dominant southern component driven by the basin-scale discharge boundaries to the south (Cochiti Lake, Albuquerque Basin) (Vesselinov 2005, 090040; Vesselinov 2005, 089753).

These alternative models represent two end-members on a spectrum of potential flow configurations and therefore capture some aspects of the potential conceptual model uncertainty. The contaminant pathways in the regional aquifer depend heavily on the existence or lack of existence of a phreatic zone in the shallow portion of the regional aquifer which is hydraulically separated from the deep portions of the regional aquifer. The hydrogeological data are analyzed in section 4.2 below, and conceptual model uncertainties are addressed; these data will help to determine which conceptual model is more appropriate to characterize flow and transport conditions at the site.

4.1.2 Hydrogeological Conditions Near TA-16

TA-16 is located near an area where local recharge to the regional aquifer has been demonstrated to occur. In this area, the regional aquifer is under water-table conditions and is characterized by a complex hydrostratigraphy (including potential impacts of the Pajarito Fault zone and the existence of various stratigraphic units with contrasting hydrogeological properties), and a complex spatial and temporal distribution of aquifer recharge (infiltrating through a thick and heterogeneous unsaturated zone). As a result, the top of the regional water table is difficult to identify. The three-dimensional configuration of the flow in the phreatic zone might be so complex that it forms a series of water tables associated with water-bearing zones that are largely hydraulically separated. The individual water-table zones are expected to be in saturated hydraulic connection with the regional aquifer. It would be difficult to clearly define the hydrogeological conditions based on existing borehole data, as demonstrated by the R-25 data. Well R-25 intersects an approximately 400-ft-thick saturated zone located about 100 ft above the regional aquifer (Figure 4.1-3). As discussed in section 4.2, these data may be interpreted in alternate ways to define the location of the regional water table.

4.1.3 Water Table Maps

Figures 4.1-4a and 4.1-4b show two alternative maps of water-table elevation based on the existing water-level data (LANL 2007, 095364). The maps differ in the interpretation of R-25 data: the first map assumes that water level at Screen 5 (6240 ft) defines the regional water-table elevation; the second map uses data from Screen 4 of R-25 (6360 ft) instead. Additional details are presented in section 4.2 and in the “2007 General Facility Information Report” (LANL 2007, 095364). Both alternative maps of the water table suggest an influence of groundwater recharge along Cañon de Valle on the shape of the water table. In the first case (Figure 4.1-4a), the impact is more significant. The water-table contours on Figures 4.1-4a and 4.1-4b are also impacted by potential recharge along Water Canyon. It is important to note that lateral hydraulic gradients at the water table in the vicinity of TA-16 are relatively high when compared to those beneath the rest of the Laboratory. The flowpaths presented in Figure 4.1-4b are based on hydrogeologic interpretation of the water-table data, not on the numerical-model simulations. The flowpaths are intended to integrate and approximate several hydrogeologic variables that affect local-scale flow.

4.2 Analysis of Water Levels of Monitoring Wells in the TA-16 Area

This section provides an analysis of groundwater-level data collected from monitoring wells located in the western part of the Pajarito Plateau in the area of TA-16. The purpose of the analysis is (1) to evaluate the quality of existing well screens to characterize water levels in the regional aquifer, (2) to assess transients in the water levels and their potential impact on local-scale flow directions, and (3) to identify causes for the temporal fluctuations. In addition, the water-level analysis provides information regarding conceptual uncertainties related to hydrodynamics of the regional aquifer. Based on information about spatial propagation of water-level transients resulting from supply-well pumping by Los Alamos County, this report will provide the estimated hydraulic separation between the shallow and deep zones of the regional aquifer (section 4.1). It is expected that water-level transients will be impacted by seasonal changes in infiltration recharge.

The regional monitoring wells analyzed are R-17, R-18, R-19, R-25, R-26, R-27, CdV-R-15-3, and CdV-R-37-2 (Figure 1.1-1 and Table 4.2-1). The supply wells closest to the TA-16 area are Pajarito Mesa (PM) 5, PM-4, and PM-2 (Figure 1.1-1). The analyses presented here focus primarily on data collected in 2005 and 2006, for which reliable data records are available for the monitoring and water-supply wells in the study area. For some of the wells, data records spanning a longer period are also presented (Allen and Koch 2007, 095268)

4.2.1 Water Levels and Pumping Rates of Water-Supply Wells

The PM well field is located in the east-central part of the Laboratory and typically produces 50% to 60% of the water for Los Alamos County (Koch and Rogers 2003, 088425). Figure 4.2-1 summarizes the monthly water production from the Pajarito Mesa wells in 2005 and 2006. PM-2 typically produces from 22% to 34% of the water in the field, PM-4 about 6%, and PM-5 from 20% to 26%. Figure 4.2-2 presents daily transients in the production history and water-level data for supply wells PM-2, PM-4, and PM-5. Wells PM-2 and PM-5 have electric pump motors and are usually operated at night and on weekends when electric rates are lower. PM-4 has a natural gas motor, so it runs continuously when it operates. Thus, the operational water-level responses are different for each class of production well.

In this section, data sets extracted for the water-supply wells are called “nonpumping” water levels. The nonpumping water levels at the water-supply wells are defined as the highest water level observed daily. However, in cases when the pumping continues for more than a day, the nonpumping water levels characterize pumping-influenced water levels as well. In addition, nonpumping water levels at a given supply well are affected by the pumping at nearby supply wells.

PM-2 has a typical drawdown of about 70 ft when it operates. When it is not pumping, PM-2 shows a response to pumping at PM-4 of about 10 ft (McLin 2006, 092218). The nonpumping water level at PM-2 varies from about 5830 to 5840 ft.

PM-4 was used only occasionally during 2005 and 2006 and has a drawdown of about 65 ft when it operates. The PM-4 aquifer test was performed during February and March 2005, at which time wells PM-2 and PM-5 were shut down and used as monitoring wells (McLin 2006, 092218). After the test, PM-4 was not operated for approximately 8 months. Observed water levels demonstrated responses to pumping at PM-2 and PM-5. Because the operational characteristics of PM-2 and PM-5 were similar during 2005 and 2006, it is difficult to relate the responses of PM-4 or the TA-16 wells to either PM-2 or PM-5 in a definite fashion. The nonpumping water level of PM-4 varies from about 5830 to 5840 ft.

PM-5 has a drawdown of about 80 ft when operating and has a nonpumping water level that varies from about 5840 to 5850 ft. When it is not pumping, PM-5 has a response to pumping in PM-4 of about 10 ft (McLin 2006, 092218).

Figure 4.2-3 shows the nonpumping water levels at supply wells PM-2, PM-4, and PM-5. Note that nonpumping water levels at PM-2 and PM-4 are similar, and the level at PM-5 is about 15 ft higher than the other two wells. Because of the pumping influences and the lack of complete recovery, the nonpumping water levels are not necessarily representative of the temporal pressure trends in the deep confined zone of the regional aquifer at a larger scale (Vesselinov 2005, 089753; Vesselinov 2005, 090040). For a given supply well, water levels are affected not only by the pumping at the well but also by the other water-supply wells in the vicinity; thus, full recovery of the water levels does not occur in the supply wells. Because PM-4 was not pumped for a long period in 2005 and 2006, the water levels at PM-4 may be considered the most representative of the deep confined zone.

In the section below, the water-level responses in regional aquifer monitoring wells are compared with the nonpumping water levels in the water-supply wells to determine if the responses may be attributed to pumping effects to investigate the potential hydraulic connection between the deep confined zone and shallower sections of the regional aquifer.

4.2.2 Monitoring Well Hydrologic Characteristics

Table 4.2-2 lists the general characteristics of monitoring well screens located at or near (within 100 ft) the top of the regional aquifer in the TA-16 area. Screens in wells CdV-R-15-3, CdV-R-37-2, and R-19 (shown in green) straddle the water table, but screens in other area wells are located at varying depths below the water table. Screens at R-17 and R-25 are within about 30 ft of the water table (shown in yellow). Some screens are also more than 30 ft below the water table (shown in peach) at R-18 (70 ft), R-26 Screen 2 (319 ft), and R-27 (38 ft). Screens located significantly below the water table (e.g., R-26) may not provide representative data for water-table elevations because of the three-dimensionality of the groundwater flow structure and the pronounced medium heterogeneity (i.e., if low permeable layers exist between the screen and the regional water table).

Table 3.4-2 summarizes the hydraulic conductivity data available for regional aquifer screens in the TA-16 area. The highest hydraulic conductivity values are from the deeper screens in the Puye Formation at R-19 (17.5 to 19.6 ft/d) and from the lower screen at R-17 (147 ft/d). The lowest hydraulic conductivity values are from Screen 2 of R-26, which was estimated to have a value of 0.0022 ft/d. When sampling was attempted at this screen, bentonite plugged the sampling device, and no samples were collected. Some pressure data results from this screen are anomalous and may not be representative of formation pressures, probably because of the presence of bentonite. No aquifer hydrologic parameter data are available for R-25 screens because the regional aquifer screens would not accept water during injection slug tests (Broxton et al. 2002, 072640, p. 48), indicating relatively tight, low-permeability zones at the screens. The history of low-flow sampling at R-25 indicates that the head declines significantly at Screens 5 and 8 during sampling. The head at Screen 5 declines over 5 ft when sampled and recovers slowly over several months after sampling, indicating very low hydraulic conductivity or possibly improper annular-fill construction at the screen. Similar long recovery times are associated with Screen 8, but the data from Screen 8 are inconclusive.

The deeper regional aquifer screens at CdV-R-15-3 have relatively low hydraulic conductivity (0.10 to 0.25 ft/d), but low flow sampling does not create drawdown. The deeper screens at CdV-R-37-2 have conductivities ranging from 7.0 to 11.4 ft/d. The properties of regional aquifer Screens 3, 4, and 5 at R-19 were not determined; drawdown resulting from low-flow sampling of these screens has not been observed. Slow sample flow during groundwater collection has been reported in Screen 3 of R-19 at the top of the regional aquifer.

Table 3.4-2 summarizes the well screen construction information and screen development information for TA-16 area regional aquifer wells (LANL 2006, 093798). The screens in different wells were developed differently, but it is important to note that in multiple completion wells (CdV-R-15-3, CdV-R-37-2, R-19, and R-25), the screens were not isolated with packers during pumping. The pump was usually situated next to a screen and operated while water-quality parameters were measured; however, the produced water would probably have been derived from the screen with the highest hydraulic conductivity and that produced water most readily. Thus, the pumping portion of the well development for multiple completion wells may not have provided proper development of all screens.

4.2.3 Monitoring Well Water Levels

The groundwater-level responses of monitoring wells in the TA-16 area were compared with the production and water levels of nearby water-supply wells to determine the source of the water-level fluctuations. In addition, the water levels of monitoring wells were analyzed to evaluate the potential impacts of regional infiltration recharge on the flow regime in the regional aquifer. The groundwater level monitoring program and groundwater-level data are summarized in Allen and Koch (2006, 093652; 2007, 095268).

Groundwater-level data in monitoring wells and water-supply wells were obtained using pressure transducers according to EP standard operating procedures. Table 4.2-3 summarizes the transducer types, transducer accuracy and resolution, and barometric efficiencies for each well and screen in the TA-16 area. Barometric-efficiency data were obtained from the aquifer test reports for single completion wells. Multiple completion wells with Westbay sampling systems have packers that isolate each screened interval from atmospheric pressure effects; thus, the barometric efficiency for these wells and screens is not as applicable and is not provided in the table.

4.2.3.1 R-17

R-17 is a two-screen well completed in January 2006 (Kleinfelder 2006, 092493), and the pump and transducers were installed in December 2006. Currently, pressure monitoring has occurred for too short a period to effectively analyze the water-level response.

4.2.3.2 R-19

The mean daily water levels at the five regional aquifer screens in R-19 were compared with the nonpumping water level at PM-2, the nearest supply well in Figure 4.2-4. Screens 4 to 7 showed an obvious response to pumping, primarily at PM-2 but also at PM-4. Because the operational characteristics of PM-2 and PM-5 were similar in 2005 and 2006, it is difficult to distinguish the response at R-19 to the pumping of PM-5. The transient response decreased gradually in the higher screens in the regional aquifer: Screen 7 exhibited the most response to pumping; Screen 3 at the top of the regional aquifer exhibited very small or no pumping response. Deep Screens 6 and 7 showed a similar response to seasonal pumping variations.

Figure 4.2-5 shows the water-level response at Screen 3 compared to the nonpumping water levels at PM-2 (note the significant change in the vertical scale). The water level at Screen 3 did not parallel the water level in PM-2 as do the deeper R-19 screens. During the PM-4 pumping test, Screen 3 showed no response, or a very slight response, to pumping and did not exhibit recovery after the pumping was discontinued. Different phenomena, for example regional changes in the water-table elevations resulting from variations in infiltration recharge, may influence the long-term water-level responses at the top of the regional aquifer at Screen 3.

Figure 4.2-6 shows the mean monthly water level at Screens 3 to 7 in R-19 for 2005 and 2006. In 2005, the summer seasonal transient response at Screen 7 from March to July was about 3.6 ft. The water level recovered about 2.7 ft during the winter of 2005–2006 and declined about 2.5 ft during the 2006 summer pumping stress period. In the fall of 2006, supply wells PM-2 and PM-5 were not used daily and the water level at Screen 7 recovered through December 2006 by 4.3 ft to the highest level in at least 2 yr.

4.2.3.3 R-27

R-27 is a single completion monitoring well located in Water Canyon. Currently, too short a period of pressure monitoring has occurred to effectively analyze the water-level response

4.2.3.4 CdV-R-15-3

At six-screen well CdV-R-15-3, shallow regional screens (4 and 5) have similar water levels, while the deepest screen (6) has a significantly lower (approximately 40 ft) water level. Figure 4.2-7 shows the water level at Screens 4 and 5 compared with the nonpumping water level at PM-5, the nearest supply well. Screens 4 and 5 do not show a response to PM-4 pumping in early 2005. Screen 4 shows several abrupt declines in water level that correlate with groundwater sampling events, indicating relatively low permeability of the formation. Screen 5 shows a rising water level in June 2005 that was not observed at Screen 4. The water-level data for Screens 4 and 5 show no discernable pumping effects in the shallow zone of the regional aquifer.

Figure 4.2-8 compares the water level time series at Screen 6 with the nonpumping water level at PM-5. The data suggest a small response of the screen to PM-5 pumping. The screen does not respond to PM-2 pumping (during the February 2005 pumping test and in July 2006 when PM-2 was idled).

The pumping response of Screen 6 is small in magnitude (fractions of a foot). In addition, the transients in the water levels at Screen 6 and PM-5 are not perfectly correlated. Potentially, Screen 6 is responding to some other stimuli (e.g., other supply well and/or water-levels fluctuations caused by variations in the regional infiltration recharge).

Figure 4.2-9 shows the mean monthly water levels at CdV-R-15-3 from 2001 to 2006. Screens 4 and 5 show a highly muted seasonal response that does not directly correspond with supply well pumping cycles. Screens 4 and 5 indicate a steady annual decline in water levels of about 0.2 ft. The mean monthly water level at Screen 6 shows a decline of about 3 ft in the year after the Westbay was installed, suggesting a pressurization of the zone when the well was open to the higher head in Screens 4 and 5. The slow decay of this head indicates a relatively low-permeability formation at Screen 6. The long-term record for Screen 6 is similar to the water levels of Screens 6 and 7 in R-19 (Figure 4.2-6), thus corroborating the hypothesis that Screen 6 responds slightly to supply-well pumping.

4.2.3.5 CdV-R-37-2

Multiscreen monitoring well CdV-R-37-2 has three screens in the regional aquifer (Screens 2 through 4); Screen 1 is located in a dry intermediate zone. The three regional screens have water levels that show similar temporal trends (Figure 4.2-10). When compared to the PM-5 nonpumping water level, no apparent correlation has been found between water levels at the TA-16 monitoring wells and those at the supply wells.

4.2.3.6 R-18

R-18, a single-completion well, is installed into the top of the regional aquifer in the Puye fanglomerates. The top of the screen is about 70 ft below the water table (Kleinfelder 2005, 092415). The screen was placed in a producing zone beneath a clay-rich zone; geophysical logs suggested that the hydrostratigraphic unit above this clay layer might not be fully saturated and hence not suitable for monitoring. This construction affects the ability of the well to monitor fluctuations in regional water-table elevation. Figure 4.2-11 shows the mean daily water level at R-18 (corrected for atmospheric pressure) compared with the daily nonpumping water levels at the water-supply wells. Despite similarities, there are significant differences between the water-level fluctuations at R-18 and the supply wells. The available water-level data from R-18 do not indicate an obvious response to pumping of the supply wells.

4.2.3.7 R-25

Depending on the interpretation of site hydrogeology, R-25 has 4 or 5 screens in the regional aquifer (Broxton et al. 2002, 072640). The questionable screen is number 4. Borehole R-25 intersects an approximately 400-ft-thick intermediate saturated zone separated from the regional aquifer by an approximately 100-ft-thick, low-permeability, clay-rich unsaturated zone (Figure 4.1-3). The intermediate zone is within the Otowi Member and the Puye Formation. The unsaturated zone between the two saturated zones and the regional aquifer are both in the Puye Formation. The Puye Formation is fully saturated without a zone of separation at R-26, which is located just west of R-25. The separation of the saturated zone at R-25 might be a local feature caused by the medium heterogeneity and spatial distribution of infiltration recharge. Nevertheless, it is unlikely that a relatively thin unsaturated zone (approximately 100 ft) can remain unsaturated under this condition. The pressures within the intermediate saturated zone are expected to exceed water-entry pressures of the clay-rich separation zone. In addition, capillary forces are expected to be able to fully saturate the clay-rich separation zone between the two zones of full saturation. The thick intermediate zone encountered at R-25 was not observed in the nearby boreholes R-18 and CdV-16-3(i). Therefore, the intermediate zone is either (1) a portion of the regional aquifer, (2) an active conduit of flow (recharge) toward the regional aquifer, or (3) an isolated (no recharge) and stagnant local feature that is in poor hydraulic communication with the regional aquifer. Based on the available hydrogeological information, it seems that the first and second options are more probable. Thus, it is likely the water level at Screen 4 is representative of the regional water-table elevation.

Figure 4.2-12 shows the water-level data from each regional aquifer screen and the nonpumping water level from PM-5, the nearest water-supply well. The water-level data at Screen 4 of R-25 are similar to the data for Screen 2 of R-26 (see Figure 4.2-13). The water-level change observed at R-25 Screens 5, 7, and 8 in August 2005 is the result of withdrawing groundwater samples. The water level slowly recovered at Screens 5 and 7 but did not recover at Screen 8. Westbay sampling is at a low rate, indicating low-permeability characteristics exist at these screens, especially at Screens 5 and 8 (see Table 3.4-2). These observations cast doubt on the ability of the screens to accurately monitor water-level fluctuations in the regional aquifer. Note that aquifer testing was not performed at these regional screens in R-25 because the tapped formations would not take water when slug tests were attempted (Broxton et al. 2002, 072640, p. 48). The water levels observed in R-25 regional aquifer screens do not appear to be influenced by supply-well pumping.

4.2.3.8 R-26

R-26 has one screen (Screen 2) in the regional aquifer. During sampling at Screen 2 in 2005, it was discovered that the lower port was plugged with bentonite. In November 2005, the transducer was relocated to another port in the same screened interval. Still, collected pressure data are suspect because bentonite was present in the screen. Figure 4.2-13 compares the available water-level data from the monitoring well and from PM-4 and PM-5. The water-level data do not reflect PM-4 pumping events. The declining water levels at the screen after October 2006 do not correlate with supply-well pumping activity. Thus, it does not appear that R-26 water level is influenced by supply-well pumping.

4.2.4 Comparison of Shallow Regional Screens

Figure 4.2-14 shows the hydrographs of the shallow regional screens in monitoring wells CdV-R-15-3, CdV-R-37-2, R-18, R-19, R-25 (Screens 4 and 6), and R-26. The well hydrographs are shown with the westernmost wells at the top of the figure and the easternmost wells at the bottom (see Figure 1.1-1). Note that the scale for each hydrograph is the same (0.8-ft full scale), except for R-26, which has a higher fluctuation in the hydrograph (5-ft full scale). All wells are multiple-completion Westbay wells, except for R-18, which is a single-completion well. Screen 6 is shown for R-25 because Screen 5 appears to have extremely low hydraulic conductivity. The mean daily water-level data are shown for each well, except for well R-18, which shows the mean daily water level corrected for atmospheric pressure.

Several of these shallow regional screens appear to exhibit similar water-level characteristics, which were shown earlier not to correlate with supply-well pumping. The water level at R-18 shows a similar trend, but the timing of highs and lows does not correlate well with the other wells; a longer water-level record from R-18 may be needed to clarify this association. The timing of highs and lows in the shallow screens in the CdV wells, R-25, and R-26 appears to correlate, but Screen 3 of well R-19 appears to have a slightly different timing of highs and lows (perhaps because R-19 is the easternmost well). The similarity in the water-level variations might result from common hydrologic processes. The water-level changes may be caused by variations in recharge to the regional aquifer along the Sierra de los Valles mountain front to the west. The variations in the recharge might cause regional scale variations of the water table that are highest in magnitude close to the source. The water-level variations at Screen 4 in R-25 and Screen 2 in R-26 are similar, potentially indicating they are tapping a hydraulically connected zone of the regional aquifer. These monitoring wells (especially R-26) are close to the Pajarito Fault zone that extends north-south along the western boundary of the Laboratory; the Pajarito Fault zone is expected to be one of the principal sources of recharge to the regional aquifer.

4.2.5 Comparison of Monitoring Well Water Levels with Surface-water Runoff and Spring Discharge

Figure 4.2-15 shows hydrographs of runoff along the western boundary of the Laboratory in Pajarito Canyon, Water Canyon, and Cañon de Valle, and the spring discharge from TA-16 area springs for 2005 and 2006. Also shown in Figure 4.2-15 are regional aquifer hydrographs from R-26, CdV-R-37-2, and CdV-R-15-3. A large snowmelt runoff event occurred from February to June 2005. It is manifest in both runoff and spring discharge hydrographs. Several runoff events during the summer of 2005 and 2006 are also shown in both the runoff and spring discharges. The winter of 2005–2006 was extremely dry; thus, no snowmelt runoff occurred in the spring of 2006.

CdV-R-37-2 and CdV-R-15-3 showed a high water level in the fall of 2005; if correlated with the snowmelt-runoff event, the levels indicate a delay in response of 3 or 4 months. Wells R-26, CdV-R-37-2, and CdV-R-15-3 showed another high water level in September 2006, which, if correlated with the runoff events in 2006, indicates a delay in response of only 2 months.

The westernmost well (R-26) shows the highest water-level fluctuation (2–3 ft), while the easternmost well (CdV-R-15-3) shows the least amount of fluctuation. This response is expected in the aquifer from infiltration of mountain-block recharge to the west. However, the timing of runoff events and potential aquifer responses does not appear to be synchronous; thus, any correlation between runoff, spring discharge, and aquifer response is tenuous, based on the currently available data.

4.2.6 Summary

The data reviewed above support a conceptual model of a hydrodynamically separated regional aquifer. Therefore, Model B, discussed in the section 4.1.1, is most likely to be correct. Under this conceptual model, the regional aquifer is divided into two zones: a shallow phreatic zone and a deep, confined zone. Pressures and hydraulic gradients in the deep zone are predominantly influenced by the supply-well pumping. Pressures and hydraulic gradients in the shallow zone are affected by seasonal variations in regional aquifer recharge; they are negligibly influenced by supply-well pumping. This finding has important implications for designing a monitoring network at TA-16. Wells into the shallow phreatic zone should be adequate for detecting contaminant releases from TA-16 and for detecting contaminants migrating downgradient along the water table.

Table 4.2-4 summarizes the transient responses observed in the TA-16 area monitoring wells. The four deep screens in R-19 show obvious responses to pumping of wells PM-2 and PM-4 and possible responses to pumping of PM-5, but the available data do not allow for a definitive determination of the response to PM-5. Screen 3 in R-19 at the top of the regional aquifer does not show clear correlation to pumping at PM-2. The magnitude of potential drawdowns is minor (less than 0.2 ft). No other monitoring well in the TA-16 area indicated a transient response that can be attributed to supply-well pumping.

When considering the ambient gradients at the regional water table, the relatively small seasonal changes observed in the water table elevations from pumping and seasonal stimuli do not appear to influence the magnitude and direction of flow gradients in the shallow zone of the regional aquifer. Similar conclusions were made on the site scale (Pajarito Plateau) (Vesselinov 2005, 089753; Vesselinov 2005, 090040), and on a local scale (Mortandad Canyon) elsewhere at the Laboratory (LANL 2006, 094431).

Therefore, transient hydrologic effects have a negligible impact on the flow directions at the regional water table (Vesselinov 2005, 089753; Vesselinov 2005, 090040) and provide added confidence that the gradients discussed in this report are correct.

Table 4.2-4 also ranks the regional screens in terms of the capability to represent the absolute values and temporal fluctuations in water levels. The ranking is somewhat subjective and based on information about well development, hydraulic properties estimated during field tests, and observed water-level fluctuations. In these terms, screens producing characteristic transient fluctuations that can be related to observed stimuli (pumping/recharge) are ranked as being representative of local water levels. Wells that may provide representative data are tied to screens that demonstrate low permeability during field testing or sampling events. Screens that cannot represent water levels show extremely low permeability during field testing or sampling events (i.e., Screens 5 and 8 in R-25 and Screen 2 in R-26).

Table 4.2-4 summarizes the information presented above about the construction and the hydrodynamic behavior of the screens. Some of the screens are installed at the top of the regional aquifer and the observed water levels are showing clear phreatic (water-table) responses. These screens are Screen 4 in CdV-R-15-3; Screen 2 in CdV-R-37-2; and Screen 3 in R-19. Screen 2 in R-26 shows a response characteristic of water-table fluctuations, but it was drilled deep into the regional aquifer. The water levels measured at Screens 1 and 2 in R-26 are different. Screen 1 is potentially tapping a perched zone above the regional aquifer. Screen 4 data from R-25 seem to be more representative of the regional water-table fluctuations compared to data for Screen 5 in the same well. The single screen in R-18 shows a response characteristic for water-table fluctuations, although the screen is located 70 ft below the regional water table.

4.3 Simulation of Flow and Transport in the Regional Aquifer

A major objective of the numerical simulations presented in this section is to analyze potential flow directions in the regional aquifer to determine the likely migration direction for contaminants released at TA-16. Uncertainties in the flow directions are also addressed. Through this analysis, monitoring wells important for detecting plume migration in the regional aquifer are identified. It is assumed that contaminant transport through the vadose zone is predominantly vertical and one-dimensional, without lateral divergence.

4.3.1 Model Description

Various basin-scale and site-scale numerical models of three-dimensional groundwater flow and transport in the aquifer beneath the Laboratory have been developed. The site-scale models represent a portion of the regional basin-scale aquifer in the vicinity of the Laboratory (Keating et al. 1999, 088746; Keating et al. 2000, 090188; Keating et al. 2001, 095399; Collins et al. 2005, 092028; LANL 2006, 091987). Previous modeling work has targeted issues related to sustainability of groundwater resources in the region, the potential impacts of previous and current Laboratory activities in the subsurface environment, and the quality and quantity of groundwater resources (LANL 1998, 059599). During previous model development, a series of site-scale models was generated. Some of the differences between the models are associated with different input information used in the model development (e.g., using latest updates in the geological model and the hydraulic-head database). More importantly, there are differences related to alternative conceptualizations of groundwater flow and transport in the models. For example, steady-state models assume that temporal changes are negligible (Keating et al. 1999, 088746) versus transient models that incorporate them (Keating et al. 2001, 095399). Some models focus on the processes at the water table in the phreatic zone, and other models incorporate the whole thickness of the regional aquifer. Based on the discussion in sections 4.1 and 4.2, it is assumed that (1) the phreatic zone near TA-16 is predominantly (if not completely) hydraulically disconnected from the deeper portions of the regional aquifer, and (2) transients in flow magnitudes and directions along the water table caused by regional infiltration recharge and water-supply pumping are small. As a result, in this report, a steady-state model of flow and transport in the phreatic zone is applied. Similar conclusions for the regional aquifer have been made previously for other locations across the Pajarito Plateau (cf., Vesselinov 2005, 090040; Vesselinov 2005, 089753; Vesselinov 2005, 090117; LANL 2006, 091987).

The explicit simulation of the phreatic zone in the numerical model requires a complex representation of both the saturated and unsaturated zones in a single three-dimensional numerical model. However, because the water table is almost at a steady state (see section 4.2), the development of such a complex model is not necessary in this case. A simpler approach is used to simulate contaminant transport in the shallow phreatic zone. It is assumed that the water-table gradients are known and defined by the two alternative maps of the water table in Figures 4.1-4a and 4.1-4b. It also is assumed that a limited vertical mixing of contaminants occurs below the phreatic zone, and, therefore, the model is reduced to a relatively thin zone along the water table. This approximation is justified by the review of water table responses in section 4.2. As a result, the model is pseudo-three-dimensional, with a uniform thickness of 100 m (approximately 325 ft). The model also accounts for the probability of contaminant flux from the phreatic zone into the deep portions of the regional aquifer through hydraulic windows.

The model domain is shown in Figure 4.3-1. Laterally, the grid extends from the flanks of the Sierra de los Valles on the west to the Rio Grande on the east. The entire Laboratory lies within the boundaries of this domain, as do all of the Los Alamos County water-supply wells. The top of the grid is defined by the shape of the regional water table (Figure 4.1-4). The computational grid is uniform (structured) and the size of the grid cells is uniform and equal to approximately 80 ft by 80 ft (25 m by 25 m).

Flow directions and magnitudes that control contaminant transport in the aquifer are generally dictated by the shape of the regional water table (Freeze and Cherry 1979, 088742, Chapter 5; Vesselinov 2005, 090040). Transport velocities are a function of the hydraulic gradients and the permeability and porosity of the hydrostratigraphic units. Permeability and porosity values of the hydrostratigraphic units are uncertain and represented as random variables, as defined in Table 4.3-1; theoretical probability distribution functions are presented in Figures 4.3-2 and 4.3-3. The permeability ranges are based on site-specific field hydraulic tests reported in McLin (2006, 093670) and literature data (Freeze and Cherry 1979, 088742). The ranges of porosity values for the regional aquifer units are defined based on data from the literature (Freeze and Cherry 1979, 088742). The only site-specific data available are for the Cerros del Rio basalt (Tb 4) and Puye Fanglomerate (Tpf), and these data were considered in developing the distributions for those two units (Keating et al. 2001, 095399). The parameter ranges include high-permeability values and low-porosity values that are expected to occur in the case of fracture flow.

It is important to note that for the case of contaminant transport near TA-16, only flow properties (permeability, porosity) of the Puye fanglomerate (Tpf) and Tschicoma Formation (Tt) are directly relevant. The flow properties of the other hydrostratigraphic units are not expected to significantly influence the flow near TA-16 because the potentiometric surface only intersects Tpf and Tt in the vicinity of TA-16.

To represent the dispersion of the contaminant plumes, an axisymmetric form of the dispersion tensor was used (cf., Lichtner et al. 2002, 095397); the longitudinal and transverse dispersivities were defined to characterize the tensor. It is assumed that longitudinal and transverse dispersivities are random variables with statistical parameters presented in Table 4.3-2. Site-specific data supporting these values are not available. Based on data from literature, the selected range of values is reasonable for the spatial scale of simulated contaminant transport (approximately 1 km [0.62 mi]) (Neuman 1990, 090184) and the properties of the flow medium.

To estimate uncertainty in the model predictions, a Monte Carlo analysis is performed. A set of 1000 uncorrelated, equally probable random realization are generated using a Latin Hypercube sampling technique with the software Crystal Ball. Each realization includes 26 random variables representing various model parameters that include the permeability and the porosity of the hydrostratigraphic units and the longitudinal and transverse dispersivities. It should be noted that the units are assumed to be uniform and the dispersivities are the same for all of the hydrostratigraphic units. Since the parameter range includes high-permeability values and low-porosity values characteristic of fracture flow, a fraction (about one-tenth) of the realizations simulate fast preferential flowpaths. Therefore, the probability that contaminant plumes might be affected by fracture flow is accounted for.

In this case, a relatively limited set of hydrogeological parameters in the model affects contaminant transport near TA-16. These parameters are the permeability and porosity of Tpf and Tt as well as the longitudinal and transverse dispersivities, a total of six parameters. Therefore, using only 1000 realizations to characterize uncertainties numerically is reasonable. More details concerning this Monte Carlo analysis will be presented in the upcoming CME report.

The numerical simulation of contaminant transport in the regional aquifer is performed using random-walk particle-tracking techniques (Lichtner et al. 2002, 095397). For each realization, 9425 particles are released within areas at the top of the regional aquifer, as presented in Figure 4.3-1. It is important to note that if the particles were released farther down Cañon de Valle (because the infiltration zones in that canyon are not well constrained), the calculated flow pathways would lie between those calculated for the Cañon de Valle and Martin Spring zones shown in Figure 4.3-4. Flowpaths originating in this part of the canyon would impinge more strongly on CdV-R-15-3 (in the near field) and on R-19 (in the far field). The number of particles is selected to be large enough for sufficient characterization of contaminant dispersion in the numerical model. The particles' movement is tracked through the model domain to estimate potential spatial migration of contaminants. The numerical simulations are performed using particle-tracking capabilities of FEHM (Zyvoloski et al. 1996, 054421) and a specially developed code for numerical convolution (CONVOLUTE). The saturated-zone analyses are computationally very intensive and produce a huge amount of output data. The analyses are achieved efficiently through parallelization using the Laboratory's supercomputers. The code MPRUN, which efficiently executes a series of Monte Carlo runs in a parallel environment, was used. Because of the independent nature of the individual Monte Carlo runs, the parallelization efficiency scales well with the number of applied processors.

It is important to note that the hydraulic gradients in the model are constrained based on the two alternative maps of the water table (Figures 4.1-4a and 4.1-4b). As a result, it is possible that the permeability variation in the 1000 stochastic runs might produce groundwater flow (Darcy) velocities that exceed ranges expected based on previous information about the total amount of water flowing through the regional aquifer. Groundwater velocity is equal to hydraulic gradient times permeability, but the velocity can be also computed by dividing the total groundwater flow rate by the flow area(Freeze and Cherry 1979, 088742, Chapter 5). The groundwater velocities through the phreatic zone in the western parts of the Laboratory are expected to be on the order of 0.6 cm/d with plausible local variations within an order of magnitude above and below this estimate (Vesselinov 2005, 090040). However, the transport velocities simulated in the model are considered to be characteristic only of the fraction of the groundwater flow medium where a dominant portion of contaminant transport occurs. As a result, the total amount of groundwater flowing through the aquifer will be consistent with existing hydrogeological information. Therefore, the simulations target estimation of potential uncertainties associated with contaminant transport velocities rather than groundwater flow velocities.

The flowpaths presented in Figure 4.1-4b are based on hydrogeological interpretation of the water-table data, not on the numerical model simulations. These flowpaths are intended to integrate and approximate the hydrogeologic variables (e.g., regional zones of recharge and discharge, measured hydraulic heads with their uncertainty, and medium properties) that affect local-scale flow. The flowpaths are not perpendicular to the potentiometric lines in the area near CdV-R-15-3, R-17, and R-19 (Figure 4.1-4b). The deviation from the flownet conformity rule is caused by expected large-scale flow structure from the western recharge areas to the eastern discharge areas. The deviation can be explained by measurement uncertainty (i.e., the potentiometric lines are not accurately interpolated) or anisotropy/heterogeneity of the medium (flow and head-gradient vectors do not coincide in an anisotropic medium when the flow gradient is not coincident with the principal directions of the permeability tensor (Freeze and Cherry 1979, 088742, Chapter 5). Therefore, the uncertainty in the flow direction in the regional aquifer will be addressed in numerical model simulations presented below.

It is important to note that the shape of the water table presented in Figures 4.1-4a and 4.1-4b is not expected to be affected by water-supply pumping at depth.

Before performing the modeling analysis, the source locations (Figure 4.3-1) and maps of the water table (Figures 4.1-4a and 4.1-4b) suggest that the regional aquifer monitoring wells that are expected to be important for detecting contaminant plumes originating from TA-16 are R-25, R-18, R-17, CdV-R-15-3, R-19, CdV-R-37-2, and R-27.

It is also important to note in the numerical simulations that properties of various hydrostratigraphic units are assumed to be spatially uniform. In reality, the aquifer is highly heterogeneous. This heterogeneity is a major constraint regarding the generality of the simulation results. Real contaminant plumes are expected be much more spatially heterogeneous than the simulations indicate. This disparity might affect the ability of the current monitoring network or any monitoring network to detect potential contaminant plumes. This uncertainty will be addressed as part of the contingency planning in the CME Report.

4.3.2 Results and Discussion

To estimate uncertainties in the flow directions in the regional aquifer, Monte Carlo simulation analyses were completed. For both flow configurations, 2000-model simulations that characterize uncertainty in the medium properties and flow structure were performed. Based on the derived-plume distributions, the general contaminant pathways in the regional aquifer were estimated (Figure 4.3-4). Figure 4.3-4 shows the principal directions of flow calculated from the two particle-release zones (the center arrows) and the width of the calculated zone of particle distribution (the outer arrows). The divergence of the plume flowpaths is controlled by advection and dispersion of contaminants in the regional aquifer. Currently, the simulations are dimensionless in time, but future work will address the transient aspects of the plume propagation in the regional aquifer in greater detail.

Regardless of uncertainties in the water-table shape, R-18 and R-17 are expected to be important monitoring wells for detecting a plume originating below Cañon de Valle. The north-diverting flowpaths predicted by the model are not expected to be caused by pumping effects. This conclusion is supported by the water-level data presented in section 4.2, which does not suggest that pumping affects the shape of the water table near TA-16. CdV-16-3(i), CdV-R-37-2, and R-27 are expected to be important well locations for detecting a plume originating below Martin Spring Canyon. These wells may also be important for detecting a southern divergence of the plume originating below Cañon de Valle. CdV-R-15-3 is an important monitoring well for detecting plumes originating from both source regions.

The model predictions demonstrate that the contaminant plumes are expected to experience substantial dispersion during their flow in the regional aquifer. In the model, plume sizes are controlled by the shape of the water table and the dispersion coefficients. Numerical analyses demonstrate that the size of a plume may not be sensitive to the assumption of a line-source of contamination rather than a point-source. Further discussion of this analysis will be provided in the CME report. It is also important to note that in the numerical simulations, the hydrostratigraphic units are assumed to be spatially uniform. In reality, they are heterogeneous. This heterogeneity will affect the size of actual contaminant plumes. A comparison of the predicted width of zones of flow and the distance between the monitoring wells suggests that the probability that contaminant transport might be not detected by the existing wells is relatively low. Based on literature data, researchers have suggested a linear correlation between the plume dispersion (dispersivity coefficient) and the plume-travel distance (cf., Neuman 1990, 090184). It is expected that the effective plume dispersivity will increase linearly with the traveled distance with a ratio of about 0.1 longitudinally and of about 0.01 transversely. Therefore, a plume originating from an instantaneous point source that has traveled approximately 3200–6500 ft (1000–2000 m) will be characterized by dispersivity values consistent with those used in this model. The increased plume size will increase the probability of plume detection by the existing monitoring wells. This model predicts that plume widths will exceed 1 km (0.62 mi), which is comparable to the distances between the monitoring wells transverse to the flowpaths (R-17, CdV-R-15-3, R-19, R-27). Therefore, the probability for plumes to migrate undetected by the abovementioned wells is low if the layered conceptual model is largely correct and the phreatic zone screens are able to detect contaminants released from TA-16. If vertical components of contaminant flowpaths are more dominant than assumed under the layered conceptual model, then the deeper screens at R-17 and R-19 are expected to detect such plume migration.

It is important to note the flow directions in the regional aquifer to the south of TA-16 are highly uncertain. In the hydrogeological analyses performed for this report (i.e., generating water table maps and developing simulation models), the groundwater flow directions to the south of TA-16 are poorly constrained because no data are available for this part of the aquifer. In these analyses, it was assumed the flownet structure has a general direction from west to east as is observed elsewhere on the Pajarito Plateau. However, the regional aquifer pathways originating beneath TA-16 might have a more southerly component than is represented in the hydrogeological model presented here. Currently, the water-level measurements at CdV-R-16-3i are used to constrain this uncertainty. However, these data are characteristic of the Tschicoma dacites (Tt) that have a very low permeability. The water levels in the deeper portion of the aquifer (in the Puye fanglomerate [Tpf] below dacites) may be different. Thus, to address this uncertainty, one recommendation made in section 6.0 is to complete CdV-R-16-3i with screens deeper in the regional aquifer.

A statistical analysis of the efficiency of monitoring networks consisting of various combinations of downgradient wells is presented in detail in Appendix E. Key aspects of that analysis are as follows:

- A monitoring network consisting of either all Laboratory wells or the downgradient wells considered in this document provides a detection efficiency of greater than 95% for contaminants leaving TA-16 from either a Cañon de Valle source or an S-Site (Martin Spring) Canyon source. Contaminants will be detected at the monitoring wells more than 95% of the time before being detected in one of the production wells.
- The mean time of detection of contaminants released from a Cañon de Valle source ranges from (<1 yr) for R-25 to approximately 10 yr for wells CdV-16-3(i), R-18, CdV-R-15-3, and CdV-R-37-2. to 20-plus yr for wells R-17, R-19 and R-27. Wells CdV-16-3(i), R-18, CdV-R-15-3, and CdV-R-37-2 (the near-field wells) detect contaminants leaving a Cañon de Valle source approximately 20 yr before mean detection times at the production wells.
- A monitoring network consisting of only the current near-field wells provides a network efficiency of less than 95% for Cañon de Valle; a near-field well network consisting of current wells provides a network efficiency of greater than 95% for an S-Site (Martin Spring) Canyon source.

4.4 Conclusions

Numerical simulations that address various aspects of existing hydrogeological uncertainties were performed. The simulations indicate that monitoring wells important for detecting contaminant released at TA-16 include R-25, CdV-16-3(i), R-18, R-17, CdV-R-15-3, R-19, CdV-R-37-2, and R-27. Modeling analyses suggest that the probability of undetected plume migration between the monitoring wells is low (<5%) because of the density of the monitoring network and model-predicted plume sizes. However, considering only the near-field wells, which would detect a plume leaving TA-16 in 10 yr or less, the probability is greater than 5%.

5.0 INFLUENCE OF GEOLOGIC STRUCTURES

The potential influence of faults, fractures, and other deformational features on flow and transport is one of the principal uncertainties associated with the hydrologic conceptual model for the TA-16 area. In both the saturated zone and the vadose zone, it is well known that fractures and other deformational features can either be rapid pathways for the flow of water and contaminants or can significantly retard the flow of water and contaminants (Antonellini and Aydin 1994, 095172).

Structures in and Around TA-16

The Pajarito Fault zone and its associated deformational features are the principal structural features that may influence fluid transport at TA-16 (Figure 5.0-1). This fault forms a approximately 400-ft- (120-m-) high escarpment due east of TA-16; its surface expression is typically a north-south trending, faulted monocline (Broxton and Vaniman 2005, 090038, p. 526; Collins et al. 2005, 092028, p. 2-9). The style of deformation in the Pajarito Fault zone ranges from simple, normal faults, to zones of small-scale faulting, to faulted monoclines, to intact monoclines. The overall sense of displacement is down to the east, with displacements within the Tshirege Member of the Bandelier Tuff ranging from 100 to 400 ft (Collins et al. 2005, 092028, p. 2-7).

The Rendija Canyon and Guaje Mountain faults are the other major faults with surface displacement of Pajarito Plateau strata (Figure 5.0-1). Both faults have surface expression to the north of TA-16 but have not been confirmed to extend as far south as TA-16. Both are north-south trending normal faults with down-to-the-west displacement. In the southern parts of the Laboratory, east of TA-16, these faults may be manifest as broader arcs of smaller displacement faults that trend southwest toward the main trace of the Pajarito Fault (Broxton and Vaniman 2005, 090038, p. 526; Collins et al. 2005, 092028, p. 2-9). Additional north-trending normal faults within the Puye Formation and Santa Fe Group are probably present beneath the Pajarito Plateau; similar faulting of the Santa Fe Group is observed east of the Laboratory site (Collins et al. 2005, 092028, p. 2-9).

Lewis et al. (2002, 073785) and Gardner et al. (2001, 070106) completed detailed small-scale structural mapping of the western portions of TA-16. They documented a wide-range of structural features that displace near-surface features by up to a couple of meters (Figure 5.0-2). In the TA-16 areas, these include fracture sets, monoclines, and faulted monoclines. Key structural features mapped in the TA-16 area by Lewis et al. (2002, 073785) include (1) a north-south graben, referred to as the TA-09 graben, that lies between building TA-16-260 and MDA P; (2) north-northwest-striking fractures and rare faults that bound the zone of deformation and may be the surface expression of deeper faulting; (3) north-south trending open and clay filled fissures; and (4) rare small east-west trending faults (Gardner et al. 2001, 070106, pp. 24-32 and Plate 1; Lewis et al. 2002, 073785, pp. 22-33 and Plates 1 and 2).

Lewis et al. (2002, 073785, pp. 29-32) also completed a detailed study of fractures at MDA P and found that fracture densities were highest on the west side of MDA P and that the preferred orientation of the fracture sets was N15W +/- 26º. Most of these deformational features trend north-south, much like the regional structural trends associated with the Pajarito Fault zone. Fractures tend to be most common in densely welded tuff and other competent units (LANL 1998, 059891; Birdsell et al. 2005, 092048) and less common in glassy to less welded tuffs. At MDA P, the fracture density is higher in the densely welded units 3 and 3T of the Bandelier Tuff (Lewis et al. 2002, 073785, pp. 29-32).

A recently documented type of structural feature at the Laboratory, including at MDA P, is deformation bands (Wilson et al. 2003, 095027; Wilson 2004, 095171; Wilson et al. 2006, 095028). These are cataclastic zones that predominate in unwelded to slightly welded tuffs and are expected to have higher unsaturated hydraulic conductivities than surrounding undeformed materials because their finer grain sizes retain moisture, thus increasing water saturation. It is estimated that unsaturated hydraulic conductivities within deformation bands can be as many as 6 orders of magnitude greater than in surrounding rock (Sigda and Wilson 2003, 095032).

Influence of Structures on Vadose Zone Transport

Deformational features in arid vadose zone regimes can either enhance the flow of water and contaminants, by providing rapid pathways for such transport, or retard the flow of water and contaminants because such structures may be plugged by clays and other impermeable minerals. Open fractures and deformation bands promote fluid transport (Sigda and Wilson 2003, 095032; Birdsell et al. 2005, 092048) in the vadose zone in the form of water-film flow along the fracture walls. In a recent series of papers, Wilson has documented evidence of fluid flow through the Tshirege Member of the Bandelier Tuff in deformation bands (Wilson et al. 2003, 095027; Wilson 2004, 095171; Wilson et al. 2006, 095028).

Several lines of evidence suggest that fracture and other fast-pathways transport are occurring through the TA-16 vadose zone. First, the presence of HE and other contaminants at depths greater than 700 ft in the R-25 well indicates that transport has occurred other than by matrix flow (Broxton et al. 2002, 072640). Second, a bromide tracer test performed at the 260 Outfall yielded breakthrough at nearby springs in less than 6 months, and the shape of the breakthrough curve indicates fracture-dominated transport (LANL 2003, 077965, section 4). Third, contaminants in the TA-16 vadose zone tend to be concentrated in fast pathways such as fractures and surge beds (LANL 2003, 077965, section 4).

Uncertainties associated with vadose-zone groundwater flow and contaminant transport are not likely to be significant for evaluating migration from TA-16 and the ability of existing wells to detect such transport. Empirical data show that fast pathways such as fractures, surge beds, and deformation bands have facilitated HE transport to the deep perched and regional aquifers at TA-16 (LANL 2006, 093798). However, because of the highly heterogeneous spatial structure of such pathways and their predominantly vertical orientation, it is unlikely that additional vertical boreholes would better characterize these pathways.

Influences of Structures on Saturated Zone Transport

Faults, fractures, and deformation bands within saturated zones beneath the Pajarito Plateau may also have disparate impacts on regional aquifer flow systems. As with impacts postulated for the vadose zone, fractures and faults can either enhance flow (if open fractures are present) or retard flow (if fractures are clay filled and hence have lower permeability and saturated hydraulic conductivities) (Caine et al. 1996, 095033). However, unlike in the vadose zone, deformation bands within the saturated zone typically reduce saturated hydraulic conductivities (Antonellini and Aydin 1994, 095172; Sigda and Wilson 2003, 095032) because porosity and permeability are reduced without counterbalancing increases in water saturation. (Saturation is uniform and equal to 1 throughout the entire regional aquifer.)

The nature of deformational features in the saturated zone will depend on the impacted hydrostratigraphic units. Competent units such as basalts, dacites, and densely welded tuffs will primarily deform brittlely and exhibit deformational features such as fractures, joints, and faults. Less competent units such as clastic sediments and glassy or nonwelded tuffs will deform via cataclasis and exhibit deformation bands (Antonellini and Aydin 1994, 095172; Wilson et al. 2003, 095027). The latter type of structural feature has been observed in the Tshirege Member of the Bandelier Tuff in unwelded/mildly welded units (Wilson et al. 2003, 095027; Wilson 2004, 095171; Wilson et al. 2006, 095028) and in Rio Grande Rift sediments south of the Pajarito Plateau (Rawling et al. 2001, 095031). These Rio Grande Rift sediments are similar in nature to the Santa Fe Group and Puye Formation sediments that represent the principal aquifer units beneath the Pajarito Plateau (Rawling et al. 2001, 095031).

Consideration of the hydrostratigraphic units postulated to be present downgradient from HE sources at TA-16 allows for qualitative evaluation of the possible effects of buried structures on saturated flow and transport.

The majority of the modeled flow paths from TA-16 trend in an east-west direction (see section 4). Lithologies present within the saturated zone along this downgradient direction (Figure 5.0-3) are primarily the Puye Formation, Santa Fe Group, and Totavi Lentil (Figure 5.0-4). These coarse, clastic units will almost certainly deform cataclastically and contain deformation bands rather than open fractures or faults. These structures will thus have finer grain sizes and lower saturated hydraulic conductivities than the undeformed units (Antonellini and Aydin 1994, 095172). They will most likely not support rapid fluid/contaminant transport. Based on the regional stress field that produced the Pajarito, Rendija, and Guaje Mountain Fault zones, such structures are likely to trend north-south and be steeply dipping. Thus, they most likely will represent zones of slower flow and transport oriented perpendicular to the regional hydrologic gradients. It should be noted that the Totavi Lentil, a relatively thin unit (thickness on the order of 30–50 ft) in most areas of the Laboratory, contains permeable sands, gravels, and cobbles deposited in an axial river setting. Because of its limited thickness, groundwater flow through this unit may be diverted or compartmentalized by faults with vertical offsets greater than the thickness of the unit. The water table map discussed in section 4 (Figure 4.1-4) suggests that the hydraulic gradients are much higher in the western than in the central part of the plateau. The gradient increase might be a result of low-permeability cataclastic zones in the regional aquifer.

It is expected that the deformation features (some of the faults may not be exposed on the ground surface) will have large spatial sizes in lateral and vertical directions within the regional aquifer. In addition, the older units such as the Miocene Santa Fe Group basin fill are more likely to be cut by faults, fractures, or deformation bands (some of which have become inactive over time) and probably display greater offsets (displacements accumulated over a longer period of time).

Existing data obtained from large-scale, cross-hole pumping tests suggest that low-permeable fault zones might be impacting the groundwater flow (1) in the vicinity of Guaje well field, (2) between saturated zones tapped by PM-1/PM-3 and PM-2/PM-4/PM-5 water-supply wells, (3) between saturated zones tapped by PM-5 and PM-4 (McLin 2006, 092218). Other explanations of the observed flow impacts that do not involve low-permeable fault zones are possible as well. Except for the water-table elevation map discussed above, no other data are available that suggest what might be the impact of the cataclastic fault zones on the regional groundwater flow to the west of PM-5.

Faults and fractures within the massive Tschicoma dacites observed in boreholes CdV-16-3(i) and CdV-R-37-2 (Figure 5.0-5) may behave as conduits for transport of water and contaminants to greater depths than the current depths of the downgradient wells (Caine et al. 1996, 095033). The nature of fault transport will primarily be determined by whether these structures are open or whether they are cored by clay-rich cataclasites and mylonites (Caine et al. 1996, 095033). The Tschicoma Formation is not observed at R-25. Nevertheless, in the three-dimensional geologic model (Cole et al. 2006, 095079), this unit exists to the north, south and west of R-25. Based on the spatial extent and expected high permeability, the Tschicoma Formation is expected to have an important impact on the redistribution of regional recharge and groundwater flow near TA-16.

6.0 SUMMARY AND RECOMMENDATIONS

This document has assessed multiple lines of evidence to evaluate the adequacy of the monitoring network to effectively measure groundwater COPCs during the interim period leading up to a monitoring network design that supports a groundwater CME remedy. The analyses

1. evaluated the ability of well screens in and around TA-16 to detect contaminants potentially released from and found to be migrating from the 260 Outfall and from other sites around TA-16 (section 3), including both an analysis of the effects of residual drilling fluids on the screens and a qualitative evaluation of well construction issues associated with the screens;
2. evaluated head data from well screens in an around TA-16 to characterize seasonal variations in the water levels, identify causes for the variations, and help constrain the hydrologic conceptual model for the regional aquifer in the western portions of the Pajarito Plateau (section 4.2);
3. determined whether potential monitoring wells downgradient from the 260 Outfall are located appropriately to detect migration of contaminants within and downgradient from TA-16 (section 4.3 and Appendix E); and
4. qualitatively evaluated the potential for geologic structures to enhance or impede downgradient flow of contaminants from TA-16 (section 5).

In this section, the results of these evaluations are combined to perform an integrated interim evaluation of the existing wells to constitute a monitoring network for contaminants released from TA-16.

Analysis of Well Screens

Different well screens require different levels of quality, depending on the primary goals of a particular well or well screen. For TA-16, it is important that the downgradient monitoring well network be able to detect RDX, which is the fastest moving, most abundant, and most toxic constituent released at the 260 Outfall and at TA-16. However, because several other contaminants (metals, organic chemicals, and other HE) were also released at the 260 Outfall and elsewhere at TA-16, it is also important that downgradient wells and screens are capable of detecting such constituents with a high degree of confidence. Finally, any screen or well located within the plume that could be used to help demonstrate MNA of HE constituents or other compounds such as VOCs needs to be able to detect present contaminants, MNA-breakdown products, and geochemical indicators of MNA. MNA is one of several groundwater remedies that will be evaluated within the CME report and from which NMED will select the final remedy.

The head analysis presented in section 4.2 strongly suggests a hydrologic conceptual model that is characterized by a distinct phreatic zone, largely hydrologically separated from deeper zones for much of the regional aquifer beneath the western and central parts of the Laboratory. Given this assumption, the most important screens for monitoring contaminant impacts to the regional aquifer would be those located within the phreatic zone. These are the screens at or near the water-table surface of the regional aquifer.

Table 6.0-1 summarizes information on the 26 screens evaluated in this document to accurately detect (above nominal laboratory detection limits) key classes of contaminants relevant for the 260 Outfall and for TA-16. Eighteen of the screens should be able to detect RDX, 18 out of 26 should be able to detect organic chemicals and other HE (including HE-breakdown products), and at least 16 out of 26 should be able to detect key geochemical indicators of MNA. Of the screens located in the phreatic zone, only Screen 2 in CdV-R-37-2 and Screen 5 in R-25, which may or may not represent the phreatic zone, are impacted to the point where key TA-16 contaminants almost certainly cannot be detected.

Location of Potential Monitoring Wells and Screens

Based on the modeling results presented in Section 4.3 and Appendix E of this report, the wells downgradient from the 260 Outfall are predicted to intercept the flowpaths for contaminants impinging on the regional aquifer beneath a Cañon de Valle source and beneath a Martin Spring source. Table 6.0-2 provides information on each well relative to calculated contaminant flow paths. The widths of the calculated plumes are broad enough that the existing downgradient monitoring network is predicted to intersect calculated contaminant plumes both in the near field (wells CdV-16-3(i), R-18, CdV-R-15-3, and CdV-R-37-2) and in the far field (R-17, R-19, and R-27). Thus, there is a high level of confidence that plumes originating at TA-16 will be detected either as they are leaving the TA-16 area or before they intersect the pumping zones of the PM well field wells. The statistical analysis presented in Appendix E suggests that consideration of the near- and far-field wells together yields greater than a 95% detection efficiency. Consideration of only the near-field wells in such a statistical analysis yields a detection efficiency slightly lower than 95% for a Cañon de Valle source and greater than 95% for a Martin Spring Canyon source. This conclusion is dependent on the assumption that a layered conceptual model is appropriate for the western parts of the Laboratory, as supported by the discussion in section 4.2, However, if this assumption is partially flawed, the deeper screens in the far field wells (particularly R-17 and R-19) provide some assurance that a deeper-traveling plume would be detected before it impinges on the PM well field.

The modeling results indicate that the regional groundwater flowpaths originating in the Cañon de Valle area trend slightly to the northeast. Cañon de Valle is hypothesized to be the principal recharge zone for the HE-contaminated plume at TA-16, Thus, these results suggest that important wells for monitoring downgradient migration from Cañon de Valle are R-18 and CdV-R-15-3 (in the near field) and R-17 and R-19 in the far field. The relative importance of these wells, particularly R-18, depends on which model of the water table is chosen. Interestingly, very low levels (<1 ppb) of RDX appear to have been detected in R-18 in some of the sampling intervals to date supporting the calculated flow paths.

Wells Within the Contaminant Plume

Wells R-25, CdV-16-1(i), and CdV-16-2(i)r are located within the contaminated perched zone at TA-16. Along with the near-field downgradient well and the boreholes that did not intersect a contaminated perched zone [wells R-18, CdV-16-3(i), CdV-R-15-3, CdV-R-37-2], R-25, CdV-16-1(i), and CdV-16-2(i)r define the extent of the contaminated perched zone. However, the data from R-25 Screens 1 and 2 are suspect; these screens are inadequate to detect several constituents of groundwater concerns reliably.

The presence of HE in the regional aquifer within the TA-16 plume is indicated, but not proven. RDX and other HE have been detected in the regional aquifer screens at R-25, but the rapid deceases in RDX concentration during the past 5 yr suggest that at least some of this RDX was brought down from the contaminated perched zone during drilling. The low-level RDX detects in R-18 suggest the regional aquifer at that location has been impacted (<1 ppb), which, in turn, suggests that the regional aquifer upgradient may be contaminated at higher levels. Based on the modeling discussed in section 4, this upgradient location is most likely to be Cañon de Valle rather than other potential RDX sources such as TA-09 (although the latter source cannot be ruled out). Redrilling a regional aquifer well through the contaminated perched zone, may also lead to cross-contamination of perched-zone HE into the regional aquifer. Borehole CdV-16-3(i) is located in the calculated radius of influence of the TA-16 plumes but did not intersect a perched zone. A regional well at this location may provide additional insights into whether the HE plume in the regional aquifer at TA-16 is extensive, with minimal risks of cross-contamination from a contaminated perched zone.

Influence of Geologic Structures

Based on a review of the recent literature, qualitative estimates of the likely effects of geologic structures on flow paths in the regional aquifer can be made. Clastic sediments such as the Puye Formation are likely to deform through the creation of deformation bands rather than open fractures. Deformation bands are typically characterized by grain-size reduction and associate porosity decreases. Within the saturated zone, such features will represent barriers to flow. Given the regional stress field in the western portions of the Laboratory, such structures are likely to be oriented north-to south, perpendicular to calculated flow paths, and hence be an impediment to downgradient flow. More competent units such as the Tschicoma dacites will deform by fracturing. In this case, either fast pathways (for open fractures) or slow pathways (for clay-filled fractures) are possible; a well that penetrates these dacites could help address this uncertainty.

Recommendations for Improving the Monitoring Network

This document has (1) reviewed the ability of screens in and around TA-16 to reliably measure contaminants of concern and MNA indicators; (2) evaluated hydrologic data from these wells, refined the site conceptual model, and completed the modeling of contaminant flowpaths and network efficiencies from sources at TA-16; and (3) qualitatively evaluated the influence of geologic structures. Table 6.0-3 summarizes key information for each well screen, including the rationale for action/inaction at the well. Based on these evaluations, the Laboratory recommends the following:

<u>CdV-16-2(i)</u>: Plug and abandon this nonwater-producing borehole. CdV-16-2(i)r was drilled at the same location and replaces its functions. This action is necessary because CdV-16-2(i)r provides data from the same location.

<u>CdV-16-3(i)</u>: Deepen this well into a producing zone of the regional aquifer and install a single completion well. Such a well may (1) help confirm or refute whether a significant HE plume exists in the regional aquifer at TA-16; (2) provide additional constraints on head gradients in the southern portions of TA-16 to support future modeling efforts designed to optimize a monitoring network; and (3) represent a very near field monitoring well for HE transport in the regional aquifer (if it is not already contaminated). It represents a potential key component of a near-field monitoring network.

<u>CdV-R-37-2</u>: Rehabilitate Screen 2, which is located in the phreatic zone. This well screen is highly impacted by residual drilling fluids, does not appear to be cleaning up significantly with time, and is in an important location, given the uncertainties associated with regional aquifer gradients in the southern portions of TA-16. It is the highest priority, most highly impacted well screen evaluated in this report. Rehabilitating this screen may be difficult, because it is located in tight dacites and could not be pumped during well development.

<u>R-25</u>: Redrill a borehole to the depth of Screen 3 and install a two-screen well. Screens 1 and 2 are the most contaminated in the well, and they are impacted by drilling fluids or screen corrosion. They do not appear to be improving; in fact, they may be corroding based on the increased detection of nickel,

chromium, and iron during recent sampling rounds. A new two-screen well would confirm or deny whether the screens are corroding. More importantly, it would be valuable to have two additional high-quality screen [beyond CdV-16-1(i) and CdV-16-2(i)r] within the contaminated perched zone that could be used to diagnose whether MNA is occurring within the TA-16 perched-zone plume. These actions associated with well R-25, are generally consistent with NMED's recommendations in its letter dated April 5, 2007 (NMED 2007, 095394).

<u>New well or wells (tentatively called R-4X)</u>: Complete a new regional aquifer well located between R-18 and CdV-R-15-3. This location is preliminary; the final location of this well will be revisited following completion of drilling of CdV-16-3(i) as a regional well and completion of drilling of the South Canyon wells in the Water Canyon area. A phased approach shall be used. This well will bring the monitoring well network efficiency to greater than 95% for the near-field wells, wells that could detect contaminant releases from Cañon de Valle in approximately 10 yr or less (compared to 20–30-yr travel times to the nearest production wells).

After the Laboratory receives NMED approval of these actions, it will prepare drilling work plans describing the details of these drilling/rehabilitation efforts and quarterly sampling strategy for these newly drilled rehabilitated wells. These well drilling/rehabilitation efforts will be completed by the end of fiscal year 2008 (October 1, 2008) (assuming funding is available).

This report is an interim evaluation of the monitoring well network in and around TA-16. The Laboratory also recommends that this evaluation be revisited following completion of the well rehabilitation/drilling activities described above. In addition, the network evaluated in this document should be reevaluated in the context of the remedy selected. Detailed monitoring-network analysis will be presented in the upcoming CME report.

7.0 REFERENCES AND MAP DATA SOURCES

7.1 References

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers 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; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; 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.

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7.2 Map Data Sources

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Fault Traces; Los Alamos National Laboratory, ENV Remediation Services Project, ER2005-0007; 1:24,000 Scale Data; 04 January 2005.

Gas Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; Development Edition of 05 January 2005.

Hypsography, 2, 10, 20 and 100 Foot Contour Intervals; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.

LANL Technical Areas; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; Development Edition of 05 January 2005.

Locations of Springs; Los Alamos National Laboratory, Environmental Stewardship Division, in cooperation with New Mexico Environment Department, DOE Oversight Bureau, ER2005-0495; 1:2,500 Scale Data; 18 July 2005.

Materials Disposal Areas; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; ER2004-0221; 1:2,500 Scale Data; 23 April 2004.

Modeled Surface Drainage, 1991; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program, ER2002-0591; 1:24,000 Scale Data; Unknown publication date.

Paved and Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; Development Edition of 05 January 2005.

Potential Release Sites; Los Alamos National Laboratory, Environmental Remediation and Surveillance Program, ER2005-0748; 1:2,500 Scale Data; 22 November 2005.

Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; Development Edition of 05 January 2005.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; Development Edition of 05 January 2005.

Water Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; Development Edition of 05 January 2005.

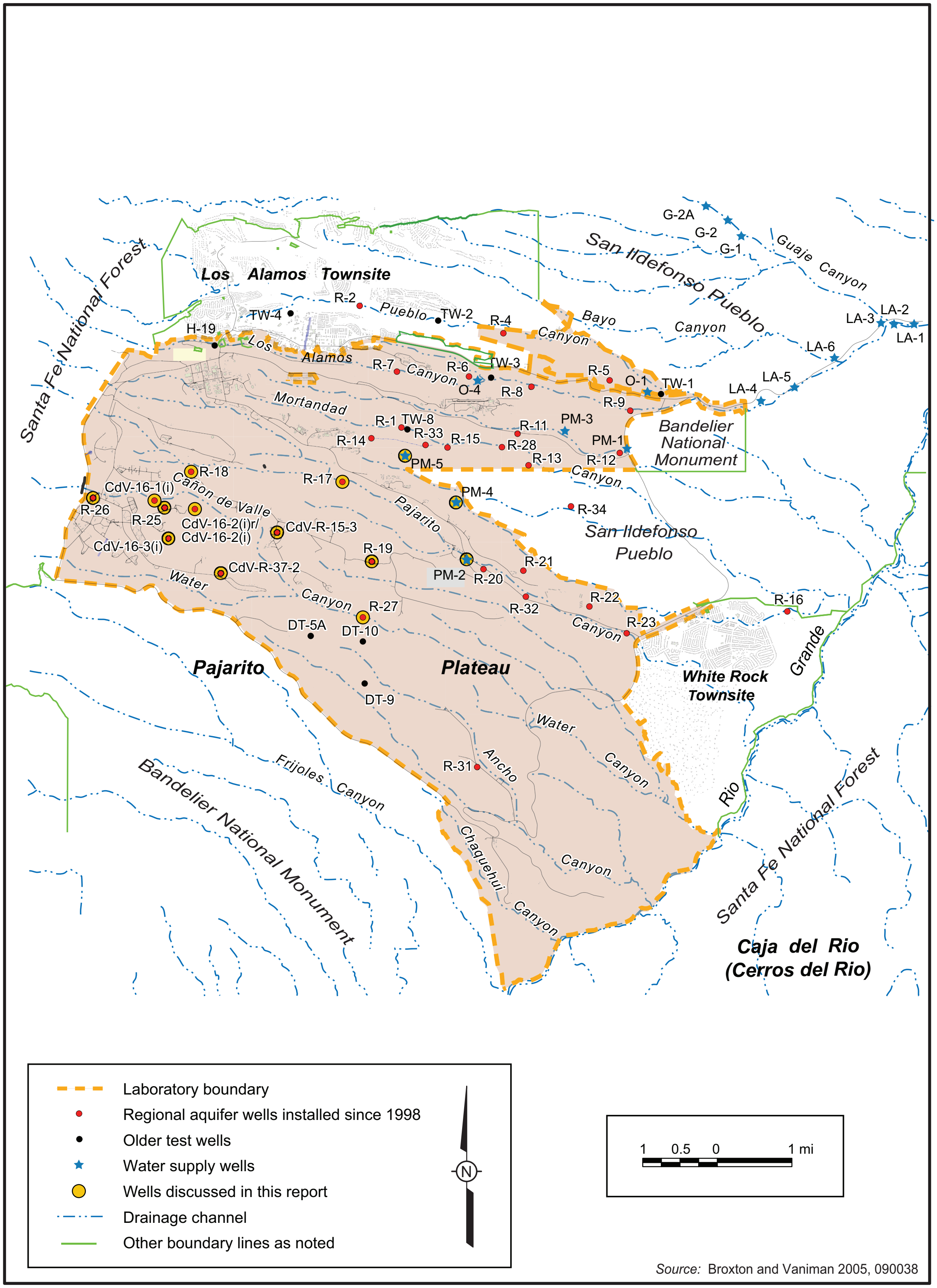


Figure 1.1-1 Groundwater monitoring and water supply wells in the vicinity of TA-16 and across the Laboratory

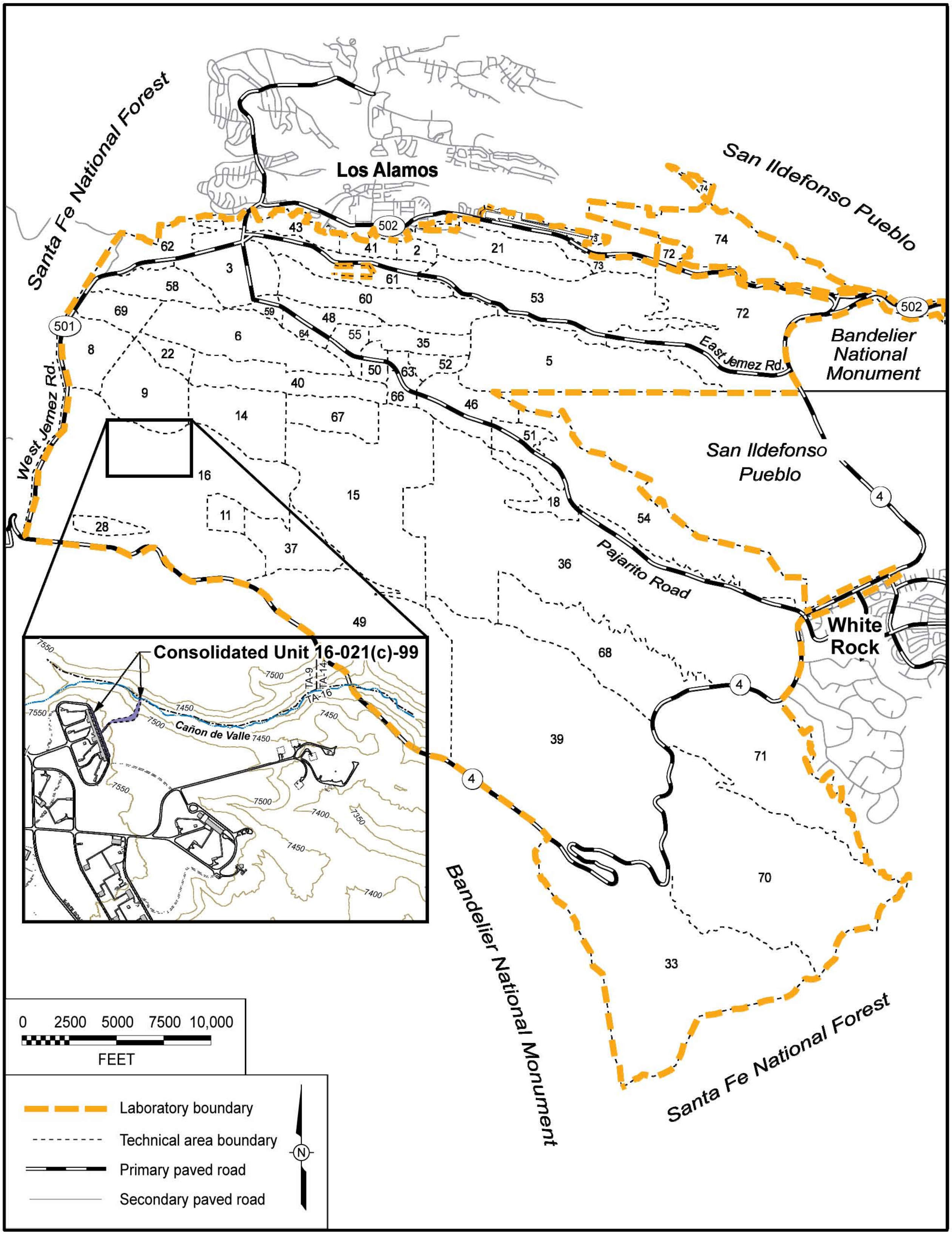


Figure 2.0-1 Location of TA-16 with respect to the Laboratory TAs and surrounding land holdings; Consolidated Unit 16-021(c)-99 is also shown

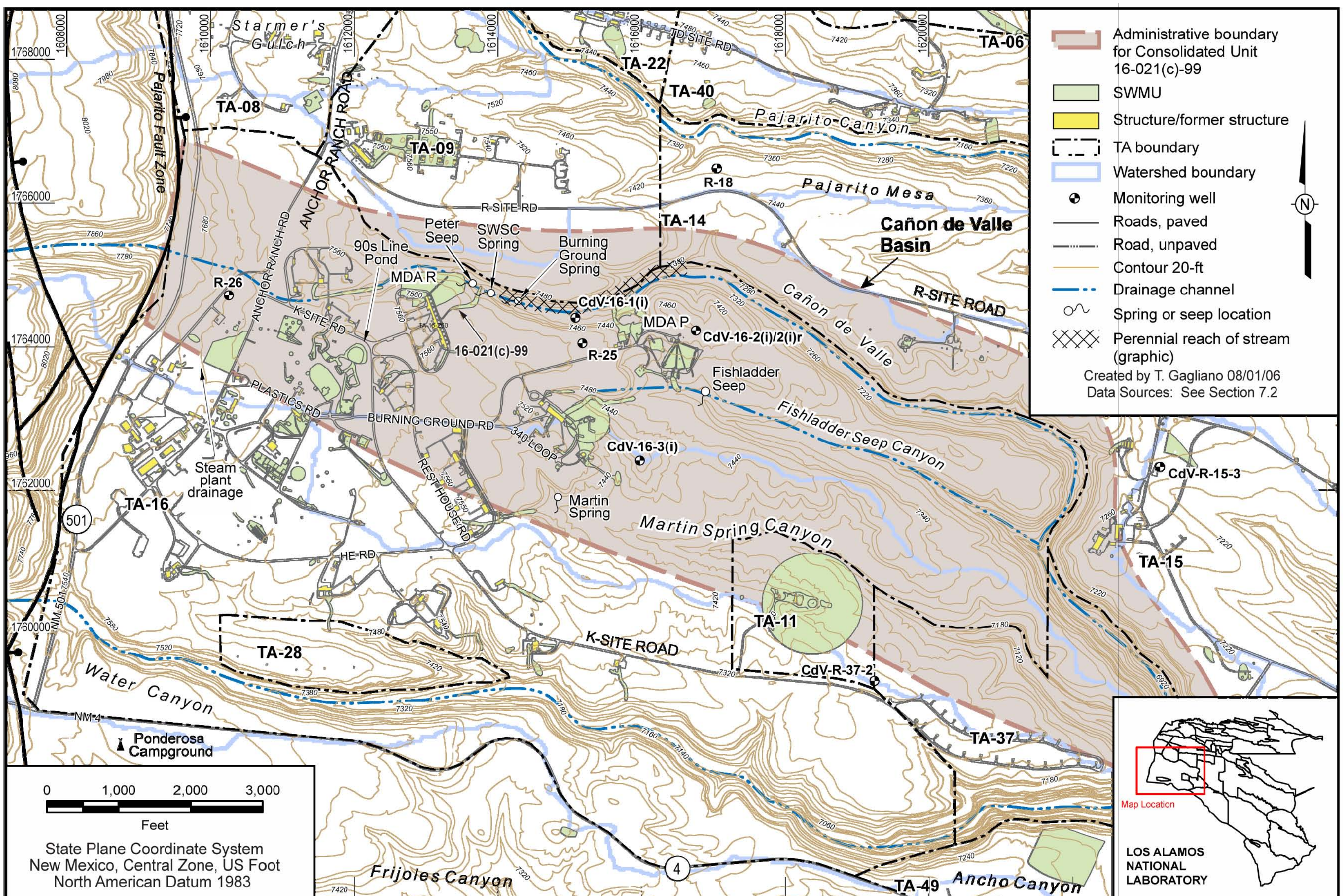


Figure 2.0-2 Administrative boundary for the Consolidated Unit 16-021(c)-99 CMS

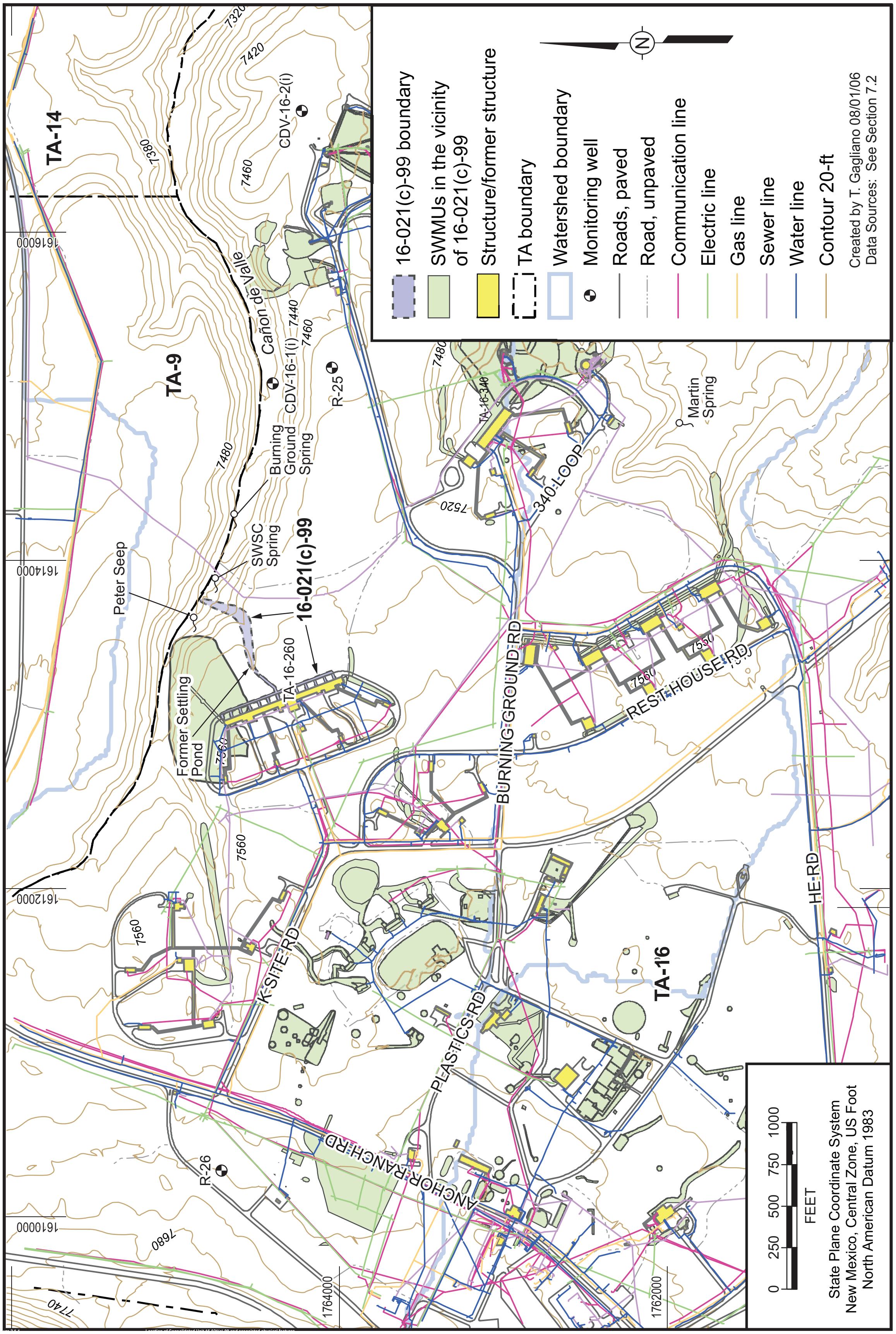


Figure 2.1-1 Location of Consolidated Unit 16-021(c)-99 and associated physical features

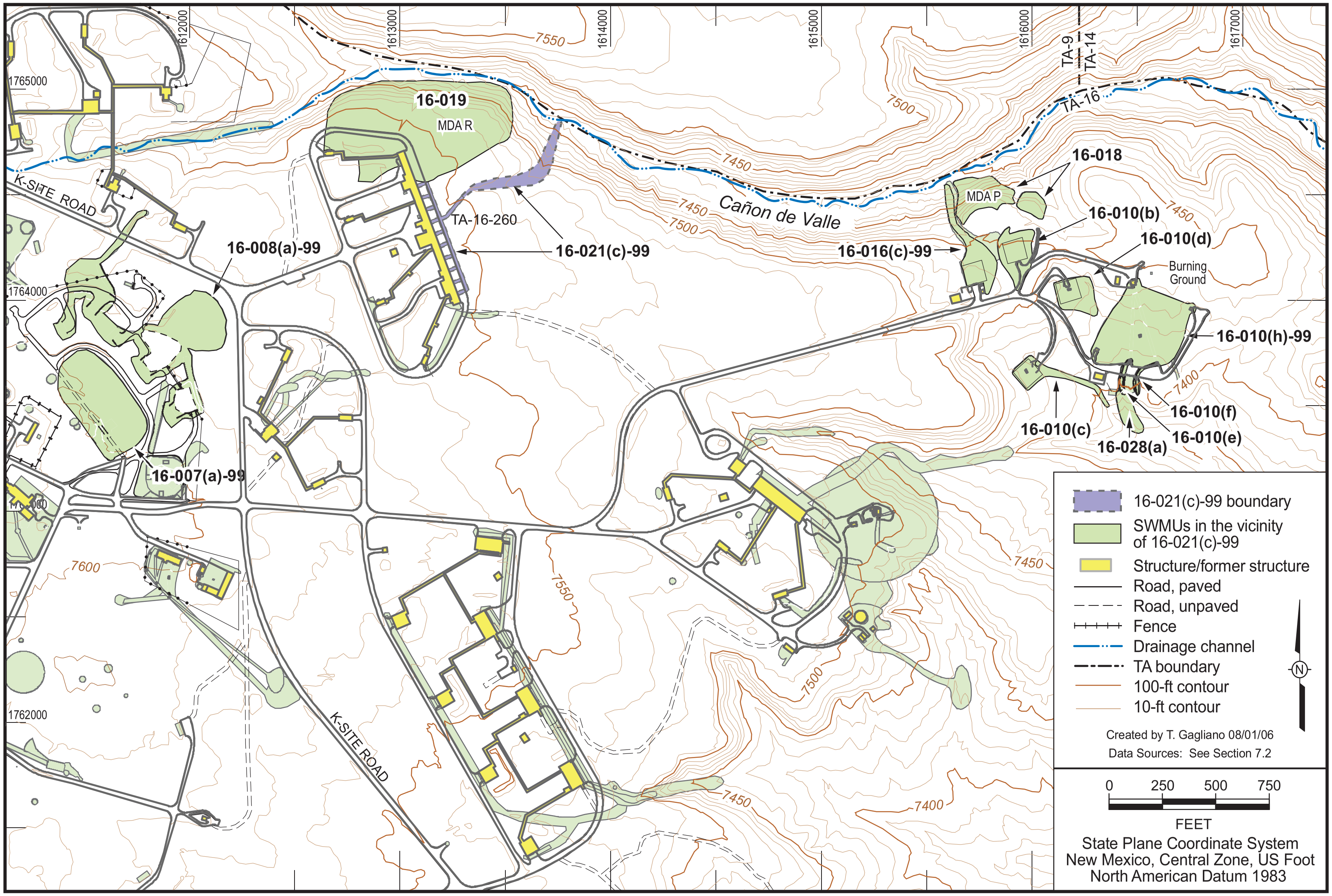


Figure 2.1-2 Major SWMUs in the vicinity of Consolidated Unit 16-021(c)-99

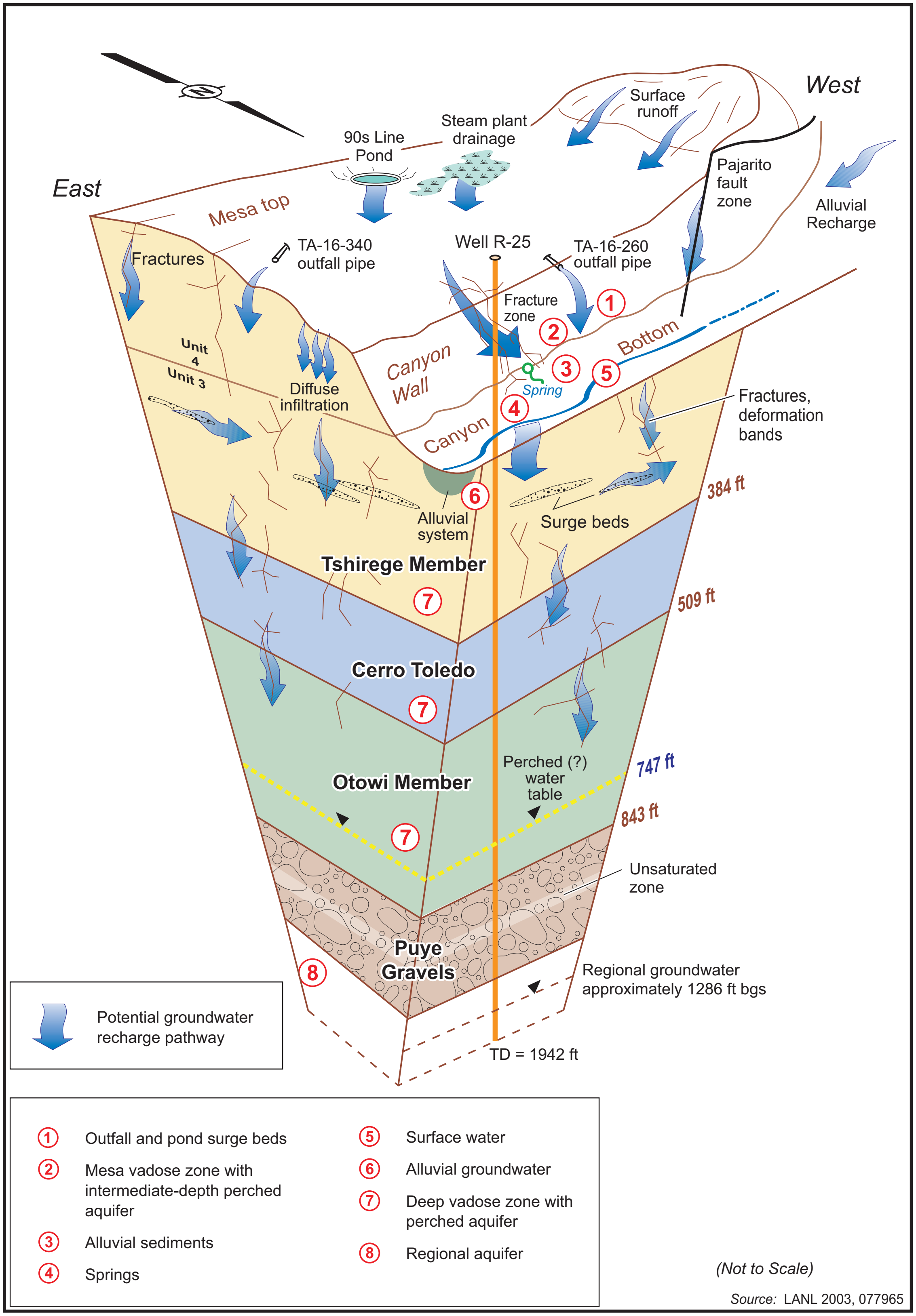
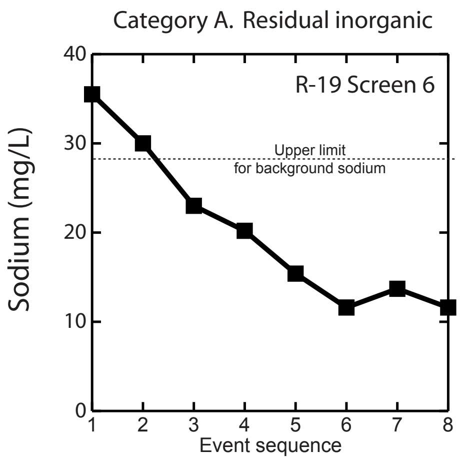
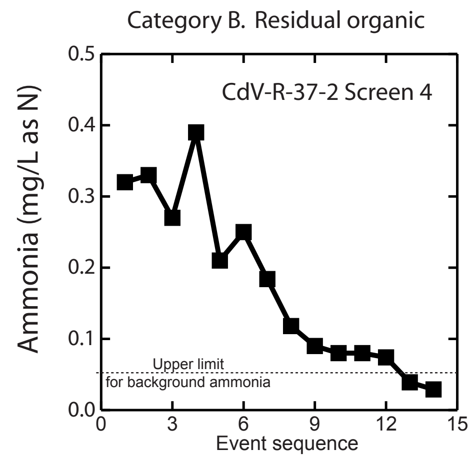


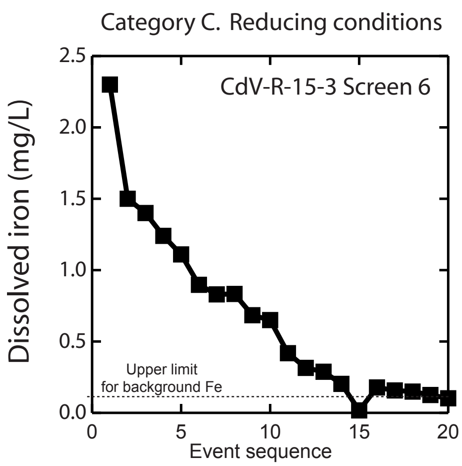
Figure 2.2-1 Conceptual site model of hydrogeology and contaminant transport for TA-16 and Consolidated Unit 16-021(c)-99



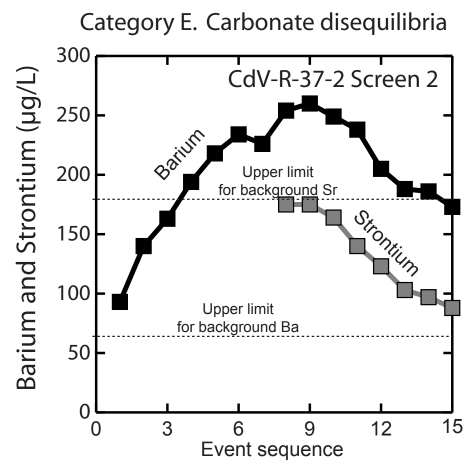
Sodium data for all screens are plotted in Figure D-22.



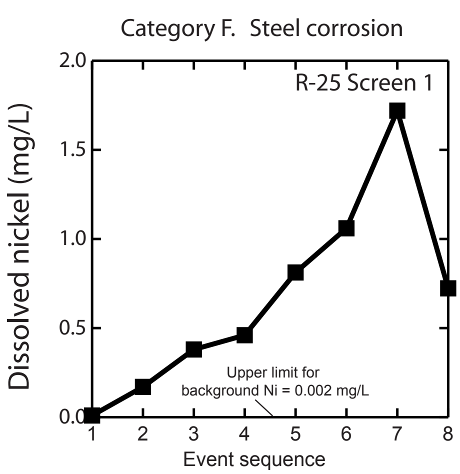
Ammonia data for all screens are plotted in Figure D-3.



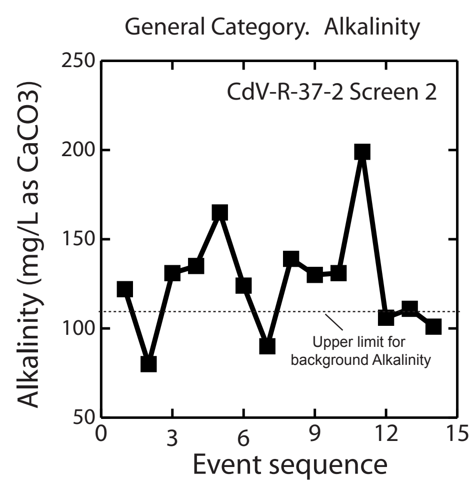
Iron data for all screens are plotted in Figure D-10.



Barium and strontium data for all screens are plotted in Figures D-4 and D-23, respectively.

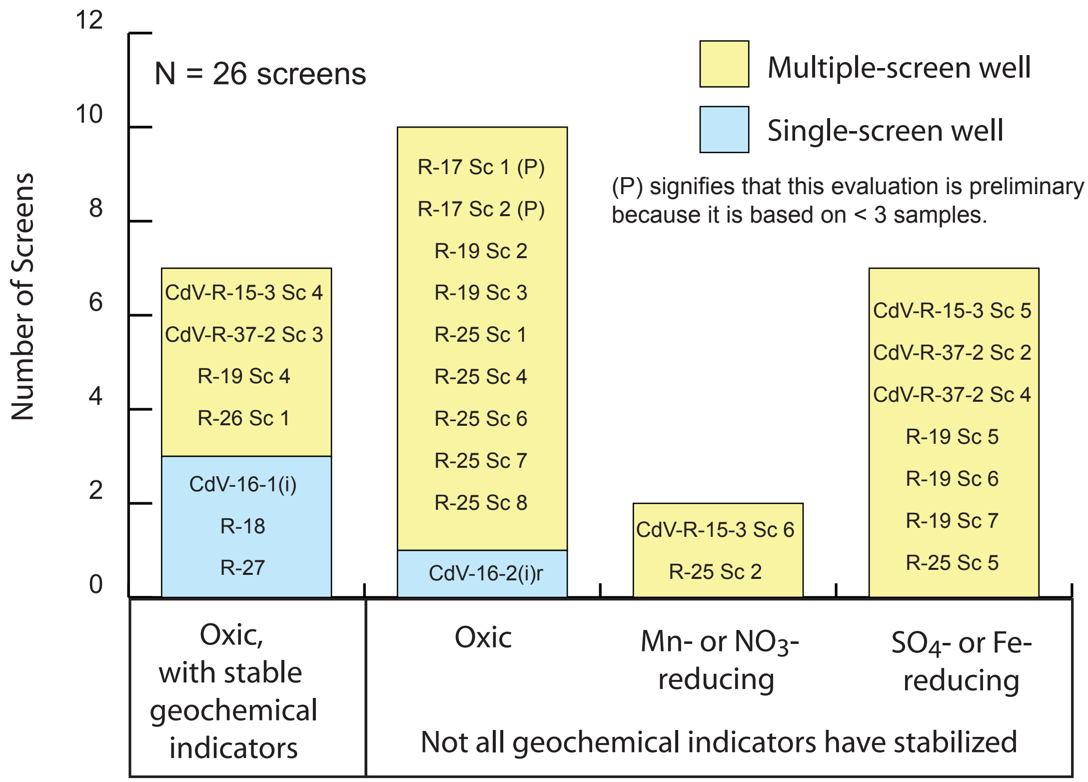


Nickel data for all screens are plotted in Figure D-15.



Alkalinity data for all screens are plotted in Figure D-2.

Figure 3.2-1 Examples of behaviors of indicators over time for different categories of drilling fluid effects



Note: This histogram plot is based on test outcomes summarized in Tables 3.2-1, C-7 and C-9; and on water-quality data trends plotted in figures in Appendix D.

Figure 3.2-2 Overall evaluation of screens for residual effects of drilling in the most recent sample

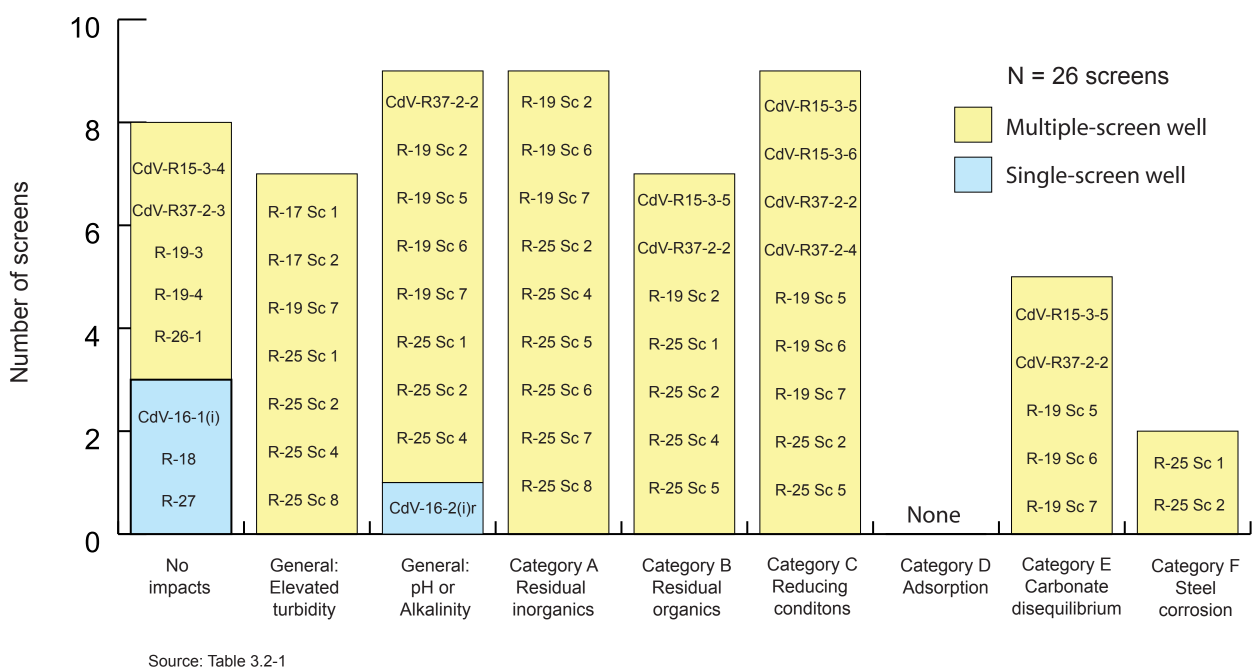


Figure 3.2-3 Frequency of residual drilling effects in the most recent sample

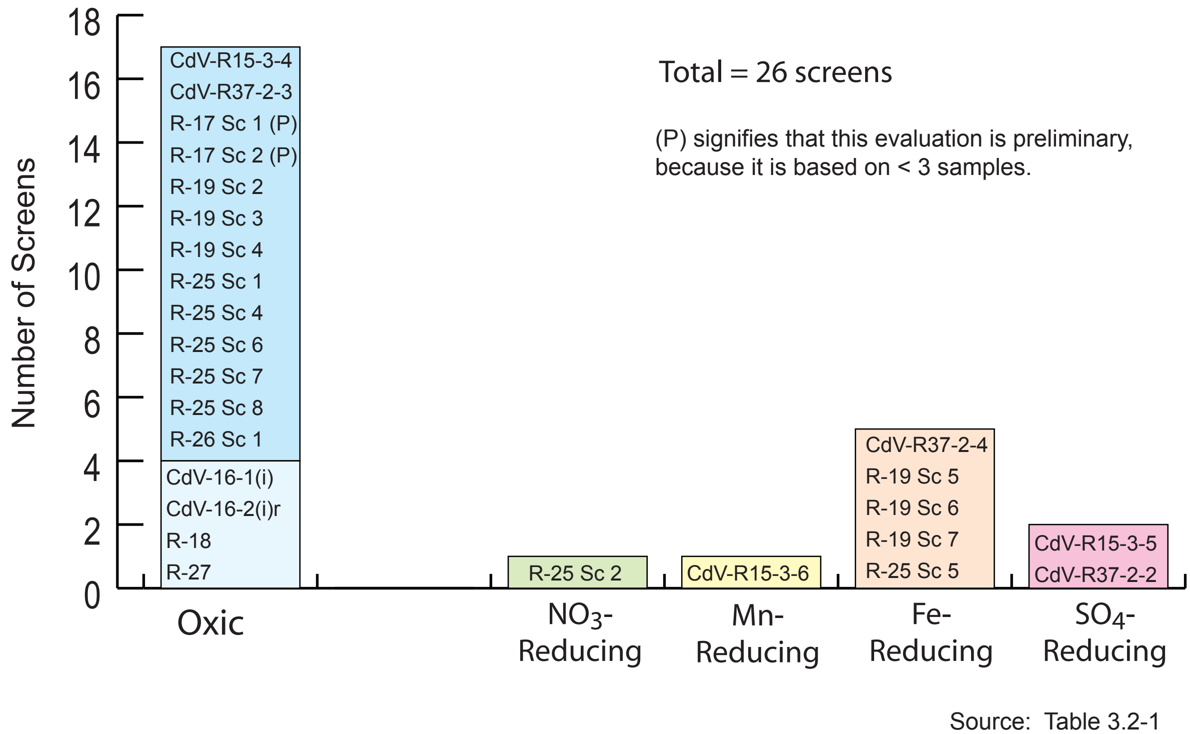
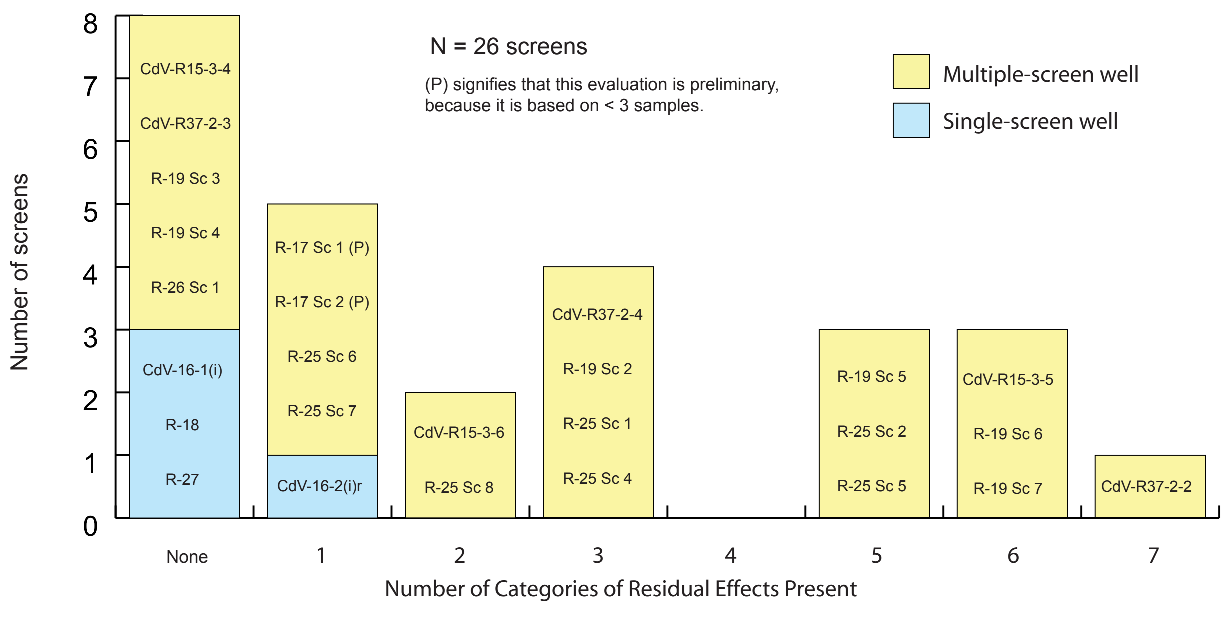


Figure 3.2-4 Redox condition in most recent sample



Note: Ten categories of residual drilling effects are possible: (1) Turbidity/pH or Alkalinity outside bounds, (2) residual inorganics, (3) residual organics, (4) NO_3-reducing, (5) Mn-reducing, (6) Fe-reducing, (7) SO_4-reducing, (8) enhanced clay adsorption, (9) carbonate disequilibria, and (10) steel corrosion. The presence of each reducing condition less than oxic is counted as a separate category, such that the presence of SO_4-reducing conditions is counted as four conditions because it is assumed that the water is also reducing with respect to Fe, Mn, and NO_3. The presence of Fe-reducing conditions is counted as three conditions (because the water is also reducing with respect to Mn and NO_3); Mn-reducing conditions are counted as two conditions, and NO_3-reducing conditions are counted as one condition following the same logic.

Source: Table 3.2-1

Figure 3.2-5 Frequency of multiple residual drilling effects in the most recent sample

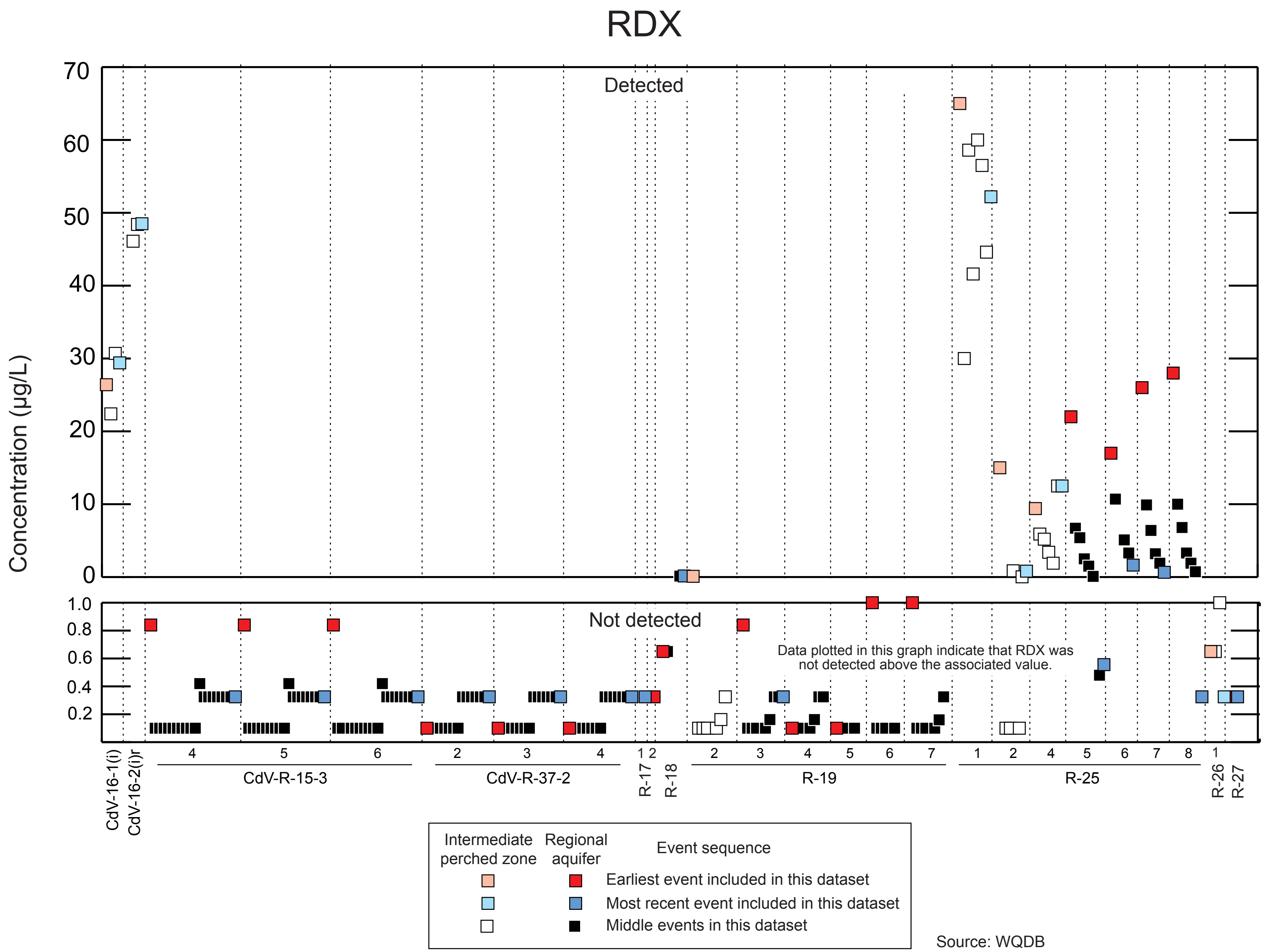
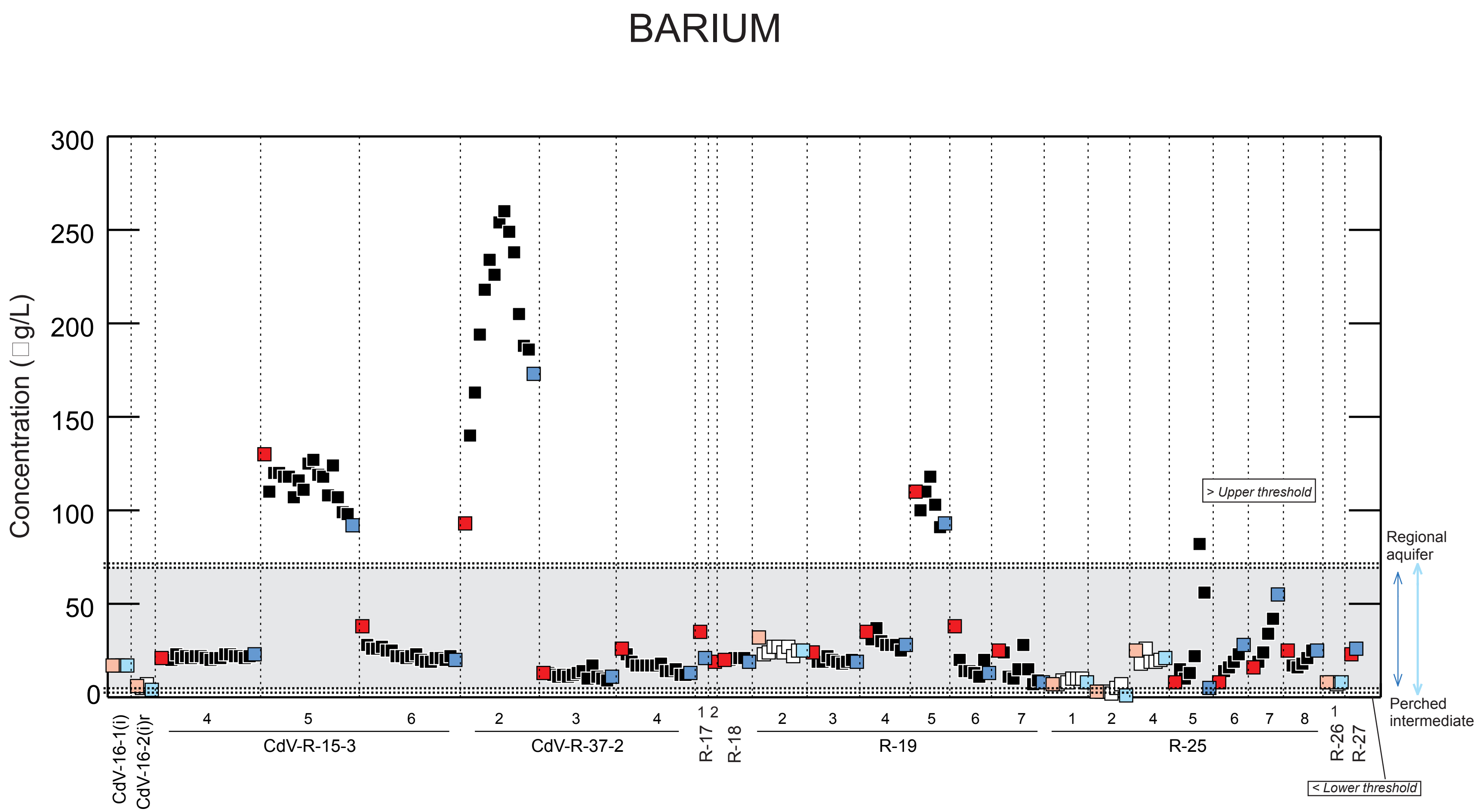


Figure 3.3-1 RDX concentrations in water-quality samples

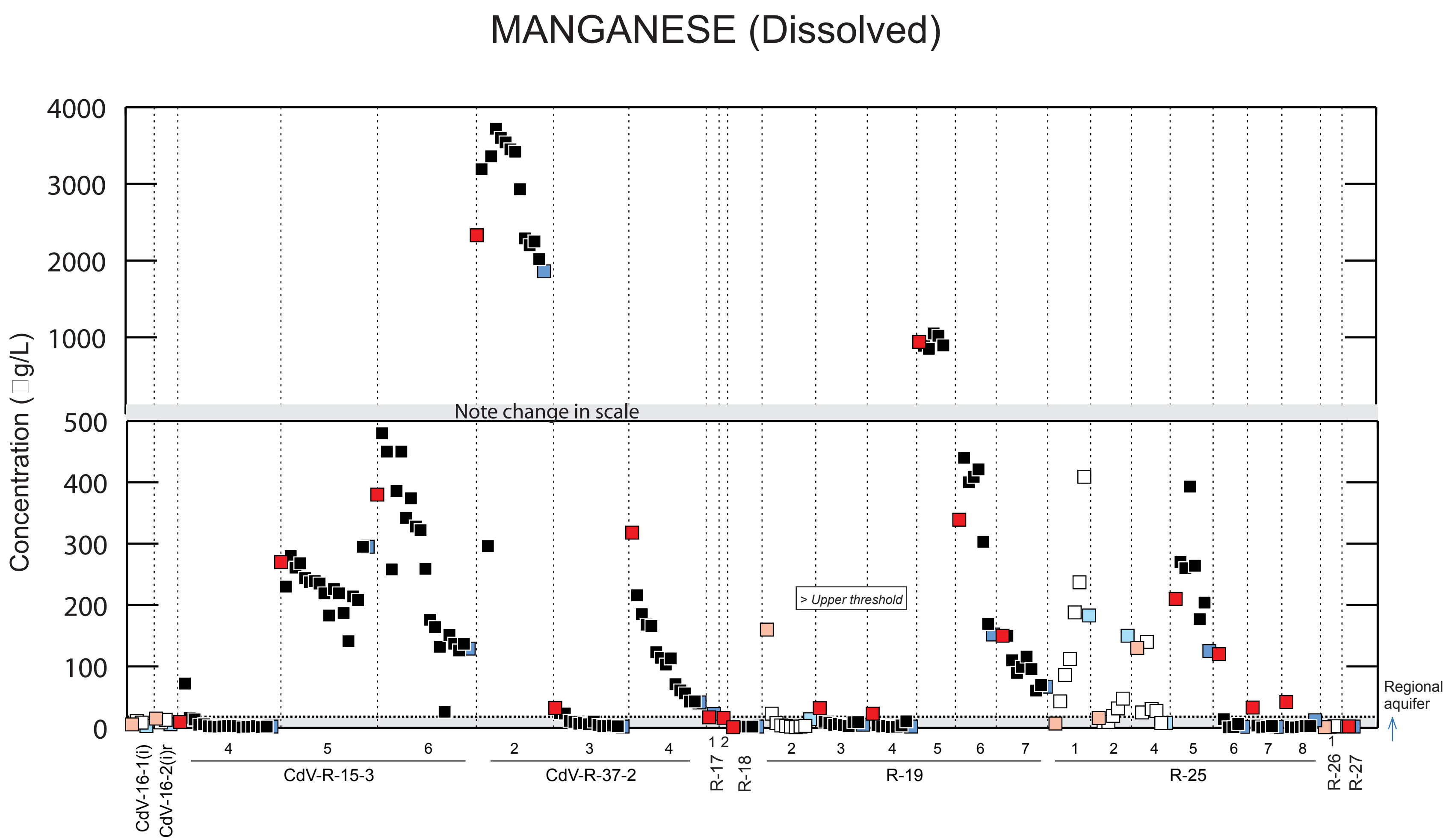


Intermediate perched zone	Regional aquifer	Event sequence
□ (peach)	■ (red)	Earliest event included in this dataset
□ (light blue)	■ (blue)	Most recent event included in this dataset
□	■	Middle events in this dataset

Note: Some data shown on this plot were obtained on nonfiltered samples, if data for filtered samples were not available. Because the test criterion applies to dissolved concentrations, the use of nonfiltered data may not always provide an accurate indication of whether or not the sample passes the test criterion. The data table in Appendix C notes which of the samples in this plot were not filtered.

Sources: Tables C-5 (data) and D-2 (test criteria).

Figure 3.3-2 Barium concentrations in water-quality samples



Intermediate perched zone	Regional aquifer	Event sequence
☐ (tan)	■ (red)	Earliest event included in this dataset
☐ (light blue)	■ (blue)	Most recent event included in this dataset
☐ (white)	■ (black)	Middle events in this dataset

Note: Some data shown on this plot were obtained on nonfiltered samples, if data for filtered samples were not available. Because the test criterion applies to dissolved concentrations, the use of nonfiltered data may not always provide an accurate indication of whether or not the sample passes the test criterion. The data table in Appendix C notes which of the samples in this plot were not filtered.

Sources: Tables C-6 (data) and D-2 (test criteria).

Figure 3.3-3 Manganese concentrations in water-quality samples

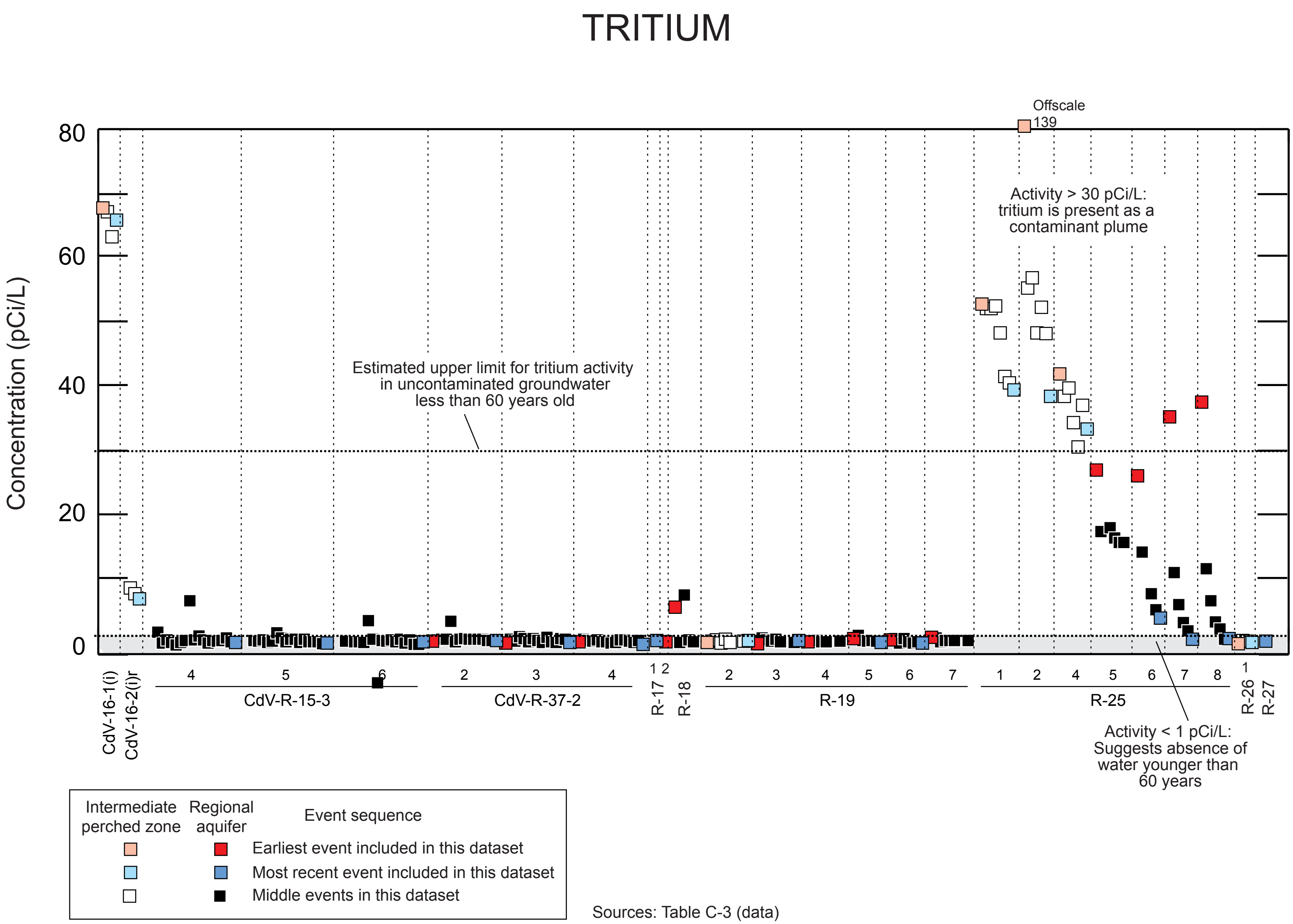
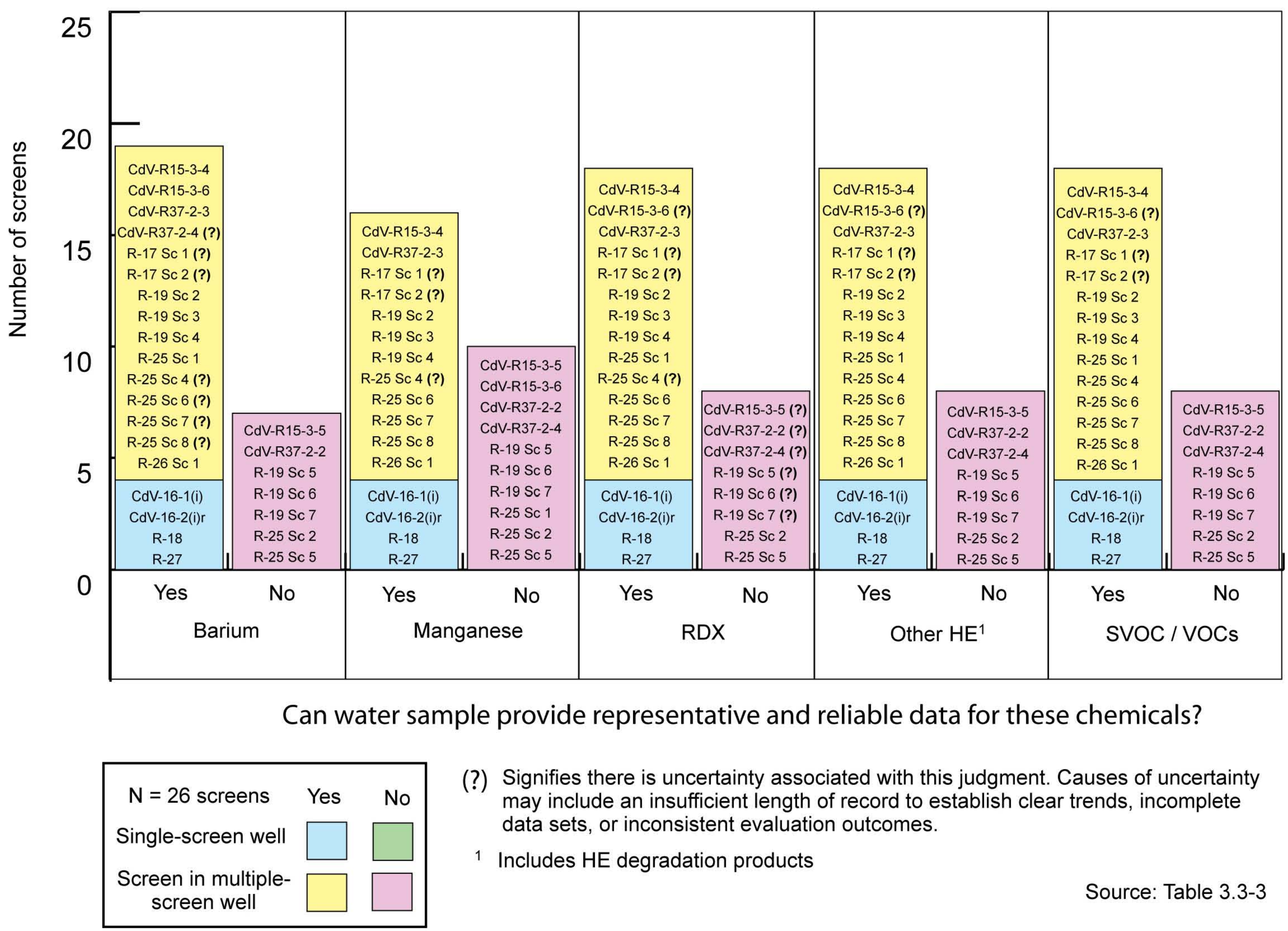


Figure 3.3-4 **Tritium activities in water-quality samples**

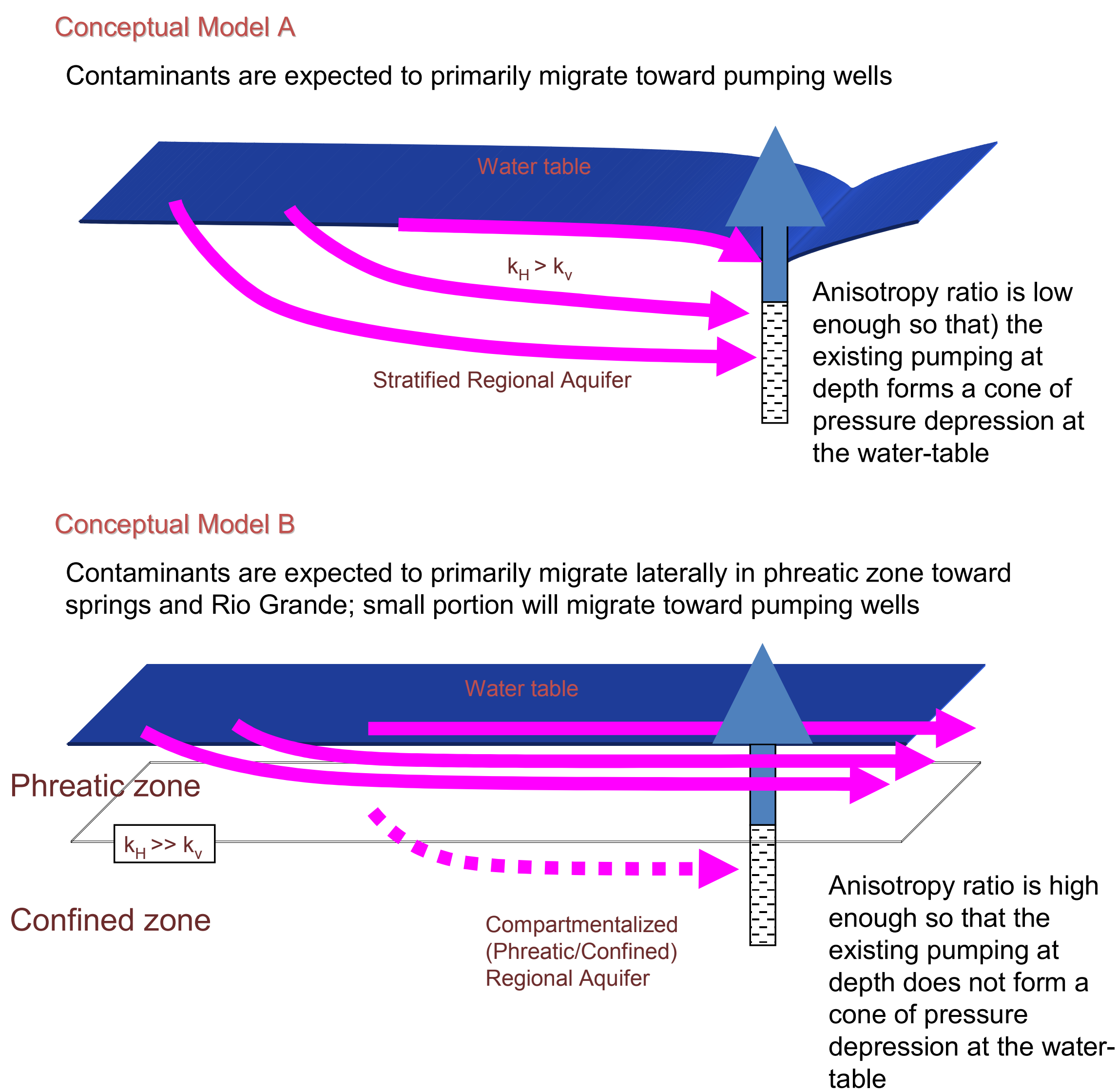


(?) Signifies there is uncertainty associated with this judgment. Causes of uncertainty may include an insufficient length of record to establish clear trends, incomplete data sets, or inconsistent evaluation outcomes.

[1] Includes HE degradation products

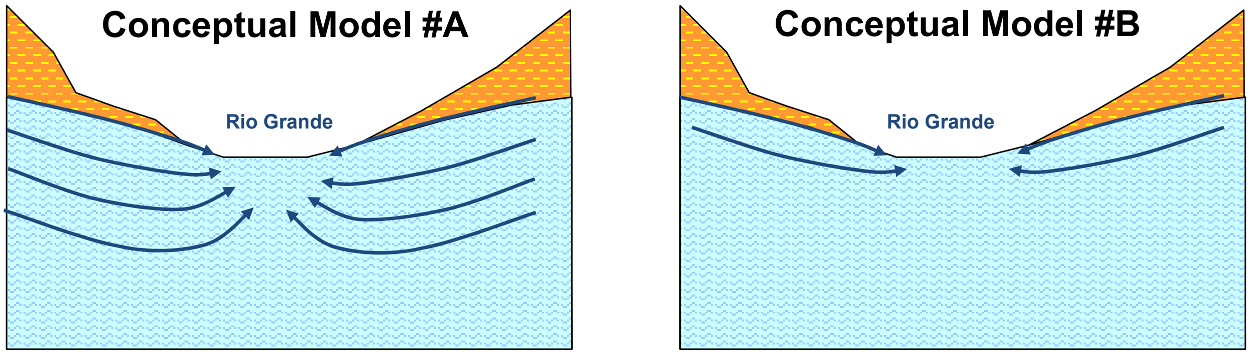
Source: Table 3.3-3

Figure 3.3-5 Capability of well screens to provide representative and reliable data for COPCs

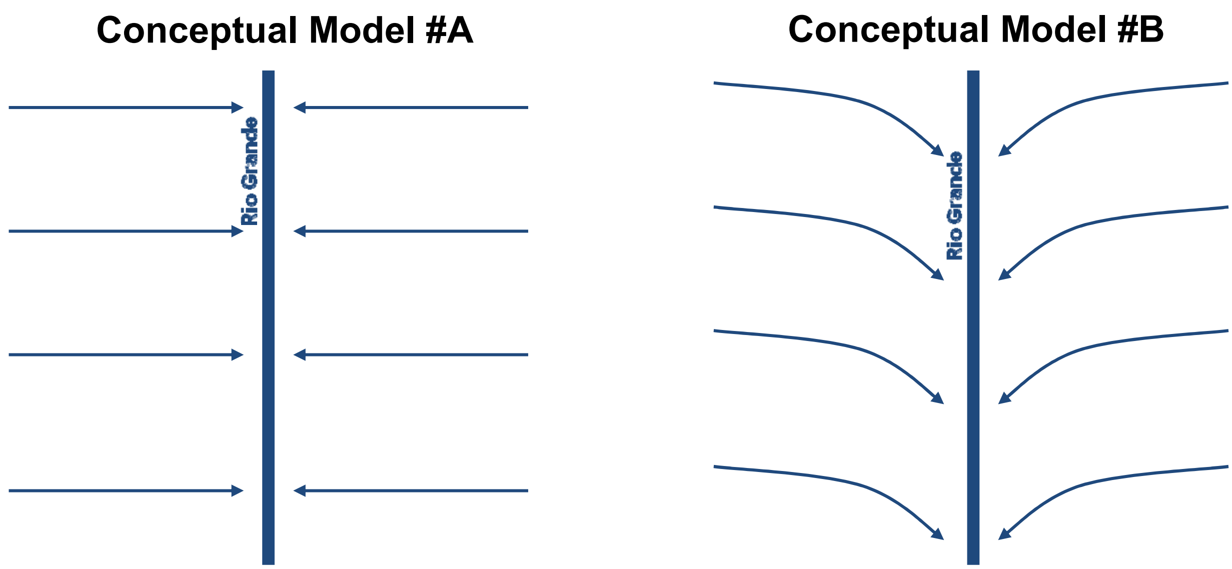


(a)

Figure 4.1-1 Schematic representation of alternative conceptual models of the flow and transport in the regional aquifer: (a) schematization of potential impact on the contaminant transport; (b) representation of potential vertical distribution of discharge flowpaths close to Rio Grande (for model B, deep flow vectors are not shown because in three-dimensional space they are intersecting the cross-section plane); (c) lateral flowpaths of aquifer discharge in the deep zone of the regional aquifer close to Rio Grande.



(b)



(c)

Note: Plots (b) and (c) characterize the three-dimensional aspect of the discharge flowpaths through the deep zone of the regional aquifer close to Rio Grande.

Figure 4.1-1 (continued) Schematic representation of alternative conceptual models of the flow and transport in the regional aquifer: (a) schematization of potential impact on the contaminant transport; (b) representation of potential vertical distribution of discharge flowpaths close to Rio Grande (for model B, deep flow vectors are not shown because in three-dimensional space they are intersecting the cross-section plane); (c) lateral flowpaths of aquifer discharge in the deep zone of the regional aquifer close to Rio Grande.

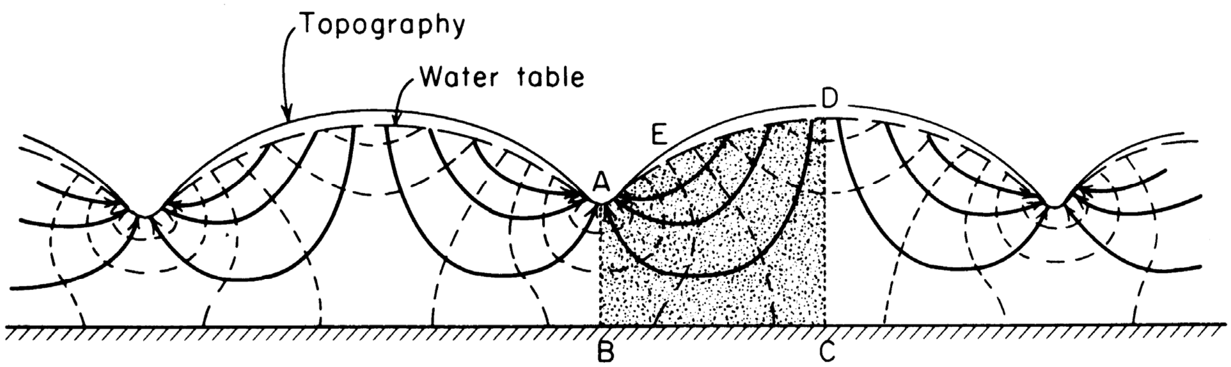
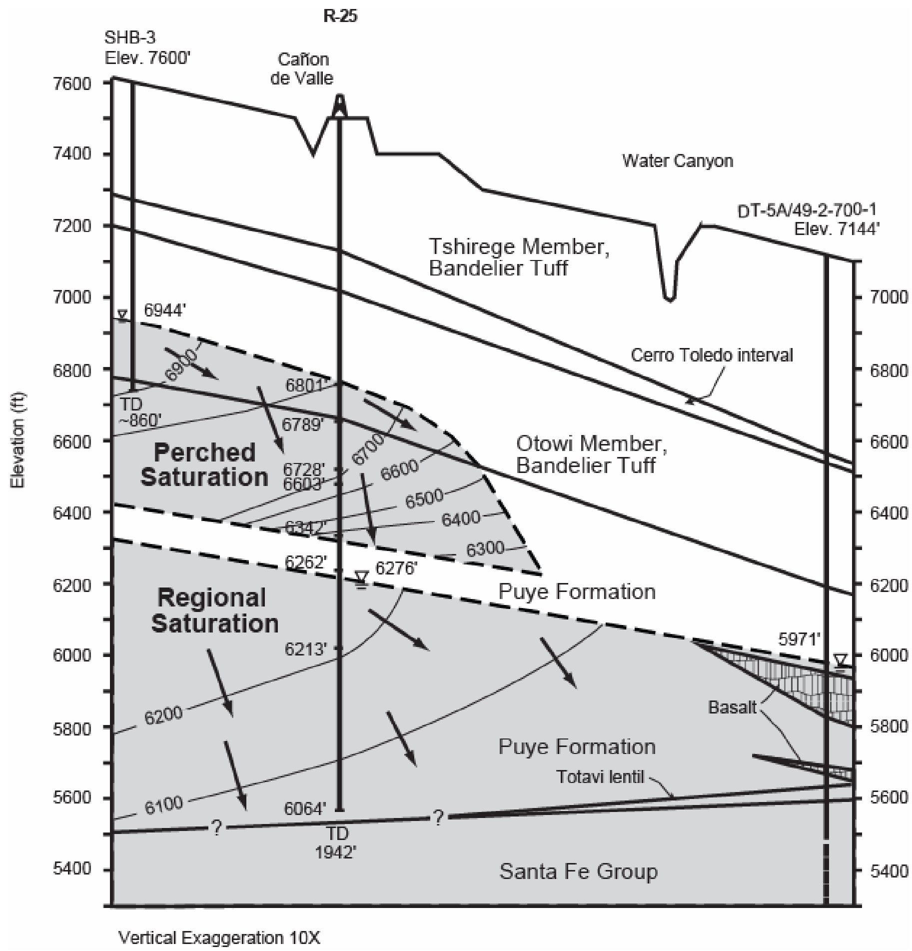


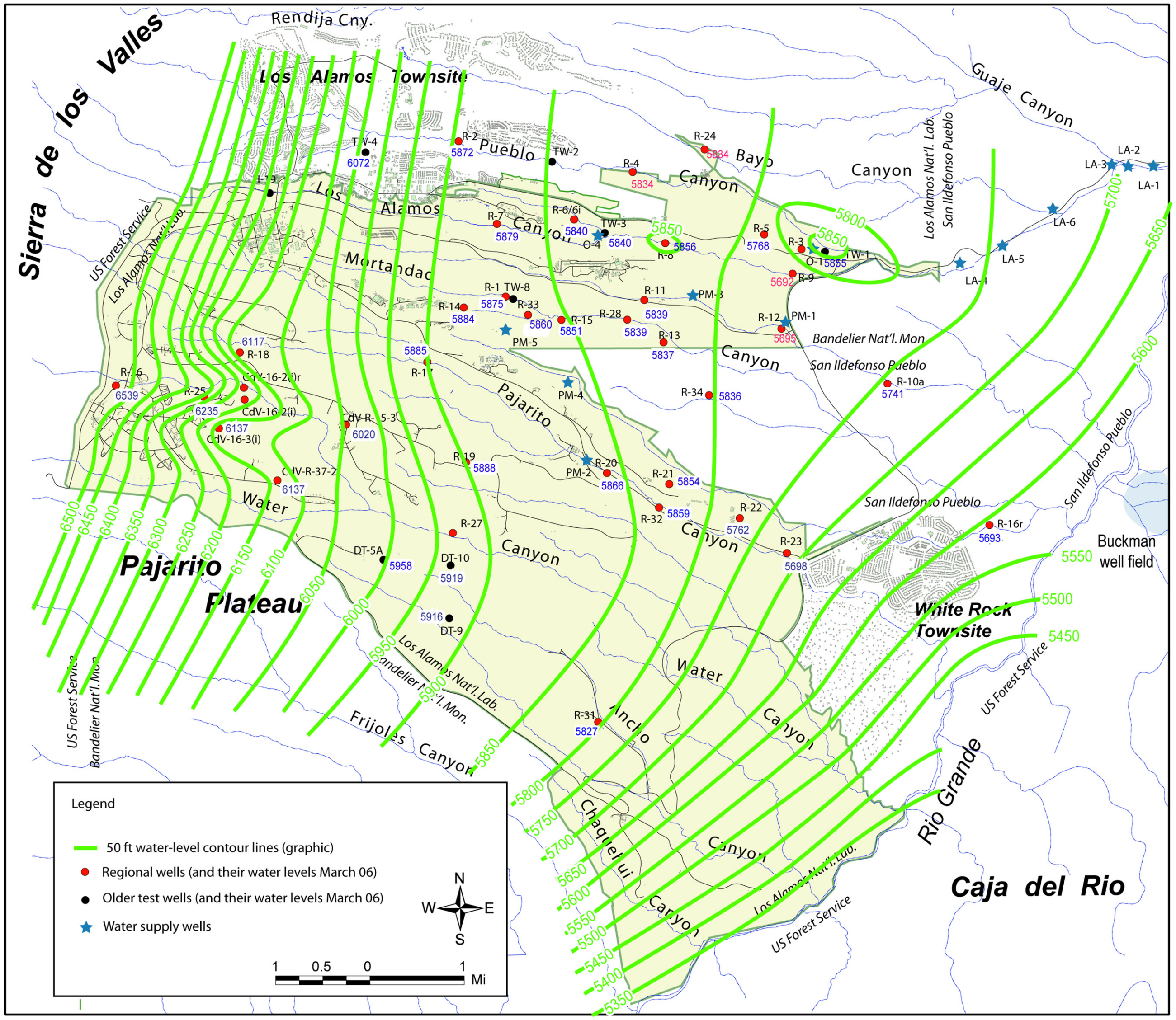
Figure 4.1-2 Classical basin-scale structure flow of groundwater flow suggested by Freeze and Cherry (1979, 088742)



Source: Broxton et al. 2002, 072640.

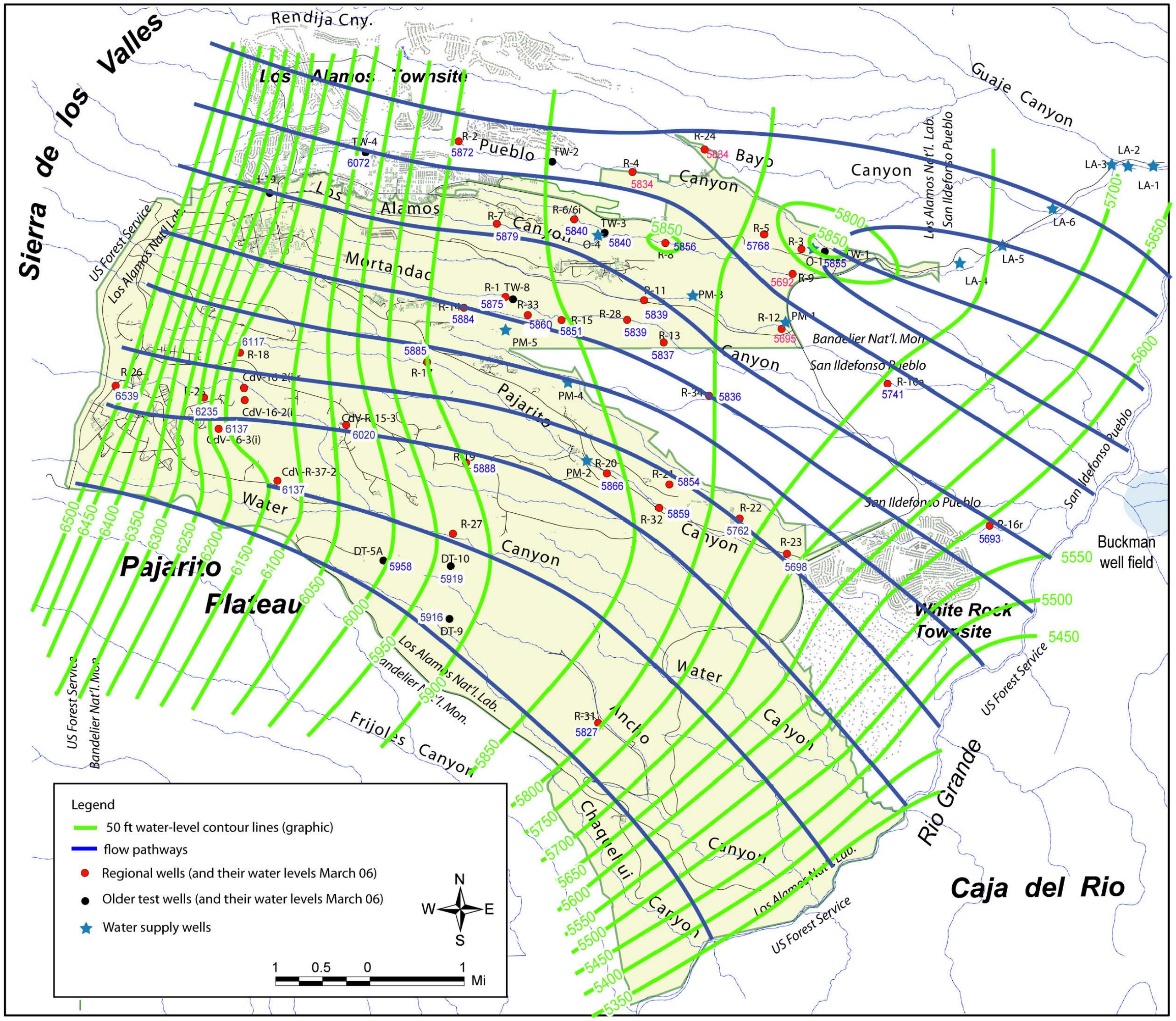
Note: Isocontours represent pressure heads and vectors show groundwater flow directions.

Figure 4.1-3 Cross-section of regional and intermediate (perched) saturation zones at R-25



(a)

Figure 4.1-4 **Contour maps of average water-table elevations in March 2006; it is assumed that water level at R-25 is defined by either (a) Screen 5 or (b) Screen 4**



(b)

Note: The second map (b) also shows the potential flow directions. The data values in red are uncertain (after LANL 2007, 095364).

Figure 4.1-4 (continued) Contour maps of average water-table elevations in March 2006; it is assumed that water level at R-25 is defined by either (a) Screen 5 or (b) Screen 4

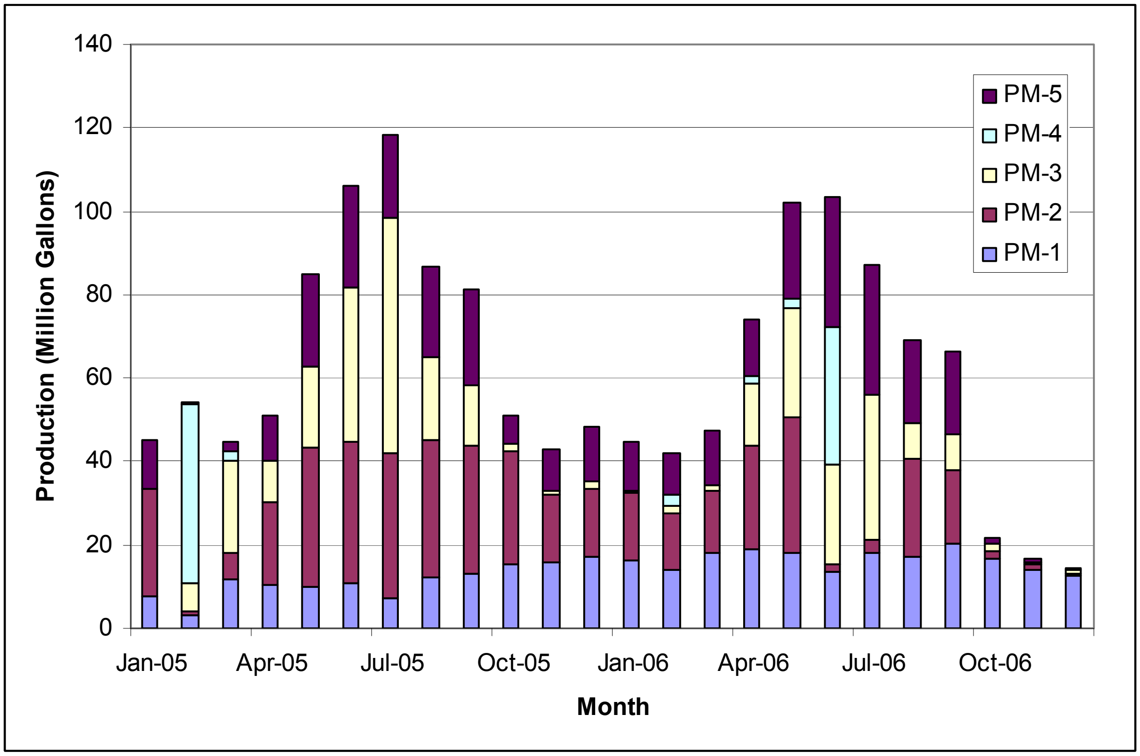


Figure 4.2-1 Summary of production from the PM well field in 2005 and 2006

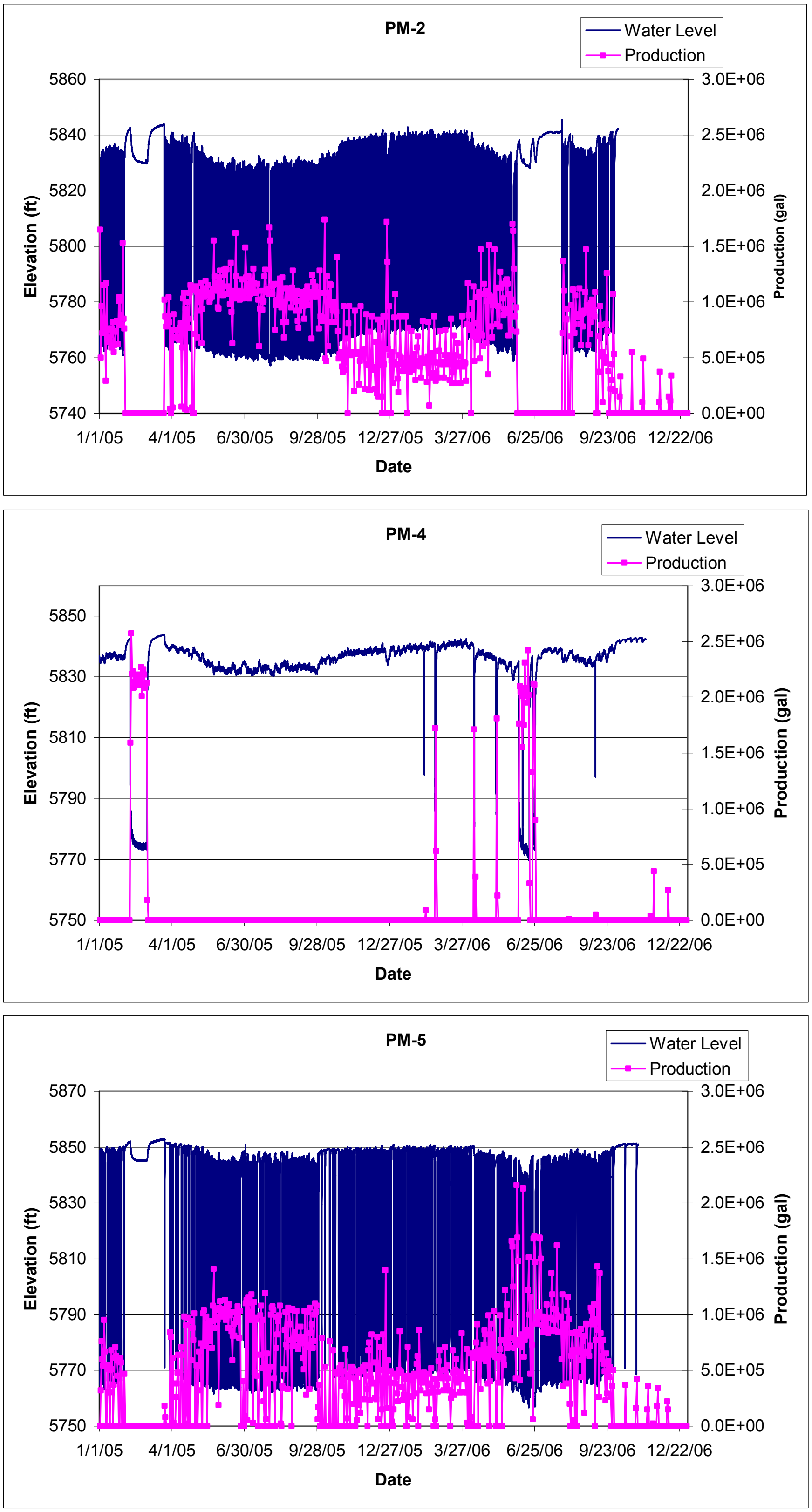


Figure 4.2-2 Summary of production and water-level data for supply wells PM-2, PM-4, and PM-5

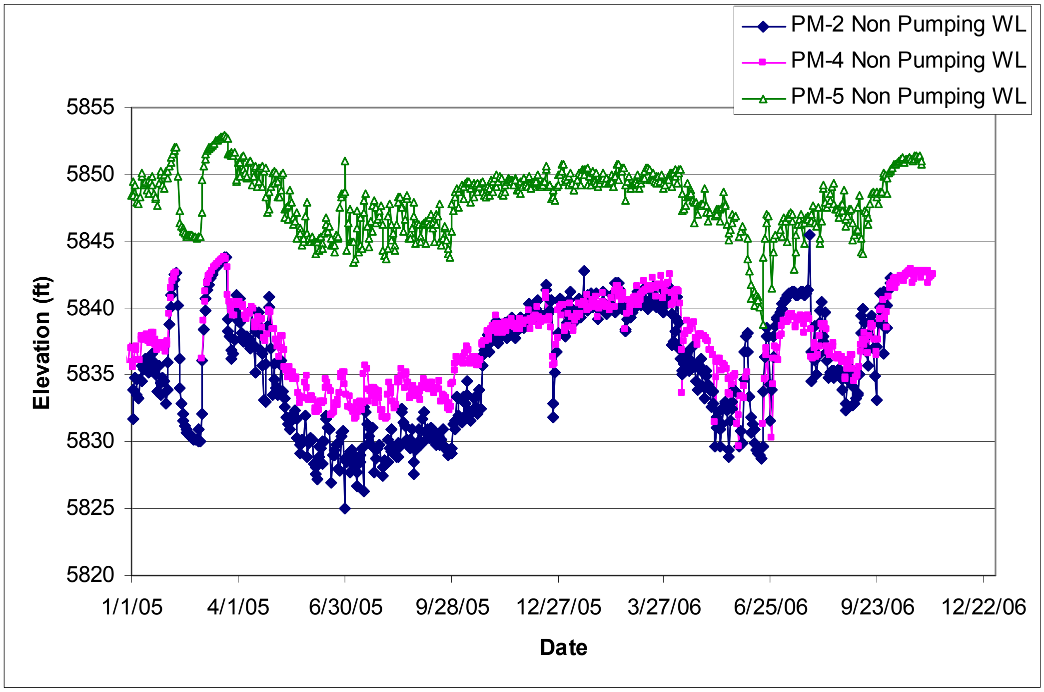


Figure 4.2-3 Nonpumping water levels at PM-2, PM-4, and PM-5

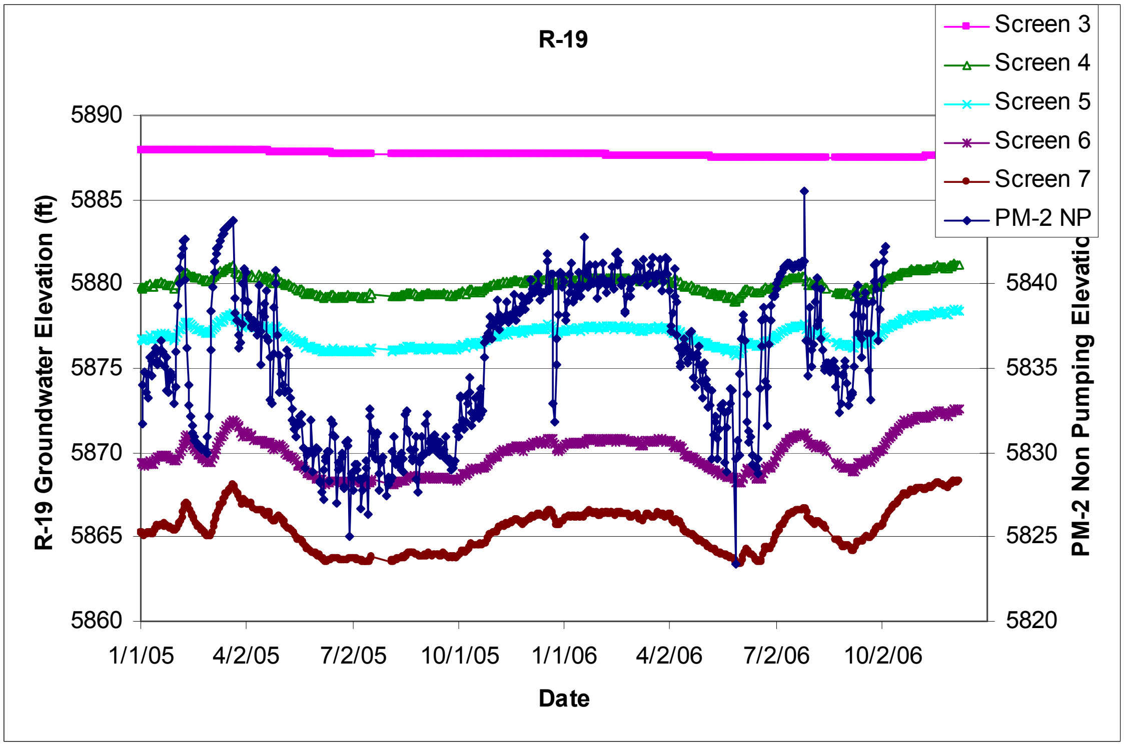


Figure 4.2-4 Mean daily water levels at R-19 Screens 3 through 7 and nonpumping water level at supply well PM-2

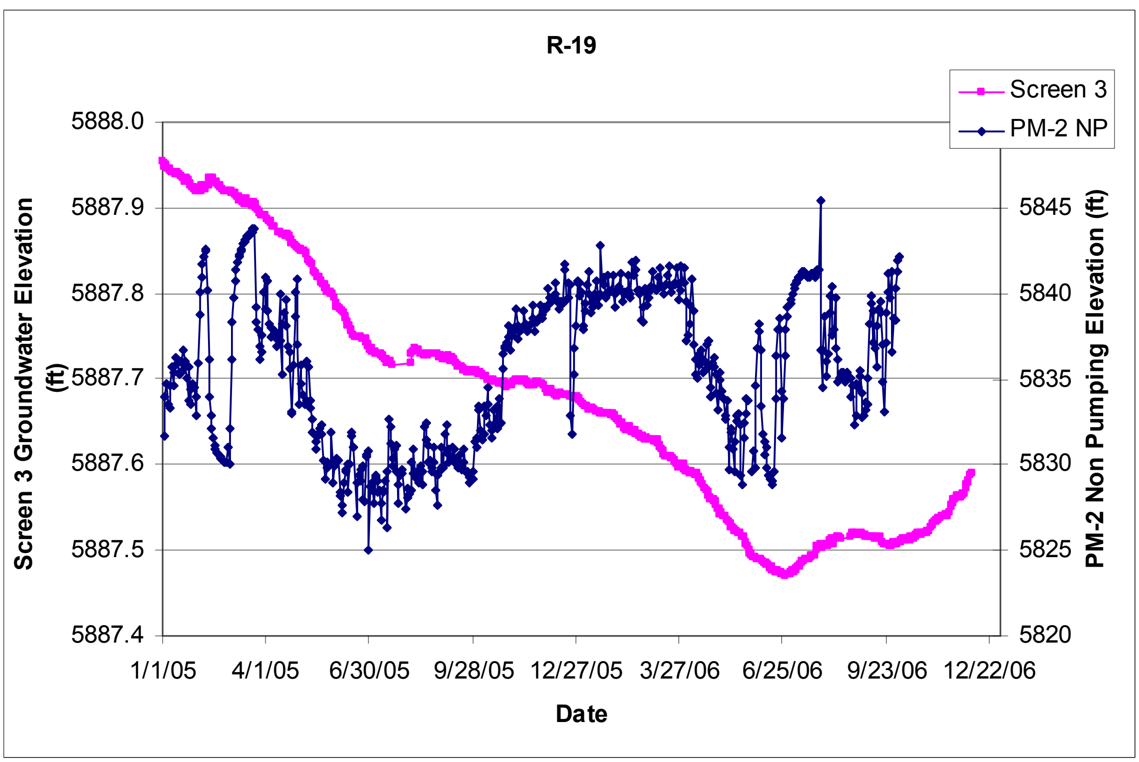


Figure 4.2-5 Mean daily water levels at R-19 Screen 3 and nonpumping water level at supply well PM-2

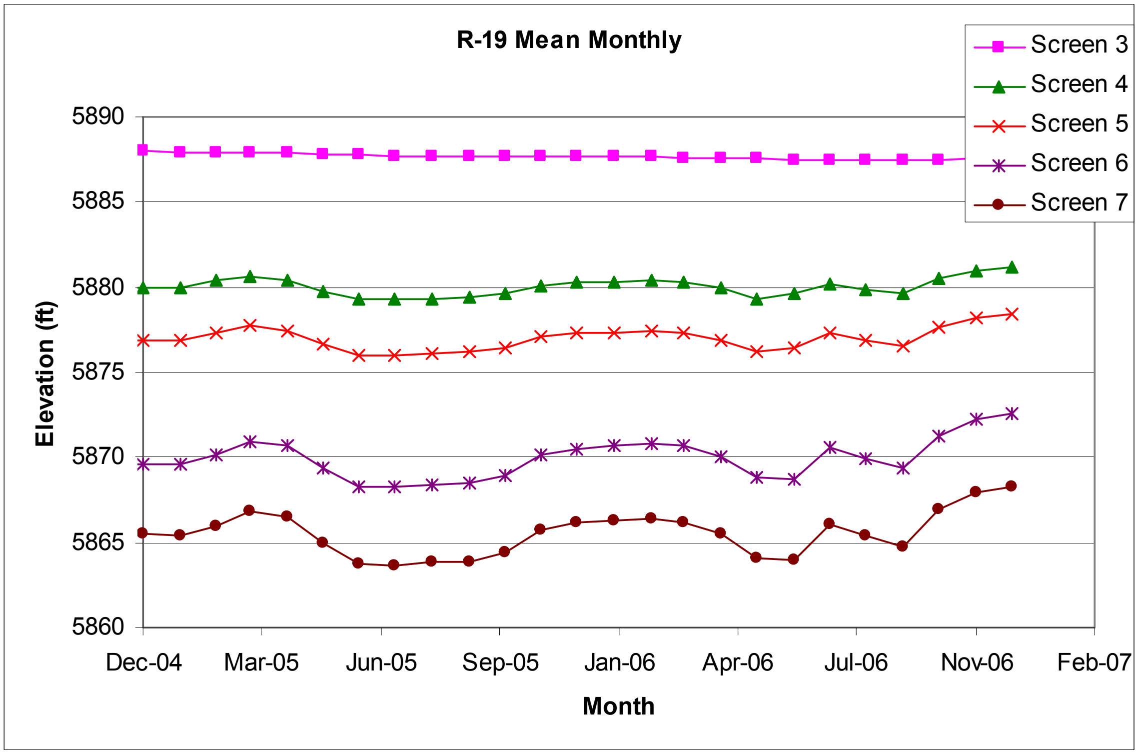


Figure 4.2-6 Mean monthly water levels in R-19 regional aquifer screens in 2005 and 2006

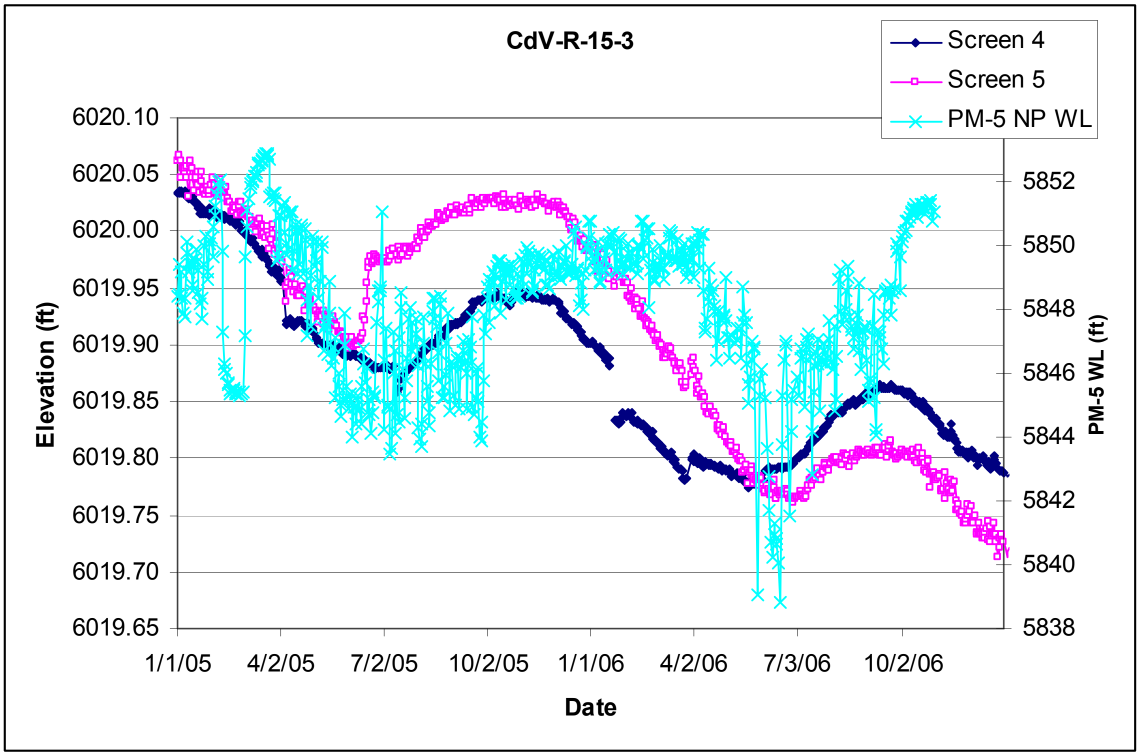


Figure 4.2-7 CdV-R-15-3 regional aquifer Screens 4 and 5 groundwater level compared with PM-5 nonpumping water level

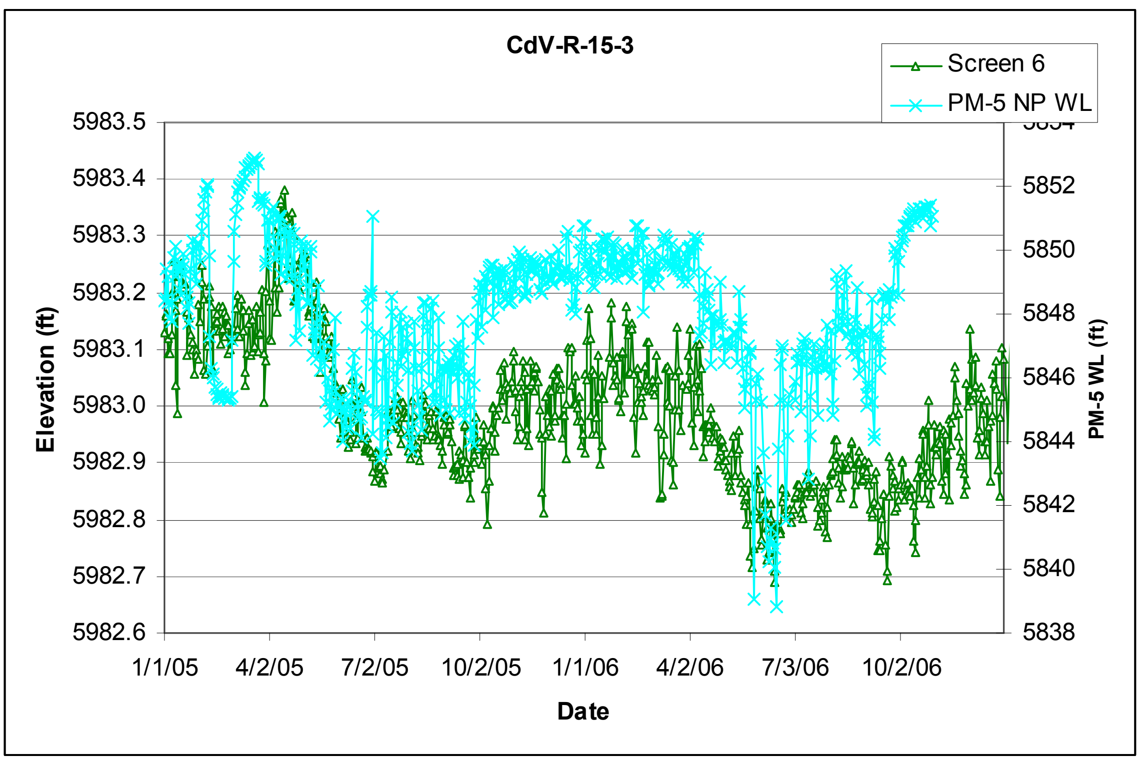


Figure 4.2-8 CdV-R-15-3 regional aquifer Screen 6 groundwater level compared with PM-5 nonpumping water level

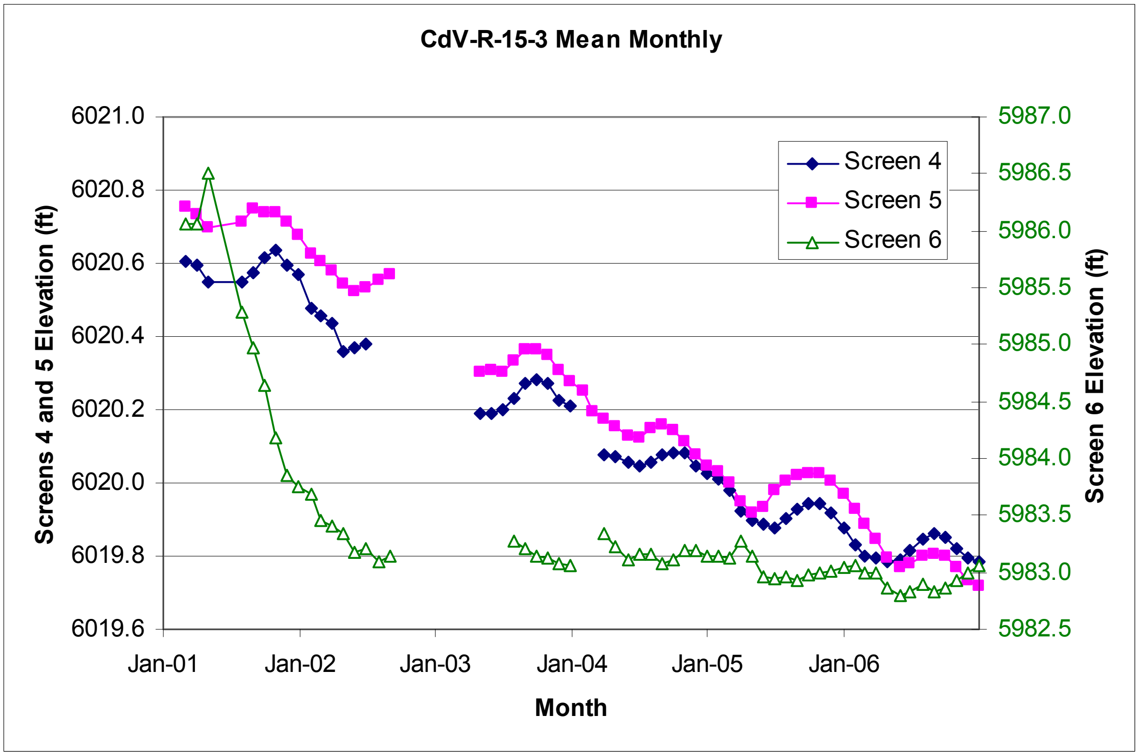


Figure 4.2-9 Mean monthly groundwater level for CdV-R-15-3 regional screens

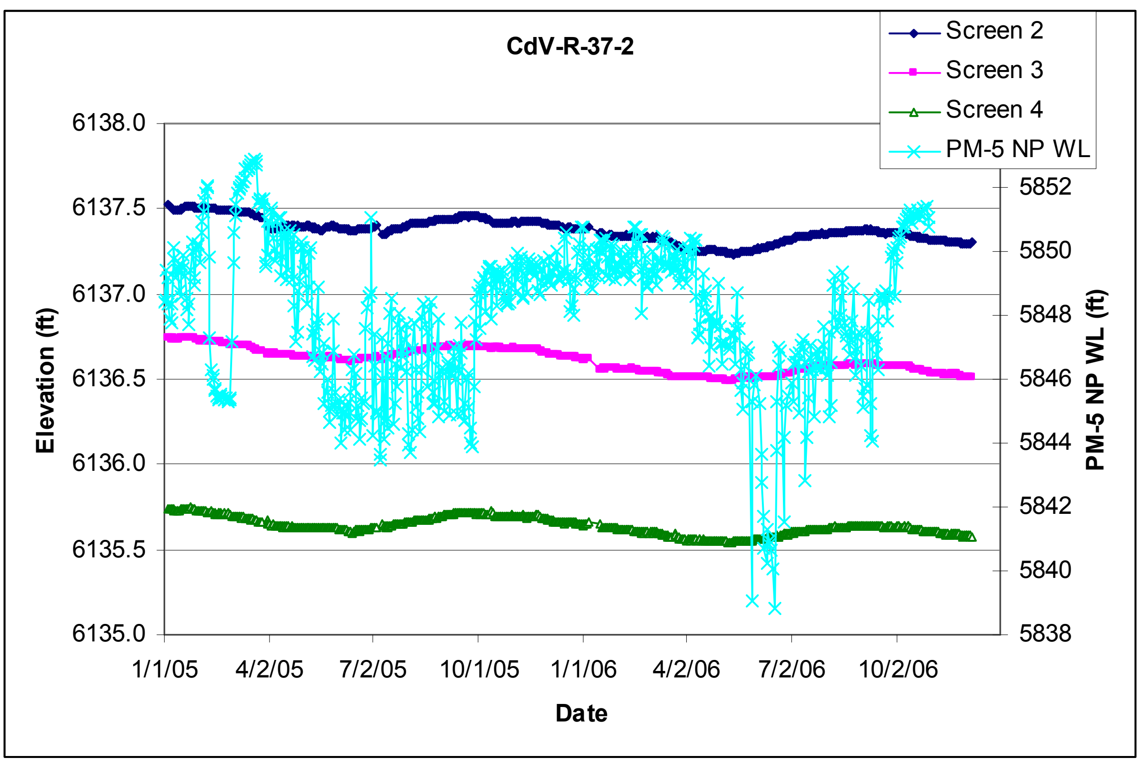


Figure 4.2-10 CdV-R-37-2 regional aquifer screen groundwater levels compared with PM-5 nonpumping water level

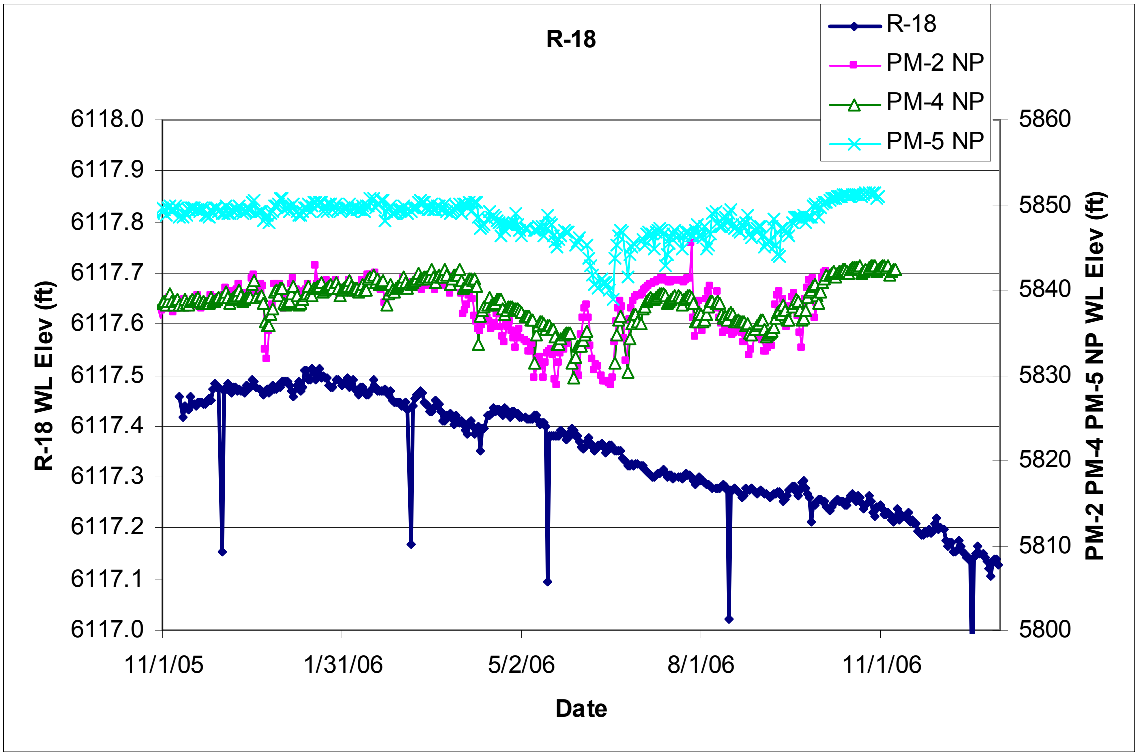


Figure 4.2-11 Mean daily water level at R-18 compared with supply well nonpumping water levels

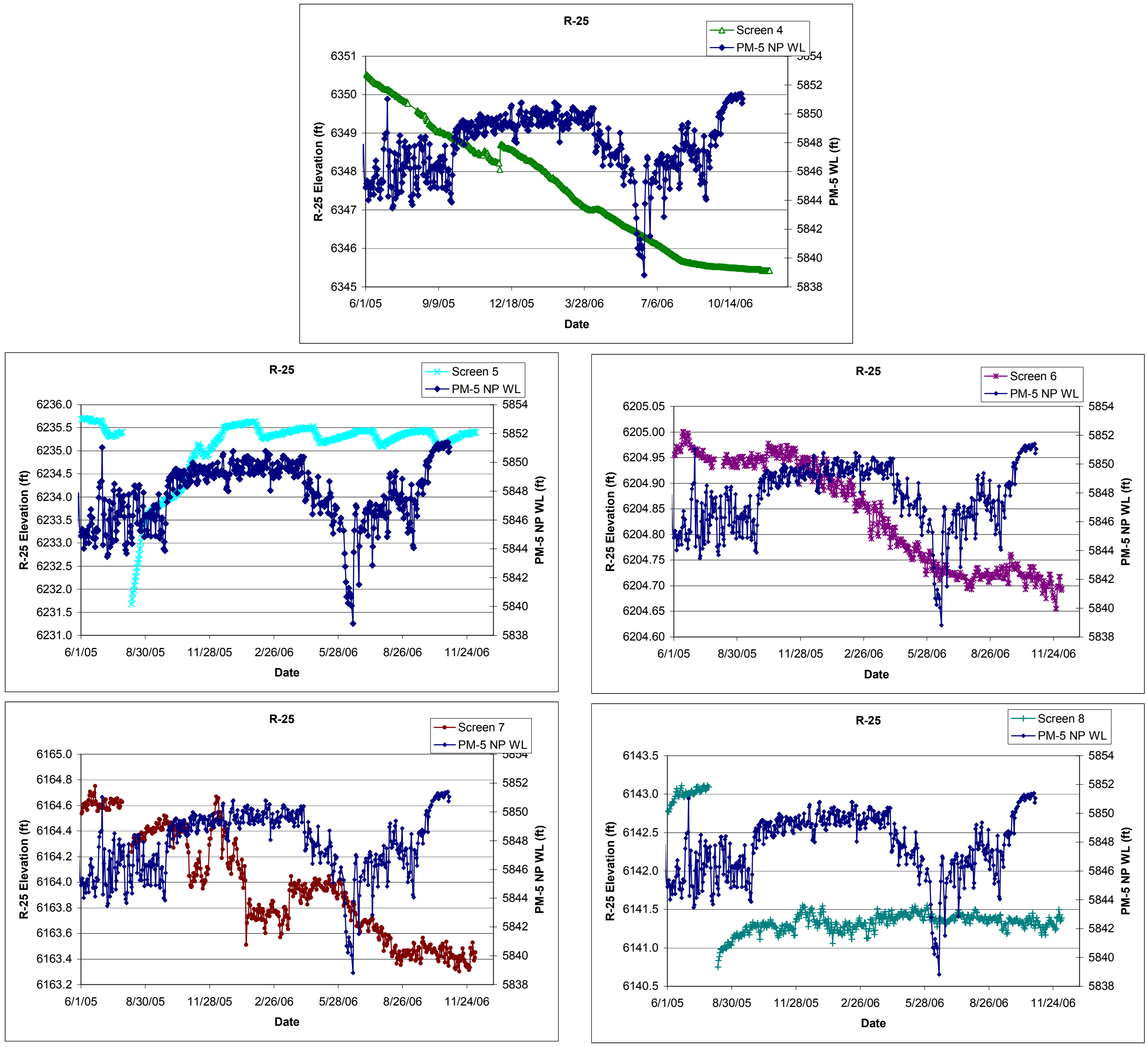


Figure 4.2-12 Water level at R-25 Screens 5 through 8 compared to the nonpumping water level at PM-5

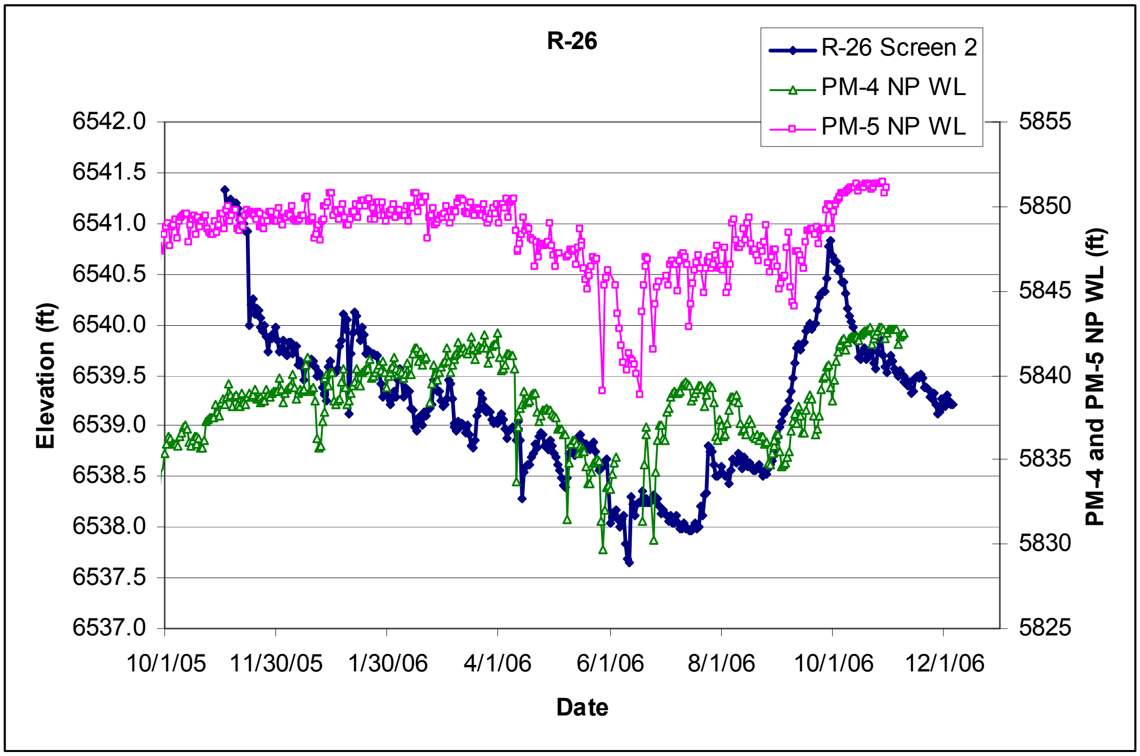


Figure 4.2-13 **Screen 2 of R-26 water level compared to nonpumping water levels at PM-4 and PM-5**

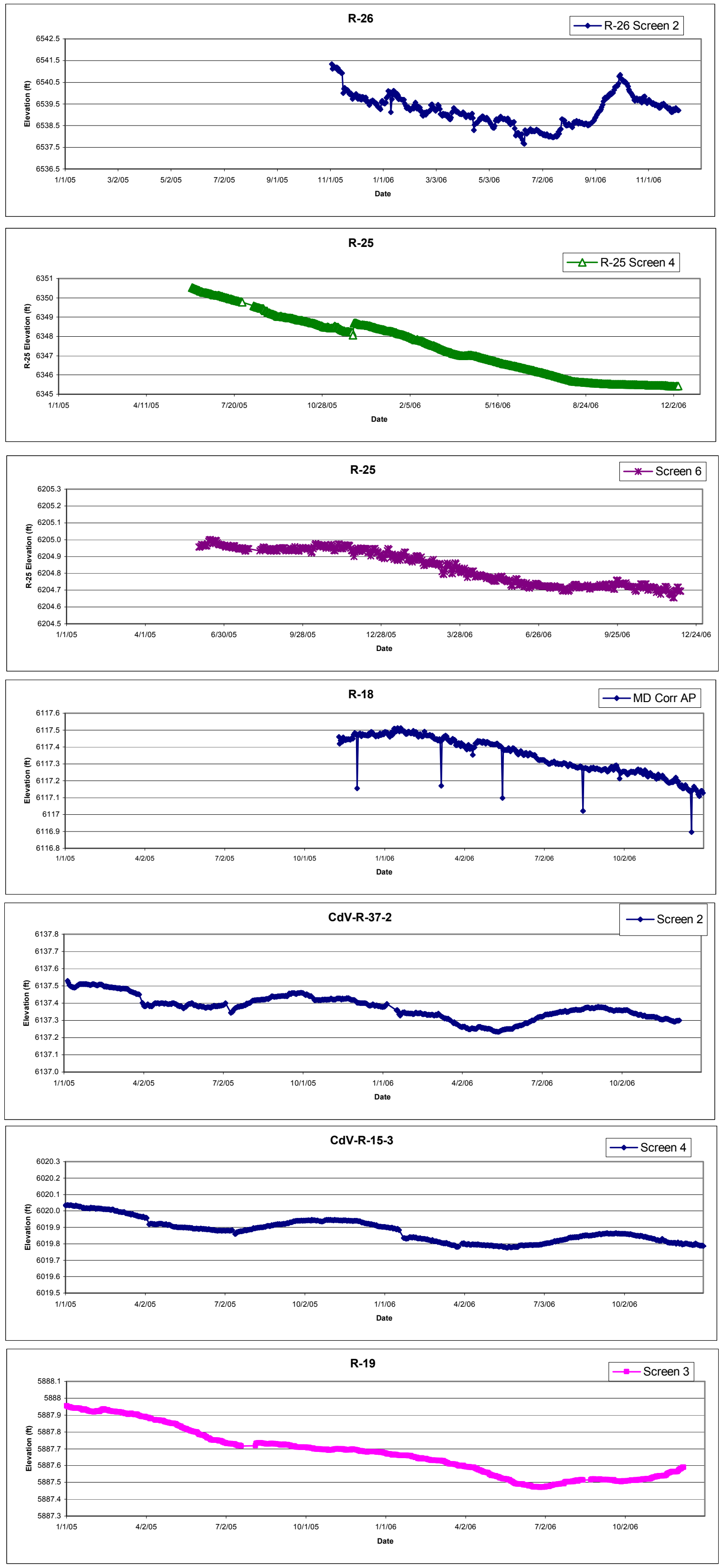


Figure 4.2-14 Comparison of water-level characteristics in shallow regional screens

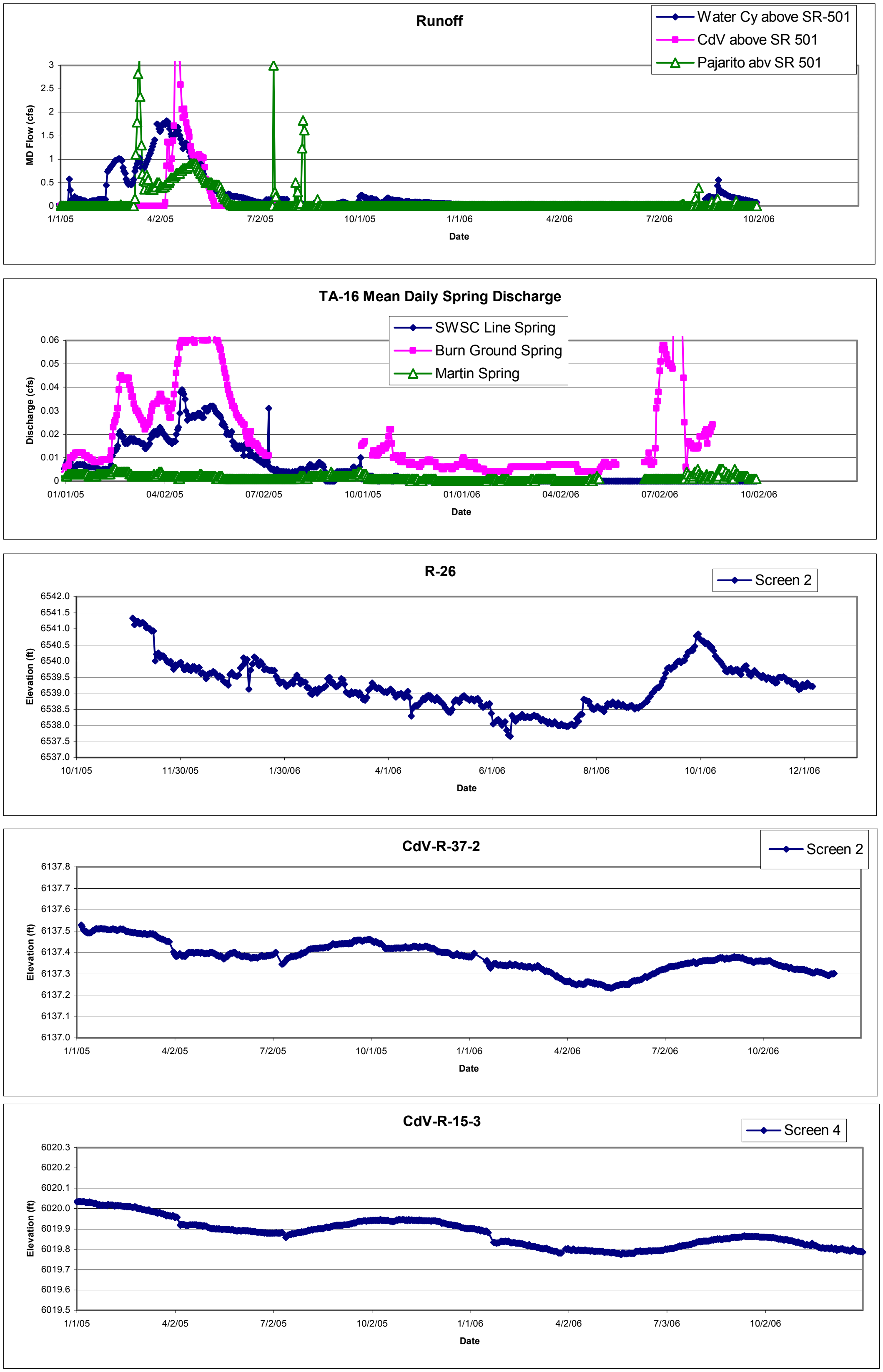


Figure 4.2-15 Runoff and spring flow compared to regional aquifer water table hydrographs

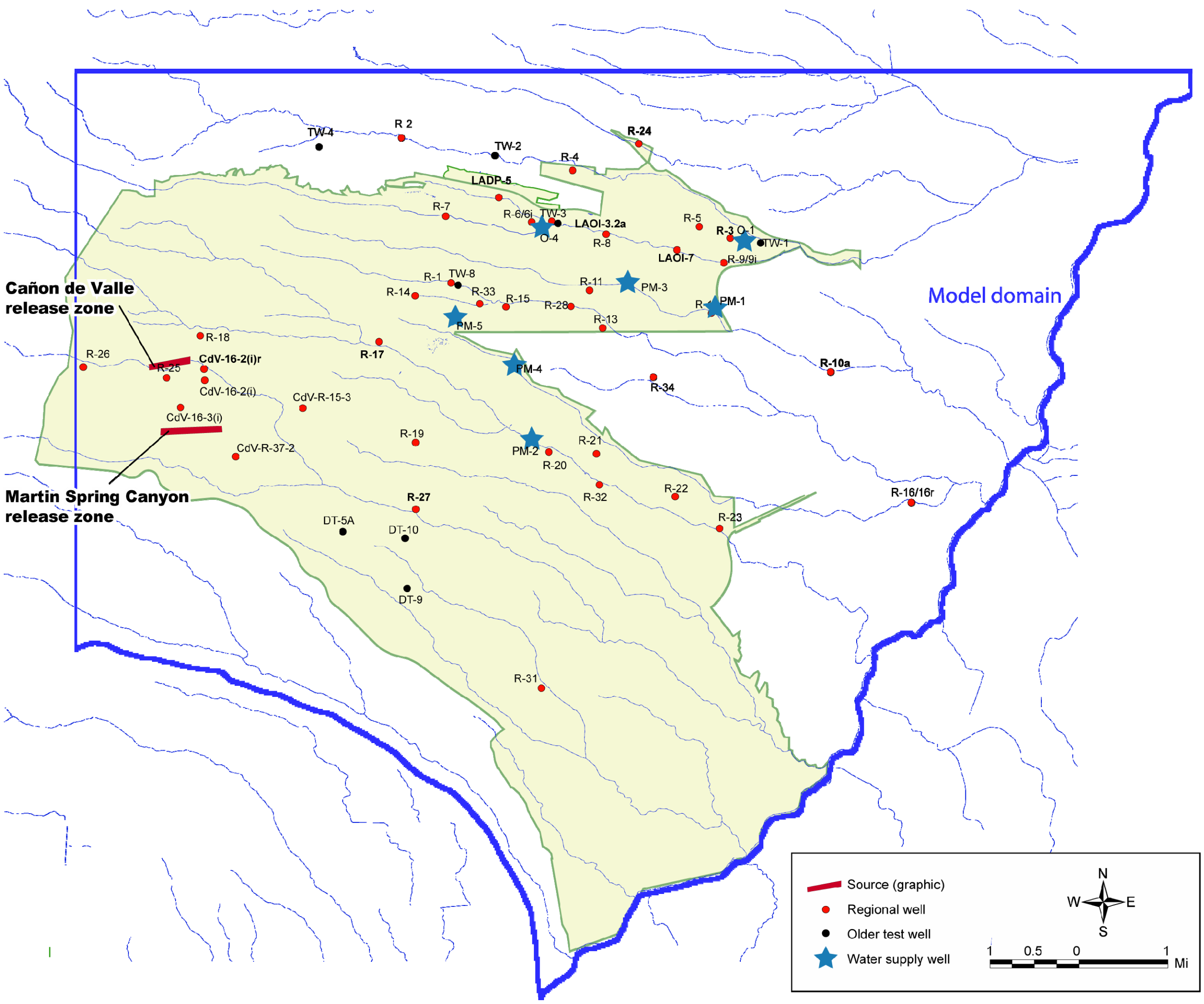
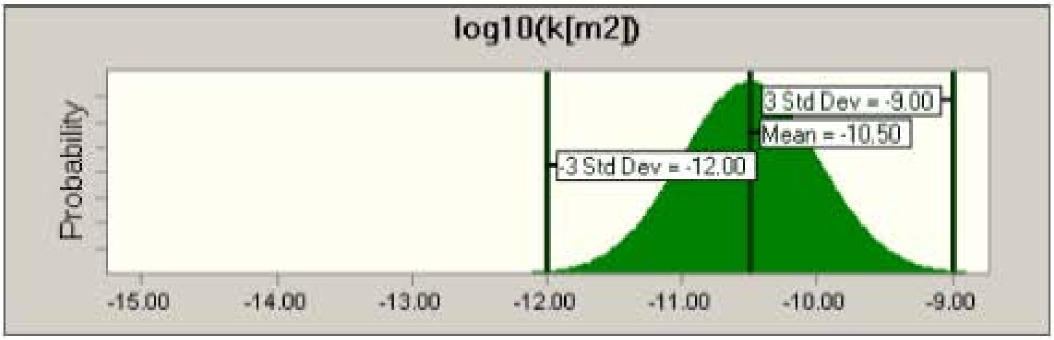
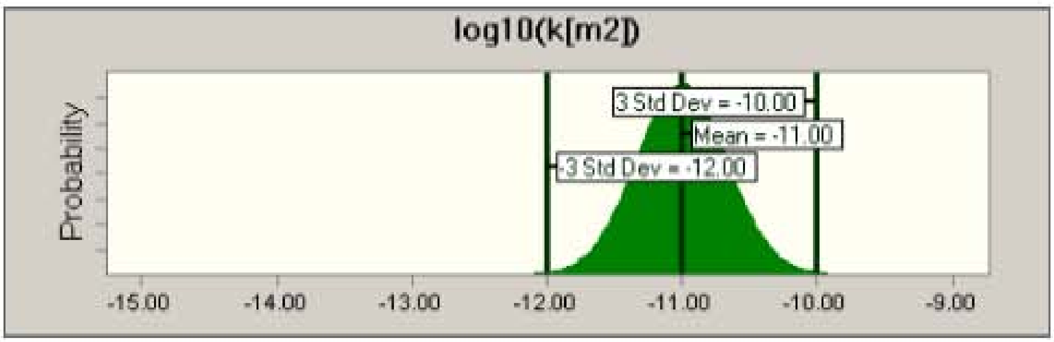


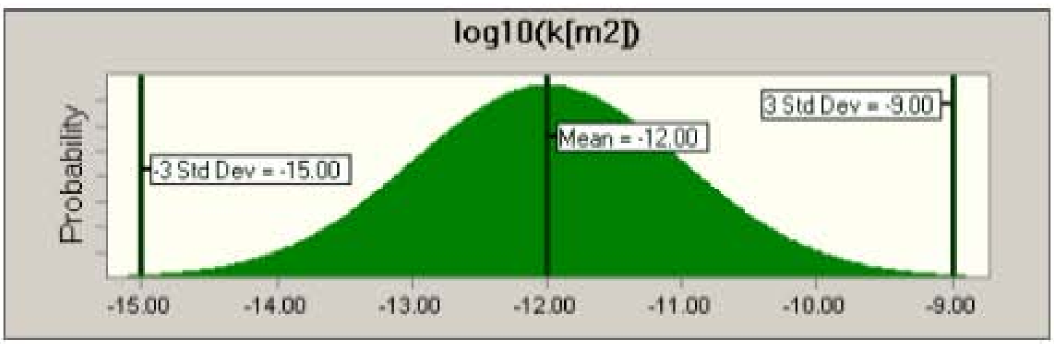
Figure 4.3-1 **Model domain and assumed location of contaminant sources (associated with Cañon de Valle and Martin Spring canyon) beneath TA-16 at the regional aquifer**



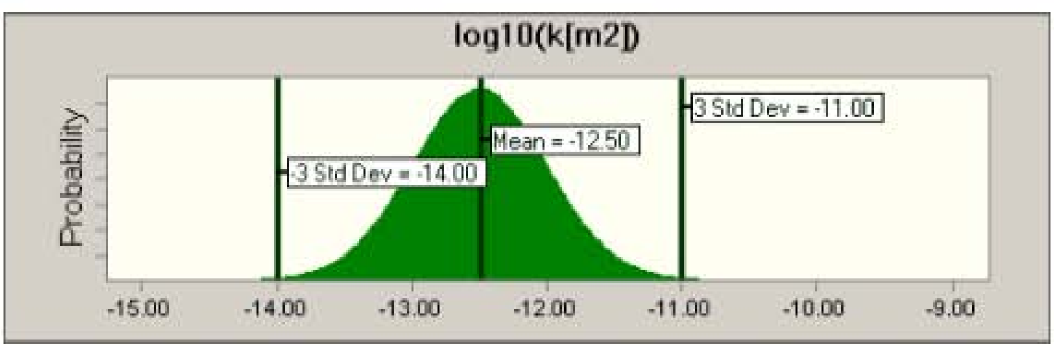
(a)



(b)

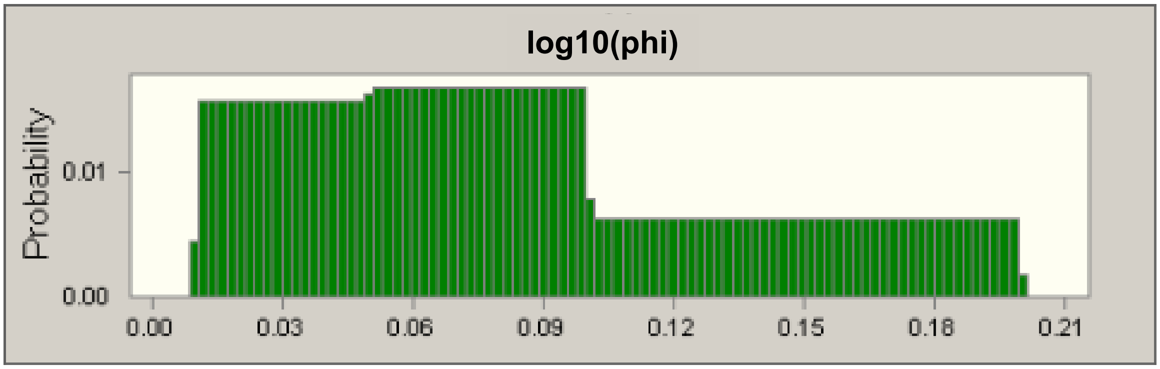


(c)

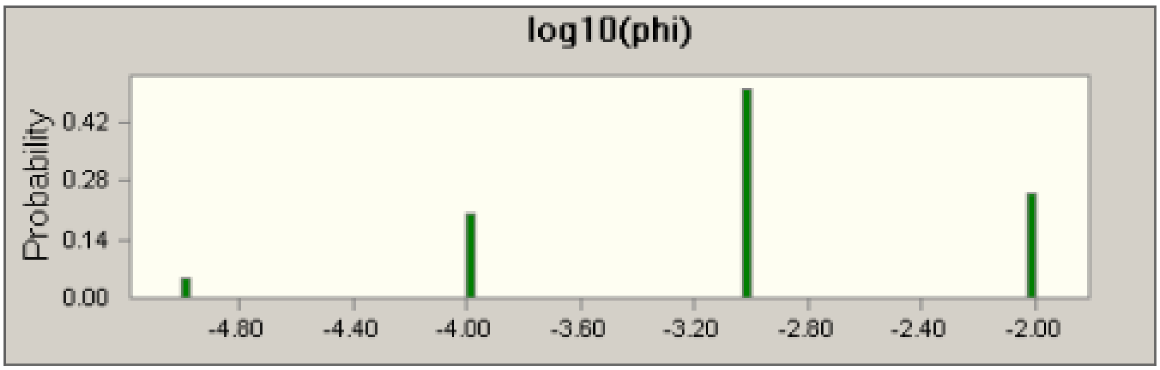


(d)

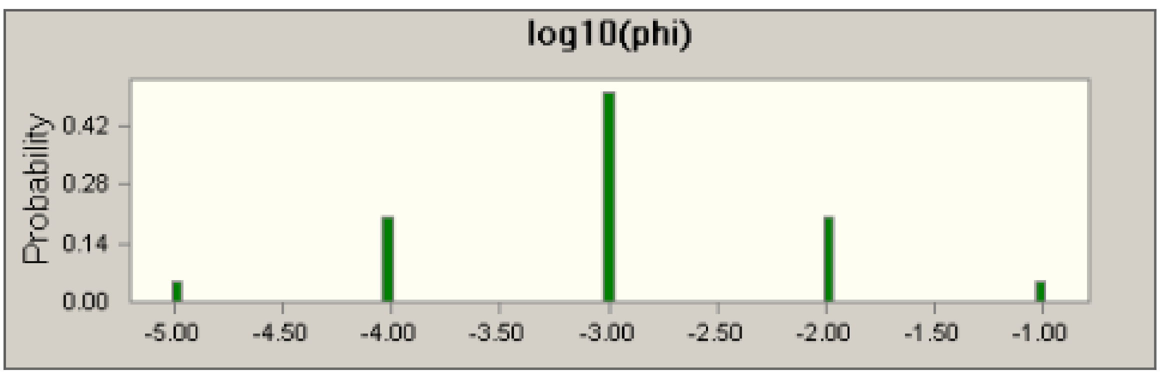
Figure 4.3-2 Probability distributions of permeability for different hydrostratigraphic units: (a) Tschicoma, Keres Group; (b) Totavi Lentil; (c) Cerros del Rio basalt, Bayo Canyon basalt; (d) pumiceous Puye, Puye fanglomerate, Santa Fe fanglomerate, Santa Fe silt and sands



(a)



(b)



(c)

Figure 4.3-3 Probability distributions of effective porosity for different hydrostratigraphic units: (a) Totavi Lentil, pumiceous Puye, Puye fanglomerate, Santa Fe Fanglomerate, Santa Fe silt and sands; (b) Tschicoma, Keres Group; and (c) Cerros del Rio basalt, Bayo Canyon basalt

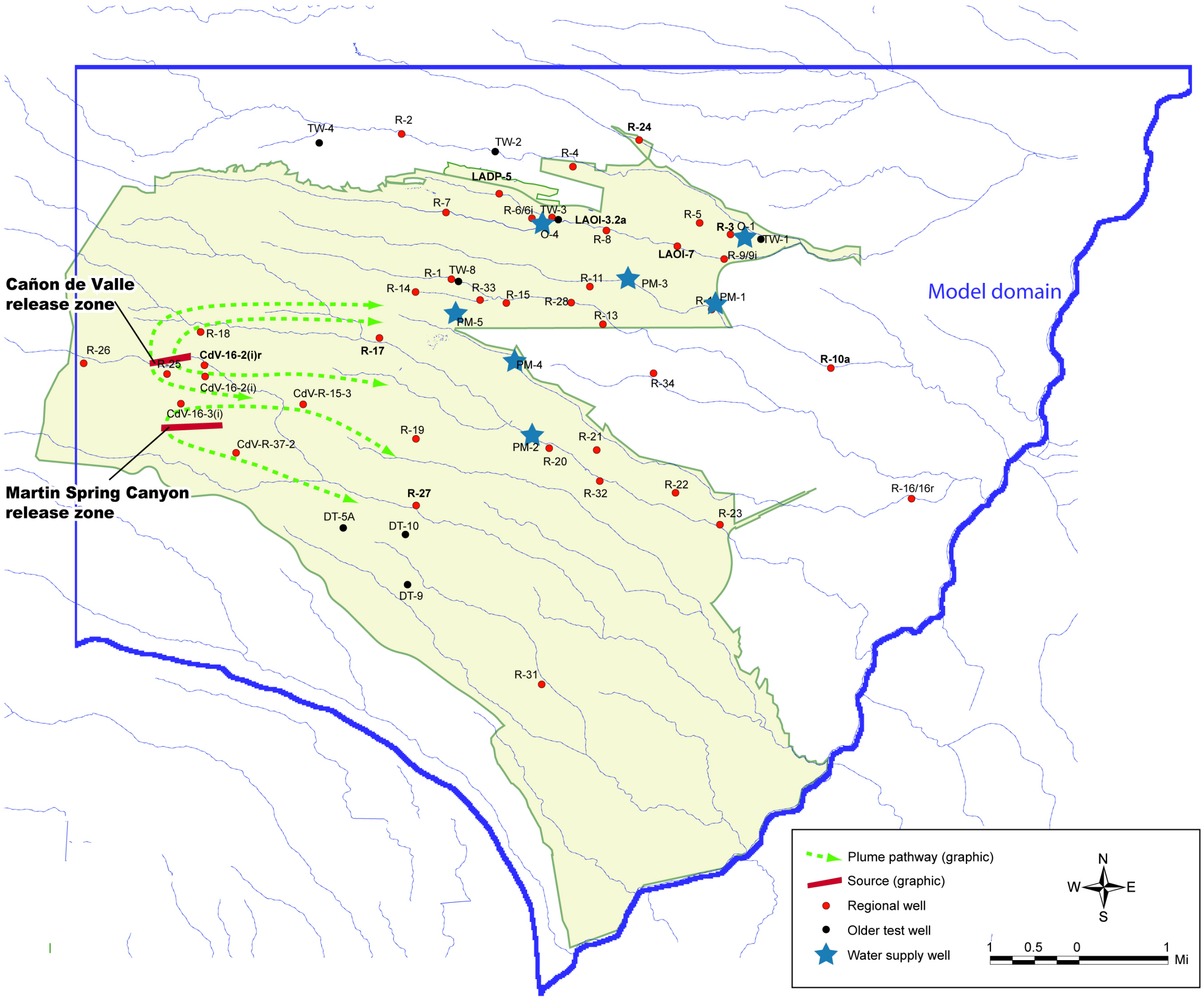
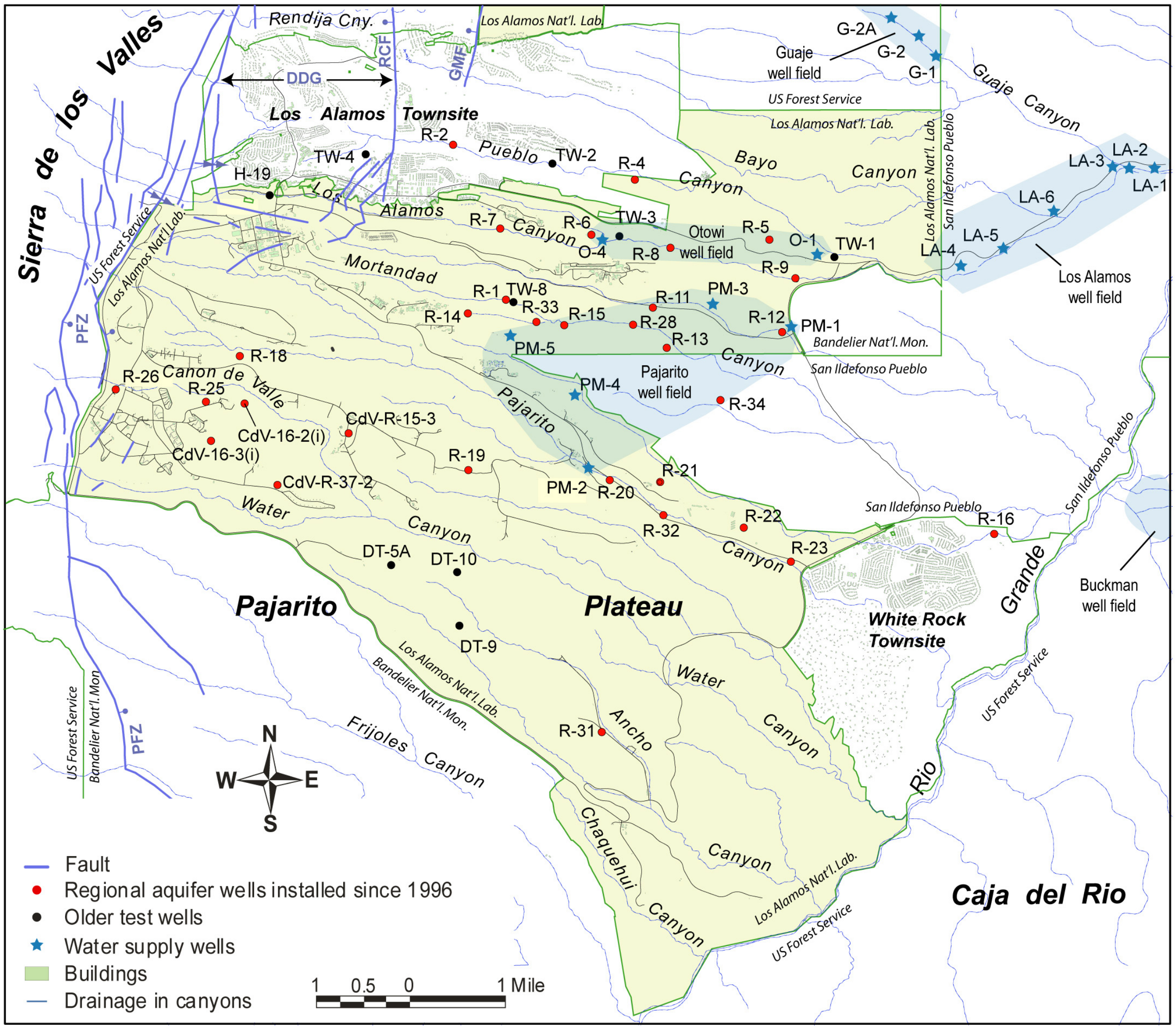
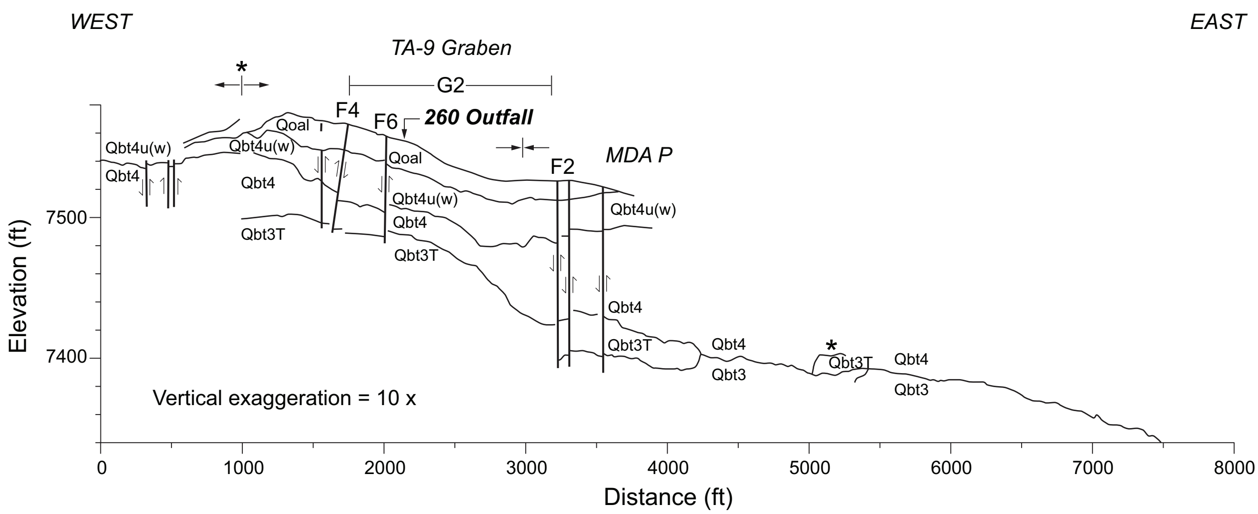


Figure 4.3-4 Calculated flow lines bounding 2000 model simulations that characterize uncertainty in the medium properties and uncertainties in the flow structures. The outer arrows for each modeled release zone show the approximate width of the modeled particle distribution zones.



Notes: Also shown are the municipalities of Los Alamos and White Rock. Water supply wells are shown as blue stars and the water supply well fields are indicated in blue shading. New regional aquifer wells installed since 1998 are shown as red dots. Older test wells are shown as black dots. PFZ in the main trace of the Pajarito Fault zone, RCF is the Rendija Canyon fault, GMF is the Guaje Mountain fault, and DDG is the Diamond Drive graben.

Figure 5.0-1 Location map of the central Pajarito Plateau showing location of major faults



Source: Lewis et al. 2002, 091682.

Figure 5.0-2 West to east cross section parallel to Cañon de Valle showing local structures

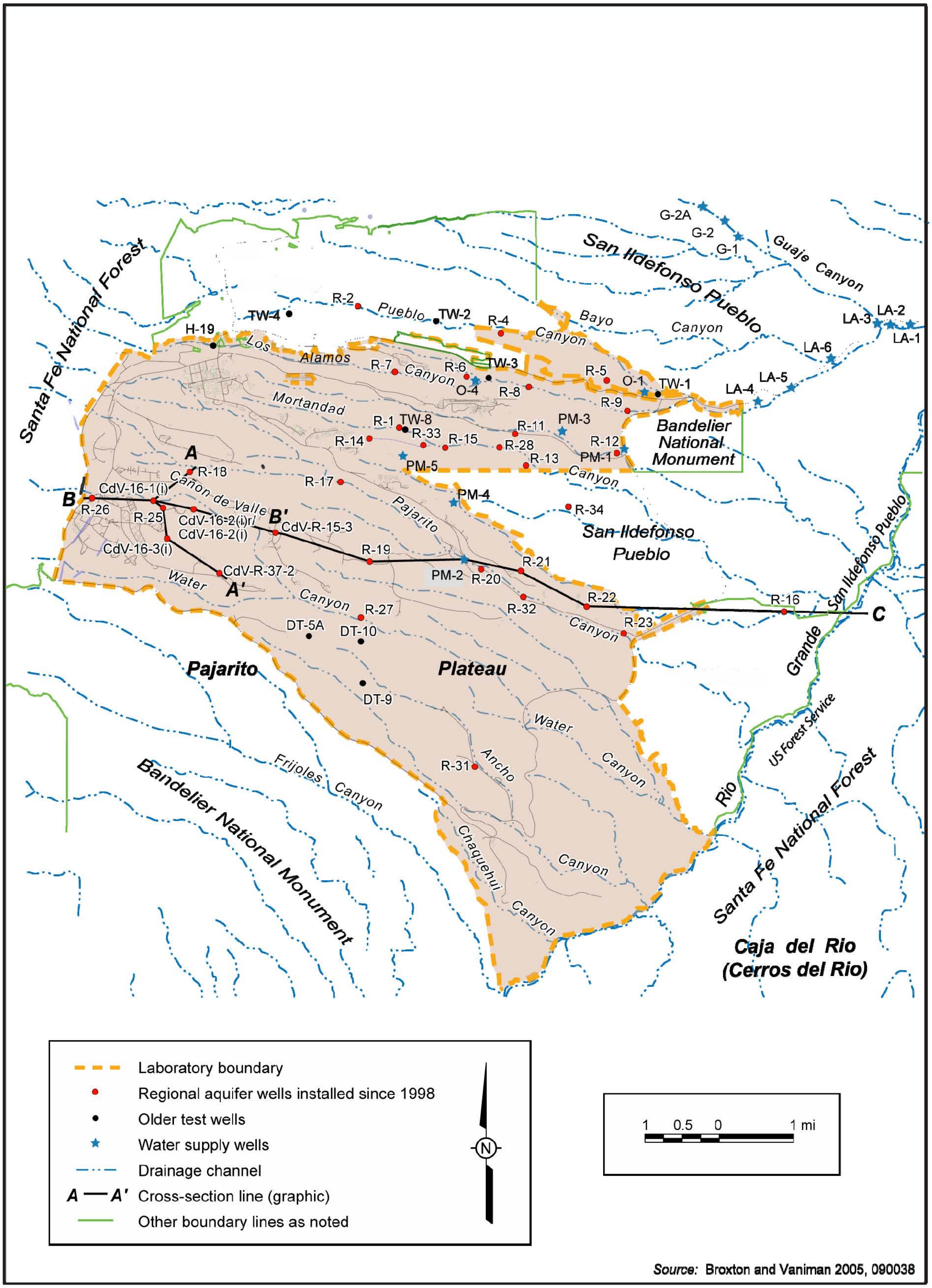


Figure 5.0-3 Locations of cross-sectional lines

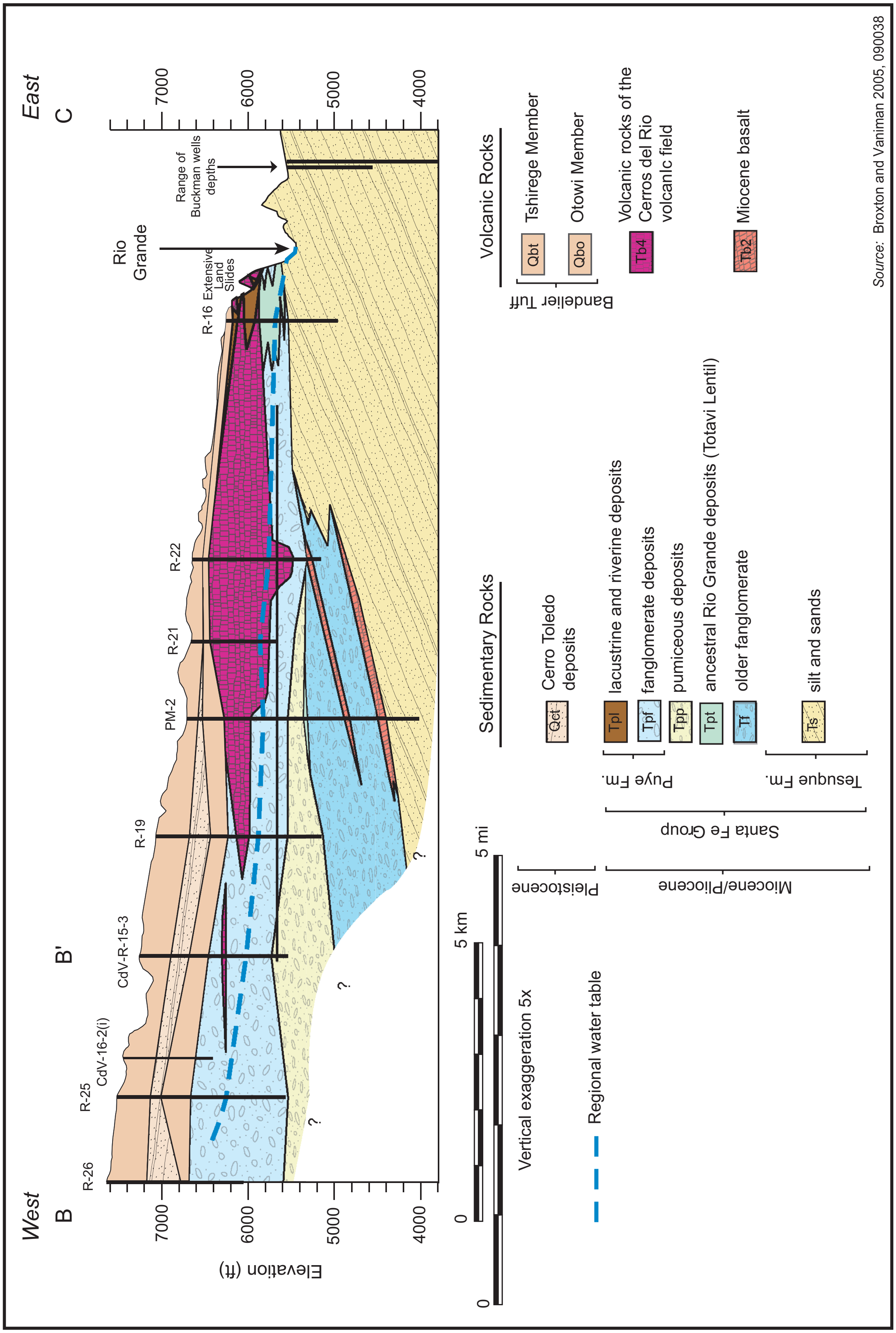


Figure 5.0-4 East-west cross-section from R-26 to the Buckman well field (B–B'–C in Figure 5.0-3)

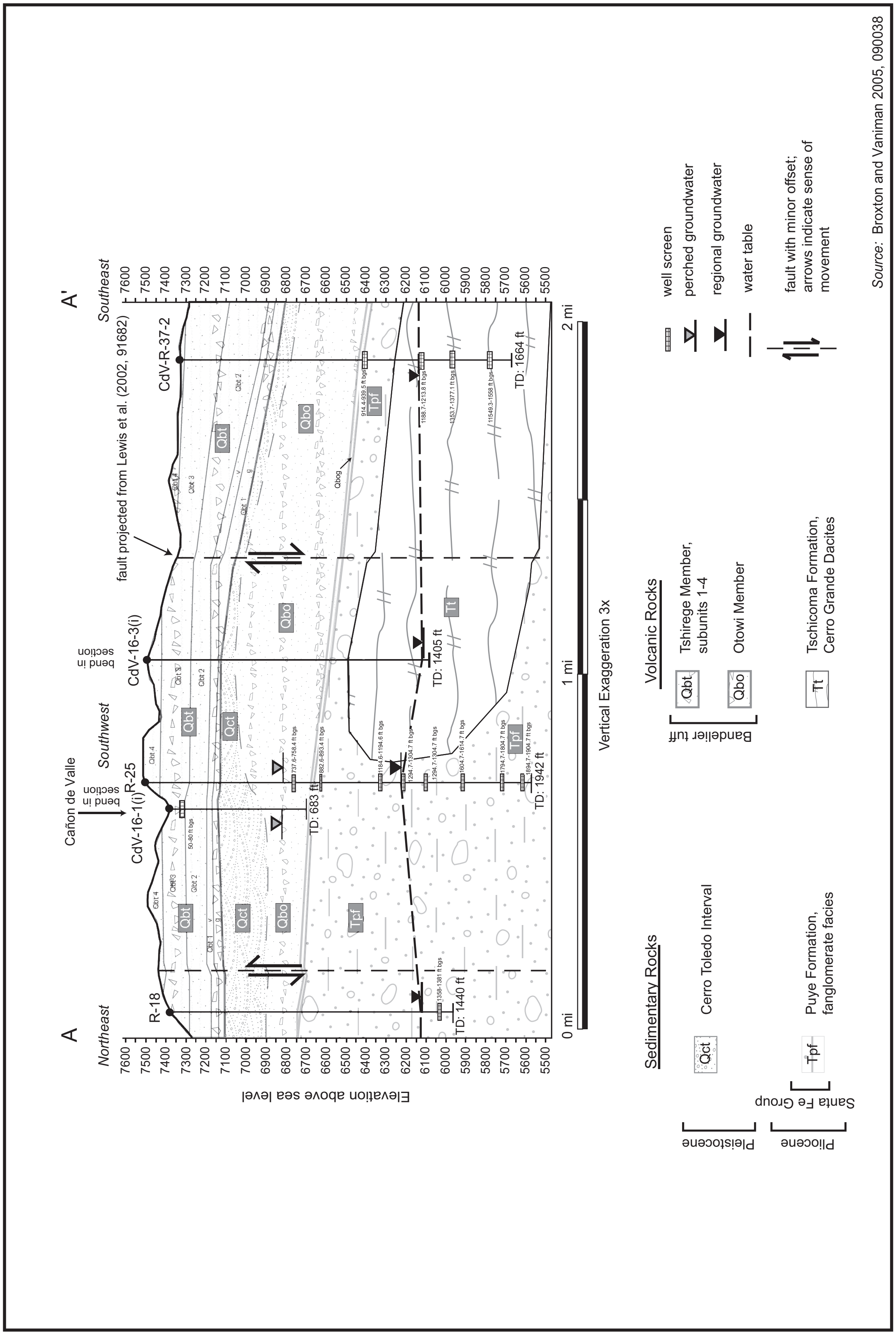


Figure 5.0-5 North-south cross-section (A–A' in Figure 5.0-3)

Table 2.2-1
Chronology of LANL Environmental Activities at Consolidated Unit 16-021(c)-99

Date	Activity (Reference)	Summary of Activity
1990	RFA (LANL 1990, 007512)	RFA initial site assessment is completed. Previous studies are summarized, and document extensive contamination in TA-16-260 sump water.
July 1993	Phase I RFI work plan—site characterization plan (LANL 1993, 020948)	"RFI Work Plan for Operable Unit 1082" is issued. Plan addresses Phase I sampling at SWMU 16-021(c).
May 1994	First addendum to Phase I RFI work plan (LANL 1994, 052910)	"RFI Work Plan for Operable Unit 1082, Addendum 1" is issued. Plan approved by NMED in January 1995.
April 1995–November 1995	Phase I RFI Site Characterization	Phase I RFI is implemented, including Phase I investigation of 16-021(c)-99.
1995–1996	Interim action – best management practices (LANL 1996, 053838)	Sandbag dam and diversion pipe are installed upgradient from the former HE pond; sandbag dam is located east of the parking lot behind TA-16-260; geotextile fabric matting is placed in former HE pond area; eight hay bale check dams are placed within the SWMU drainage between the rock dam and the 15-ft-high cliff.
September 1996	Phase I RFI Report (LANL 1996, 055077)	Phase I RFI report is issued. Data show widespread HE contamination at Consolidated Unit 16-021(c)-99, extending from the 260 Outfall discharge point down to the sediment and waters of Cañon de Valle. Report is approved by NMED in March 1998.
September 1996	Phase II RFI work plan (part of LANL 1996, 055077)	Phase II RFI work plan is included in Phase I RFI report. Report approved by NMED in March 1998.
November 1, 1996–December 23, 1996; May 1997–November 9, 1997	Phase II RFI site characterization	Phase II RFI implemented at 16-021(c)-99.
September 1998	Phase II RFI report (LANL 1998, 059891)	Phase II RFI report is issued. Data confirm widespread HE contamination extending from the 260 Outfall discharge point down to the sediment and waters of Cañon de Valle and show deeper subsurface contamination. Up to 1% total HE is detected in surge bed at a depth of 17 ft. Report documents risk to human health and the environment. Report approved by NMED in September 1999.
September 30, 1998	CMS plan (LANL 1998, 062413)	CMS plan is issued. Alternatives are evaluated. Report includes Phase III RFI sampling plan and describes ongoing hydrogeologic investigations for the site. Report approved by NMED in September 1999.
October 1998–March 2002	Phase III RFI site characterization	Continued monitoring and sampling are used to characterize the temporal and spatial variability of site contamination; components of the site hydrogeologic system are undergoing continued evaluation.
October 1998–November 2003	CMS—ongoing evaluation of alternatives	CMS is initiated. Series of soil and water corrective measures technologies are evaluated. Investigation of components of the site hydrogeologic system continues. Report approved by NMED in June 2004.

Table 2.2-1 (continued)

Date	Activity (Reference)	Summary of Activity
September 30, 1999	Addendum to CMS plan (LANL 1999, 064873)	Addendum to CMS plan is issued. Addendum expands investigations to include deeper perched and regional groundwater potentially impacted by releases from 16-021(c)-99.
November 1999	IM plan—abatement of potential risks at the source area (LANL 2000, 064355)	IM plan is issued. Plan specifies removal of the highly contaminated soil and tuff identified in the 260 Outfall drainage channel. Plan approved by NMED in April 2002.
November 12, 1999–November 18, 2000	Abatement of ongoing risks is initiated	TA-16-260 IM begins. Activities are interrupted by Cerro Grande fire. Initial stage of project completed in November 2000.
January 7, 2000	Contained-in determination (NMED 2000, 064730)	NMED memo of contained-in determination sent to the Laboratory (J. Brown) and DOE-ER (T. Taylor).
April 4, 2000	Designation of area of contamination (NMED 2000, 070649)	NMED designates Consolidated Unit 16-021(c)-99 as an area of contamination. Purpose of designation is to allow material from entire drainage area to be excavated, processed, and segregated without invoking RCRA land disposal restrictions. Excavated material considered potentially hazardous waste is staged in covered piles within area-of-contamination boundary.
June 5, 2000	In situ blending authorization (NMED 2000, 067094)	NMED authorizes in situ blending in memo sent to the Laboratory and DOE. To ensure worker health and safety during the IM and after, settling pond soil is robotically blended in situ with clean or low HE concentration material to reduce maximum concentration of settling pond sediment to below-reactive limit.
August 4, 2001–October 13, 2001	Abatement of ongoing risks is completed	Remobilization and removal of isolated areas containing more than 100 mg/kg of RDX is completed. Waste disposal stage of project is completed.
July 2002	260 Outfall IM report (LANL 2002, 073706)	IM results are presented in IM report. Report approved by NMED in January 2003.
March 2003	Revision 1 to CMS plan addendum—evaluation of alternatives (LANL 2003, 075986)	Addendum to CMS plan updated. Investigation into deeper perched and regional groundwater and deeper vadose zone potentially impacted by releases from Consolidated Unit 16-021(c)-99 is expanded further. Plan approved by NMED in March 2003.
September 2003	Phase III RFI report (LANL 2003, 077965)	Report focuses on investigations into the surface water, alluvial groundwater, canyon sediment, and springs in Cañon de Valle and Martin Spring Canyon. Report includes analysis of data generated since Phase II RFI report (post-1998) and baseline risk assessments using a comprehensive database of both pre- and post-1998 data and emphasizes greater understanding of site hydrogeology and contaminant behavior. Report presents human health baseline risk assessments for source area, and selected reaches of Cañon de Valle and Martin Spring Canyon. In addition, a baseline ecological risk assessment was performed for that reach of Cañon de Valle. Report approved by NMED in June 2004.

Table 2.2-1 (continued)

Date	Activity (Reference)	Summary of Activity
November 2003	CMS report for alluvial system corrective measures evaluated/selected (LANL 2003, 085531)	CMS report for Consolidated Unit 16-021(c)-99 alluvial system. Report is a companion document to Phase III RFI report and relies heavily on the understanding of site hydrogeology and contaminant behavior outlined in that document. Report evaluates potential remedial technologies for each media and proposes appropriate technologies. NMED approves remedy October 2006.
May 2006	NMED request for public comment, alluvial system statement of basis	NMED issues request for public comment for selection of permeable reactive barriers as the preferred alternative the alluvial system.
August 2006	Investigation report for intermediate and regional groundwater (LANL 2006, 093798)	Investigation report for the nature and extent of 16-021(c)-99 impacts to intermediate and regional groundwater. NMED approves report November 2006, request evaluating wells near TA-16.
April 2007	Evaluation of the Suitability of Wells Near Technical Area 16 for Monitoring Contaminant Releases from Consolidated Unit 16-021(c)-99	Documents conditions of wells and well screens and evaluates locations of wells for monitoring releases and migration to groundwater from Consolidated Unit 16-021(c)-99.

Table 3.1-1
Background Information for Candidate Monitoring Wells

Well Screen	Screen #	Port Depth (ft)	Zone of Saturation	# Samples Available	Range of Dates of Sampling Events	Drilling Fluids Used in Interval	Other Issues
CdV-16-1(i)	1	624	Intermediate	4	Jun-05–Mar-06	• QUIK-FOAM, EZ-MUD	• Contaminant plume
CdV-16-2(i)r	1	850	Intermediate	4	Sep-05–May-06	• VERSAFOAM	• Contaminant plume
CdV-R-15-3	4	1254	Regional water table	20	Jan-01–Mar-06	• QUIK-FOAM, EZ-MUD	—[a]
CdV-R-15-3	5	1350	Regional aquifer	19	Jan-01–Mar-06	• QUIK-FOAM, EZ-MUD • TORKease used in 1360–1505-ft interval	• Screen partially obscured with bentonite-rich annular fill
CdV-R-15-3	6	1640	Regional aquifer	20	Jan-01–Mar-06	• QUIK-FOAM, EZ-MUD	• Total depth 1722 ft but borehole sloughed in to 1680 ft
CdV-R-37-2	2	1200	Regional water table	15	Jan-02–Mar-06	• QUIK-FOAM, EZ-MUD	—
CdV-R-37-2	3	1359	Regional aquifer	15	Jan-02–Mar-06	• QUIK-FOAM, EZ-MUD	—
CdV-R-37-2	4	1550	Regional aquifer	15	Jan-02–Mar-06	• QUIK-FOAM, EZ-MUD	—
R-17	1	1057	Regional water table	2	Feb-06–Oct-06	• QUIK-FOAM, EZ-MUD	—
R-17	2	1124	Regional aquifer	1	Oct-06	• QUIK-FOAM, EZ-MUD	—
R-18	1	1358	Regional water table	6	Aug-05–Dec-06	• QUIK-FOAM, EZ-MUD	• Contaminant plume
R-19	2	909	Intermediate	10	Sep-00–Dec-06	• QUIK-FOAM, EZ-MUD • Lubrication slurry including TORKease	—
R-19	3	1190	Regional water table	10	Sep-00–Dec-06	• QUIK-FOAM, EZ-MUD, TORKease	—
R-19	4	1412	Regional aquifer	9	Apr-01–Dec-06	• QUIK-FOAM, EZ-MUD, TORKease	—
R-19	5	1586	Regional aquifer	7	Apr-01–Dec-06	• QUIK-FOAM, EZ-MUD, TORKease	—
R-19	6	1730	Regional aquifer	8	Oct-00–Dec-06	• QUIK-FOAM, EZ-MUD, TORKease	—
R-19	7	1834	Regional aquifer	10	Oct-00–Dec-06	• QUIK-FOAM, EZ-MUD, TORKease	—
R-25	1	754	Intermediate	8	Nov-00–Aug-05	• Ben-Seal bentonite, TORKease • Pressure-washed with SAPP solution	• Contaminant plume
R-25	2	891	Intermediate	7	Nov-00–Aug-05	• Ben-Seal bentonite, TORKease • Pressure-washed with SAPP solution	• Contaminant plume

Table 3.1-1 (continued)

Well Screen	Screen #	Port Depth (ft)	Zone of Saturation	# Samples Available	Range of Dates of Sampling Events	Drilling Fluids Used in Interval	Other Issues
R-25	4	1192	Intermediate	7	Dec-00–Aug-05	• Pressure-washed with SAPP solution • Lubricating slurry of bentonite, QUIK-FOAM, and EZ-Mud *Plus*	• Contaminant plume • Grout composition[a] • Possible mixing of bentonite into the sand pack[b]
R-25	5	1303	Regional water table	8	Dec-00–Aug-05	• Lubricating slurry of bentonite, QUIK-FOAM, and EZ-Mud *Plus* • Pressure-washed with SAPP solution	• Contaminant plume? • Grout composition[b] • Possible mixing of bentonite into the sand pack[c] • Slow fill
R-25	6	1406	Regional aquifer	6	Dec-00–Dec-03	• Lubricating slurry of bentonite, QUIK-FOAM, and EZ-Mud *Plus* • Pressure-washed with SAPP solution	• Contaminant plume • Grout composition[b] • Possible mixing ofbbentonite into the sand pack[c]
R-25	7	1606	Regional aquifer	6	Dec-00–Dec-03	• Lubricating slurry of bentonite, QUIK-FOAM, and EZ-Mud *Plus* • Pressure-washed with SAPP solution	• Contaminant plume • Grout composition[b] • Possible mixing of bentonite into the sand pack[c]
R-25	8	1796	Regional aquifer	7	Dec-00–Aug-05	• Lubricating slurry of bentonite, QUIK-FOAM, and EZ-Mud *Plus* • Pressure-washed with SAPP solution	• Contaminant plume • Grout composition[b] • Possible mixing of bentonite into the sand pack[c]
R-26	1	659	Intermediate	4	Apr-05–Feb-06	• QUIK-FOAM, EZ-MUD • Bentonite/soda ash/PAC-L, and cellulose used to drill below 1005 ft	—

Table 3.1-1 (continued)

Well Screen	Screen #	Port Depth (ft)	Zone of Saturation	# Samples Available	Range of Dates of Sampling Events	Drilling Fluids Used in Interval	Other Issues
R-27	1	852	Regional water table	2	Nov-05–Jul-06	• QUIK-FOAM, EZ-MUD	—

Source: Well Screen Analysis Report, Revision 1, Table 2-1 and Table B-2 (LANL 2007, 095043).

Notes: SAPP = Sodium acid pyrophosphate. Number of samples available is limited to postdevelopment sampling events with sufficient data for application of 15 or more test criteria.

[a] — = None identified.

[b] Ingredients used in grout emplaced between R-25 screen intervals varied with depth but included Ben-Seal bentonite, Bentonite Gel, Aqua-Guard bentonite, Mag Fiber, Nylon fiber, cellophane, TORKease, retardant (Catalyst) mix.

[c] Possible mixing of bentonite into the sand pack around R-25 screens #4, #5, #6, #7, and #8 as result of dropped tremie pipes.

Table 3.2-1
Summary of Well Screen Evaluation for Residual Impacts from Drilling Fluids

Well Screen		Contaminant Plume is Present	No Apparent Residual Drillling Fluid Effects	General Effects		Residual Fluids		Reducing Conditions				Other Effects		
				Turbidity	pH or Alkalinity Outside Bounds	Residual Inorganics	Residual Organics	SO_4	Fe	Mn	NO_3	Sorption	Carbonate Disequilibrium	Steel Corrosion
CdV-16-1(i)	1	•[a]	• ?[b]	—[c]	—	— ?[d]	—	—	—	—	—	—	—	—
CdV-16-2(i)r	1	•	— ?	—	•	— ?	—	—	—	—	—	—	—	— ?
CdV-R-15-3	4	—	• ?	—	—	—	—	—	—	—	—	—	—	—
CdV-R-15-3	5	—	—	—	—	—	•	•	•	•	•	—	•	—
CdV-R-15-3	6	—	—	—	—	—	—	—	—	•	•	—	—	—
CdV-R-37-2	2	—	—	— ?	•	—	•	•	•	•	•	—	•	—
CdV-R-37-2	3	—	•	—	—	—	—	—	—	—	—	—	—	—
CdV-R-37-2	4	—	—	—	—	—	—	—	•	•	•	—	—	—
R-17	1	—	• ?	— ?	—	—	—	—	— ?	— ?	— ?	—	—	—
R-17	2	—	• ?	— ?	—	—	—	—	— ?	— ?	— ?	—	—	—
R-18	1	—	•	—	—	—	—	—	—	—	—	—	—	—
R-19	2	—	—	—	•	•	•?	—	—	—	—	—	—	—
R-19	3	—	• ?	—	—	— ?	—	—	—	—	— ?	—	—	—
R-19	4	—	•	—	—	—	—	—	—	—	—	—	—	—
R-19	5	—	—	—	•	— ?	—	• ?	•	•	•	—	•	—
R-19	6	—	—	—	•	• ?	—	—	•	•	•	—	•	—
R-19	7	—	—	•	•	•	—	—	•	•	•	—	•	—
R-25	1	•	—	•	•	—	—	—	— ?	— ?	— ?	—	—	•
R-25	2	•	—	•	•	•	•	—	— ?	— ?	•	—	—	•
R-25	4	•	—	•	•	•	•	—	—	—	—	—	—	—
R-25	5	— ?	—	—	—	•	•	—	•	•	•	—	— ?	—

Table 3.2-1 (continued)

Well Screen		Contaminant Plume is Present	No Apparent Residual Drillling Fluid Effects	General Effects		Residual Fluids		Reducing Conditions				Other Effects		
				Turbidity	pH or Alkalinity Outside Bounds	Residual Inorganics	Residual Organics	SO_4	Fe	Mn	NO_3	Sorption	Carbonate Disequilibrium	Steel Corrosion
R-25	6	– ?	–	–	–	●	–	–	–	–	–	–	– ?	–
R-25	7	– ?	–	–	–	●	–	–	–	–	–	–	–	–
R-25	8	– ?	–	●	–	●	–	–	–	–	–	–	–	–
R-26	1	–	●	–	–	–	–	–	–	–	–	–	–	–
R-27	1	–	●	–	–	–	–	–	–	–	–	–	–	–

Note: A condition is identified as "present" only if strong and consistent evidence support that conclusion, that is, the condition is supported by a sufficient number of samples to establish clear trends, and test outcomes for the geochemical indicators are internally consistent for individual samples as well as for the set of samples from a particular screen. Source for evaluation outcomes is Tables C-7 and C-9 of this report.

[a] ● = This residual drilling effect or condition Is present in this screen interval.

[b] ●?= This residual drilling effect or condition appears to be present in this screen interval but there is uncertainty associated with this judgment because of an insufficient number of samples or because of inconsistent test outcomes among the geochemical indicators.

[c] – = This residual drilling effect or condition is not present in this screen interval.

[d] –? = This residual drilling effect or condition does not appear to be present in this screen interval but there is uncertainty associated with this judgment because of an insufficient number of samples or because of inconsistent test outcomes among the geochemical indicators.

Table 3.3-1a
Identification of Relevant Inorganic COPCs

Chemical Above Background	Phase III RFI COPCs in Cañon de Valle			Phase III RFI COPCs in Martin Spring Canyon			Phase III RFI COPCs in Springs
	Surface Water	Alluvial Groundwater	Sediment	Surface Water	Alluvial Groundwater	Sediment	
Aluminum	[a]			●[b]	●	●	
Antimony	●	●	●	●			●
Arsenic				●	●	●	
Barium	●	●	●	●	●	●	●
Beryllium					●		
Boron			●	●	●	●	●
Cadmium		●	●		●	●	
Cesium	●	●					●
Chromium			●		●	●	
Cobalt			●	●	●	●	
Copper			●		●	●	
Cyanide (Total)		●					●
Lead			●	●	●	●	
Manganese		●		●	●		
Mercury	●		●	●	●	●	●
Nickel			●		●		
Nitrate-Nitrite as N	●						●
Perchlorate	●	●	●		●		●
Rubidium		●					●
Selenium	●		●	●	●	●	
Silver	●		●		●	●	
Thallium	●	●	●	●	●		●
Uranium	●						●
Vanadium			●	●	●	●	
Zinc			●		●		

Source of COPC information: CMS Report for Consolidated Unit 16-021(c)-99, Tables B-1 through B-14 (LANL 2003, 085531).

[a] Blank cell = Not a COPC for this media.

[b] ● = COPC for this media.

Table 3.3-1b
Identification of Relevant Organic COPCs

Chemical above Background	Phase III RFI COPCs in Cañon de Valle			Phase III RFI COPCs in Martin Spring Canyon			Phase III RFI COPCs in Springs
	Surface Water	Alluvial Groundwater	Sediment	Surface Water	Alluvial Groundwater	Sediment	
Amino-2,6-dinitrotoluene[4-]	[a]		●[b]			●	
Amino-4,6-dinitrotoluene[2-]			●			●	
Benzo(a)anthracene						●	
Benzo(a)pyrene			●			●	
Benzo(b)fluoranthene						●	
Benzo(g,h,i)perylene						●	
Benzo(k)fluoranthene						●	
Benzoic acid			●			●	
Bis(2-ethylhexyl)phthlate	●					●	
Chloromethane		●					
Chrysene						●	
Di-n-butylphthalate			●				
Dinitrobenzene[1,3-]		●					●
DNX	●						
Fluoranthene			●			●	
Hexachlorobenzene			●				
HMX			●				
Indeno(1,2,3,cd)pyrene			●			●	
Methylene chloride	●						
Methylphenol[4-]			●				
MNX	●	●					
Naphthalene			●				
Nitrobenzene		●					●
Nitroglycerin	●						
Phenanthrene						●	
Pyrene			●			●	
Pyridine			●				
RDX	●	●	●	●	●	●	●
Tetrachloroethene	●						
TNT	●	●	●				●
Trichloroethene	●						
Trinitrotoluene[2,4,6-]						●	

Source of COPC information: CMS Report for Consolidated Unit 16-021(c)-99, Tables B-1 through B-14 (LANL 2003, 085531).
[a] Blank cell = Not a COPC for this media.
[b] ● = COPC for this media.

Table 3.3-2a
Effect of Residual Drilling Impacts on Relevant Site-Specific Inorganic COPCs

Inorganic Analyte	Speciation in Native Groundwater[a]	Turbidity	pH or Alkalinity Outside Bounds[b]	Residual Inorganics	Residual Organics	SO4-reducing	Fe-reducing	Mn-reducing	NO3-reducing	Sorption	Carbonate Disequilibrium	Steel Corrosion
Aluminum	$Al(OH)_4^-$	•[c]	—[d]	—	—	—	—	—	—	—	—	—
Antimony	SbO_3^-	—	•	—	—	•	•	•	—	•	—	—
Arsenic	$HAsO_4^{-2}$, $H_2AsO_4^-$	—	•	•	—	•	•	•	—	•	—	—
Barium	Ba^{+2}	—	—	•	—	•	•	•	—	•	•	•
Beryllium	$BeOH^+$, $Be(OH)_2$	—	•	—	—	•	•	•	—	•	—	•
Boron	H_3BO_3	—	—	•	—	—	—	—	—	—	—	—
Cadmium	Cd^{+2}	—	—	—	—	•	•	•	—	•	•	•
Cesium	Cs^+	—	—	—	—	•	•	•	—	•	—	•
Chromium	CrO_4^{-2}	—	—	•	—	•	•	•	—	—	—	•
Cobalt	Co^{+2}	—	—	—	—	•	•	•	—	•	•	•
Copper	$CuCO_3$, $CuOH^+$	—	—	•	—	•	•	•	—	•	•	•
Cyanide	CN^-	—	—	—	—	—	—	—	—	—	—	—
Lead	$PbCO_3$, $PbOH^+$, Pb^{+2}	—	—	•	—	•	•	•	—	•	•	•
Manganese	Mn^{+2}	—	•	•	—	•	•	•	—	•	•	•
Mercury	$Hg(OH)_2$	—	—	—	—	•	•	•	—	•	—	•
Nickel	Ni^{+2}, $NiHCO_3^+$	—	—	•	—	•	•	•	—	—	•	•
Nitrate	NO_3^-	—	—	•	—	•	•	•	•	—	—	—
Perchlorate	ClO_4^-	—	—	—	—	•	•	•	—	—	—	—
Rubidium	Rb^+	—	—	•	—	—	—	—	—	—	—	—
Selenium	SeO_4^{-2}	—	—	•	—	•	•	•	—	—	—	—
Silver	Ag^+	—	—	—	—	•	•	•	—	•	—	—
Thallium	$Tl(OH)_3$	—	—	—	—	•	•	•	—	•	—	—

Table 3.3-2a (continued)

Inorganic Analyte	Speciation in Native Groundwater[a]	Turbidity	pH or Alkalinity Outside Bounds[b]	Residual Inorganics	Residual Organics	SO4-reducing	Fe-reducing	Mn-reducing	NO3-reducing	Sorption	Carbonate Disequilibrium	Steel Corrosion
Uranium	$UO_2(CO_3)_2^{-2}$ $UO_2(CO_3)_3^{-4}$ $UO_2(HPO_4)_2^{-2}$	—	—	—	—	●	●	●	—	—	●	—
Vanadium	$H_2VO_4^-$, HVO_4^{-2}	—	—	●	—	●	●	●	—	●	—	—
Zinc	Zn^{+2}, $ZnCO_3$	—	●	—	—	●	●	●	—	●	●	●

Source for COPCs affected by residual drilling effects: Well Screen Analysis Report, Revision 1 (LANL 2007, 095043): Tables A-1and A-2 (summary); detailed listings in Tables 4-8 and A-10 (COPCs affected by residual inorganics); Table 4-13 (COPCs affected by reducing conditions); Tables 4-15, A-11 and A-12 (COPCs affected by adsorption onto bentonite); Table 4-17 (COPCs affected by carbonate disequilibria); Table 4-18 (COPCs affected by stainless-steel corrosion).

Note: In some cases, the identification of COPCs affected by the different categories of residual drilling effects may differ from the guidance provided in the Well Screen Analysis Report, Revision 1 (LANL 2007, 095043) because the modeled COPC speciation based on the Groundwater Background Investigation Report, Revision 2 (LANL 2007, 094856) differed from that indicated in Tables A-1 or A-2 of the Well Screen Analysis Report, Revision 1 (LANL 2007, 095043), or for other reasons documented in Section 3.3 of this report. Gray-shaded rows indicate Priority 1 COPCs.

[a] Listed species are in order of relative concentrations and include species contributing at least 10% of the total analyte concentration. Speciation calculated using PHREEQC (with WATEQF.V4 database) (Parkhurst and Appelo 1999, 045555) for median concentrations in groundwater from the regional aquifer (LANL 2007, 094856, Table 4-2e).

[b] An entry in this column signifies that the analyte's speciation may differ significantly from that expected under pH/alkalinity conditions that are characteristic of native groundwater, such that some entries for this analyte may not be valid.

[c] ● = Analytical data for this COPC may not be reliable or representative of predrilling conditions if this condition is present in the screen interval.

[d] — = The reliability or representativeness of analytical data for this COPC are not affected by this condition, even if present.

Table 3.3-2b
Effect of Residual Drilling Impacts on Relevant Site-Specific Organic COPCs

Organic Analyte	Not Significantly Affected	Turbidity	pH or Alkalinity Outside Bounds	Residual Inorganics	Residual Organics	SO_4-reducing	Fe-reducing	Mn-reducing	NO_3-reducing	Sorption	Carbonate Disequi-librium	Steel Corrosion
Amino-2,6-dinitrotoluene[4-]	—[a]	—	—	—	—	•[b]	•	•	•	—	—	—
Amino-4,6-dinitrotoluene[2-]	—	—	—	—	—	•	•	•	•	—	—	—
Benzo(a)anthracene	—	—	—	—	•	•	•	•	•	•	—	—
Benzo(a)pyrene	—	—	—	—	•	•	•	•	•	•	—	—
Benzo(b)fluoranthene	—	—	—	—	•	•	•	•	•	•	—	—
Benzo(g,h,i)perylene	—	—	—	—	•	•	•	•	•	•	—	—
Benzo(k)fluoranthene	—	—	—	—	•	•	•	•	•	•	—	—
Benzoic acid	—	—	—	—	—	•	•	•	•	—	—	—
Bis(2-ethylhexyl)phthlate	—	—	—	—	•	•	•	•	•	•	—	—
Chloromethane	—	—	—	—	—	•	•	•	•	—	—	—
Chrysene	—	—	—	—	•	•	•	•	•	•	—	—
Di-n-butylphthalate	—	—	—	—	•	•	•	•	•	•	—	—
Dinitrobenzene[1,3-]	—	—	—	—	—	•	•	•	•	—	—	—
DNX	—	—	—	—	•	•	•	•	•	•	—	—
Fluoranthene	—	—	—	—	•	•	•	•	•	•	—	—
Hexachlorobenzene[c]	—	—	—	—	•	•	•	•	•	•	—	—
HMX	—	—	—	—	•	•	•	•	•	•	—	—
Indeno(1,2,3,cd)pyrene	—	—	—	—	•	•	•	•	•	•	—	—
Methylene chloride	—	—	—	—	—	•	•	•	•	—	—	—
Methylphenol[4-]	—	—	—	—	•	•	•	•	•	•	—	—
MNX	—	—	—	—	•	•	•	•	•	•	—	—
Naphthalene	—	—	—	—	•	•	•	•	•	•	—	—

Table 3.3-2b (continued)

Organic Analyte	Not Significantly Affected	Turbidity	pH or Alkalinity Outside Bounds	Residual Inorganics	Residual Organics	SO_4-reducing	Fe-reducing	Mn-reducing	NO_3-reducing	Sorption	Carbonate Disequi-librium	Steel Corrosion
Nitrobenzene	—	—	—	—	—	●	●	●	●	—	—	—
Nitroglycerin	—	—	—	—	—	●	●	●	●	—	—	—
Phenanthrene	—	—	—	—	●	●	●	●	●	●	—	—
Pyrene	—	—	—	—	●	●	●	●	●	●	—	—
Pyridine	—	—	—	—	—	●	●	●	●	—	—	—
RDX	● ?	—	—	—	—	● ?[d]	● ?	● ?	● ?	—	—	—
Tetrachloroethene	—	—	—	—	●	●	●	●	●	●	—	—
TNT	—	—	—	—	—	●	●	●	●	—	—	—
Trichloroethene	—	—	—	—	—	●	●	●	●	—	—	—
Trinitrotoluene[2,4,6-]	—	—	—	—	●	●	●	●	●	●	—	—

Source for COPCs affected by residual drilling effects: Well Screen Analysis Report, Revision 1 (LANL 2007, 095043): Table 4-13 (COPCs affected by reducing conditions); Tables 4-15 and A-4 through A-8 (COPCs affected by adsorption onto bentonite).

Note: In some cases, the identification of COPCs affected by the different categories of residual drilling effects differs from the guidance provided in the Well Screen Analysis Report, Revision 1 (LANL 2007, 095043) for reasons documented in Section 3.3 of this report. Gray-shaded rows indicate Priority 1 COPCs.

[a] — = The reliability or representativeness of analytical data for this COPC are not affected by this condition even if present.

[b] ● = Analytical data for this COPC may not be reliable or representative of predrilling conditions if this condition is present in the screen interval.

[c] Sorption coefficient for hexachlorobenzene is not reported in the "Well Screen Analysis Report, Revision 1" (LANL 2007, 095043). Its value is estimated to be 8 mL/g, based on log K_{OC} = 3.9 (Dannenfelser et al. 1991, 090522, Table IX) and assuming 0.1% organic carbon.

[d] ●? = Analytical data for RDX may not be reliable or representative under reducing conditions but uncertainty is associated with this judgment.

Table 3.3-3
Capability of Screen to Provide R&R Samples
for Selected COPCs and Other Contaminant Plume Constituents

Well	Port Depth (ft)	Scr	Date	Selected COPCs					Other Plume Constituents			
				Ba	Mn	RDX	Other HE[a]	SVOC /VOCs	^3H	Cl	SO_4	NO_3
CdV-16-1(i)	624	1	Mar-06	■[b]	■	■	■	■	■	■	■	■
CdV-16-2(i)r	850	1	May-06	■	■	■	■	■	■	■	■	■
CdV-R-15-3	1254	4	Mar-06	■	■	■	■	■	■	■	■	■
CdV-R-15-3	1350	5	Mar-06	—[c]	—	— ?[d]	—	—	■	■	—	—
CdV-R-15-3	1640	6	Mar-06	■	—	■ ?[e]	■ ?	■ ?	■	■	■	—
CdV-R-37-2	1200	2	Mar-06	—	—	— ?	—	—	■	■	—	—
CdV-R-37-2	1359	3	Mar-06	■	■	■	■	■	■	■	■	■
CdV-R-37-2	1551	4	Mar-06	■ ?	—	— ?	—	—	■	■	■ ?	—
R-17	1057	1	Oct-06	■ ?	■ ?	■	■ ?	■ ?	■	■	■	■ ?
R-17	1124	2	Oct-06	■ ?	■ ?	■	■ ?	■ ?	■	■	■	■ ?
R-18	1358	1	Dec-06	■	■	■	■	■	■	■	■	■
R-19	909	2	Dec-06	■	■	■	■	■	■	■	■	■
R-19	1191	3	Dec-06	■	■	■	■	■	■	■	■	■ ?
R-19	1413	4	Dec-06	■	■	■	■	■	■	■	■	■
R-19	1586	5	Dec-06	—	—	— ?	—	—	■	■	—	—
R-19	1730	6	Dec-06	—	—	— ?	—	—	■	■	—	—
R-19	1835	7	Dec-06	—	—	— ?	—	—	■	— ?	—	—
R-25	755	1	Aug-05	■	—	■	■	■ ?	■	■	■	■
R-25	892	2	Aug-05	—	—	— ?	—	—	■	— ?	—	—
R-25	1192	4	Aug-05	■ ?	■ ?	■ ?	■	■	■	— ?	— ?	■
R-25	1303	5	Aug-05	—	—	— ?	—	—	■	■	■ ?	—
R-25	1406	6	Dec-03	■ ?	■	■	■	■	■	■	■	■
R-25	1606	7	Dec-03	■ ?	■	■	■	■	■	■	■	■
R-25	1796	8	Aug-05	■ ?	■	■	■	■	■	■	■	■
R-26	659	1	Feb-06	■	■	■	■	■	■	■	■	■
R-27	852	1	Jul-06	■	■	■	■	■	■	■	■	■

Note: The conditions under which a screen cannot provide R&R sample from residual effects of drilling are tabulated in Tables 3.3-2a and 3.3-2b. These tables provide general guidance for the identification of impacted COPC in a particular screen. The evaluation process also places considerable weight on data trends established in the screen for COPCs present in background groundwater as well as in data trends for detections of other COPCs if a contaminant plume is known to be present. Primary considerations in examining data trends are the degree to which COPC concentrations remain stable in the presence of variable concentrations of indicators for residual drilling effects and the direction of COPC concentration trends relative to those predicted by the conceptual model for residual drilling effects.

[a] This includes degradation products of HE.

[b] ■ = Screen can provide R&R sample for this COPC.

[c] — = Screen cannot provide R&R sample for this COPC.

[d] — ? = Screen probably cannot provide R&R sample for this analyte, but uncertainty is associated with this judgment, as documented in Tables 3.2-1, 3.3-2a, or 3.3-2b.

[e] ■? = Screen can probably provide R&R sample for this analyte, but uncertainty is associated with this judgment, as documented in Tables 3.2-1, 3.3-2a, or 3.3-2b.

Table 3.4-1
Summary of Screen Hydraulic Properties, Geophysics, Sampling Characteristics, and Related Issues

Well	Screen	Screen Length (ft)	Geologic Unit[a]	Hydrodynamic Zone	Geophysics Summary	Screen Sampling Characteristics/Seal Integrity[b]	Comment/Issues
CdV-16-1(i)	Single	10.0	Qbo	Perched	[c]	No drawdown into the screen during sampling	>30 ft of drawdown during sampling
CdV-16-2(i) r	Single	9.7	Tpf	Perched	Gamma, CMR indicate homogeneous, tight Tpf	Drawdown into the screen during sampling/Bridges developed during well construction.	About 13 ft of drawdown during sampling
CdV-R-15-3	4	43.8	Tp	Phreatic	CMR shows 2 10 ft producing zones. Geologic break in Puye based on gamma.	No drawdown during low flow sampling	Screen not tested for hydraulic properties. Long screen across regional aquifer surface may lead to minor dilution of aquifer-top contaminants.
CdV-R-15-3	5	6.9	Tp	Deep	CMR shows >5-ft producing zone. Homogeneous Puye on gamma.	No drawdown during low flow sampling/Bentonite present in screen due to 9 ft screen placement error.	Bentonite present in front of screen
CdV-R-15-3	6	6.9	Tp	Deep	CMR shows 6-ft producing zone. Heterogeneous formation on gamma.	No drawdown during low flow sampling	Screen exhibited very slow equilibration after installation of Westbay.
CdV-R-37-2	2	25.1	Tt	Phreatic	CMR shows 10–15 ft producing zone. Heterogeneous.	No drawdown during low flow sampling	Screen not tested for hydraulic properties. Not pumped during development. Moderate length screen could lead to dilution of contaminants.
CdV-R-37-2	3	23.4	Tt	Deep	CMR shows 10 ft producing zone at bottom of screen	No drawdown during low flow sampling	Not enough water to pump during development. Moderate length screen could lead to dilution of contaminants.
CdV-R-37-2	4	6.7	Tt	Deep	CMR shows homogeneous hydrostratigraphy	No drawdown during low flow sampling	

Table 3.4-1 (continued)

Well	Screen	Screen Length (ft)	Geologic Unit[a]	Hydrodynamic Zone	Geophysics Summary	Screen Sampling Characteristics/Seal Integrity[b]	Comment/Issues
R-17	1	23.0	Tpf	Inadequate data	CMR shows producing zone with 10 ft high-flow zone. Homogeneous on gamma.	Drawdown 3.7 ft or more during pumping. Bridge developed during well construction.	Pump rate about 2.5 gal. per min (gpm). Moderate length screen could lead to dilution of contaminants.
R-17	2	10.0	Tpf	Inadequate data	Washout zone. CMR poor quality.	Drawdown about 0.2 ft during pumping	Pump rate about 2.5 gpm
R-18	Single	23.0	Tpf	Phreatic/Deep (?)	CMR shows homogeneous producing zone	Drawdown about 6 ft during sampling, quick recovery	
R-19	3	44.0	Tpf	Phreatic	CMR shows 2 10 ft producing zones and (gamma) geologic heterogeneity	No drawdown during low flow sampling	Sampling flow rates reported to be low. Long screen across regional aquifer surface may lead to minor dilution of aquifer-top contaminants.
R-19	4	7.2	Tpf	Deep	CMR, gamma show tight homogeneous formation	No drawdown during low flow sampling	
R-19	5	7.2	Tpf	Deep	CMR, gamma show homogeneous moderate producing zone	No drawdown during low flow sampling	
R-19	6	7.1	Tpf	Deep	CMR, gamma show several 5–10 ft producing zones within filter pack	No drawdown during low flow sampling	
R-19	7	7.1	Tpf	Deep	CMR, gamma show homogeneous moderate producing zone	No drawdown during low flow sampling	

Table 3.4-1 (continued)

Well	Screen	Screen Length (ft)	Geologic Unit[a]	Hydrodynamic Zone	Geophysics Summary	Screen Sampling Characteristics/Seal Integrity[b]	Comment/Issues
R-25	1	20.8	Qbo	Perched	Geophysics through casing	No drawdown during low flow sampling. Dropped tremie pipe probably impacted seal integrity. Screen 3 repairs may have introduced fine-grained casing material in screen pack.	Intermediate zone. Screen would not take slug-injection water
R-25	2	10.8	TPf	Perched	Geophysics through casing	No drawdown during low flow sampling. Dropped tremie pipe probably impacted seal integrity. Screen 3 repairs may have introduced fine-grained casing material in screen pack.	Intermediate zone. Screen would not take slug-injection water
R-25	4	10.0	Tpf	Phreatic (?)	Geophysics through casing	No drawdown during low flow sampling. Dropped tremie pipe may have impacted seal integrity.	Probable intermediate zone
R-25	5	10.0	Tpf	Phreatic (?)	Geophysics through casing	Head falls significantly (> 5 ft) during low flow sampling. Dropped tremie pipe may have impacted seal integrity.	Screen would not take slug-injection water; recovery after sampling slow.
R-25	6	10.0	Tpf	Deep	Geophysics through casing	No drawdown during low flow sampling. Dropped tremie pipe may have impacted seal integrity.	Screen would not take slug-injection water.
R-25	7	10.0	Tpf	Deep	Geophysics through casing	No drawdown during low flow sampling. Dropped tremie pipe may have impacted seal integrity.	Screen would not take slug-injection water.
R-25	8	10.0	Tpf	Deep	Geophysics through casing	Head falls 2 to 4 ft during low flow sampling. Dropped tremie pipe may have impacted seal integrity.	Screen would not take slug-injection water; recovery after sampling slow.
R-26	1	18.1	Qct	Perched ?	Gamma shows heterogeneity. CMR shows 10-ft producing zone.	No drawdown during low-flow sampling	Hydraulic conductivity higher 2.4–3.7 ft/day farther from borehole

Table 3.4-1 (continued)

Well	Screen	Screen Length (ft)	Geologic Unit[a]	Hydrodynamic Zone	Geophysics Summary	Screen Sampling Characteristics/Seal Integrity[b]	Comment/Issues
R-26	2	23.0	Tp	Deep	CMR, gamma show homogeneous producing zone	Cannot sample; bentonite plugs sampler	Screen accepted injection water very slowly. Moderate length screen could lead to dilution of contaminants.
R-27	Single	23.0	Tpf	Phreatic	CMR shows fairly uniform producing unit	No data	Specific capacity about 4.1 gpm/ft

[a] Qct = Cerro Toledo Member; Qbo = Otowi Member; Tp = Puye Formation; Tpf = Puye Formation fanglomerate; Tt = Tschicoma Formation; CMR = combined magnetic resonance.

[b] Seal integrity judged to be good unless otherwise noted.

[c] Blank cell = No comments or issues.

Table 3.4-2
Summary of Well Screen Construction Information, Screen Development Activities, and Related Issues

Well	Screen	Screen Top (ft bgs)	Screen Bottom (ft bgs)	Screen Length (ft)	Filter Pack Top (ft bgs)	Filter Pack Bottom (ft bgs)	Filter Pack Length (ft)	Hydraulic Conductivity (ft/day)	Screen Development									Comment/Issues
									Pressure Wash	Scrubbing	Jetting	Swabbing	Bailing	Surging	Air Lifting	Pumping	Water Volume (gal.)	
CdV-16-1(i)	Single	624	634	10.0	611.0	644.0	33.0	0.50-0.70				x	X			x	7994	
CdV-16-2(i)r	Single	850	859.7	9.7	839.0	867.5	38.5	3.0				x	X			x	10820	
CdV-R-15-3	4	1235.1	1278.9	43.8	1207.0	1287.0	80.0	Not tested		x			X			x	8860	Pumping performed adjacent to each screen but did not include packers to isolate the screens. Screens placed 9 ft deeper than intended due to pipe tally error.
CdV-R-15-3	5	1348.4	1355.3	6.9	1321.0	1349.0	28.0	0.25		x			X			x	7700	
CdV-R-15-3	6	1637.9	1644.8	6.9	1604.0	1649.0	45.0	0.10		x			X			x	16460	
CdV-R-37-2	2	1188.7	1213.8	25.1	1174.4	1223.0	48.6	Not tested		x			X	x				Pumping performed adjacent to screens 3 and 4 but did not include packers to isolate the screens. Screen 2 did not make enough water to pump.
CdV-R-37-2	3	1353.7	1377.1	23.4	1340.0	1386.5	46.5	7.0		x			X	x		x	17480	
CdV-R-37-2	4	1549.3	1556.0	6.7	1537.3	1563.3	26.0	11.4		x			X	x		x	9860	
R-17	1	1057.0	1080.0	23.0	1053.0	1085.5	32.5	1.7				x	X			x	9454	Bridge plug installed below screen during development.
R-17	2	1124.0	1134.0	10.0	1119.0	1143.0	24.0	147.0				x	X			x	7331	Packer installed above screen during development.
R-18	Single	1358.0	1381.0	23.0	1345.5	1388.0	42.5	6.5				x	X			x	18870	

Table 3.4-2 (continued)

Well	Screen	Screen Top (ft bgs)	Screen Bottom (ft bgs)	Screen Length (ft)	Filter Pack Top (ft bgs)	Filter Pack Bottom (ft bgs)	Filter Pack Length (ft)	Hydraulic Conductivity (ft/day)	Screen Development									Comment/Issues
									Pressure Wash	Scrubbing	Jetting	Swabbing	Bailing	Surging	Air Lifting	Pumping	Water Volume (gal.)	
R-19	3	1171.4	1215.4	44.0	1149.8	1240.5	90.7	Not tested	x		x				x	x	91	Pumping performed adjacent to each screen but did not include packers to isolate the screens.
R-19	4	1410.2	1417.4	7.2	1380.0	1445.5	65.5	Not tested	x		x				x	x	1175	
R-19	5	1582.6	1589.8	7.2	1557.9	1606.8	48.9	Not tested	x		x				x	x	3500	
R-19	6	1726.8	1733.9	7.1	1657.9	1779.8	121.9	17.5	x		x				x	x	2400	
R-19	7	1832.4	1839.5	7.1	1828.2	1848.4	20.2	19.6	x		x				x	x	4813	
R-25	1	737.6	758.4	20.8	726	762	36	Not tested	x	x	x					x	192000	Pumping performed adjacent to each screen but did not include packers to isolate the screens.
R-25	2	882.6	893.4	10.8	865	905	40	Not tested	x	x	x				x	x		
R-25	4	1184.6	1194.6	10.0	1180.0	1202.0	22.0	Not tested	x	x	x					x		
R-25	5	1294.7	1304.7	10.0	1284.0	1308.0	24.0	Not tested	x	x	x					x		
R-25	6	1404.7	1414.7	10.0	1394.0	1424.0	30.0	Not tested	x	x	x					x		
R-25	7	1604.7	1614.7	10.0	1595.0	1625.0	30.0	Not tested	x	x	x					x		
R-25	8	1794.7	1804.7	10.0	1781.0	1813.0	32.0	Not tested	x	x	x				x	x		
R-26	1	651.8	669.9	18.1	618.0	672.0	54.0	1.7				X	X	X	X	X	47,717	Screen 1 probably not isolated during pumping
R-26	2	1422.0	1445.0	23.0	1408.0	1450.0	42.0	0.0022				x	X	x	x	x	28943	Screen 2 probably not isolated during pumping
R-27	Single	852.0	875.0	23.0	840.5	885.0	44.5	25.0				x	X	x		x	38793	230 gal. removed during swabbing and bailing

Source: Well completion reports as included in the “Investigation Report for Intermediate and Regional Groundwater, Consolidated Unit 16-021(c)-99” (LANL 2006, 093798).

Table 3.4-3
Screen Parameters Associated with Long Screens/Filter Packs

Well Screen	Filter Pack Length (ft)	Screen Length (ft)	Filter Pack Length Below Water Table (in ft)	Geologic Unit/ Heterogeneity	Approximate Lateral Distance from CdV Source (ft)	Calculated Vertical Plume Depth Due to Transverse Dispersion (ft)[a]	Comments
CdV-R-15-3 (Screen 4)	80.0	43.8	47.9	Puye Formation /Two 10-ft producing zones in screen	7620	102	Much of this long filter pack is above the water table. However, geophysics indicates two producing zones, so 50% or more dilution is possible.
CdV-R-37-2 (Screen 2)	48.6	25.1	29.7	Tschicoma dacite/10–15-ft producing zone	6096	91	Much of this long filter pack is above the water table. Saturated filter pack is <30 ft. Most water is produced at producing zone, so dilution >50% is not likely.
CdV-R-37-2 (Screen 3)	46.5	23.4	n/a[b]	Tschicoma dacite/10-ft producing zone in screen	6096	91	Saturated filter pack is 4 times the length of the producing zone, but most of the water probably derived from producing zone. Some dilution is possible.
R-17 (Screen 1)	32.5	23.0	n/a	Puye Formation/10-ft producing zone	12,192	129	Saturated filter pack is 3 times the length of the producing zone, but most of the water is probably derived in the producing zone. Some dilution is possible.
R-18	42.5	23.0	n/a	Puye Formation/ Homogeneous producing zone	2438	56	Homogeneous producing zone and likely depth of dispersive mixing suggests that dilution is not likely.
R-19 Screen 3	90.7	44.0	61.8	Puye Formation/Two 10-ft producing zones	13,716	136	Much of this long filter pack is above the water table. However, geophysics indicates two producing zones, so 50% or more dilution is possible.

Table 3.4-3 (continued)

Well Screen	Filter Pack Length	Screen Length	Filter Pack Length Below Water Table	Geologic Unit/ Heterogeneity	Approximate Lateral Distance from CdV Source ft)	Calculated Vertical Plume Depth Due to Transverse Dispersion (ft)[a]	Comments
R-19 Screen 4	65.5	7.2	n/a	Puye Formation/ Homogeneous formation	13,716	136	Homogeneous producing zone and likely depth of dispersive mixing suggest that dilution is not likely.
R-19 Screen 5	48.9	7.2	n/a	Puye Formation/ Homogeneous formation	13,716	136	Homogeneous producing zone and likely depth of dispersive mixing suggest that dilution is unlikely.
R-19 Screen 6	121.9	7.1	n/a	Puye Formation/Several 5–10-ft producing zones	13,716	136	Geophysics indicates several producing zones so dilution >50% is likely.
R-25 (Screen 1)	36.0	20.8	n/a	Otowi Member/No detailed geophysics	305	20	Geologic logging indicates homogeneous producing zone.
R-26 Screen 1	54.0	18.1	n/a	Cerro Toledo/10-ft producing zone	Upgradient	—[c]	Upgradient well
R-26 Screen 2	42.0	23.0	n/a	Homogeneous producing zone	Upgradient	—	Upgradient well. Homogeneous producing zone suggests no heterogeneity.
R-27	44.5	23.0	n/a	Homogeneous producing zone	15,240	144	Homogeneous producing zone and likely depth of dispersive mixing suggest dilution is not likely.

[a] Using an analytical method it is possible to estimate the vertical dispersion of the plume, if it is assumed that (1) the groundwater fluxes downgradient from Canon de Valle are similar to the fluxes near the source, (2) there is no focusing/channeling of the groundwater flow, and (3) vertical transverse dispersivity is on the order of 1/1000 of the traveled distance which is considered typical for the scale and heterogeneity impacting the transport (Neuman 1990, 090184; Freeze and Cherry 1972, 088742, Chapter 9). The vertical spread σ_Z of the plume is computed using the following expression:

$$\sigma_Z = \sqrt{2D_z t} = \sqrt{2\lambda_z L}$$

where *t* is traveled time [T], *L* is traveled distance [L], D_Z is vertical dispersion coefficient [L2/T], and λ_Z is vertical dispersivity [L]. The vertical depth d_Z defines the section that will contain the major fraction of the plume mass. It is computed as 1/3 of the vertical spread σ_Z. Since the mass distribution is bounded by the water table, 64.2 % of the contaminant mass should be within the calculated vertical depth

[b] n/a = Not applicable: The entire screen is below the water table.

[c] — = Upgradient well.

Table 4.2-1
General Information Regarding Monitoring Wells Near TA-16

Well	Completed	Transducers Installed (Most Recently)	Number of Intermediate Screens	Number of Regional Screens	Approximate Distances [mi] to Water-Supply Wells		
					PM-2	PM-4	PM-5
CdV-R-15-3	2000	06/2003	3	3	2.6	2.0	2.4
CdV-R-37-2	2001	08/2003	1	3	3.3	3.3	3.0
R-17	2006	12/2006	0	2	1.9	1.4	0.9
R-18	2004	10/2005	0	1	4.0	3.5	2.8
R-19	2000	12/2004	2	5	1.3	1.3	1.5
R-25	2000	06/2005	3 or 4	4 or 5	4.1	3.9	3.3
R-26	2004	11/2005	1	1	5.1	5.0	4.1
R-27	2005	09/2006	0	1	1.6	3.2	4.1

Table 4.2-2
Downgradient Monitoring Well Screens at the Top of the Regional Aquifer

Well	Screen	Avg March 2006 Water Level (ft)	Screen Top (ft bgs)	Screen Bottom (ft bgs)	Screen Length (ft)	Geologic Unit*	Screen Top Elev (ft)	Top of Screen from Water Table (ft)	Comment
CDV-R-15-3	4	6019.8	1235.1	1278.9	43.8	Tp	6023.8	4.0	Screen straddles water table
CDV-R-37-2	2	6137.3	1188.7	1213.8	25.1	Tt	6141.9	4.6	Screen straddles water table
R-17	1	5885.7	1057.0	1080.0	23.0	Tpf	5864.5	-21.2	Screen below water table
R-18	Single	6117.4	1358.0	1381.0	23.0	Tpf	6046.8	-70.6	Screen significantly below water table
R-19	3	5887.6	1171.4	1215.4	44.0	Tpf	5894.9	7.3	Screen straddles water table
R-25	4	6347.3	1184.6	1194.6	10.0	Tpf	6331.5	-15.8	Probable intermediate zone
R-25	5	6235.4	1294.7	1304.7	10.0	Tpf	6221.4	-14.0	Screen below water table
R-27	Single	5900.0	852.0	875.0	23.0	Tpf	5861.7	-38.3	Screen significantly below water table

Note: Screens shown in green straddle the water table. Screens within about 30 ft of the water table are shown in yellow. Screens more than 30 ft below the water table are shown in peach.

*Tp = Puye Formation; Tpf = fanglomerate member of Puye; Tt = Tshirege dacite.

Table 4.2-3
Summary of Transducer Types and Accuracy and Barometric Efficiency in Regional Wells

Well	Screen	Transducer Manufacturer	Transducer Type	Transducer Pressure Rating (psi)	Transducer Accuracy (ft)	Transducer Resolution (ft)	Barometric Efficiency (%)	Comment
CdV-R-15-3	4	Westbay	Absolute	100	0.23	0.012	n/a[a]	[b]
CdV-R-15-3	5	Westbay	Absolute	250	0.58	0.029	n/a	
CdV-R-15-3	6	Westbay	Absolute	250	0.58	0.029	n/a	
CdV-R-37-2	2	Westbay	Absolute	100	0.23	0.012	n/a	
CdV-R-37-2	3	Westbay	Absolute	100	0.23	0.012	n/a	
CdV-R-37-2	4	Westbay	Absolute	250	0.58	0.029	n/a	
R-17	1	In-Situ	Gagged	30	0.07	0.003	92	
R-17	2	In-Situ	Gagged	30	0.07	0.003	45	Transducer gage tube installed in well provides higher barometric efficiency
R-18	Single	In-Situ	Gagged	30	0.07	0.003	100	
R-19	3	Westbay	Absolute	100	0.23	0.012	n/a	
R-19	4	Westbay	Absolute	250	0.58	0.029	n/a	
R-19	5	Westbay	Absolute	250	0.58	0.029	n/a	
R-19	6	Westbay	Absolute	250	0.58	0.029	n/a	
R-19	7	Westbay	Absolute	500	1.16	0.058	n/a	
R-25	4	Westbay	Absolute	100	0.23	0.012	n/a	
R-25	5	Westbay	Absolute	100	0.23	0.012	n/a	
R-25	6	Westbay	Absolute	100	0.23	0.012	n/a	
R-25	7	Westbay	Absolute	250	0.58	0.029	n/a	
R-25	8	Westbay	Absolute	500	1.16	0.058	n/a	
R-26	2	Westbay	Absolute	250	0.58	0.029	na	
R-27	Single	In-Situ	Gagged	30	0.07	0.003	65	Recent data indicate barometric efficiency may be 90 to 100%

[a] n/a = Not applicable.
[b] Blank cell = No comments or issues.

Table 4.2-4
Summary of Transient Aquifer Responses in TA-16 Regional Aquifer Screens

Well	Screen	PM-2	PM-4	PM-5	Infiltration/ Recharge	Representativeness of Measured Water Levels	Hydrodynamic Behavior: Phreatic vs. Deep Screens
CdV-R-15-3	4	None	None	None	Possible	Yes	Phreatic
CdV-R-15-3	5	None	None	None	Possible	Yes	Deep
CdV-R-15-3	6	None	None	Possible	Possible	Maybe	Deep
CdV-R-37-2	2	None	None	None	Possible	Yes	Phreatic
CdV-R-37-2	3	None	None	None	Possible	Yes	Deep
CdV-R-37-2	4	None	None	None	Possible	Yes	Deep
R-17	1	Inadequate data	Inadequate data	Inadequate data	Inadequate data	Yes (preliminary estimate)	Inadequate data
R-17	2	Inadequate data	Inadequate data	Inadequate data	Inadequate data	Yes (preliminary estimate)	Inadequate data
R-18	Single	None	None	None	Possible	Yes	Phreatic/deep (?)
R-19	3	Possible	None	Possible	Possible	Maybe	Phreatic
R-19	4	Yes	Yes	Possible	None	Yes	Deep
R-19	5	Yes	Yes	Possible	None	Yes	Deep
R-19	6	Yes	Yes	Possible	None	Yes	Deep
R-19	7	Yes	Yes	Possible	None	Yes	Deep
R-25	4	None	None	None	Possible	Maybe	Phreatic(?)
R-25	5	None	None	None	Possible	No	Phreatic(?)
R-25	6	None	None	None	Possible	Maybe	Deep
R-25	7	None	None	None	Possible	Maybe	Deep
R-25	8	None	None	None	Possible	Maybe	Deep
R-26	2	None	None	None	Possible	No	Phreatic(?)
R-27	Single	Inadequate data	Inadequate data	Inadequate data	Inadequate data	Yes (preliminary estimate)	Inadequate data

Table 4.3-1
Characteristics of Hydrostratigraphic Units Represented in the Model

Unit	Name	Number of Nodes	Percentage in the Model	Permeability			Porosity		
				Distribution Type	Mean	Standard Deviation	Distribution Type	Min	Max
Tschicoma	Tt	73049	10.5%	Log normal	-10.5	0.50	Discrete	1.E-05	1.E-02
Keres Group	Tk	2865	0.4%	Log normal	-10.5	0.50	Discrete	1.E-05	1.E-02
Cerros del Rio basalt	Tb4	97099	14.0%	Log normal	-12.0	1.00	Discrete	1.E-05	1.E-01
Bayo Canyon basalt	Tb2	24007	3.5%	Log normal	-12.0	1.00	Discrete	1.E-05	1.E-01
Totavi Lentil	Tpt	22543	3.2%	Log normal	-11.0	0.33	Discrete	1.E-02	2.E-01
Pumaceous Puye	Tpp	29116	4.2%	Log normal	-12.5	0.50	Discrete	1.E-02	2.E-01
Puye fanglomerate	Tpf	152808	22.0%	Log normal	-12.5	0.50	Discrete	1.E-02	2.E-01
Santa Fe fanglomerate	Tf	78269	11.3%	Log normal	-12.5	0.50	Discrete	1.E-02	2.E-01
Santa Fe Silt and Sands	Ts	214192	30.9%	Log normal	-12.5	0.50	Discrete	1.E-02	2.E-01

Table 4.3-2
Statistical Properties of Dispersivities

	Distribution Type	Min	Max
Longitudinal dispersivity	Uniform	50	300
Transverse dispersivity	Uniform	5	30

Table 6.0-1
Capability of Screen to Provide R&R Samples
for Selected COPCs and Other Contaminant Plume Constituents

Well	Port Depth (ft)	Scr	Selected COPCs						Other Plume Constituents/MNA Indicators			
			Zone	Ba	Mn	RDX	Other HE	SVOC /VOCs	^3H	Cl	SO_4	NO_3
CdV-16-1(i)	624	1	Perched	■ [a]	■	■	■	■	■	■	■	■
CdV-16-2(i)r	850	1	Perched	■	■	■	■	■	■	■	■	■
CdV-R-15-3	1254	4	Phreatic	■	■	■	■	■	■	■	■	■
CdV-R-15-3	1350	5	Deep	— [b]	—	— ? [c]	—	—	■	■	—	—
CdV-R-15-3	1640	6	Deep	■	—	■ ? [d]	■ ?	■ ?	■	■	■	—
CdV-R-37-2	1200	2	Phreatic	—	—	— ?	—	—	■	■	—	—
CdV-R-37-2	1359	3	Deep	■	■	■	■	■	■	■	■	■
CdV-R-37-2	1551	4	Deep	■ ?	—	— ?	—	—	■	■	■ ?	—
R-17	1057	1	Phreatic (?)	■ ?	■ ?	■	■ ?	■ ?	■	■	■	■ ?
R-17	1124	2	Deep	■ ?	■ ?	■	■ ?	■ ?	■	■	■	■ ?
R-18	1358	1	Phreatic	■	■	■	■	■	■	■	■	■
R-19	909	2	Phreatic	■	■	■	■	■	■	■	■	■
R-19	1191	3	Deep	■	■	■	■	■	■	■	■	■ ?
R-19	1413	4	Deep	■	■	■	■	■	■	■	■	■
R-19	1586	5	Deep	—	—	— ?	—	—	■	■	—	—
R-19	1730	6	Deep	—	—	— ?	—	—	■	■	—	—
R-19	1835	7	Deep	—	—	— ?	—	—	■	— ?	—	—
R-25	755	1	Perched	■	—	■	■	■ ?	■	■	■	■
R-25	892	2	Perched	—	—	— ?	—	—	■	— ?	—	—
R-25	1192	4	Phreatic (?)	■ ?	■ ?	■ ?	■	■	■	— ?	— ?	■
R-25	1303	5	Phreatic (?)	—	—	— ?	—	—	■	■	■ ?	—
R-25	1406	6	Deep	■ ?	■	■	■	■	■	■	■	■
R-25	1606	7	Deep	■ ?	■	■	■	■	■	■	■	■
R-25	1796	8	Deep	■ ?	■	■	■	■	■	■	■	■
R-26	659	1	Phreatic (?)	■	■	■	■	■	■	■	■	■
R-27	852	1	Phreatic (?)	■	■	■	■	■	■	■	■	■

Note: The conditions under which a screen cannot provide R&R sample because of residual effects of drilling are tabulated in Tables 3.3-2a and 3.3-2b.

[a] ■ = Screen can provide reliable and representative sample for this COPC.

[b] — = Screen cannot provide R&R sample for this COPC.

[c] — ? = Screen probably cannot provide R&R sample for this analyte, but uncertainty is associated with this judgment, as documented in Tables 3.2-1, 3.3-2a, or 3.3-2b.

[d] ■? = Screen can probably provide R&R sample for this analyte, but uncertainty associated with this judgment.

Table 6.0-2
Monitoring Well Screens Downgradient from TA-16 at the Top of the Regional Aquifer

Well	Screen	Distance from TA-16 Sources	Screen Top (ft bgs)	Screen Bottom (ft bgs)	Screen Length (ft)	Geologic Unit	Comment/Importance to Monitoring Network
CDV-R-15-3	4	< 1.0 mile	1235.1	1278.9	43.8	Tp	Moderately important for monitoring contaminant migration from TA-16, central areas. Near field.
CDV-R-37-2	2	< 0.5 miles	1188.7	1213.8	25.1	Tt	Important for monitoring contaminant migration from TA-16 southern sources such as Martin spring canyon. Near field
R-17	1	< 2.0 miles	1057.0	1080.0	23.0	Tpf	Extremely important for monitoring contaminant migration from TA-16 sources in Cañon de Valle (postulated principal source of HE impacts on TA-16 groundwater). Far field. Potential sentinel well of PM-5.
R-18	Single	< 0.5 miles	1358.0	1381.0	23.0	Tpf	Extremely important for monitoring contaminant migration from TA-16 sources in Cañon de Valle (postulated principal source of HE impacts on TA-16 groundwater). Near field. Apparent low-level RDX contamination. Very important for model calibration.
R-19	3	< 2.0 miles	1171.4	1215.4	44.0	Tpf	Moderately important for monitoring contaminant migration from TA-16, central areas. Far field.
R-25	4	In plume	1184.6	1194.6	10.0	Tpf	Important for monitoring impacts of HE releases within boundaries of TA-16 plume.
R-25	5	In plume	1294.7	1304.7	10.0	Tpf	Important for monitoring impacts of HE releases within boundaries of TA-16 plume.
R-27	Single	< 2.0 miles	852.0	875.0	23.0	Tpf	Important for monitoring contaminant migration from TA-16 southern sources such as Martin spring canyon. Far field

Note: Geologic Unit designations: Tp = Puye Formation; Tpf = fanglomerate member of Puye; Tt = Tshicoma dacite.

Table 6.0-3
Summary of Recommended Actions for Wells/Screens Considered

Well/Screen Name	Recommended Action	Rationale
CdV-16-1(i)	Monitor in accordance with the “2007 Interim Facility-Wide Groundwater Monitoring Plan” (LANL 2007, 096665)	Well meets monitoring network objectives. It provides R&R data for COPCs and is located within the TA-16 plume; thus, it needs to be sampled to evaluate CME remedy.
CdV-16-2(i)	Plug and abandon the well	Well has not produced water since initial drilling. CdV-16-2(i) replaces CdV-16-2(i)r.
CdV-16-2(i)r	Monitor in accordance with the “2007 Interim Facility-Wide Groundwater Monitoring Plan” (LANL 2007, 096665)	Well meets monitoring network objectives. It provides R&R data for COPCs and is located within the TA-16 plume; thus, it needs to be sampled to evaluate CME remedy.
CdV-16-3(i)	Complete as a single screen well within the regional aquifer	Borehole is currently open and within poorly producing Tschicoma dacites. Well is located in an important location to augment TA-16 monitoring network and provides useful information about the regional hydraulic gradients along the water table in this area.
CdV-R-15-3 (Screens 1–3)	Monitor for presence of water during sampling of CdV-R-15-3 in accordance with the “2007 Interim Facility-Wide Groundwater Monitoring Plan” (LANL 2007, 096665)	These screens, located within possible perched zones observed during drilling, have never produced water.
CdV-R-15-3 (Screen 4)	Monitor in accordance with the “2007 Interim Facility-Wide Groundwater Monitoring Plan” (LANL 2007, 096665)	Well and screen meet monitoring network objectives. The screen provides R&R data for COPCs and is located overlapping the water table, which is a key criterion. It is an important component of monitoring networks for both a CdV source and a Martin Spring Canyon source (see Appendix E).
CdV-R-15-3 (Screen 5)	Abandon sampling screen	Well and screen do not currently meet monitoring network objectives. Screen conditions are improving slowly. Bentonite is present next to screen. Screen 6 of this well provides information on deep aquifer at this location.
CdV-R-15-3 (Screen 6)	Monitor in accordance with the “2007 Interim Facility-Wide Groundwater Monitoring Plan” (LANL 2007, 096665)	Well and screen meet most monitoring network objectives. The screen provides R&R data for COPCs (except manganese). Reducing conditions in screen are improving over time. It is an important component of monitoring networks for both a CdV source and a Martin Spring Canyon source (see Appendix E). It provides information on COPCs at this location at depth within the regional aquifer.
CdV-R-37-2 (Screen 1)	Monitor for presence of water during sampling of CdV-R-37-2 in accordance with the “2007 Interim Facility-Wide Groundwater Monitoring Plan” (LANL 2007, 096665)	This screen located within a possible perched zone observed during drilling has never produced water.

Table 6.0-3 (continued)

Well/Screen Name	Recommended Action	Rationale
CdV-R-37-2 (Screen 2)	Rehabilitate screen	Well and screen do not meet monitoring network objectives. The screen does not provide R&R data for COPCs. The screen remains strongly reducing and is not improving. It is located overlapping the water table, which is a key criterion. It is potentially an important component of monitoring networks particularly for a Martin Spring Canyon source (see Appendix E).
CdV-R-37-2 (Screen 3)	Monitor in accordance with the "2007 Interim Facility-Wide Groundwater Monitoring Plan" (LANL 2007, 096665)	Well and screen meet monitoring network objectives. The screen provides R&R data for COPCs. It is an important component of monitoring networks for both a CdV source and a Martin Spring Canyon source (see Appendix E). It provides information on COPCs at this locality at depth within the regional aquifer.
CdV-R-37-2 (Screen 4)	Monitor in accordance with the "2007 Interim Facility-Wide Groundwater Monitoring Plan" (LANL 2007, 096665). No rehabilitation proposed.	Well and screen do not currently meet monitoring network objectives. The screen still has reducing conditions, but the screen conditions are improving quickly. Screen 3 of this well provides information on deep aquifer at this location. Rehabilitating this screen would require pulling entire Westbay system.
R-17 (Screen 1)	Monitor in accordance with the "2007 Interim Facility-Wide Groundwater Monitoring Plan" (LANL 2007, 096665)	Well and screen meet monitoring network objectives. The screen provides R&R data for COPCs and is near the regional aquifer surface. It is an important component of monitoring networks for both a CdV source and a Martin Spring Canyon source (see Appendix E).
R-17	Monitor in accordance with the "2007 Interim Facility-Wide Groundwater Monitoring Plan" (LANL 2007, 096665)	Well and screen meet monitoring network objectives. The screen provides R&R data for COPCs and is located at depth within the regional aquifer. It is an important component of monitoring networks particularly for a CdV source (see Appendix E).
R-18	Monitor in accordance with the "2007 Interim Facility-Wide Groundwater Monitoring Plan" (LANL 2007, 096665)	Well and screen meet monitoring network objectives. The screen provides R&R data for COPCs and is near the regional aquifer surface. It is an important component of monitoring networks particularly for a CdV source (see Appendix E).
R-19 (Screen 1)	Monitor for presence of water during sampling of R-19 in accordance with the "2007 Interim Facility-Wide Groundwater Monitoring Plan" (LANL 2007, 096665)	This screen, located within a possible perched zone observed during drilling, has never produced water.
R-19 (Screen 2)	Monitor in accordance with the "2007 Interim Facility-Wide Groundwater Monitoring Plan" (LANL 2007, 096665)	Well meets monitoring network objectives. It provides R&R data for COPCs and is located within a perched zone.

Table 6.0-3 (continued)

Well/Screen Name	Recommended Action	Rationale
R-19 (Screen 3)	Monitor in accordance with the “2007 Interim Facility-Wide Groundwater Monitoring Plan” (LANL 2007, 096665)	Well and screen meet monitoring network objectives. The screen provides R&R data for COPCs and is located overlapping the water table, which is a key criteria. It is an important component of monitoring networks for both a CdV source and a Martin Spring Canyon source (see Appendix E).
R-19 (Screen 4)	Monitor in accordance with the “2007 Interim Facility-Wide Groundwater Monitoring Plan” (LANL 2007, 096665)	Well and screen meet monitoring network objectives. The screen provides R&R data for COPCs and is located at depth within the regional aquifer. It is an important component of monitoring networks for both a CdV and Martin Spring Canyon source (see Appendix E).
R-19 (Screens 5, 6, and 7)	Monitor at a frequency of once per year. Modify the “2007 Interim Facility-Wide Groundwater Monitoring Plan” (LANL 2007, 096665). No rehabilitation proposed.	Well and screens do not currently meet monitoring network objectives. Screens still have reducing conditions, but screen conditions are improving. Screen 4 of this well provides information on deep aquifer at this location. Rehabilitating these screens would require pulling entire Westbay system, potentially impacting useful Screens 2, 3, and 4.
R-25 (Screens 1 and 2)	Cease sampling these screens. Replace Screen 1 with a new intermediate Baske well at this location.	Well and screens do not currently meet monitoring network objectives. Screens are possibly subject to steel corrosion. They are located within the TA 16 plume, so the location depth needs to be sampled to evaluate CME remedy.
R-25 (Screen 3)	Replace Screen 3 with a new intermediate Baske well at this location	Well and screens do not currently meet monitoring network objectives. Cement in screen has prevented sampling since initial well installation. This depth in R-25 had the highest concentrations of RDX during drilling.
R-25 (Screen 4)	Monitor in accordance with the “2007 Interim Facility-Wide Groundwater Monitoring Plan” (LANL 2007, 096665)	Well and screen meet monitoring network objectives. It provides R&R data for COPCs and is located near the water table (depending on interpretation of regional hydrogeologic data), which is a key criterion. It is an important component of monitoring networks for a CdV source (see Appendix E) because it can diagnose near-field impacts on the deep aquifer near CdV.
R-25 (Screen 5)	Abandon sampling this screen	Screen does not provide R&R data for COPCs at this time. Screen does not appear to be improving quickly. Screens 4 and 6 to 8 provide data at this location for the deep aquifer.
R-25 (Screen 6, 7, and 8)	Monitor in accordance with the “2007 Interim Facility-Wide Groundwater Monitoring Plan” (LANL 2007, 096665)	Well and screens meet monitoring network objectives. They provide R&R data for COPCs and are within the regional aquifer.
R-25 (Screen 9)	Abandon sampling this screen	Screen does not provide R&R data for COPCs at this time. Screens 6 through 8 provide data at this location for the deep aquifer.

Table 6.0-3 (continued)

Well/Screen Name	Recommended Action	Rationale
R-26 (Screen 1)	Monitor in accordance with the "2007 Interim Facility-Wide Groundwater Monitoring Plan" (LANL 2007, 096665)	Well and screen meet monitoring network objectives. The screen provides R&R data for COPCs and is located upgradient of TA-16.
R-26 (Screen 2)	Abandon sampling of this screen	Well and screen have never been able to be sampled because of the presence of bentonite.
R-27	Monitor in accordance with the "2007 Interim Facility-Wide Groundwater Monitoring Plan" (LANL 2007, 096665)	Well and screen meet monitoring network objectives. The screen provides R&R data for COPCs and is near the regional aquifer surface. It is an important component of monitoring networks particularly for a Martin Spring Canyon source (see Appendix E).

Appendix A

Acronyms, Glossary, and Metric Conversion Table

A-1.0 ACRONYMS AND ABBREVIATIONS

A-DNT	amino-dinitrotoluene
bgs	below ground surface
BH	borehole
CdV	Cañon de Valle
CME	corrective measures evaluation
CMR	combinable magnetic resistance (tool)
CMS	corrective measures study
COPC	chemical of potential concern
CRDL	contract-required detection limit
DNX	dinitroso-RDX
DOE	Department of Energy (U.S.)
EP	Environmental Programs (Laboratory Directorate)
EPA	Environmental Protection Agency (U.S.)
EQL	estimated quantitation limit
GAC	granular activated carbon
gmp	gallon per minute
HE	high explosive(s)
HEXP	high explosives analytical suite
HI	hazard index
HMX	1,3,5,7-tetranitro-1,3,5,7-tetrazocine
ICP-MS	inductively coupled plasma–mass spectroscopy
IDL	instrument detection limit
IM	interim measure
IR	investigation report
LANL	Los Alamos National Laboratory
Ma	million years ago
MCL	maximum contaminant level
MDA	material disposal area
MDL	method detection limit
MNA	monitored natural attenuation
MNX	mononitrosodimethylamine
NFA	no further action
NMAC	New Mexico Administrative Code

NMED	New Mexico Environment Department
NMHWA	New Mexico Hazardous Waste Act
NMWQCC	New Mexico Water Quality Control Commission
NPDES	National Pollutant Discharge Elimination System
OD	outside diameter
ORP	oxidation reduction potential
PAH	polycyclic aromatic hydrocarbon
PM	Pajarito Mesa
ppb	parts per billion
R&R	reliable and representative
RCRA	Resource Conservation and Recovery Act
RDX	cyclotrimethylenetrinitramine
RFA	RCRA facility assessment
RFI	RCRA facility investigation
RPF	Records Processing Facility
SVOA	semivolatile organic analysis
SVOC	semivolatile organic compound
SWMU	solid waste management unit
SWSC	Sanitary Wastewater Systems Consolidation plant
TA	technical area
TKN	total Kjeldahl nitrogen
TNB	1,3,5-trinitrobenzene
TNT	2,4,6-trinitrotoluene [dynamite]
TNX	trinitroso-RDX
TOC	total organic carbon
VCA	voluntary corrective action
VOA	volatile organic analysis
VOC	volatile organic compound
WETF	Weapons Engineering Tritium Facility
WQDB	Water Quality Database

A-2.0 GLOSSARY

abandonment—The plugging of a well or borehole in a manner that precludes the migration of surface runoff or groundwater along the length of the well or borehole.

absorption—The uptake of water, other fluids, or dissolved chemicals by a cell or organism (e.g., tree roots absorb dissolved nutrients in soil).

administrative authority—For Los Alamos National Laboratory, one or more regulatory agencies, such as the New Mexico Environment Department, the U.S. Environmental Protection Agency, or the U.S. Department of Energy, as appropriate.

administrative order on consent—A legal agreement signed by the U.S. Environmental Protection Agency and an individual, business, or other entity through which a violator agrees to pay for the correction of violations, take the required corrective or cleanup actions, or refrain from an activity. It describes the actions to be taken, may be subject to a comment period, applies to civil actions, and can be enforced in court.

adsorption—The surface retention of solid, liquid, or gas molecules, atoms, or ions by a solid.

alkalinity—In water analysis, the presence of carbonates, bicarbonates, and/or hydroxides, and occasionally borates, chlorates, silicates, or phosphates.

alluvial—Pertaining to geologic deposits or features formed by running water.

alluvial fan—A fan-shaped piedmont accumulation of alluvium.

alluvium—Soil deposited by a river or other running water.

analysis—A critical evaluation, usually made by breaking a subject (either material or intellectual) down into its constituent parts, then describing the parts and their relationship to the whole. Analyses may include physical analysis, chemical analysis, toxicological analysis, and knowledge-of-process determinations.

analyte—The element, nuclide, or ion a chemical analysis seeks to identify and/or quantify; the chemical constituent of interest.

analytical method—A procedure or technique for systematically performing an activity.

aquifer—An underground geological formation (or group of formations) containing water that is the source of groundwater for wells and springs.

assessment—(1) The act of reviewing, inspecting, testing, checking, conducting surveillance, auditing, or otherwise determining and documenting whether items, processes, or services meet specified requirements. (2) An evaluation process used to measure the performance or effectiveness of a system and its elements. In this glossary, assessment is an all-inclusive term used to denote any one of the following: audit, performance evaluation, management system review, peer review, inspection, or surveillance.

background data—Data that represent naturally occurring concentrations of inorganic and radionuclide constituents in a geologic medium. Los Alamos National Laboratory's (the Laboratory's) background data are derived from samples collected at locations that are either within, or adjacent to, the Laboratory. These locations (1) are representative of geological media found within Laboratory boundaries, and (2) have not been affected by Laboratory operations.

background level—(1) The concentration of a substance in an environmental medium (air, water, or soil) that occurs naturally or is not the result of human activities. (2) In exposure assessment, the concentration of a substance in a defined control area over a fixed period of time before, during, or after a data-gathering operation.

basalt—A fine-grained, dark volcanic rock composed chiefly of plagioclase, augite, olivine, and magnetite.

baseline risk assessment—A site-specific analysis of the potential adverse effects of hazardous constituents that have been released from a site in the absence of any controls or mitigating actions. A baseline risk assessment consists of the following four steps: data collection and analysis, exposure assessment, toxicity assessment, and risk characterization.

bentonite—An absorbent aluminum silicate clay formed from volcanic ash and used in various adhesives, cements, and ceramic fillers. Because bentonite can absorb large quantities of water and expand to several times its normal volume, it is a common drilling mud additive.

borehole—(1) A hole drilled or bored into the ground, usually for exploratory or economic purposes. (2) A hole into which casing, screen, and other materials may be installed to construct a well.

borehole logging—The process of making remote measurements of physical, chemical, or other parameters at multiple depths in a borehole.

breccia—A coarse-grained rock that consists of angular fragments cemented together or embedded in a fine-grained matrix.

caldera—A large crater formed by a volcanic explosion or by the collapse of a volcanic cone.

canyon—A stream-cut chasm or gorge, the sides of which are composed of cliffs or a series of cliffs rising from the chasm's bed. Canyons are characteristic of arid or semiarid regions where downcutting by streams greatly exceeds weathering.

casing—A solid piece of pipe, typically steel, stainless steel, or polyvinyl chloride plastic, used to keep a well open in either unconsolidated material or unstable rock and as a means to contain zone-isolation materials, such as cement grout.

chemical—Any naturally occurring or human-made substance characterized by a definite molecular composition.

chemical analysis—A process used to measure one or more attributes of a sample in a clearly defined, controlled, and systematic manner. Chemical analysis often requires treating a sample chemically or physically before measurement.

chemical of potential concern (COPC)—A detected chemical compound or element that has the potential to adversely affect human receptors as a result of its concentration, distribution, and toxicity.

cleanup—A series of actions taken to deal with the release, or threat of a release, of a hazardous substance that could affect humans and/or the environment. The term cleanup is sometimes used interchangeably with the terms remedial action, removal action, or corrective action.

Compliance Order on Consent (Consent Order)—For the Environmental Remediation and Surveillance Program, an enforcement document signed by the New Mexico Environment Department, the U.S. Department of Energy, and the Regents of the University of California on March 1, 2005, which prescribes the requirements for corrective action at Los Alamos National Laboratory. The purposes of the Consent Order are (1) to define the nature and extent of releases of contaminants at, or from, the facility; (2) to identify and evaluate, where needed, alternatives for corrective measures to clean up contaminants in the environment and prevent or mitigate the migration of contaminants at, or from, the facility; and (3) to implement such corrective measures. The Consent Order supersedes the corrective action requirements previously specified in Module VIII of the Laboratory's Hazardous Waste Facility Permit.

conceptual model—See site conceptual model.

confined—Pertaining to groundwater in an artesian aquifer.

confluence—A place where two or more streams or canyons meet; the point where a tributary meets the main stream.

Consent Order—See Compliance Order on Consent.

consolidated unit—A group of solid waste management units (SWMUs), or SWMUs and areas of concern, which generally are geographically proximate and have been combined for the purposes of investigation, reporting, or remediation.

construction worker scenario—A land-use condition that evaluates exposures to a human receptor throughout a construction project. The activities typically involve substantial short-term on-site exposures.

contaminant—(1) Chemicals and radionuclides present in environmental media or on debris above background levels. (2) According to the March 1, 2005, Compliance Order on Consent (Consent Order), any hazardous waste listed or identified as characteristic in 40 Code of Federal Regulations (CFR) 261 (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]); any hazardous constituent listed in 40 CFR 261 Appendix VIII (incorporated by 20.4.1.200 NMAC) or 40 CFR 264 Appendix IX (incorporated by 20.4.1.500 NMAC); any groundwater contaminant listed in the Water Quality Control Commission (WQCC) Regulations at 20.6.3.3103 NMAC; any toxic pollutant listed in the WQCC Regulations at 20.6.2.7 NMAC; explosive compounds; nitrate; and perchlorate. (Note: Under the Consent Order, the term "contaminant" does not include radionuclides or the radioactive portion of mixed waste.)

corrective action—(1) In the Resource Conservation and Recovery Act, an action taken to rectify conditions potentially adverse to human health or the environment. (2) In the quality assurance field, the process of rectifying and preventing nonconformances.

corrective measure—An action taken at a solid waste management unit or area of concern to protect human health or the environment in the event of a release of contaminants into the environment, or to prevent a release of contaminants into the environment.

corrective measure evaluation—An evaluation of potential remedial alternatives undertaken to identify a preferred remedy that will be protective of human health and the environment and that will attain appropriate cleanup goals.

corrective measures study—A formal process for identifying and evaluating alternative remedies for releases at a facility.

detect (detection)—An analytical result, as reported by an analytical laboratory, that denotes a chemical or radionuclide to be present in a sample at a given concentration.

discharge—The accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying, or dumping of hazardous waste into, or on, any land or water.

disposal—The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into, or on, any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwaters.

dissolved oxygen—The amount of oxygen dissolved in water, in parts per million (ppm) by weight or in milligrams per liter (mg/L) by volume.

drilling fluid—The fluid used to lubricate a bit and to convey drill cuttings to the surface with rotary drilling equipment. Usually composed of bentonite slurry or muddy water. The fluid can become contaminated, lead to cross-contamination, and may require special disposal.

Environmental Restoration Project—A Los Alamos National Laboratory project established in 1989 as part of a U.S. Department of Energy nationwide program, and precursor of today's Environmental Remediation and Surveillance (ERS) Program. This program is designed (1) to investigate hazardous and/or radioactive materials that may be present in the environment as a result of past Laboratory operations, (2) to determine if the materials currently pose an unacceptable risk to human health or the environment, and (3) to remediate (clean up, stabilize, or restore) those sites where unacceptable risk is still present.

ephemeral—Pertaining to a stream or spring that flows only during, and immediately after, periods of rainfall or snowmelt.

ER identification (ER ID) number—A unique identifier assigned by the Environmental Remediation and Surveillance Program‘s Records Processing Facility to each document when it is submitted as a final record.

facility—All contiguous land (and structures, other appurtenances, and improvements on the land) used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units. For the purpose of implementing a corrective action, a facility is all the contiguous property that is under the control of the owner or operator seeking a permit under Subtitle C of the Resource Conservation and Recovery Act.

fault—A fracture, or zone of fractures, in rock along which vertical or horizontal movement has taken place and adjacent rock layers or bodies have been displaced.

geohydrology—The science that applies hydrologic methods to the understanding of geologic phenomena.

groundwater—Interstitial water that occurs in saturated earth material and is capable of entering a well in sufficient amounts to be used as a water supply.

grout—Cement or bentonite mixtures used for sealing boreholes and wells and for zone isolation. Only Portland Type I or II cement is approved for use at investigative sites.

hazard index—The sum of hazard quotients for multiple contaminants to which a receptor may have been exposed.

hazardous constituent (hazardous waste constituent)—According to the March 1, 2005, Compliance Order of Consent (Consent Order), any constituent identified in Appendix VIII of Part 261, Title 40 Code of Federal Regulations (CFR) (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]) or any constituent identified in 40 CFR 264, Appendix IX (incorporated by 20.4.1.500 NMAC).

hazardous waste—(1) Solid waste that is listed as a hazardous waste, or exhibits any of the characteristics of hazardous waste (i.e., ignitability, corrosivity, reactivity, or toxicity, as provided in 40 CFR, Subpart C). (2) According to the March 1, 2005, Compliance Order of Consent (Consent Order), any solid waste or combination of solid wastes that, because of its quantity, concentration, or physical, chemical, or infectious characteristics, meets the description set forth in New Mexico Statutes Annotated 1978, § 74-4-3(K) and is listed as a hazardous waste or exhibits a hazardous waste characteristic under 40 CFR 261 (incorporated by 20.4.1.200 New Mexico Administrative Code).

hydraulic conductivity—(1) A coefficient of proportionality that describes the rate at which a fluid can move through a permeable medium. The rate is a function of both the medium and the fluid flowing through it. (2) The quantity of water that will flow through a unit of cross-sectional area of a porous material per unit time under a hydraulic gradient of 1.00 (measured at right angles to the direction of flow) at a specified temperature.

hydraulic gradient—The rate of change in hydraulic head per unit of distance in the direction of groundwater flow.

hydraulic head—The elevation of the water table or potentiometric surface as measured in a well.

hydrogen-ion activity (pH)—The effective concentration (activity) of dissociated hydrogen ions (H+); a measure of the acidity or alkalinity of a solution that is numerically equal to 7 for neutral solutions, increases with alkalinity, and decreases as acidity increases.

hydrogeology—The science dealing with the occurrence of surface water and groundwater, their uses, and their functions in modifying the earth, primarily by erosion and deposition.

industrial scenario—A land-use condition in which current Los Alamos National Laboratory operations or industrial/commercial operations within Los Alamos County are continued or planned. Any necessary remediation involves cleanup to standards designed to ensure a safe and healthy work environment for workers.

infiltration—(1) The penetration of water through the ground surface into subsurface soil. (2) The technique of applying large volumes of wastewater to land to penetrate the surface and percolate through the underlying soil.

interflow—A runoff process that involves lateral subsurface flow within the soil zone.

interim measure—An action that can be implemented to minimize or prevent the migration of contaminants and to minimize or prevent actual or potential human or ecological exposure to contaminants, while long-term final corrective action remedies are evaluated and, if necessary, implemented.

intermittent stream—A stream that flows only in certain reaches as a result of the channel bed's losing and gaining characteristics.

instrument detection limit (IDL)—A measure of instrument sensitivity without any consideration for contributions to the signal from reagents. The IDL is calculated as follows: Three times the average of the standard deviations obtained on three nonconsecutive days from the analysis of a standard solution, with seven consecutive measurements of that solution per day. The standard solution must be prepared at a concentration of three to five times the instrument manufacturer's estimated IDL.

logging tool—A device that is run in a borehole to make borehole logging measurements.

Los Alamos unlimited release (LA-UR) number—A unique identification number required for all documents or presentations prepared for distribution outside Los Alamos National Laboratory (the Laboratory). LA-UR numbers are obtained by filling out a technical information release form (http://enterprise.lanl.gov/alpha.htm) and submitting the form together with 2 copies of the document to the Laboratory's Classification Group (S-7) for review.

material disposal area (MDA)—A subset of the solid waste management units at Los Alamos National Laboratory (the Laboratory) that include disposal units such as trenches, pits, and shafts. Historically, various disposal areas (but not all) were designated by the Laboratory as MDAs.

method detection limit (MDL)—The minimum concentration of a substance that can be measured and reported with a known statistical confidence that the analyte concentration is greater than zero. After subjecting samples to the usual preparation, the MDL is determined by analyzing those samples of a given matrix type that contain the analyte. The MDL is used to establish detection status.

medium (environmental)—Any material capable of absorbing or transporting constituents. Examples of media include tuffs, soils and sediments derived from these tuffs, surface water, soil water, groundwater, air, structural surfaces, and debris.

medium (geological)—The solid part of the hydrogeological system; may be unsaturated or saturated.

migration—The movement of inorganic and organic chemical species through unsaturated or saturated materials.

model—A schematic description of a physical, biological, or social system, theory, or phenomenon that accounts for its known or inferred properties and may be used for the further study of its characteristics.

Module VIII—Module VIII of the Los Alamos National Laboratory (the Laboratory) Hazardous Waste Facility Permit. This permit allows the Laboratory to operate as a hazardous-waste treatment, storage, and disposal facility. From 1990 to 2005, Module VIII included requirements from the Hazardous and Solid Waste Amendments. These requirements have been superceded by the March 1, 2005, Compliance Order on Consent (Consent Order).

monitoring well—(1) A well used to obtain water-quality samples or to measure groundwater levels, (2) A well drilled at a hazardous waste management facility or Superfund site to collect groundwater samples for the purpose of physical, chemical, or biological analysis and to determine the amounts, types, and distribution of contaminants in the groundwater beneath the site.

National Pollutant Discharge Elimination System (NPDES) —The national program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits to discharge wastewater or storm water, and for imposing and enforcing pretreatment requirements under the Clean Water Act.

outfall—A place where effluent is discharged into receiving waters.

perched water—A zone of unpressurized water held above the water table by impermeable rock or sediment.

permit—An authorization, license, or equivalent control document issued by the U.S. Environmental Protection Agency or an approved state agency to implement the requirements of an environmental regulation.

population—(1) A group of interbreeding organisms occupying a particular space. (2) The number of humans or other living creatures in a designated area.

porosity—The degree to which soil, gravel, sediment, or rock is permeated with pores or cavities through which water or air can move.

porphyritic—Pertaining to the texture of an igneous rock in which larger crystals (phenocrysts) are set in a finer ground mass or matrix.

Quaternary—The second period of the Cenozoic Era, following the Tertiary, and including the last two to three million years of earth history.

radiation—A stream of particles or electromagnetic waves emitted by atoms and molecules of a radioactive substance as a result of nuclear decay. The particles or waves emitted can consist of neutrons, positrons, alpha particles, beta particles, or gamma radiation.

radioactive material—For purposes of complying with U.S. Department of Transportation regulations, any material having a specific activity (activity per unit mass of the material) greater than 2 nanocuries per gram (nCi/g) and in which the radioactivity is evenly distributed.

radioactivity (radioactive decay; radioactive disintegration)—The spontaneous change in an atom by the emission of charged particles and/or gamma rays.

radionuclide—Radioactive particle (human-made or natural) with a distinct atomic weight number.

RCRA facility assessment (RFA)—Usually the first step in the Resource Conservation and Recovery Act (RCRA) corrective action process. The RFA includes the identification of potential and actual releases from solid waste management units and preliminary determinations about releases and the need for corrective action and stabilization measures.

RCRA facility investigation (RFI)—A Resource Conservation and Recovery Act (RCRA) investigation that determines if a release has occurred and characterizes the nature and extent of contamination at a hazardous waste facility. The RFI is generally equivalent to the remedial investigation portion of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

receptor—A person, other animal, plant, or geographical location that is exposed to a chemical or physical agent released to the environment by human activities.

recharge—The process by which water is added to a zone of saturation, usually by percolation from the soil surface (e.g., the recharge of an aquifer).

record—Any book, paper, map, photograph, machine-readable material, or other documentary material, regardless of physical form or characteristics.

recreational scenario—A land-use condition under which individuals may be exposed to contaminants for a limited amount of time as a result of outdoor activities such as hiking, camping, hunting, or fishing.

redox potential (Eh)—Chemical reactions whereby a participating element changes its valence state by losing or gaining orbital electrons. This may also be referred to as oxidation-reduction potential.

reference set—A hard-copy compilation of reference items cited in Environmental Remediation and Surveillance Program documents.

regional aquifer—Geologic material(s) or unit(s) of regional extent whose saturated portion yields significant quantities of water to wells, contains the regional zone of saturation, and is characterized by the regional water table or potentiometric surface.

regulatory standard—Media-specific contaminant concentration levels of potential concern that are mandated by federal or state legislation or regulation (e.g., the Safe Drinking Water Act, New Mexico Water Quality Control Commission regulations).

release—Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of hazardous waste or hazardous constituents into the environment.

remediation—(1) The process of reducing the concentration of a contaminant (or contaminants) in air, water, or soil media to a level that poses an acceptable risk to human health and the environment. (2) The act of restoring a contaminated area to a usable condition based on specified standards.

representativeness—The degree to which data accurately and precisely represent a characteristic of a population or an environmental condition.

residential scenario—The land use condition under which individuals may be exposed to contaminants as a result of living on or near contaminated sites.

Resource Conservation and Recovery Act—The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 (Public Law [PL] 94-580, as amended by PL 95-609 and PL 96-482, United States Code 6901 et seq.).

restricted area—Any area to which access is controlled by a licensee to protect individuals from exposure to radiation and radioactive materials. The “restricted area” shall not include areas used as residential quarters, although a separate room or rooms in a residential building may be set apart as a restricted area.

risk—A measure of the probability that damage to life, health, property, and/or the environment will occur as a result of a given hazard.

risk analysis—In the quality assurance field, a qualitative evaluation of the probability and the potential consequences associated with noncompliant documents or work activities.

risk assessment—See baseline risk assessment.

runoff—The portion of the precipitation on a drainage area that is discharged from the area.

run-on—Surface water that flows onto an area as a result of runoff occurring higher up on a slope.

sample—A portion of a material (e.g., rock, soil, water, or air), which, alone or in combination with other portions, is expected to be representative of the material or area from which it is taken. Samples are typically either sent to a laboratory for analysis or inspection or are analyzed in the field. When referring to samples of environmental media, the term field sample may be used.

sample matrix—In chemical analysis, that portion of a sample that is exclusive of the analytes of interest. Together, the matrix and the analytes of interest form the sample.

sediment—(1) A mass of fragmented inorganic solid that comes from the weathering of rock and is carried or dropped by air, water, gravity, or ice. (2) A mass that is accumulated by any other natural agent and that forms in layers on the earth’s surface (e.g., sand, gravel, silt, mud, fill, or loess). (3) A solid material that is not in solution and is either distributed through the liquid or has settled out of the liquid.

sensitivity—An indication of the lowest analyte concentration that can be measured with a specified degree of confidence.

site conceptual model (also conceptual site model)—A qualitative or quantitative description of sources of contamination, environmental transport pathways for contamination, and receptors that may be impacted by contamination and whose relationships describe qualitatively or quantitatively the release of contamination from the sources, the movement of contamination along the pathways to the exposure points, and the uptake of contaminants by the receptors.

site-specific health and safety plan (SSHASP)—A health and safety plan that has been tailored to a site or to an Environmental Remediation and Surveillance (ERS) Program field activity and that has been approved by an ERS health and safety representative. A SSHASP contains information specific to the project, including the scope of work, relevant history, descriptions of hazards from activity associated with the project site(s), and techniques for exposure mitigation (e.g., personal protective equipment and hazard mitigation).

slope—A ratio of units of elevation change to units of horizontal change, usually expressed in degrees.

soil—(1) A material that overlies bedrock and has been subject to soil-forming processes. (2) A sample media group that includes naturally occurring and artificial fill materials.

solid waste management unit (SWMU)—(1) Any discernible site at which solid wastes have been placed at any time, whether or not the site use was intended to be the management of solid or hazardous waste. SWMUs include any site at a facility at which solid wastes have been routinely and systematically released. This definition includes regulated sites (i.e., landfills, surface impoundments, waste piles, and land treatment sites), but does not include passive leakage or one-time spills from production areas and sites in which wastes have not been managed (e.g., product storage areas). (2) According to the March 1, 2005, Compliance Order on Consent (Consent Order), any discernible site at which solid waste has been placed at any time, and from which the New Mexico Environment Department determines there may be a risk of a release of hazardous waste or hazardous waste constituents (hazardous constituents), whether or not the site use was intended to be the management of solid or hazardous waste. Such sites include any area in Los Alamos National Laboratory at which solid wastes have been routinely and systematically released; they do not include one-time spills.

spring—Groundwater seeping out of the earth where the water table intersects the ground surface.

stratification—The process of separating into layers.

stratigraphy—The study of the formation, composition, and sequence of sediments, whether consolidated or not.

topography—The physical or natural features of an object or entity and their structural relationships.

tremie pipe—A small-diameter pipe used to carry sand pack, bentonite, or grouting materials to a borehole's bottom. Materials are pumped under pressure or poured to the hole bottom through the pipe. The pipe is retracted as the annular space is filled.

trip blank—A sample of analyte-free medium taken from a sampling site and returned to an analytical laboratory unopened, along with samples taken in the field; used to monitor cross contamination of samples during handling and storage both in the field and in the analytical laboratory.

tuff—Consolidated volcanic ash, composed largely of fragments produced by volcanic eruptions.

turbidity (nephelometric)—A measure of the intensity of light scattered by sample particulates relative to a standard reference suspension. The range of water turbidity is measured between 0 and 40 nephelometric turbidity units (NTU).

unconfined aquifer—An aquifer containing water that is not under pressure; the water level in a well is the same as the water table outside the well.

underflow—Groundwater flow beneath the bed of a nonflowing stream. Such water is often perched in the channel alluvium atop the bedrock surface.

unsaturated zone—The area above the water table where soil pores are not fully saturated, although some water may be present.

U.S. Department of Energy—The federal agency that sponsors energy research and regulates nuclear materials for weapons production.

U.S. Environmental Protection Agency (EPA)—The federal agency responsible for enforcing environmental laws. Although state regulatory agencies may be authorized to administer some of this responsibility, EPA retains oversight authority to ensure the protection of human health and the environment.

vadose zone—The zone between the land surface and the water table within which the moisture content is less than saturation (except in the capillary fringe) and pressure is less than atmospheric. Soil pore space also typically contains air or other gases. The capillary fringe is included in the vadose zone.

water content—The amount of water in an unsaturated medium, expressed as the ratio of the weight of water in a sample to the weight of the oven-dried sample (often expressed as a percentage).

watercourse—Any river, creek, arroyo, canyon, draw, wash, or other channel that has definite banks and beds and provides visual evidence of the occasional flow of water.

watershed—A region or basin drained by, or contributing waters to, a river, stream, lake, or other body of water and separated from adjacent drainage areas by a divide, such as a mesa, ridge, or other geologic feature.

water table—The top of the regional saturated zone; the piezometric surface associated with an unconfined aquifer.

welded tuff—A volcanic deposit hardened by the action of heat, pressures from overlying material, and hot gases.

well casing—A solid piece of pipe, typically steel or polyvinyl chloride (PVC) plastic, used to keep a well open in either unconsolidated materials or unstable rock and as a means to contain zone-isolation materials such as cement grout or bentonite.

well screen—A perforated wire-wrapped casing that allows fluids, but not solid material, to enter a well.

work plan—A document that specifies the activities to be performed when implementing an investigation or remedy. At a minimum, the work plan should identify the scope of the work to be performed, specify the procedures to be used to perform the work, and present a schedule for performing the work. The work plan may also present the technical basis for performing the work.

A-3.0 METRIC CONVERSION TABLE

Multiply SI (Metric) Unit	by	To Obtain US Customary Unit
kilometers (km)	0.622	miles (mi)
kilometers (km)	3281	feet (ft)
meters (m)	3.281	feet (ft)
meters (m)	39.37	inches (in.)
centimeters (cm)	0.03281	feet (ft)
centimeters (cm)	0.394	inches (in.)
millimeters (mm)	0.0394	inches (in.)
micrometers or microns (μm)	0.0000394	inches (in.)
centimeters (cm)	0.394	inches (in.)
millimeters (mm)	0.0394	inches (in.)
micrometers or microns (μm)	0.0000394	inches (in.)
square kilometers (km^2)	0.3861	square miles (mi^2)
hectares (ha)	2.5	acres
square meters (m^2)	10.764	square feet (ft^2)
cubic meters (m^3)	35.31	cubic feet (ft^3)
kilograms (kg)	2.2046	pounds (lb)
grams (g)	0.0353	ounces (oz)
grams per cubic centimeter (g/cm^3)	62.422	pounds per cubic foot (lb/ft^3)
milligrams per kilogram (mg/kg)	1	parts per million (ppm)
micrograms per gram (μg/g)	1	parts per million (ppm)
liters (L)	0.26	gallons (gal.)
milligrams per liter (mg/L)	1	parts per million (ppm)
degrees Celsius (°C)	9/5 + 32	degrees Fahrenheit (°F)

Appendix B

Most Recent Data for Wells Evaluated (After December 2005)
(on CD included with this document)

Appendix C

Water-Quality Data Used for Screen Assessments

C-1.0 PURPOSE OF THIS APPENDIX

The tables in this appendix document the evaluation of water-quality data for each sampling event from each screen against the applicable criteria.

C-2.0 OVERVIEW OF CONTENTS

Table C-1 defines laboratory qualifier codes that are reported with the analytical data in this appendix. Table C-2 defines abbreviations used in the data tables to indicate why a particular test outcome is indeterminate.

Tables C-3 through C-6 compare water-quality data against each of the applicable criteria for the six categories of drilling effects. The contents of these four data tables are organized as follows:

Table	Indicators
C-3 General Water Quality Indicators	• Tritium • Field pH • Field Alkalinity • Turbidity
C-4 Organic Indicators	• Acetone • Ammonia • Total Kjehdahl Nitrogen • Total Organic Carbon
C-5 General Inorganic (Non-metal) Indicators	• Barium • Calcium • Chloride • Fluoride • Magnesium • Nitrate + Nitrite • Oxygen Reduction Potential • Oxygen, Dissolved • Phosphate • Sodium • Sulfate • Sulfide
C-6 Trace Metal Indicators	• Chromium (Filtered, Total, Total-to-Filtered Ratio) • Iron (Filtered, Total, Total-to-Filtered Ratio) • Manganese • Molybdenum • Nickel • Strontium • Uranium • Zinc

Except as noted in the tables, in the column labeled “Source,” water-quality data are taken from the Water Quality Data Base (WQDB). Other data rources are abbreviated as follows in the tables:

- FN = Field data from field notebooks and/or data forms
- FP = Field parameter database in WQDB
- GR = Characterization well geochemistry report
- IP = Data in process of submission by the EES-6 Geochemistry and Geomaterials Research Laboratory (GGRL) to WQDB

Table C-7 provides a visual synopsis of the detailed data assessment tables in Table C-3 through C-6. In this table, the raw data and their qualifiers shown in the earlier tables have been stripped out, leaving only the Pass/Fail outcomes for each test. Tests are grouped by category of drilling effects; for example, all of the tests to evaluate redox conditions are grouped together in Category C. When the test outcomes are presented in a more compact way, trends and correlations may be discerned more readily.

Table C-8 summarizes the numbers of tests that passed and failed for each water sample, and reports the percentage passed. Finally, Table C-9 lists for each sample the individual test criteria that failed, again grouped by category of drilling effects. The identification of consistent outcomes for the different test categories is the basis for determining what residual drilling effects are present.

Table C-1
Laboratory Qualifier Codes Used in this Appendix

Laboratory Qualifier Code	Laboratory Qualifier Code Description
*	(Inorganic) - Duplicate analysis not within control limits. (Organic) - Spike recovery is equal to or outside the control criteria used.
B	(Inorganic) - Reported value was obtained from a reading that was less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL). (Organic) - Analyte present in the blank and the sample.
E	(Inorganic) (inductively coupled plasma - atomic emissions spectroscopy) - The result for this analyte in the serial dilution analysis was outside acceptance criteria. (Inorganic) (graphite furnace atomic adsorption) - The result for this analyte failed one or more contract laboratory procedure acceptance criteria as explained in the case narrative. (Organic) - The result for this analyte exceeded the upper range of the instrument initial calibration curve.
H	Holding time exceeded.
J	(Inorganic) -The associated numerical value is an estimated quantity. (Organic) - The associated numerical value is an estimated quantity.
J*	(Inorganic) -The associated numerical value is an estimated quantity. Duplicate analysis not within control limits.
N	(Inorganic) - Spiked sample recovery not within control limits. (Organic) - Presumptive evidence based on a mass spectral library search to make a tentative identification of the analyte.
U	The material was analyzed for, but was not detected above the level of the associated numeric value. The associated numerical value is either the sample quantitation limit or the sample detection limit.
U*	(Inorganic) - Compound was analyzed for, but was not detected. Duplicate analysis not within control limits.

Table C-1b
Data Sources (if other than WQDB)

Source Abbreviation	Description of Source
FN	Field data from field notebooks and/or data forms
FP	fFeld parameter database in WQDB
GR	Characterization well geochemistry report
IP	Data in process of submission by EES-6 to WQDB

Table C-2
Definitions of Test Outcomes

Abbreviation	Definition
P	Pass. The measured data meet the test condition
Fail	The measured data do not meet the test condition
Reasons for Indeterminate Outcomes	
DL	Indeterminate because of inadequate detection or reporting limit
Err	Indeterminate due to suspected error or otherwise unreliable data
NA	Indeterminate because this test is either not applicable or is meaningless for this case
ND	Indeterminate because no suitable data are available
Plm	Indeterminate because test is not considered reliable due to the known presence of a contaminant plume. See Table 4-21 for list of well screens and indicators to which this code applies.
Red	Indeterminate because this test is not reliable under the prevailing reducing conditions
UF	Indeterminate because this test is not reliable when applied to data from a nonfiltered sample

Table C-3
General Water-Quality Indicators

Well	Port Depth (ft)	Scr	Sample Collection Date	Event	Tritium	Modern Water Test	Field pH	Low pH Test	High pH Test	Test Gen-1		Field Alkalinity	Test Gen-2		Turbidity	Test Gen-3	
			Units			**pCi/L**		**SU**	**SU**				**mg/L**			**NTU**	
			Test			**<UL**		**>LL**	**<UL**				**<UL**			**<UL**	
			Limit: Regional Aquifer			**1**		**6.94**	**8.65**				**105**			**5**	
			Limit: Intermediate			**1**		**6.73**	**8.80**				**52**			**5**	
CdV-16-1(i)	624	1	1-Jun-05	1	67.7	No	5.18	No	Yes	Fail		63	Fail		5.8	Fail	
CdV-16-1(i)	624	1	29-Aug-05	2	67.1	No	6.79	Yes	Yes	P		49	P		4.9	P	
CdV-16-1(i)	624	1	7-Dec-05	3	63.2	No	6.78	Yes	Yes	P		52	P		2.3	P	
CdV-16-1(i)	624	1	9-Mar-06	4	65.8	No	6.80	Yes	Yes	P		38	P	FP	1.4	P	
CdV-16-2(i)r	850	1	14-Sep-05	1	–	ND	7.23	Yes	Yes	P		61	Fail	E6	—	ND	
CdV-16-2(i)r	850	1	15-Dec-05	2	8.4	No	7.23	Yes	Yes	P		107	Fail		2.5	P	
CdV-16-2(i)r	850	1	15-Mar-06	3	7.5	No	6.99	Yes	Yes	P		35	P	FP	91.2	Fail	
CdV-16-2(i)r	850	1	17-May-06	4	6.7	No	6.64	No	Yes	Fail		50	P	CL	3.3	P	
CdV-R-15-3	1254	4	3-Jan-01	1	–	ND	8.22	Yes	Yes	P	FN	60	P	CL	1.6	P	FN
CdV-R-15-3	1254	4	23-Apr-01	2	–	ND	7.53	Yes	Yes	P	FN	41	P	FN	1.2	P	FN
CdV-R-15-3	1254	4	18-Jul-01	3	1.5	No	6.96	Yes	Yes	P	FN	60	P	CL	0.8	P	FN
CdV-R-15-3	1254	4	9-Oct-01	4	-0.2	Yes	7.53	Yes	Yes	P		95	P	FP	0.54	P	
CdV-R-15-3	1254	4	4-Jan-02	5	0.3	Yes	8.59	Yes	Yes	P		59	P	FP	0.85	P	
CdV-R-15-3	1254	4	15-Apr-02	6	-0.1	Yes	8.34	Yes	Yes	P		63	P		0.68	P	
CdV-R-15-3	1254	4	16-Jul-02	7	-0.5	Yes	8.70	Yes	No	Fail		59	P		0.65	P	
CdV-R-15-3	1254	4	16-Sep-02	8	-0.1	Yes	8.71	Yes	No	Fail	FN	58	P	FN	0.77	P	FN
CdV-R-15-3	1254	4	14-Jan-03	9	0.2	Yes	8.96	Yes	No	Fail	FN	57	P	FN	0.36	P	FN
CdV-R-15-3	1254	4	1-May-03	10	6.4	No	8.32	Yes	Yes	P	FN	55	P	FN	0.39	P	FN
CdV-R-15-3	1254	4	30-Jul-03	11	0.3	Yes	8.23	Yes	Yes	P	FN	38	P	FN	0.24	P	FN
CdV-R-15-3	1254	4	6-Jan-04	12	0.9	Yes	7.63	Yes	Yes	P		59	P	E6	0.45	P	FN
CdV-R-15-3	1254	4	20-Apr-04	13	0.3	Yes	8.57	Yes	Yes	P		54	P		0.3	P	

Table C-3 (continued)

Well	Port Depth (ft)	Scr	Sample Collection Date	Event	Tritium	Modern Water Test	Field pH	Low pH Test	High pH Test	Test Gen-1		Field Alkalinity	Test Gen-2		Turbidity	Test Gen-3	
			Units			**pCi/L**		**SU**	**SU**				**mg/L**			**NTU**	
			Test			**<UL**		**>LL**	**<UL**				**<UL**			**<UL**	
			Limit: Regional Aquifer			**1**		**6.94**	**8.65**				**105**			**5**	
			Limit: Intermediate			**1**		**6.73**	**8.80**				**52**			**5**	
CdV-R-15-3	1254	4	6-Jul-04	14	-0.2	Yes	8.34	Yes	Yes	P		56	P		0.27	P	
CdV-R-15-3	1254	4	19-Oct-04	15	0.2	Yes	8.99	Yes	No	Fail		57	P		0.4	P	
CdV-R-15-3	1254	4	4-Apr-05	16	0.1	Yes	8.17	Yes	Yes	P		47	P		0.2	P	
CdV-R-15-3	1254	4	12-Jul-05	17	0.2	Yes	8.46	Yes	Yes	P		57	P	CL	0.3	P	
CdV-R-15-3	1254	4	18-Oct-05	18	0.6	Yes	8.39	Yes	Yes	P		50	P		0.3	P	
CdV-R-15-3	1254	4	19-Jan-06	19	0.0	Yes	8.36	Yes	Yes	P		50	P	FP	0.5	P	
CdV-R-15-3	1254	4	27-Mar-06	20	-0.1	Yes	8.44	Yes	Yes	P		52	P	FP	0.3	P	
CdV-R-15-3	1350	5	4-Jan-01	1	–	ND	7.45	Yes	Yes	P	FN	170	Fail	CL	3.4	P	FN
CdV-R-15-3	1350	5	25-Apr-01	2	–	ND	7.06	Yes	Yes	P	FN	120	Fail	CL	2.1	P	FN
CdV-R-15-3	1350	5	19-Jul-01	3	0.2	Yes	7.36	Yes	Yes	P	FN	97	P	CL	2.7	P	FN
CdV-R-15-3	1350	5	11-Oct-01	4	0.1	Yes	7.66	Yes	Yes	P		77	P	CL	2.12	P	
CdV-R-15-3	1350	5	15-Jan-02	5	0.3	Yes	7.80	Yes	Yes	P		75	P		0.71	P	
CdV-R-15-3	1350	5	15-Apr-02	6	-0.1	Yes	7.40	Yes	Yes	P		95	P		0.52	P	
CdV-R-15-3	1350	5	16-Jul-02	7	0.1	Yes	7.45	Yes	Yes	P		66	P		0.75	P	
CdV-R-15-3	1350	5	17-Sep-02	8	1.4	No	7.67	Yes	Yes	P	FN	75	P	CL	1.11	P	FN
CdV-R-15-3	1350	5	15-Jan-03	9	0.6	Yes	7.41	Yes	Yes	P	FN	70	P	CL	0.38	P	FN
CdV-R-15-3	1350	5	2-May-03	10	0.0	Yes	7.17	Yes	Yes	P	FN	66	P	CL	0.31	P	FN
CdV-R-15-3	1350	5	7-Jan-04	11	0.4	Yes	7.24	Yes	Yes	P	E6	85	P		0.29	P	FN
CdV-R-15-3	1350	5	21-Apr-04	12	0.4	Yes	7.66	Yes	Yes	P		71	P		0.29	P	
CdV-R-15-3	1350	5	7-Jul-04	13	-0.1	Yes	7.76	Yes	Yes	P		74	P		0.22	P	
CdV-R-15-3	1350	5	20-Oct-04	14	0.4	Yes	7.79	Yes	Yes	P		75	P		0.3	P	
CdV-R-15-3	1350	5	5-Apr-05	15	0.0	Yes	7.20	Yes	Yes	P		76	P		0.2	P	

Table C-3 (continued)

Well	Port Depth (ft)	Scr	Sample Collection Date	Event	Tritium	Modern Water Test	Field pH	Low pH Test	High pH Test	Test Gen-1		Field Alkalinity	Test Gen-2		Turbidity	Test Gen-3	
			Units			**pCi/L**		**SU**	**SU**				**mg/L**			**NTU**	
			Test			**<UL**		**>LL**	**<UL**				**<UL**			**<UL**	
			Limit: Regional Aquifer			**1**		**6.94**	**8.65**				**105**			**5**	
			Limit: Intermediate			**1**		**6.73**	**8.80**				**52**			**5**	
CdV-R-15-3	1350	5	12-Jul-05	16	0.0	Yes	7.32	Yes	Yes	P		67	P	CL	0.2	P	
CdV-R-15-3	1350	5	18-Oct-05	17	0.0	Yes	7.32	Yes	Yes	P		62	P		0.5	P	
CdV-R-15-3	1350	5	20-Jan-06	18	-0.3	Yes	7.29	Yes	Yes	P		65	P	FP	0.3	P	
CdV-R-15-3	1350	5	28-Mar-06	19	-0.2	Yes	6.65	No	Yes	Fail		55	P	FP	0.4	P	
CdV-R-15-3	1640	6	3-Jan-01	1	–	ND	7.31	Yes	Yes	P		110	Fail	CL	0.5	P	FN
CdV-R-15-3	1640	6	25-Apr-01	2	–	ND	7.27	Yes	Yes	P	FN	77	P	FN	1.1	P	FN
CdV-R-15-3	1640	6	20-Jul-01	3	0.1	Yes	7.27	Yes	Yes	P	FN	33	P	FN	0.9	P	FN
CdV-R-15-3	1640	6	12-Oct-01	4	–	ND	7.31	Yes	Yes	P		95	P	FP	0.86	P	
CdV-R-15-3	1640	6	15-Jan-02	5	0.0	Yes	7.78	Yes	Yes	P		67	P	FP	0.63	P	
CdV-R-15-3	1640	6	16-Apr-02	6	0.0	Yes	7.21	Yes	Yes	P		78	P		0.56	P	
CdV-R-15-3	1640	6	17-Jul-02	7	-0.1	Yes	7.26	Yes	Yes	P		65	P		0.75	P	
CdV-R-15-3	1640	6	18-Sep-02	8	3.3	No	7.32	Yes	Yes	P	FN	59	P	FN	0.93	P	FN
CdV-R-15-3	1640	6	16-Jan-03	9	0.4	Yes	7.44	Yes	Yes	P	FN	53	P	FN	0.33	P	FN
CdV-R-15-3	1640	6	5-May-03	10	-6.4	Yes	7.11	Yes	Yes	P	FN	55	P	FN	0.46	P	FN
CdV-R-15-3	1640	6	31-Jul-03	11	0.2	Yes	6.90	No	Yes	Fail	FN	42	P	FN	0.54	P	FN
CdV-R-15-3	1640	6	8-Jan-04	12	0.1	Yes	7.28	Yes	Yes	P	E6	60	P	E6	0.6	P	FN
CdV-R-15-3	1640	6	21-Apr-04	13	0.3	Yes	7.55	Yes	Yes	P		47	P		0.83	P	
CdV-R-15-3	1640	6	8-Jul-04	14	0.0	Yes	7.70	Yes	Yes	P		57	P		0.95	P	
CdV-R-15-3	1640	6	21-Oct-04	15	0.4	Yes	7.86	Yes	Yes	P		51	P		1.1	P	
CdV-R-15-3	1640	6	6-Apr-05	16	-0.2	Yes	7.11	Yes	Yes	P		60	P		0.7	P	
CdV-R-15-3	1640	6	13-Jul-05	17	0.3	Yes	7.42	Yes	Yes	P		59	P	CL	1.2	P	
CdV-R-15-3	1640	6	19-Oct-05	18	-0.4	Yes	7.57	Yes	Yes	P		63	P		0.6	P	

Table C-3 (continued)

Well	Port Depth (ft)	Scr	Sample Collection Date	Event	Tritium	Modern Water Test	Field pH	Low pH Test	High pH Test	Test Gen-1		Field Alkalinity	Test Gen-2		Turbidity	Test Gen-3	
			Units			**pCi/L**		**SU**	**SU**				**mg/L**			**NTU**	
			Test			**<UL**		**>LL**	**<UL**				**<UL**			**<UL**	
			Limit: Regional Aquifer			**1**		**6.94**	**8.65**				**105**			**5**	
			Limit: Intermediate			**1**		**6.73**	**8.80**				**52**			**5**	
CdV-R-15-3	1640	6	20-Jan-06	19	-0.4	Yes	7.41	Yes	Yes	P		66	P	FP	0.7	P	
CdV-R-15-3	1640	6	29-Mar-06	20	0.0	Yes	7.78	Yes	Yes	P		58	P	FP	0.7	P	
CdV-R-37-2	1200	2	28-Jan-02	1	0.1	Yes	6.98	Yes	Yes	P	FN	122	Fail	FN	3.45	Fail	FN
CdV-R-37-2	1200	2	23-Apr-02	2	0.3	Yes	6.76	No	Yes	Fail		80	P		4.91	Fail	
CdV-R-37-2	1200	2	18-Jul-02	3	0.4	Yes	6.81	No	Yes	Fail	FN	131	Fail	FN	12.9	Fail	FN
CdV-R-37-2	1200	2	18-Sep-02	4	0.4	Yes	7.02	Yes	Yes	P	FN	135	Fail	FN	14.9	Fail	FN
CdV-R-37-2	1200	2	21-Jan-03	5	3.2	Yes	7.00	Yes	Yes	P	FN	165	Fail	FN	11.7	Fail	FN
CdV-R-37-2	1200	2	6-May-03	6	0.0	Yes	6.93	No	Yes	Fail	FN	124	Fail	FN	12.1	Fail	FN
CdV-R-37-2	1200	2	5-Aug-03	7	0.4	Yes	6.92	No	Yes	Fail	FN	90	P	FN	26.4	Fail	FN
CdV-R-37-2	1200	2	2-Dec-03	8	0.5	Yes	7.20	Yes	Yes	P	FN	139	Fail	FN	16.6	Fail	FN
CdV-R-37-2	1200	2	13-Apr-04	9	0.4	Yes	7.29	Yes	Yes	P	E6	130	Fail	E6	13.2	Fail	FP
CdV-R-37-2	1200	2	26-Oct-04	10	0.4	Yes	6.98	Yes	Yes	P		131	Fail	E6	15	Fail	FP
CdV-R-37-2	1200	2	29-Mar-05	11	0.4	Yes	6.83	No	Yes	Fail		199	Fail	FN	12	Fail	FP
CdV-R-37-2	1200	2	6-Jul-05	12	0.4	Yes	6.83	No	Yes	Fail		106	Fail	CL	36	Fail	
CdV-R-37-2	1200	2	12-Oct-05	13	0.2	Yes	6.97	Yes	Yes	P		111	Fail		5.2	Fail	
CdV-R-37-2	1200	2	9-Jan-06	14	0.2	Yes	7.01	Yes	Yes	P		101	P	FP	12.9	Fail	
CdV-R-37-2	1200	2	21-Mar-06	15	0.2	Yes	6.46	No	Yes	Fail		77	P	CL	3.4	P	
CdV-R-37-2	1359	3	29-Jan-02	1	-0.2	Yes	7.47	Yes	Yes	P		65	P	FP	0.84	P	
CdV-R-37-2	1359	3	24-Apr-02	2	0.4	Yes	7.18	Yes	Yes	P		62	P		0.71	P	
CdV-R-37-2	1359	3	19-Jul-02	3	0.1	Yes	7.28	Yes	Yes	P	FN	55	P	FN	0.98	P	FN
CdV-R-37-2	1359	3	24-Sep-02	4	0.8	Yes	7.55	Yes	Yes	P	FN	46	P	FN	1.04	P	FN
CdV-R-37-2	1359	3	22-Jan-03	5	0.5	Yes	7.43	Yes	Yes	P	FN	55	P	FN	0.34	P	FN

Table C-3 (continued)

Well	Port Depth (ft)	Scr	Sample Collection Date	Event	Tritium	Modern Water Test	Field pH	Low pH Test	High pH Test	Test Gen-1		Field Alkalinity	Test Gen-2		Turbidity	Test Gen-3	
			Units			**pCi/L**		**SU**	**SU**				**mg/L**			**NTU**	
			Test			**<UL**		**>LL**	**<UL**				**<UL**			**<UL**	
			Limit: Regional Aquifer			**1**		**6.94**	**8.65**				**105**			**5**	
			Limit: Intermediate			**1**		**6.73**	**8.80**				**52**			**5**	
CdV-R-37-2	1359	3	7-May-03	6	0.0	Yes	7.46	Yes	Yes	P	FN	40	P	FN	0.25	P	FN
CdV-R-37-2	1359	3	6-Aug-03	7	0.5	Yes	7.61	Yes	Yes	P	FN	36	P	FN	0.49	P	FN
CdV-R-37-2	1359	3	3-Dec-03	8	0.2	Yes	7.77	Yes	Yes	P	FN	54	P	FN	0.26	P	FN
CdV-R-37-2	1359	3	13-Apr-04	9	-0.1	Yes	8.05	Yes	Yes	P	E6	57	P	E6	0.59	P	FP
CdV-R-37-2	1359	3	27-Oct-04	10	0.7	Yes	7.62	Yes	Yes	P		58	P		0.4	P	FP
CdV-R-37-2	1359	3	30-Mar-05	11	0.0	Yes	8.10	Yes	Yes	P	FP	59	P	FN	0.2	P	FP
CdV-R-37-2	1359	3	7-Jul-05	12	-0.1	Yes	7.89	Yes	Yes	P		57	P	CL	0.3	P	
CdV-R-37-2	1359	3	12-Oct-05	13	0.5	Yes	7.99	Yes	Yes	P		58	P		0.5	P	
CdV-R-37-2	1359	3	10-Jan-06	14	0.4	Yes	7.98	Yes	Yes	P		57	P	FP	0.4	P	
CdV-R-37-2	1359	3	22-Mar-06	15	-0.1	Yes	8.02	Yes	Yes	P		55	P	FP	3.1	P	
CdV-R-37-2	1551	4	30-Jan-02	1	0.0	Yes	6.97	Yes	Yes	P		86	P		4.08	P	
CdV-R-37-2	1551	4	25-Apr-02	2	0.4	Yes	6.89	No	Yes	Fail		69	P		1.22	P	
CdV-R-37-2	1551	4	22-Jul-02	3	0.2	Yes	6.81	No	Yes	Fail	FN	57	P	FN	1.19	P	FN
CdV-R-37-2	1551	4	26-Sep-02	4	0.1	Yes	6.92	No	Yes	Fail	FN	51	P	FN	1.26	P	FN
CdV-R-37-2	1551	4	23-Jan-03	5	0.3	Yes	6.98	Yes	Yes	P	FN	51	P	FN	1.01	P	FN
CdV-R-37-2	1551	4	8-May-03	6	0.0	Yes	6.74	No	Yes	Fail	FN	47	P	FN	0.75	P	FN
CdV-R-37-2	1551	4	6-Aug-03	7	0.0	Yes	6.69	No	Yes	Fail	FN	37	P	FN	0.69	P	FN
CdV-R-37-2	1551	4	3-Dec-03	8	-0.2	Yes	6.78	No	Yes	Fail	FN	51	P	FN	1.39	P	FN
CdV-R-37-2	1551	4	15-Apr-04	9	-0.1	Yes	7.31	Yes	Yes	P	E6	52	P	E6	0.8	P	FP
CdV-R-37-2	1551	4	27-Oct-04	10	0.3	Yes	6.86	No	Yes	Fail		53	P		1.1	P	FP
CdV-R-37-2	1551	4	31-Mar-05	11	0.3	Yes	7.16	Yes	Yes	P	FP	50	P	FN	1	P	FP
CdV-R-37-2	1551	4	8-Jul-05	12	0.1	Yes	6.90	No	Yes	Fail		55	P	CL	1.1	P	

Table C-3 (continued)

Well	Port Depth (ft)	Scr	Sample Collection Date	Event	Tritium	Modern Water Test	Field pH	Low pH Test	High pH Test	Test Gen-1		Field Alkalinity	Test Gen-2		Turbidity	Test Gen-3	
			Units			**pCi/L**		**SU**	**SU**				**mg/L**			**NTU**	
			Test			**<UL**		**>LL**	**<UL**				**<UL**			**<UL**	
			Limit: Regional Aquifer			**1**		**6.94**	**8.65**				**105**			**5**	
			Limit: Intermediate			**1**		**6.73**	**8.80**				**52**			**5**	
CdV-R-37-2	1551	4	13-Oct-05	13	-0.1	Yes	6.74	No	Yes	Fail		50	P		3.1	P	
CdV-R-37-2	1551	4	11-Jan-06	14	0.2	Yes	7.24	Yes	Yes	P		57	P	FP	0.9	P	
CdV-R-37-2	1551	4	22-Mar-06	15	-0.4	Yes	6.96	Yes	Yes	P		58	P	FP	1.1	P	
R-17	1057	1	24-Feb-06	1	–	ND	7.47	Yes	Yes	P		58	P		—	ND	
R-17	1057	1	19-Oct-06	2	0.2	Yes	8.21	Yes	Yes	P		68	P		19.5	Fail	
R-17	1124	2	17-Oct-06	1	0.0	Yes	7.92	Yes	Yes	P		59	P		10	Fail	
R-18	1358	1	25-Aug-05	1	5.4	No	7.63	Yes	Yes	P		46	P		0.5	P	
R-18	1358	1	1-Dec-05	2	-0.1	Yes	7.67	Yes	Yes	P		22	P		0.2	P	
R-18	1358	1	7-Mar-06	3	7.3	No	7.62	Yes	Yes	P		45	P		1.1	P	
R-18	1358	1	16-May-06	4	0.3	Yes	7.22	Yes	Yes	P		50	P		1	P	
R-18	1358	1	15-Aug-06	5	0.0	Yes	7.72	Yes	Yes	P		51	P	CL	1	P	
R-18	1358	1	18-Dec-06	6	–	ND	7.44	Yes	Yes	P		50	P	CL	1.37	P	
R-19	909	2	22-Sep-00	1	-0.1	Yes	7.80	Yes	Yes	P		82	Fail	CL	25	Fail	
R-19	909	2	10-Apr-01	2	0.1	Yes	8.76	Yes	No	P		80	Fail		0.6	P	
R-19	909	2	5-Jul-01	3	0.3	Yes	9.10	Yes	No	Fail		86	Fail	CL	0.8	P	
R-19	909	2	13-Sep-01	4	-0.2	Yes	9.19	Yes	No	Fail		72	Fail	CL	0.8	P	
R-19	909	2	20-Aug-02	5	0.4	Yes	9.06	Yes	No	Fail		78	Fail		0.73	P	
R-19	909	2	15-Dec-03	6	-0.1	Yes	8.84	Yes	No	Fail		71	Fail	CL	0.2	P	
R-19	909	2	10-Jun-04	7	–	ND	8.94	Yes	No	Fail		68	Fail	CL	0.2	P	
R-19	909	2	21-Jul-05	8	–	ND	8.44	Yes	Yes	P		71	Fail	CL	0.4	P	
R-19	909	2	18-Aug-06	9	0.1	Yes	8.63	Yes	Yes	P		83	Fail	E6	0.2	P	
R-19	909	2	11-Dec-06	10	0.2	Yes	7.94	Yes	Yes	P		86	Fail	E6/IP	0.12	P	

Table C-3 (continued)

Well	Port Depth (ft)	Scr	Sample Collection Date	Event	Tritium	Modern Water Test	Field pH	Low pH Test	High pH Test	Test Gen-1		Field Alkalinity	Test Gen-2		Turbidity	Test Gen-3	
			Units			**pCi/L**		**SU**	**SU**				**mg/L**			**NTU**	
			Test			**<UL**		**>LL**	**<UL**				**<UL**			**<UL**	
			Limit: Regional Aquifer			**1**		**6.94**	**8.65**				**105**			**5**	
			Limit: Intermediate			**1**		**6.73**	**8.80**				**52**			**5**	
R-19	1191	3	26-Sep-00	1	-0.3	Yes	7.68	Yes	Yes	P		62	P	CL	1.8	P	
R-19	1191	3	9-Apr-01	2	0.6	Yes	6.81	No	Yes	Fail		65	P		0.8	P	
R-19	1191	3	10-Jul-01	3	0.3	Yes	7.08	Yes	Yes	P		63	P	CL	0.9	P	
R-19	1191	3	18-Sep-01	4	0.1	Yes	7.91	Yes	Yes	P		75	P	CL	0.8	P	
R-19	1191	3	22-Aug-02	5	0.4	Yes	7.87	Yes	Yes	P		54	P	CL	0.43	P	
R-19	1191	3	15-Dec-03	6	0.0	Yes	7.80	Yes	Yes	P		57	P	CL	0.4	P	
R-19	1191	3	14-Jun-04	7	–	ND	8.20	Yes	Yes	P		53	P	CL	0.2	P	
R-19	1191	3	21-Jul-05	8	–	ND	7.80	Yes	Yes	P		57	P	CL	0.6	P	
R-19	1191	3	15-Aug-06	9	-0.1	Yes	7.86	Yes	Yes	P		75	P	E6	0.27	P	
R-19	1191	3	11-Dec-06	10	0.2	Yes	7.78	Yes	Yes	P		66	P	E6/IP	0.16	P	
R-19	1413	4	6-Apr-01	1	0.0	Yes	8.78	Yes	No	Fail		60	P		4.6	P	
R-19	1413	4	11-Jul-01	2	-0.1	Yes	7.40	Yes	Yes	P		53	P	CL	6.3	Fail	
R-19	1413	4	19-Sep-01	3	0.2	Yes	7.50	Yes	Yes	P	GR	75	P	GR	0.5	P	GR
R-19	1413	4	26-Aug-02	4	0.0	Yes	7.73	Yes	Yes	P		50	P	CL	0.48	P	
R-19	1413	4	16-Dec-03	5	0.0	Yes	7.97	Yes	Yes	P		48	P	CL	0.4	P	
R-19	1413	4	15-Jun-04	6	–	ND	8.11	Yes	Yes	P		47	P	CL	0.2	P	
R-19	1413	4	28-Jul-05	7	–	ND	7.69	Yes	Yes	P		49	P	CL	0.4	P	
R-19	1413	4	16-Aug-06	8	0.1	Yes	7.50	Yes	Yes	P		65	P	E6	0.3	P	
R-19	1413	4	12-Dec-06	9	–	ND	7.58	Yes	Yes	P		55	P	CL	0.42	P	
R-19	1586	5	4-Apr-01	1	0.5	Yes	7.13	Yes	Yes	P		141	Fail		32.4	Fail	
R-19	1586	5	12-Jul-01	2	1.0	Yes	6.73	No	Yes	Fail		123	Fail		14.4	Fail	
R-19	1586	5	20-Sep-01	3	0.2	Yes	7.27	Yes	Yes	P		145	Fail	GR	6.5	Fail	

Table C-3 (continued)

Well	Port Depth (ft)	Scr	Sample Collection Date	Event	Tritium	Modern Water Test	Field pH	Low pH Test	High pH Test	Test Gen-1		Field Alkalinity	Test Gen-2		Turbidity	Test Gen-3	
			Units			**pCi/L**		**SU**	**SU**				**mg/L**			**NTU**	
			Test			**<UL**		**>LL**	**<UL**				**<UL**			**<UL**	
			Limit: Regional Aquifer			**1**		**6.94**	**8.65**				**105**			**5**	
			Limit: Intermediate			**1**		**6.73**	**8.80**				**52**			**5**	
R-19	1586	5	23-Aug-02	4	0.1	Yes	6.90	No	Yes	Fail		124	Fail	FP	4	P	
R-19	1586	5	16-Dec-03	5	0.2	Yes	6.90	No	Yes	Fail		125	Fail	CL	0.4	P	
R-19	1586	5	17-Aug-06	6	0.1	Yes	6.81	No	Yes	Fail		157	Fail	E6	0.4	P	
R-19	1586	5	11-Dec-06	7	-0.1	Yes	6.75	No	Yes	Fail		139	Fail	E6/IP	2.45	P	
R-19	1730	6	4-Oct-00	1	0.3	Yes	7.23	Yes	Yes	P		112	Fail	CL	1.7	P	
R-19	1730	6	2-Apr-01	2	0.5	Yes	7.30	Yes	Yes	P		85	P		1.2	P	
R-19	1730	6	16-Jul-01	3	-0.2	Yes	7.14	Yes	Yes	P		75	P	CL	10	Fail	
R-19	1730	6	21-Sep-01	4	0.5	Yes	7.17	Yes	Yes	P		67	P	CL	1.1	P	
R-19	1730	6	27-Aug-02	5	0.0	Yes	7.12	Yes	Yes	P		50	P	FP	0.6	P	
R-19	1730	6	16-Dec-03	6	-0.2	Yes	6.87	No	Yes	Fail		41	P	CL	0.3	P	
R-19	1730	6	17-Aug-06	7	0.0	Yes	6.84	No	Yes	Fail		54	P	E6	0.2	P	
R-19	1730	6	11-Dec-06	8	-0.2	Yes	6.62	No	Yes	Fail		49	P	E6/IP	0.16	P	
R-19	1835	7	3-Oct-00	1	0.7	Yes	7.24	Yes	Yes	P		112	Fail	CL	17	Fail	
R-19	1835	7	29-Mar-01	2	0.6	Yes	7.69	Yes	Yes	P		230	Fail	CL	8.8	Fail	
R-19	1835	7	17-Jul-01	3	0.0	Yes	7.72	Yes	Yes	P		210	Fail	CL	23	Fail	
R-19	1835	7	24-Sep-01	4	0.2	Yes	7.55	Yes	Yes	P		160	Fail	CL	24	Fail	
R-19	1835	7	26-Aug-02	5	0.2	Yes	7.33	Yes	Yes	P		192	Fail	FP	10	Fail	
R-19	1835	7	17-Dec-03	6	0.2	Yes	7.60	Yes	Yes	P		150	Fail	CL	41	Fail	
R-19	1835	7	16-Jun-04	7	–	ND	7.75	Yes	Yes	P		133	Fail	CL	33	Fail	
R-19	1835	7	28-Jul-05	8	–	ND	7.60	Yes	Yes	P		126	Fail	CL	73	Fail	
R-19	1835	7	18-Aug-06	9	0.2	Yes	7.12	Yes	Yes	P		173	Fail	E6	14.9	Fail	
R-19	1835	7	13-Dec-06	10	–	ND	7.52	Yes	Yes	P	E6	156	Fail	E6/IP	—	ND	

Table C-3 (continued)

Well	Port Depth (ft)	Scr	Sample Collection Date	Event	Tritium	Modern Water Test	Field pH	Low pH Test	High pH Test	Test Gen-1		Field Alkalinity	Test Gen-2		Turbidity	Test Gen-3	
			Units			**pCi/L**		**SU**	**SU**				**mg/L**			**NTU**	
			Test			**<UL**		**>LL**	**<UL**				**<UL**			**<UL**	
			Limit: Regional Aquifer			**1**		**6.94**	**8.65**				**105**			**5**	
			Limit: Intermediate			**1**		**6.73**	**8.80**				**52**			**5**	
R-25	755	1	14-Nov-00	1	52.7	No	7.65	Yes	Yes	P		73	Fail	CL	1.6	P	
R-25	755	1	3-May-01	2	52.0	No	6.98	Yes	Yes	P		78	Fail		4.1	P	
R-25	755	1	13-Aug-01	3	52.0	No	7.39	Yes	Yes	P		64	Fail		—	ND	
R-25	755	1	4-Feb-02	4	52.4	No	7.53	Yes	Yes	P		95	Fail		6.18	Fail	
R-25	755	1	7-Aug-02	5	48.2	No	7.30	Yes	Yes	P		74	Fail		11	Fail	
R-25	755	1	11-Dec-03	6	41.4	No	6.91	Yes	Yes	P		64	Fail	CL	10	Fail	
R-25	755	1	1-Sep-04	7	40.4	No	6.81	Yes	Yes	P		49	P	CL	22	Fail	
R-25	755	1	2-Aug-05	8	39.3	No	6.82	Yes	Yes	P		59	Fail	CL	9.1	Fail	
R-25	892	2	15-Nov-00	1	138.9	No	8.83	Yes	No	Fail		130	Fail	CL	41.7	Fail	
R-25	892	2	4-May-01	2	55.2	No	9.08	Yes	No	Fail		130	Fail		8.7	Fail	
R-25	892	2	14-Aug-01	3	56.8	No	8.89	Yes	No	Fail		190	Fail	CL	18.2	Fail	
R-25	892	2	5-Feb-02	4	48.2	No	8.55	Yes	Yes	P		210	Fail		30.8	Fail	FP
R-25	892	2	8-Aug-02	5	52.2	No	8.22	Yes	Yes	P		202	Fail	FP	12	Fail	
R-25	892	2	10-Dec-03	6	48.1	No	7.68	Yes	Yes	P		146	Fail	CL	17	Fail	
R-25	892	2	3-Aug-05	7	38.3	No	7.03	Yes	Yes	P		86	Fail	CL	12	Fail	
R-25	1192	4	4-Dec-00	1	41.8	No	7.64	Yes	Yes	P		69	Fail	CL	5.3	Fail	
R-25	1192	4	7-May-01	2	38.3	No	7.31	Yes	Yes	P		78	Fail		31.7	Fail	
R-25	1192	4	14-Aug-01	3	39.6	No	7.30	Yes	Yes	P		74	Fail	CL	4.8	P	
R-25	1192	4	6-Feb-02	4	34.2	No	7.53	Yes	Yes	P		71	Fail		3.82	P	
R-25	1192	4	8-Aug-02	5	30.4	No	7.22	Yes	Yes	P		52	P	FP	3.7	P	
R-25	1192	4	10-Dec-03	6	36.9	No	6.89	Yes	Yes	P		75	Fail	CL	1.1	P	
R-25	1192	4	4-Aug-05	7	33.2	No	7.19	Yes	Yes	P		66	Fail	CL	7.6	Fail	

Table C-3 (continued)

Well	Port Depth (ft)	Scr	Sample Collection Date	Event	Tritium	Modern Water Test	Field pH	Low pH Test	High pH Test	Test Gen-1		Field Alkalinity	Test Gen-2		Turbidity	Test Gen-3	
			Units			**pCi/L**		**SU**	**SU**				**mg/L**			**NTU**	
			Test			**<UL**		**>LL**	**<UL**				**<UL**			**<UL**	
			Limit: Regional Aquifer			**1**		**6.94**	**8.65**				**105**			**5**	
			Limit: Intermediate			**1**		**6.73**	**8.80**				**52**			**5**	
R-25	1303	5	7-Dec-00	1	26.8	No	7.73	Yes	Yes	P		97	P	CL	6.2	Fail	
R-25	1303	5	8-May-01	2	17.2	No	7.54	Yes	Yes	P		90	P		3.2	P	
R-25	1303	5	15-Aug-01	3	–	ND	7.32	Yes	Yes	P		100	P	CL	4.9	P	
R-25	1303	5	7-Feb-02	4	17.8	No	7.57	Yes	Yes	P		120	Fail	FP	3.4	P	
R-25	1303	5	9-Aug-02	5	16.2	No	7.47	Yes	Yes	P		108	Fail	CL	4.8	P	
R-25	1303	5	9-Dec-03	6	15.5	No	7.38	Yes	Yes	P		92	P	CL	1.4	P	
R-25	1303	5	31-Aug-04	7	15.5	No	7.00	Yes	Yes	P		—	ND		5	P	
R-25	1303	5	9-Aug-05	8	–	ND	7.19	Yes	Yes	P		—	ND		3.6	P	
R-25	1406	6	8-Dec-00	1	25.9	No	7.91	Yes	Yes	P		90	P	CL	1.8	P	
R-25	1406	6	9-May-01	2	14.0	No	7.20	Yes	Yes	P		79	P		0.3	P	
R-25	1406	6	16-Aug-01	3	–	ND	7.60	Yes	Yes	P		88	P	CL	2.7	P	
R-25	1406	6	8-Feb-02	4	7.5	No	7.79	Yes	Yes	P		90	P		0.4	P	
R-25	1406	6	12-Aug-02	5	5.0	No	7.79	Yes	Yes	P		74	P	FP	0.5	P	
R-25	1406	6	9-Dec-03	6	3.7	No	7.93	Yes	Yes	P		67	P	CL	0.4	P	
R-25	1606	7	11-Dec-00	1	35.1	No	7.90	Yes	Yes	P		74	P	CL	10.2	Fail	
R-25	1606	7	11-May-01	2	10.8	No	7.66	Yes	Yes	P		66	P	CL	3.9	P	
R-25	1606	7	17-Aug-01	3	5.8	No	7.81	Yes	Yes	P		61	P	CL	4.7	P	
R-25	1606	7	11-Feb-02	4	3.0	No	7.80	Yes	Yes	P		65	P		2.6	P	FN
R-25	1606	7	12-Aug-02	5	1.7	No	8.06	Yes	Yes	P		46	P	FP	1.8	P	
R-25	1606	7	8-Dec-03	6	0.4	Yes	7.96	Yes	Yes	P		51	P	CL	1.4	P	
R-25	1796	8	12-Dec-00	1	37.4	No	8.07	Yes	Yes	P		83	P	CL	14.3	Fail	
R-25	1796	8	14-May-01	2	11.4	No	7.57	Yes	Yes	P		58	P		6.5	Fail	

Table C-3 (continued)

Well	Port Depth (ft)	Scr	Sample Collection Date	Event	Tritium	Modern Water Test	Field pH	Low pH Test	High pH Test	Test Gen-1		Field Alkalinity	Test Gen-2		Turbidity	Test Gen-3	
			Units			**pCi/L**		**SU**	**SU**				**mg/L**			**NTU**	
			Test			**<UL**		**>LL**	**<UL**				**<UL**			**<UL**	
			Limit: Regional Aquifer			**1**		**6.94**	**8.65**				**105**			**5**	
			Limit: Intermediate			**1**		**6.73**	**8.80**				**52**			**5**	
R-25	1796	8	20-Aug-01	3	6.4	No	8.21	Yes	Yes	P		64	P	CL	8.4	Fail	
R-25	1796	8	12-Feb-02	4	3.1	No	8.06	Yes	Yes	P		67	P		3.4	P	
R-25	1796	8	14-Aug-02	5	2.0	No	8.37	Yes	Yes	P		56	P	FP	4.4	P	
R-25	1796	8	4-Dec-03	6	0.4	Yes	8.62	Yes	Yes	P		54	P	CL	3.6	P	
R-25	1796	8	10-Aug-05	7	0.5	Yes	8.48	Yes	Yes	P		61	P	CL	5.1	Fail	
R-26	659	1	13-Apr-05	1	-0.3	Yes	7.70	Yes	Yes	P		46	P		0.1	P	
R-26	659	1	27-Jul-05	2	0.2	Yes	7.77	Yes	Yes	P		46	P		0.1	P	
R-26	659	1	2-Nov-05	3	0.1	Yes	7.67	Yes	Yes	P		41	P		0.1	P	
R-26	659	1	22-Feb-06	4	-0.1	Yes	7.68	Yes	Yes	P		48	P		0.2	P	FP
R-27	852	1	14-Nov-05	1	−	ND	7.57	Yes	Yes	P		48	P		—	ND	
R-27	852	1	1-Jul-06	2	0.1	Yes	7.63	Yes	Yes	P		45	P		0.8	P	

Data source: WQDB except where indicated otherwise.

Notes: Pass and fail outcomes for each sample are determined by comparison against test threshold criteria. In the above column headers, the indicator name and associated test identifier, type of test threshold (>LL or <UL), and threshold values for the regional aquifer and perched intermediate aquifer are listed from top to bottom. If reliable field data are available, these are used in lieu of pH and alkalinity data measured off-site.

−=no data, LL=lower limit, UL=upper limit, SU=standard (pH) units; P=pass; UF=unfiltered

CL=pH and alkalinity analyzed by off-site contract laboratory

E6=pH and alkalinity data measured by EES-6 on-site laboratory

FN=field data from field notebooks and/or data forms

FP=field parameter database in WQDB

IP=data in process of submission by EES-6 to WQDB

Table C-4
Organic Indicators

Well	Port Depth (ft)	Scr	Sample Date	Event		Acetone	LQC	Test B1		NH_3-N	LQC	Test B2		TKN	LQC	Test B3		TOC	LQC	Source	Test B4
Units								µg/L				mg/L				mg/L					mg/L
Test								<UL				<UL				<UL					<UL
Limit: Regional Aquifer								5				0.05				0.28					1
Limit: Intermediate								5				0.05				0.28					1
CdV-16-1(i)	624	1	1-Jun-05	1	<	64		Fail	<	0.01	U	P	<	0.01	U	P		1.30			Fail
CdV-16-1(i)	624	1	29-Aug-05	2	<	3	J	P	<	0.04	U	P		0.44		Fail		0.80	J		P
CdV-16-1(i)	624	1	7-Dec-05	3	<	5	U	P	<	0.01	U	P		0.52		Fail	<	1.04			P
CdV-16-1(i)	624	1	9-Mar-06	4	<	5	U	P	<	0.01	U	P		0.04	J	P		0.83	J		P
CdV-16-2(i)r	850	1	14-Sep-05	1		—		ND		—		ND		—		ND		—			ND
CdV-16-2(i)r	850	1	15-Dec-05	2		7.8		Fail	<	0.01	U	P	<	0.74		Fail	<	0.84	J		P
CdV-16-2(i)r	850	1	15-Mar-06	3	<	1.6	J	P	<	0.01	U	P	<	0.06	J	P		0.58	J		P
CdV-16-2(i)r	850	1	17-May-06	4	<	3.9	J	P	<	0.1	U	DL		0.01	J	P		0.46	J		P
CdV-R-15-3	1254	4	3-Jan-01	1		—		ND		—		ND		—		ND		—			ND
CdV-R-15-3	1254	4	23-Apr-01	2		—		ND		—		ND		—		ND		—			ND
CdV-R-15-3	1254	4	18-Jul-01	3	<	30	U	DL		—		ND		—		ND	<	1	U		P
CdV-R-15-3	1254	4	9-Oct-01	4		6.9	B	P	<	0.05	U	P		0.52		Fail		0.15	J		P
CdV-R-15-3	1254	4	4-Jan-02	5	<	5	U	P	<	0.05	U	P		0.74		Fail		0.59			P
CdV-R-15-3	1254	4	15-Apr-02	6		—		ND	<	0.05	U	P	<	0.1	U	P		0.41			P
CdV-R-15-3	1254	4	16-Jul-02	7		—		ND	<	0.05	U	P		0.27		P		0.46			P
CdV-R-15-3	1254	4	16-Sep-02	8	<	5	U	P	<	0.05	U	P		0.14		P		0.47			P
CdV-R-15-3	1254	4	14-Jan-03	9		—		ND	<	0.05	U	P		0.09	J	P		0.48			P
CdV-R-15-3	1254	4	1-May-03	10		—		ND	<	0.05	U	P		0.15		P		0.32			P
CdV-R-15-3	1254	4	30-Jul-03	11		—		ND		—		ND		—		ND		—			ND
CdV-R-15-3	1254	4	6-Jan-04	12	<	5	U	P		0.04	J	P		0.13		P		0.36			P
CdV-R-15-3	1254	4	20-Apr-04	13		—		ND	<	0.016	U	P		0.16		P		0.43			P

Table C-4 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Acetone	LQC	Test B1		NH3-N	LQC	Test B2		TKN	LQC	Test B3		TOC	LQC	Source	Test B4
Units								**µg/L**				**mg/L**				**mg/L**					**mg/L**
Test								**<UL**				**<UL**				**<UL**					**<UL**
Limit: Regional Aquifer								**5**				**0.05**				**0.28**					**1**
Limit: Intermediate								**5**				**0.05**				**0.28**					**1**
CdV-R-15-3	1254	4	6-Jul-04	14		—		ND	<	0.016	U	P	<	0.04	U	P		0.24			P
CdV-R-15-3	1254	4	19-Oct-04	15		—		ND	<	0.02	U	P		0.07	J	P	<	0.30			P
CdV-R-15-3	1254	4	4-Apr-05	16	<	5	U	P	<	0.01	U	P	<	0.12		P		0.40			P
CdV-R-15-3	1254	4	12-Jul-05	17	<	5	U	P	<	0.01	U	P		0.06	J	P	<	0.30			P
CdV-R-15-3	1254	4	18-Oct-05	18	<	5	U	P	<	0.01	U	P	<	0.22	J	P		0.95	J		P
CdV-R-15-3	1254	4	19-Jan-06	19	<	5	U	P	<	0.05	U	P	<	0.01	U	P		—			ND
CdV-R-15-3	1254	4	27-Mar-06	20	<	2.4	J	P	<	0.01	U	P		26.7		Err	<	0.33	U		P
CdV-R-15-3	1350	5	4-Jan-01	1		—		ND		—		ND		—		ND		—			ND
CdV-R-15-3	1350	5	25-Apr-01	2		—		ND		—		ND		—		ND		—			ND
CdV-R-15-3	1350	5	19-Jul-01	3		17	J	ND		—		ND		—		ND		4.50			Fail
CdV-R-15-3	1350	5	11-Oct-01	4	<	14	B	Fail		0.16		Fail		0.43		Fail		4.34			Fail
CdV-R-15-3	1350	5	15-Jan-02	5	<	5	U	P		0.14		Fail		0.43		Fail		4.68			Fail
CdV-R-15-3	1350	5	15-Apr-02	6		6.3		Fail		0.21		Fail		0.25		P		3.88			Fail
CdV-R-15-3	1350	5	16-Jul-02	7		—		ND		0.12		Fail		0.21		P		3.11			Fail
CdV-R-15-3	1350	5	17-Sep-02	8		6.3		Fail		0.13		Fail		0.33		Fail		2.50			Fail
CdV-R-15-3	1350	5	15-Jan-03	9		—		ND		0.05		P		15.5		Err		4.09			Fail
CdV-R-15-3	1350	5	2-May-03	10		—		ND		0.11		Fail		0.3		Fail		4.47			Fail
CdV-R-15-3	1350	5	7-Jan-04	11		22		Fail		0.15		Fail	<	0.25		P		8.00			Fail
CdV-R-15-3	1350	5	21-Apr-04	12		—		ND		0.113		Fail		0.19		P		5.57			Fail
CdV-R-15-3	1350	5	7-Jul-04	13		—		ND	<	0.139		Fail		0.23		P		5.32			Fail
CdV-R-15-3	1350	5	20-Oct-04	14		—		ND		0.12		Fail		0.27		P		4.40			Fail
CdV-R-15-3	1350	5	5-Apr-05	15		16		Fail		0.12		Fail		0.3		Fail		4.90			Fail

Table C-4 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Acetone	LQC	Test B1		NH3-N	LQC	Test B2		TKN	LQC	Test B3		TOC	LQC	Source	Test B4
			Units					**µg/L**				**mg/L**				**mg/L**					**mg/L**
			Test					**<UL**				**<UL**				**<UL**					**<UL**
			Limit: Regional Aquifer					**5**				**0.05**				**0.28**					**1**
			Limit: Intermediate					**5**				**0.05**				**0.28**					**1**
CdV-R-15-3	1350	5	12-Jul-05	16		6		Fail		0.14		Fail		0.29		Fail		1.40			Fail
CdV-R-15-3	1350	5	18-Oct-05	17		3.4	J	P		0.133		Fail	<	0.09	J	P		1.48			Fail
CdV-R-15-3	1350	5	20-Jan-06	18	<	5	U	P		0.089		Fail		0.25		P		—			ND
CdV-R-15-3	1350	5	28-Mar-06	19	<	9.7		Fail		0.075		Fail	<	0.14		P		1.56			Fail
CdV-R-15-3	1640	6	3-Jan-01	1		—		ND		—		ND		0.31		Fail		—			ND
CdV-R-15-3	1640	6	25-Apr-01	2		—		ND		—		ND		—		ND		—			ND
CdV-R-15-3	1640	6	20-Jul-01	3		7.9	J	Fail		—		ND		—		ND	<	1.00	U		P
CdV-R-15-3	1640	6	12-Oct-01	4		—		ND		0.1		Fail		—		ND		—			ND
CdV-R-15-3	1640	6	15-Jan-02	5	<	5	U	P		0.06		Fail		0.33		Fail		1.41			Fail
CdV-R-15-3	1640	6	16-Apr-02	6		—		ND		0.15		Fail		0.24		P		1.13			Fail
CdV-R-15-3	1640	6	17-Jul-02	7		—		ND		0.06		Fail		0.25		P		1.23			Fail
CdV-R-15-3	1640	6	18-Sep-02	8	<	5	U	P		0.12		Fail		0.33		Fail		1.12			Fail
CdV-R-15-3	1640	6	16-Jan-03	9		—		ND		0.04		P		4.9		Err		1.21			Fail
CdV-R-15-3	1640	6	5-May-03	10		—		ND		0.18		Fail		0.56		Fail		0.98			P
CdV-R-15-3	1640	6	31-Jul-03	11		—		ND		—		ND		—		ND		—			ND
CdV-R-15-3	1640	6	8-Jan-04	12	<	5	U	P		0.03		P	<	0.19		P		0.64			P
CdV-R-15-3	1640	6	21-Apr-04	13		—		ND	<	0.016	U	P		0.07		P		0.48			P
CdV-R-15-3	1640	6	8-Jul-04	14		—		ND	<	0.016	U	P		0.15		P		0.41			P
CdV-R-15-3	1640	6	21-Oct-04	15		—		ND	<	0.02	U	P		0.14		P	<	0.50			P
CdV-R-15-3	1640	6	6-Apr-05	16	<	5	U	P	<	0.01	U	P		0.14		P		0.60			P
CdV-R-15-3	1640	6	13-Jul-05	17	<	5	U	P	<	0.01	U	P		0.06	J	P		—			ND
CdV-R-15-3	1640	6	19-Oct-05	18	<	5	U	P		0.015	J	P	<	0.01	U	P		1.11			Fail

Table C-4 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Acetone	LQC	Test B1		NH3-N	LQC	Test B2		TKN	LQC	Test B3		TOC	LQC	Source	Test B4
Units								µg/L				mg/L				mg/L					mg/L
Test								<UL				<UL				<UL					<UL
Limit: Regional Aquifer								5				0.05				0.28					1
Limit: Intermediate								5				0.05				0.28					1
CdV-R-15-3	1640	6	20-Jan-06	19	<	5	U	P	<	0.01	U	P		0.14		P		—			ND
CdV-R-15-3	1640	6	29-Mar-06	20	<	3	J	P	<	0.01	U	P	<	0.07	J	P		0.44	J		P
CdV-R-37-2	1200	2	28-Jan-02	1		19		Fail		0.41		Fail		0.81		Fail		4.87			Fail
CdV-R-37-2	1200	2	23-Apr-02	2		—		ND		0.51		Fail		0.83		Fail		5.66			Fail
CdV-R-37-2	1200	2	18-Jul-02	3		—		ND		0.52		Fail		0.7		Fail		6.20			Fail
CdV-R-37-2	1200	2	18-Sep-02	4	<	5	U	P		0.61		Fail		0.66		Fail		5.25			Fail
CdV-R-37-2	1200	2	21-Jan-03	5		—		ND		0.58		Fail		0.8		Fail		5.69			Fail
CdV-R-37-2	1200	2	6-May-03	6		—		ND		0.67		Fail		0.72		Fail		5.22			Fail
CdV-R-37-2	1200	2	5-Aug-03	7		—		ND		—		ND		—		ND		—			ND
CdV-R-37-2	1200	2	2-Dec-03	8	<	5	U	P		0.604		Fail		1.32		Fail		5.60			Fail
CdV-R-37-2	1200	2	13-Apr-04	9		—		ND		0.634		Fail		0.96		Fail		4.81			Fail
CdV-R-37-2	1200	2	26-Oct-04	10		—		ND		0.54		Fail		0.59		Fail		4.60			Fail
CdV-R-37-2	1200	2	29-Mar-05	11	<	5	U	P		0.39		Fail		0.48		Fail		5.70			Fail
CdV-R-37-2	1200	2	6-Jul-05	12	<	5	U	P		0.29		Fail		0.48		Fail		4.70			Fail
CdV-R-37-2	1200	2	12-Oct-05	13	<	5	U	P		0.299		Fail		0.26		P		4.78			Fail
CdV-R-37-2	1200	2	9-Jan-06	14	<	5	U	P		0.232		Fail	<	0.23		P		4.76			Fail
CdV-R-37-2	1200	2	21-Mar-06	15	<	3	J	P		0.204		Fail		0.31		Fail		4.17			Fail
CdV-R-37-2	1359	3	29-Jan-02	1		49		Fail	<	0.05	U	P		0.14		P		0.71			P
CdV-R-37-2	1359	3	24-Apr-02	2		—		ND	<	0.05	U	P		0.14		P		0.52			P
CdV-R-37-2	1359	3	19-Jul-02	3		—		ND	<	0.05	U	P		0.13		P		0.60			P
CdV-R-37-2	1359	3	24-Sep-02	4	<	5	U	P	<	0.05	U	P		0.14		P		0.50			P
CdV-R-37-2	1359	3	22-Jan-03	5		—		ND	<	0.05	U	P		0.21		P		0.45			P

Table C-4 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Acetone	LQC	Test B1		NH3-N	LQC	Test B2		TKN	LQC	Test B3		TOC	LQC	Source	Test B4
			Units					**µg/L**				**mg/L**				**mg/L**					**mg/L**
			Test					**<UL**				**<UL**				**<UL**					**<UL**
			Limit: Regional Aquifer					**5**				**0.05**				**0.28**					**1**
			Limit: Intermediate					**5**				**0.05**				**0.28**					**1**
CdV-R-37-2	1359	3	7-May-03	6		—		ND	<	0.05	U	P		0.17		P		0.29			P
CdV-R-37-2	1359	3	6-Aug-03	7		—		ND		—		ND		—		ND		—			ND
CdV-R-37-2	1359	3	3-Dec-03	8	<	5	U	P	<	0.034	J	P		0.2		P	<	0.53			P
CdV-R-37-2	1359	3	13-Apr-04	9		—		ND	<	0.016	U	P		0.34		Fail	<	0.27			P
CdV-R-37-2	1359	3	27-Oct-04	10		—		ND	<	0.02	U	P	<	0.04	U	P	<	0.30			P
CdV-R-37-2	1359	3	30-Mar-05	11	<	5	U	P	<	0.01	U	P		0.08	J	P	<	0.50			P
CdV-R-37-2	1359	3	7-Jul-05	12	<	5	U	P	<	0.01	U	P	<	0.01	U	P		0.20			P
CdV-R-37-2	1359	3	12-Oct-05	13	<	5	U	P	<	0.01	U	P		0.07	J	P	<	0.61	J		P
CdV-R-37-2	1359	3	10-Jan-06	14	<	5	U	P	<	0.01	U	P		0.94	J	Fail	<	0.62	J		P
CdV-R-37-2	1359	3	22-Mar-06	15	<	2.6	J	P	<	0.01	U	P	<	0.05	J	P	<	0.33	J		P
CdV-R-37-2	1551	4	30-Jan-02	1		46		Fail		0.32		Fail		0.54		Fail		3.87			Fail
CdV-R-37-2	1551	4	25-Apr-02	2		—		ND		0.33		Fail		0.46		Fail		1.38			Fail
CdV-R-37-2	1551	4	22-Jul-02	3		—		ND		0.27		Fail		0.41		Fail		1.56			Fail
CdV-R-37-2	1551	4	26-Sep-02	4	<	5	U	P		0.39		Fail		0.46		Fail		1.18			Fail
CdV-R-37-2	1551	4	23-Jan-03	5		—		ND		0.21		Fail		0.41		Fail		1.18			Fail
CdV-R-37-2	1551	4	8-May-03	6		—		ND		0.25		Fail		0.45		Fail		0.81			P
CdV-R-37-2	1551	4	6-Aug-03	7		—		ND		—		ND		—		ND		—			ND
CdV-R-37-2	1551	4	3-Dec-03	8	<	5	U	P		0.184		Fail		0.67		Fail	<	1.11			Fail
CdV-R-37-2	1551	4	15-Apr-04	9		—		ND		0.118		Fail		0.48		Fail		1.64			Fail
CdV-R-37-2	1551	4	27-Oct-04	10		—		ND		0.09		Fail		0.1	J	P		0.80			P
CdV-R-37-2	1551	4	31-Mar-05	11	<	5	U	P		0.08		Fail		0.33		Fail		1.40			Fail
CdV-R-37-2	1551	4	8-Jul-05	12	<	5	U	P		0.08		Fail		0.18		P		0.80			P

Table C-4 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Acetone	LQC	Test B1		NH3-N	LQC	Test B2		TKN	LQC	Test B3		TOC	LQC	Source	Test B4
Units								**µg/L**				**mg/L**				**mg/L**					**mg/L**
Test								**<UL**				**<UL**				**<UL**					**<UL**
Limit: Regional Aquifer								**5**				**0.05**				**0.28**					**1**
Limit: Intermediate								**5**				**0.05**				**0.28**					**1**
CdV-R-37-2	1551	4	13-Oct-05	13	<	5	U	P		0.074		Fail		0.09	J	P		1.46			Fail
CdV-R-37-2	1551	4	11-Jan-06	14	<	5	U	P		0.039	J	P	<	0.01	U	P	<	0.90	J		P
CdV-R-37-2	1551	4	22-Mar-06	15	<	2.2	J	P	<	0.029	J	P	<	0.09	J	P	<	0.68	J		P
R-17	1057	1	24-Feb-06	1		—		ND		—		ND		—		ND		0.34			P
R-17	1057	1	19-Oct-06	2	<	3.8	J	P	<	0.01	U	P	<	0.1	U	P		0.96	J		P
R-17	1124	2	17-Oct-06	1	<	5	U	P	<	0.01	U	P	<	0.01	U	P		0.39	J		P
R-18	1358	1	25-Aug-05	1	<	5	U	P	<	0.04	U	P	<	0.02	U	P		0.60	J		P
R-18	1358	1	1-Dec-05	2	<	5	U	P	<	0.01	U	P		0.49		Fail	<	1.03			Fail
R-18	1358	1	7-Mar-06	3	<	5	U	P	<	0.01	U	P		1		Fail		—			ND
R-18	1358	1	16-May-06	4	<	2.5	J	P	<	0.01	U	P	<	0.01	U	P		—			ND
R-18	1358	1	15-Aug-06	5	<	5	U	P		0.047	J	P	<	0.1	U	P		0.78	J		P
R-18	1358	1	18-Dec-06	6	<	5	U	P		0.593		Err	<	0.1	U	P		0.36			P
R-19	909	2	22-Sep-00	1	<	30	U	DL	<	0.05	U	P		0.28		P		3.30			Fail
R-19	909	2	10-Apr-01	2	<	30	U	DL	<	0.5	U	DL		0.12		P		1.20			Fail
R-19	909	2	5-Jul-01	3	<	30	U	DL	<	0.1	U	DL		0.16		P	<	1.00	U		P
R-19	909	2	13-Sep-01	4		3.1	J	P	<	0.024	U	P		0.17		P		0.73			P
R-19	909	2	20-Aug-02	5	<	5	U	P	<	0.024	U	P		—		ND		0.24			P
R-19	909	2	15-Dec-03	6		—		ND	<	0.024	U	P		—		ND		0.30			P
R-19	909	2	10-Jun-04	7		—		ND		—		ND		—		ND		—			ND
R-19	909	2	21-Jul-05	8		—		ND	<	0.01	U	P		0.32		Fail		—			ND
R-19	909	2	18-Aug-06	9		—		ND		—		ND		—		ND		—			ND
R-19	909	2	11-Dec-06	10		—		ND		—		ND		—		ND		—			ND

Table C-4 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Acetone	LQC	Test B1		NH3-N	LQC	Test B2		TKN	LQC	Test B3		TOC	LQC	Source	Test B4
Units								**µg/L**				**mg/L**				**mg/L**					**mg/L**
Test								**<UL**				**<UL**				**<UL**					**<UL**
Limit: Regional Aquifer								**5**				**0.05**				**0.28**					**1**
Limit: Intermediate								**5**				**0.05**				**0.28**					**1**
R-19	1191	3	26-Sep-00	1	<	30	U	DL	<	0.05	U	P		0.65		Fail	<	1.00	U		P
R-19	1191	3	9-Apr-01	2	<	30	U	DL	<	0.5	U	DL		0.14		P	<	1.00	U		P
R-19	1191	3	10-Jul-01	3	<	30	U	DL	<	0.1	U	DL		0.12		P	<	1.00	U		P
R-19	1191	3	18-Sep-01	4		2.1	J	P	<	0.024	U	P		0.13		P		0.50			P
R-19	1191	3	22-Aug-02	5	<	5	U	P	<	0.024	U	P		—		ND		0.14	J		P
R-19	1191	3	15-Dec-03	6		—		ND	<	0.024	U	P		—		ND		0.25			P
R-19	1191	3	14-Jun-04	7	<	5	U	P		—		ND		—		ND		—			ND
R-19	1191	3	21-Jul-05	8	<	5	U	P	<	0.01	U	P		22.9		Err		—			ND
R-19	1191	3	15-Aug-06	9		—		ND		—		ND		—		ND		—			ND
R-19	1191	3	11-Dec-06	10		—		ND		—		ND		—		ND		—			ND
R-19	1413	4	6-Apr-01	1	<	30	U	DL	<	0.5	U	DL		0.15		P	<	1.00	U		P
R-19	1413	4	11-Jul-01	2	<	30	U	DL	<	0.1	U	DL		0.11		P	<	1.00	U		P
R-19	1413	4	19-Sep-01	3		—		ND	<	0.024	U	P		0.08		P		0.47		GR	P
R-19	1413	4	26-Aug-02	4	<	5	U	P	<	0.024	U	P		—		ND		0.21			P
R-19	1413	4	16-Dec-03	5		—		ND	<	0.02	U	P		—		ND		0.18	J		P
R-19	1413	4	15-Jun-04	6	<	5	U	P		—		ND		—		ND		—			ND
R-19	1413	4	28-Jul-05	7	<	5	U	P	<	0.05		P		0.02	J	P		—			ND
R-19	1413	4	16-Aug-06	8	<	5	U	P		0.021	J	P	<	0.1	U	P		0.53	J		P
R-19	1413	4	12-Dec-06	9	<	5	U	P	<	0.01	U	P	<	0.1	U	P		0.53	J		P
R-19	1586	5	4-Apr-01	1	<	30	U	DL		0.9		Fail		1.5		Fail		8.70			Fail
R-19	1586	5	12-Jul-01	2	<	30	U	DL		0.77		Fail		1.1		Fail		11.00			Fail
R-19	1586	5	20-Sep-01	3		13		Fail		0.79		Fail		0.96		Fail		6.40			Fail

Table C-4 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Acetone	LQC	Test B1		NH3-N	LQC	Test B2		TKN	LQC	Test B3		TOC	LQC	Source	Test B4
Units								**µg/L**				**mg/L**				**mg/L**					**mg/L**
Test								**<UL**				**<UL**				**<UL**					**<UL**
Limit: Regional Aquifer								**5**				**0.05**				**0.28**					**1**
Limit: Intermediate								**5**				**0.05**				**0.28**					**1**
R-19	1586	5	23-Aug-02	4	<	5	U	P		0.88		Fail		—		ND		7.60			Fail
R-19	1586	5	16-Dec-03	5		—		ND		0.76		Fail		—		ND		6.40			Fail
R-19	1586	5	17-Aug-06	6		—		ND		—		ND		—		ND		—			ND
R-19	1586	5	11-Dec-06	7		—		ND		—		ND		—		ND		—			ND
R-19	1730	6	4-Oct-00	1	<	10	U	DL		0.429		Fail		6.3		Fail		2.70			Fail
R-19	1730	6	2-Apr-01	2	<	30	U	DL		0.73		Fail		0.6		Fail		7.80			Fail
R-19	1730	6	16-Jul-01	3	<	30	U	DL		0.6		Fail		1.6		Fail		2.50			Fail
R-19	1730	6	21-Sep-01	4	<	5	U	P		0.49		Fail		0.92		Fail		3.00			Fail
R-19	1730	6	27-Aug-02	5	<	5	U	P		0.31		Fail		—		ND		1.40			Fail
R-19	1730	6	16-Dec-03	6		—		ND		0.37		Fail		—		ND		0.65			P
R-19	1730	6	17-Aug-06	7		—		ND		—		ND		—		ND		—			ND
R-19	1730	6	11-Dec-06	8		—		ND		—		ND		—		ND		—			ND
R-19	1835	7	3-Oct-00	1		—		ND		0.21		Fail		4.6		Fail		—			ND
R-19	1835	7	29-Mar-01	2	<	30	U	DL	<	0.5	U	DL		0.92		Fail		0.01			Err
R-19	1835	7	17-Jul-01	3		11	J	Fail		0.27		Fail		0.84		Fail		4.40			Fail
R-19	1835	7	24-Sep-01	4		5.7		Fail		0.27		Fail		0.57		Fail		4.14			Fail
R-19	1835	7	26-Aug-02	5	<	5	U	P		0.37		Fail		—		ND		3.60			Fail
R-19	1835	7	17-Dec-03	6		—		ND		0.23		Fail		—		ND		2.30			Fail
R-19	1835	7	16-Jun-04	7	<	5	U	P		—		ND		—		ND		—			ND
R-19	1835	7	28-Jul-05	8	<	5	U	P		0.33		Fail		0.6		Fail		—			ND
R-19	1835	7	18-Aug-06	9		—		ND		—		ND		—		ND		—			ND
R-19	1835	7	13-Dec-06	10		—		ND		—		ND		—		ND		—			ND

Table C-4 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Acetone	LQC	Test B1		NH3-N	LQC	Test B2		TKN	LQC	Test B3		TOC	LQC	Source	Test B4
Units								**µg/L**				**mg/L**				**mg/L**					**mg/L**
Test								**<UL**				**<UL**				**<UL**					**<UL**
Limit: Regional Aquifer								**5**				**0.05**				**0.28**					**1**
Limit: Intermediate								**5**				**0.05**				**0.28**					**1**
R-25	755	1	14-Nov-00	1	<	30	U	DL	<	0.5	U	DL		—		ND		1.50		GR	Fail
R-25	755	1	3-May-01	2	<	30	U	DL	<	0.5	U	DL		—		ND	<	1.00	U		P
R-25	755	1	13-Aug-01	3	<	30	U	DL	<	0.1	U	DL		—		ND	<	1.00	U		P
R-25	755	1	4-Feb-02	4		3	J	P	<	0.05	U	P		0.39		Fail		1.41			Fail
R-25	755	1	7-Aug-02	5	<	5	U	P	<	0.024	U	P		—		ND		1.08			Fail
R-25	755	1	11-Dec-03	6	<	5	U	P	<	0.02	U	P		—		ND		0.94			P
R-25	755	1	1-Sep-04	7	<	5	U	P		—		ND		—		ND		—			ND
R-25	755	1	2-Aug-05	8		1	J	P	<	0.04	J	P	<	0.01	U	P		—			ND
R-25	892	2	15-Nov-00	1	<	30	U	DL	<	0.5	U	DL		—		ND		2.30		GR	Fail
R-25	892	2	4-May-01	2	<	30	U	DL	<	0.5	U	DL		—		ND		6.63			Fail
R-25	892	2	14-Aug-01	3	<	30	U	DL		0.1		Fail		—		ND		2.2			Fail
R-25	892	2	5-Feb-02	4		12		Fail	<	0.05	U	P		0.24		P		2.90			Fail
R-25	892	2	8-Aug-02	5	<	5	U	P	<	0.02	U	P		—		ND		2.70			Fail
R-25	892	2	10-Dec-03	6	<	5	U	P		0.05		P		—		ND		2.40			Fail
R-25	892	2	3-Aug-05	7	<	5	U	P		0.15		Fail		0.23		P		—			ND
R-25	1192	4	4-Dec-00	1	<	30	U	DL	<	0.5	U	DL		—		ND		1.10		GR	Fail
R-25	1192	4	7-May-01	2	<	30	U	DL	<	0.5	U	DL		—		ND		2.2			Fail
R-25	1192	4	14-Aug-01	3	<	30	U	DL		0.12		Fail		—		ND	<	1	U		P
R-25	1192	4	6-Feb-02	4		3.4	J	P	<	0.05	U	P		0.29		Fail		5.07			Fail
R-25	1192	4	8-Aug-02	5	<	5	U	P	<	0.02	U	P		—		ND		1.65			Fail
R-25	1192	4	10-Dec-03	6	<	5	U	P		0.56		Fail		—		ND		0.97			P
R-25	1192	4	4-Aug-05	7	<	5	U	P	<	0.01	U	P		0.17		P		—			ND

Table C-4 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Acetone	LQC	Test B1		NH3-N	LQC	Test B2		TKN	LQC	Test B3		TOC	LQC	Source	Test B4
Units								**µg/L**				**mg/L**				**mg/L**					**mg/L**
Test								**<UL**				**<UL**				**<UL**					**<UL**
Limit: Regional Aquifer								**5**				**0.05**				**0.28**					**1**
Limit: Intermediate								**5**				**0.05**				**0.28**					**1**
R-25	1303	5	7-Dec-00	1	<	30	U	DL	<	0.5	U	DL		—		ND		1.30		GR	Fail
R-25	1303	5	8-May-01	2	<	30	U	DL	<	0.5	U	DL		—		ND		7.00			Fail
R-25	1303	5	15-Aug-01	3	<	30	U	DL	<	0.1	U	DL		—		ND		—			ND
R-25	1303	5	7-Feb-02	4	<	5	U	P	<	0.05	U	P		0.21		P		3.44			Fail
R-25	1303	5	9-Aug-02	5	<	5	U	P	<	0.024	U	P		—		ND		6.91			Fail
R-25	1303	5	9-Dec-03	6	<	5	U	P		0.08		Fail		—		ND		10.30			Fail
R-25	1303	5	31-Aug-04	7	<	5	U	P		—		ND		—		ND		—			ND
R-25	1303	5	9-Aug-05	8	<	5	U	P		—		ND		—		ND		—			ND
R-25	1406	6	8-Dec-00	1	<	30	U	DL	<	0.5	U	DL		—		ND		0.91			P
R-25	1406	6	9-May-01	2	<	30	U	DL	<	0.5	U	DL		—		ND		1.3			Fail
R-25	1406	6	16-Aug-01	3		—		ND	<	0.1	U	DL		—		ND		—			ND
R-25	1406	6	8-Feb-02	4	<	5	U	P	<	0.05	U	P	<	0.1	U	P		0.72			P
R-25	1406	6	12-Aug-02	5	<	5	U	P	<	0.02	U	P		—		ND	<	0.54			P
R-25	1406	6	9-Dec-03	6	<	5	U	P	<	0.02	U	P		—		ND		0.44			P
R-25	1606	7	11-Dec-00	1	<	30	U	DL	<	0.5	U	DL		—		ND		0.88			P
R-25	1606	7	11-May-01	2	<	30	U	DL	<	0.5	U	DL		—		ND		1.70			Fail
R-25	1606	7	17-Aug-01	3	<	30	U	DL	<	0.1	U	DL		—		ND	<	1.00	U		P
R-25	1606	7	11-Feb-02	4	<	5	U	P	<	0.05	U	P	<	0.1	U	P		0.25			P
R-25	1606	7	12-Aug-02	5	<	5	U	P	<	0.02	U	P		—		ND		0.26			P
R-25	1606	7	8-Dec-03	6	<	5	U	P	<	0.02	U	P		—		ND		0.25			P
R-25	1796	8	12-Dec-00	1	<	30	U	DL	<	0.5	U	DL		—		ND		2.10		GR	Fail
R-25	1796	8	14-May-01	2	<	30	U	DL	<	0.5	U	DL		—		ND		—			ND

Table C-4 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Acetone	LQC	Test B1		NH3-N	LQC	Test B2		TKN	LQC	Test B3		TOC	LQC	Source	Test B4
Units								**µg/L**				**mg/L**				**mg/L**					**mg/L**
Test								**<UL**				**<UL**				**<UL**					**<UL**
Limit: Regional Aquifer								**5**				**0.05**				**0.28**					**1**
Limit: Intermediate								**5**				**0.05**				**0.28**					**1**
R-25	1796	8	20-Aug-01	3	<	30	U	DL	<	0.1	U	DL		—		ND		15.00			Err
R-25	1796	8	12-Feb-02	4	<	5	U	P	<	0.05	U	P	<	0.1	U	P		0.21			P
R-25	1796	8	14-Aug-02	5	<	5	U	P	<	0.02	U	P		—		ND		0.32			P
R-25	1796	8	4-Dec-03	6	<	5	U	P	<	0.03	J	P		—		ND	<	0.52			P
R-25	1796	8	10-Aug-05	7	<	5	U	P	<	0.01	U	P		0.23		P		—			ND
R-26	659	1	13-Apr-05	1	<	5	U	P	<	0.01	U	P	<	0.01	U	P	<	0.20			P
R-26	659	1	27-Jul-05	2	<	5	U	P		0.04	J	P		0.04	J	P		0.20			P
R-26	659	1	2-Nov-05	3	<	5	U	P	<	0.01	U	P		0.62		Fail	<	0.13	J		P
R-26	659	1	22-Feb-06	4	<	5	U	P	<	0.01	U	P	<	0.01	U	P		—			ND
R-27	852	1	14-Nov-05	1		—		ND		—		ND		—		ND		—			ND
R-27	852	1	1-Jul-06	2	<	1.5	J	P		0.034	J	P	<	0.01	U	P	<	0.33	U		P

Data source: WQDB except where indicated otherwise

Notes: Pass and fail outcomes for each sample are determined by comparison against test threshold criteria. From top to bottom in the column headers above are listed the indicator name and associated test identifier, units of measurement, type of test threshold, and threshold values for the regional aquifer and perched intermediate aquifer, respectively.

LL=lower limit, UL=upper limit, P=pass; UF=unfiltered

Table C-5a
General Inorganic (non-metal) Indicators

Well	Port Depth (ft)	Scr	Sample Date	Event	Ba mg/L	UF?	Source	Test D3	Test E2	Ca mg/L	UF?	Source	Test E1a	Test E1b	E1	Cl mg/L	Source	Test A1		F mg/L	LQ C	Source	Test A2	Mg mg/L	UF?	Source	Test E4		NO3-N mg/L	LQC	Source	Test C11
			Units					**mg/L**	**mg/L**				**mg/L**	**mg/L**	**Within**			**mg/L**					**mg/L**				**mg/L**					**mg/L**
			Test					**>LL**	**<UL**				**>LL**	**<UL**	**range**			**<UL**					**<UL**				**<UL**					**>LL**
			Limit: Regional Aquifer					**4.6**	**70**				**8.66**	**24.1**				**3.75**					**0.53**				**4.81**					**0.1**
			Limit: Intermediate					**1.4**	**72**				**4.39**	**17.3**				**1.75**					**0.23**				**6.12**					**0.1**
CdV-16-1(i)	624	1	1-Jun-05	1	17			P	P	13.0			Yes	Yes	P	5.78		Plm	<	0.03	U		P	5.5			P		0.60			P
CdV-16-1(i)	624	1	29-Aug-05	2	17			P	P	13.5			Yes	Yes	P	6.64		Plm		0.09	J		P	5.6			P		0.61			P
CdV-16-1(i)	624	1	7-Dec-05	3	17			P	P	13.4			Yes	Yes	P	6.75		Plm		0.08	J		P	5.6			P		0.52			P
CdV-16-1(i)	624	1	9-Mar-06	4	17			P	P	13.5			Yes	Yes	P	6.71		Plm		0.12			P	5.7			P		0.74			P
CdV-16-2(i)r	850	1	14-Sep-05	1	6	UF		P	P	6.3			Yes	Yes	P	2.31		Plm		0.15			P	1.6	UF		P		0.57			P
CdV-16-2(i)r	850	1	15-Dec-05	2	5			P	P	7.7			Yes	Yes	P	2.67		Plm		0.28			Fail	2.0			P		0.64			P
CdV-16-2(i)r	850	1	15-Mar-06	3	7			P	P	9.6			Yes	Yes	P	2.17		Plm		0.20			P	2.3			P		0.57			P
CdV-16-2(i)r	850	1	17-May-06	4	4			P	P	8.1			Yes	Yes	P	2.03		Plm	<	0.24			Fail	2.1			P		0.54			P
CdV-R-15-3	1254	4	3-Jan-01	1	21			P	P	8.4			Yes	Yes	P	1.90		P	<	0.10	U		P	2.7			P		0.29			P
CdV-R-15-3	1254	4	23-Apr-01	2	21			P	P	9.1			Yes	Yes	P	1.60		P		0.21			P	3.0	E		P	<	0.10	U		Fail
CdV-R-15-3	1254	4	18-Jul-01	3	20			P	P	9.6			Yes	Yes	P	1.24		P	<	0.01	U		P	3.2			P		0.06			Fail
CdV-R-15-3	1254	4	9-Oct-01	4	23			P	P	10.9			Yes	Yes	P	1.41		P		0.15			P	3.5			P		0.07			Fail
CdV-R-15-3	1254	4	4-Jan-02	5	21			P	P	10.9			Yes	Yes	P	1.50		P		0.28			Fail	3.5			P		0.11			P
CdV-R-15-3	1254	4	15-Apr-02	6	22			P	P	10.4			Yes	Yes	P	1.39		P		0.15			P	3.3			P		0.15			P
CdV-R-15-3	1254	4	16-Jul-02	7	21			P	P	10.7			Yes	Yes	P	1.47		P		0.13			P	3.5			P		0.16			P
CdV-R-15-3	1254	4	16-Sep-02	8	22			P	P	10.9			Yes	Yes	P	1.45		P		0.18			P	3.5			P		0.13			P
CdV-R-15-3	1254	4	14-Jan-03	9	22			P	P	11.1			Yes	Yes	P	1.45		P		0.14			P	3.6			P		0.19			P
CdV-R-15-3	1254	4	1-May-03	10	21			P	P	10.6			Yes	Yes	P	1.44		P		0.18			P	3.5			P		0.20			P
CdV-R-15-3	1254	4	30-Jul-03	11	20			P	P	10.5			Yes	Yes	P	—		ND		—			ND	3.4			P		—			ND
CdV-R-15-3	1254	4	6-Jan-04	12	21			P	P	10.8			Yes	Yes	P	1.49		P		0.07	J		P	3.2			P		0.25			P
CdV-R-15-3	1254	4	20-Apr-04	13	21			P	P	10.4			Yes	Yes	P	1.52		P		0.16			P	3.4			P		0.19			P
CdV-R-15-3	1254	4	6-Jul-04	14	23			P	P	10.5			Yes	Yes	P	1.41		P	<	0.06	U		P	3.4			P		0.20			P
CdV-R-15-3	1254	4	19-Oct-04	15	23			P	P	10.8			Yes	Yes	P	1.37		P		0.08	J		P	3.4			P		0.23			P
CdV-R-15-3	1254	4	4-Apr-05	16	22			P	P	10.5			Yes	Yes	P	1.30		P		0.09	J		P	3.4			P		0.15			P
CdV-R-15-3	1254	4	12-Jul-05	17	22			P	P	10.4			Yes	Yes	P	1.37		P	<	0.03	U		P	3.3			P		0.18			P
CdV-R-15-3	1254	4	18-Oct-05	18	21			P	P	10.4			Yes	Yes	P	1.34		P		0.16			P	3.4			P		0.15			P
CdV-R-15-3	1254	4	19-Jan-06	19	22			P	P	10.2			Yes	Yes	P	1.38		P		0.12			P	3.3			P		0.20			P
CdV-R-15-3	1254	4	27-Mar-06	20	23			P	P	10.6			Yes	Yes	P	1.34		P	<	0.19			P	3.4			P		0.21			P
CdV-R-15-3	1350	5	4-Jan-01	1	130			P	Fail	20.0			Yes	Yes	P	3.80		Fail		0.24			P	2.5			P	<	0.10	U	ERDB	Fail
CdV-R-15-3	1350	5	25-Apr-01	2	110			P	Fail	17.0			Yes	Yes	P	2.60		P		0.45			P	2.2			P	<	0.10	U		Fail
CdV-R-15-3	1350	5	19-Jul-01	3	120			P	Fail	15.0			Yes	Yes	P	2.40		P		0.31			P	2.1			P	<	0.05	U		Fail

Table C-5a (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	Ba mg/L	UF?	Source	Test D3	Test E2	Ca mg/L	UF?	Source	Test E1a	Test E1b	E1	Cl mg/L	Source	Test A1		F mg/L	LQ C	Source	Test A2	Mg mg/L	UF?	Source	Test E4		NO3-N mg/L	LQC	Source	Test C11
			Units					**mg/L**	**mg/L**				**mg/L**	**mg/L**	**Within**			**mg/L**					**mg/L**				**mg/L**					**mg/L**
			Test					**>LL**	**<UL**				**>LL**	**<UL**	**range**			**<UL**					**<UL**				**<UL**					**>LL**
			Limit: Regional Aquifer					**4.6**	**70**				**8.66**	**24.1**				**3.75**					**0.53**				**4.81**					**0.1**
			Limit: Intermediate					**1.4**	**72**				**4.39**	**17.3**				**1.75**					**0.23**				**6.12**					**0.1**
CdV-R-15-3	1350	5	11-Oct-01	4	120			P	Fail	15.5			Yes	Yes	P	1.76		P		0.27			P	2.1			P		0.02	J		Fail
CdV-R-15-3	1350	5	15-Jan-02	5	118			P	Fail	15.9			Yes	Yes	P	1.98		P		0.43			P	2.1			P		0.03	J		Fail
CdV-R-15-3	1350	5	15-Apr-02	6	118			P	Fail	15.4			Yes	Yes	P	7.78		Err		0.65			Fail	2.0			P	<	0.02	J		Fail
CdV-R-15-3	1350	5	16-Jul-02	7	107			P	Fail	14.7			Yes	Yes	P	1.83		P		0.37			P	2.0			P	<	0.02	J		Fail
CdV-R-15-3	1350	5	17-Sep-02	8	116			P	Fail	14.8			Yes	Yes	P	1.90		P		0.33			P	2.0			P	<	0.02	J		Fail
CdV-R-15-3	1350	5	15-Jan-03	9	111			P	Fail	14.8			Yes	Yes	P	1.81		P		0.27			P	2.1			P	<	0.02	J		Fail
CdV-R-15-3	1350	5	2-May-03	10	125			P	Fail	17.7			Yes	Yes	P	2.06		P		0.41			P	2.2			P	<	0.01	J		Fail
CdV-R-15-3	1350	5	7-Jan-04	11	127			P	Fail	18.1			Yes	Yes	P	2.15		P		0.52			P	2.1			P	<	0.00	U		Fail
CdV-R-15-3	1350	5	21-Apr-04	12	119			P	Fail	16.8			Yes	Yes	P	1.95		P		0.44			P	2.2			P	<	0.01	U		Fail
CdV-R-15-3	1350	5	7-Jul-04	13	118			P	Fail	16.3			Yes	Yes	P	1.87		P		0.35			P	2.1			P	<	0.01	U		Fail
CdV-R-15-3	1350	5	20-Oct-04	14	108			P	Fail	15.2			Yes	Yes	P	1.56		P		0.19			P	1.9			P	<	0.003	U		Fail
CdV-R-15-3	1350	5	5-Apr-05	15	124			P	Fail	18.3			Yes	Yes	P	1.89		P		0.58			Fail	1.9			P	<	0.003	U		Fail
CdV-R-15-3	1350	5	12-Jul-05	16	107			P	Fail	13.9			Yes	Yes	P	3.09		P		0.24			P	2.2			P	<	0.017	U		Fail
CdV-R-15-3	1350	5	18-Oct-05	17	99			P	Fail	13.4			Yes	Yes	P	1.49		P		0.29			P	2.3			P	<	0.02	U		Fail
CdV-R-15-3	1350	5	20-Jan-06	18	98			P	Fail	13.2			Yes	Yes	P	1.65		P		0.29			P	2.3			P	<	0.02	U		Fail
CdV-R-15-3	1350	5	28-Mar-06	19	92			P	Fail	13.0			Yes	Yes	P	1.54		P		0.35			P	2.2			P		0.37			P
CdV-R-15-3	1640	6	3-Jan-01	1	38			P	P	13.0			Yes	Yes	P	2.90		P	<	0.10	U		P	3.7			P		1.0		ERDB	P
CdV-R-15-3	1640	6	25-Apr-01	2	28			P	P	12.0			Yes	Yes	P	2.00		P		0.18			P	3.5			P		280			Err
CdV-R-15-3	1640	6	20-Jul-01	3	26			P	P	11.0			Yes	Yes	P	2.20		P		0.23			P	3.4			P	<	0.1	U	ERDB	Fail
CdV-R-15-3	1640	6	12-Oct-01	4	26			P	P	11.2			Yes	Yes	P	1.52		P		0.16			P	3.3			P		0.02	J		Fail
CdV-R-15-3	1640	6	15-Jan-02	5	27			P	P	10.3			Yes	Yes	P	1.73		P		0.27			P	3.1			P		0.02	J		Fail
CdV-R-15-3	1640	6	16-Apr-02	6	25			P	P	9.8			Yes	Yes	P	8.64		Err		0.57			Err	2.9			P	<	0.01	J		Fail
CdV-R-15-3	1640	6	17-Jul-02	7	25			P	P	9.9			Yes	Yes	P	1.64		P		0.18			P	3.1			P	<	0.02	J		Fail
CdV-R-15-3	1640	6	18-Sep-02	8	22			P	P	9.8			Yes	Yes	P	1.63		P		0.21			P	3.0			P	<	0.05	U		Fail
CdV-R-15-3	1640	6	16-Jan-03	9	22			P	P	9.5			Yes	Yes	P	1.67		P		0.18			P	2.9			P	<	0.02	J		Fail
CdV-R-15-3	1640	6	5-May-03	10	21			P	P	9.7			Yes	Yes	P	1.61		P		0.18			P	3.0			P	<	0.05	U		Fail
CdV-R-15-3	1640	6	31-Jul-03	11	22			P	P	8.8			Yes	Yes	P	—		ND		—			ND	2.8			P		—			ND
CdV-R-15-3	1640	6	8-Jan-04	12	23			P	P	9.1			Yes	Yes	P	1.52		P	<	0.14			P	3.1			P	<	0.01	U		Fail
CdV-R-15-3	1640	6	21-Apr-04	13	20			P	P	9.3			Yes	Yes	P	1.56		P		0.22			P	3.0			P	<	0.01	U		Fail
CdV-R-15-3	1640	6	8-Jul-04	14	19			P	P	8.8			Yes	Yes	P	1.46		P		0.08	J		P	2.8			P	<	0.01	U		Fail
CdV-R-15-3	1640	6	21-Oct-04	15	19			P	P	10.2			Yes	Yes	P	1.31		P		0.09	J		P	2.8			P	<	0.003	U		Fail
CdV-R-15-3	1640	6	6-Apr-05	16	21			P	P	9.1			Yes	Yes	P	1.34		P		0.15			P	2.9			P	<	0.003	U		Fail
CdV-R-15-3	1640	6	13-Jul-05	17	21			P	P	9.3			Yes	Yes	P	1.45		P	<	0.03	U		P	2.8			P		0.036	J		Fail
CdV-R-15-3	1640	6	19-Oct-05	18	20			P	P	9.3			Yes	Yes	P	1.35		P		0.21			P	2.9			P	<	0.02	U		Fail

Table C-5a (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	Ba mg/L	UF?	Source	Test D3	Test E2	Ca mg/L	UF?	Source	Test E1a	Test E1b	E1	Cl mg/L	Source	Test A1		F mg/L	LQ C	Source	Test A2	Mg mg/L	UF?	Source	Test E4		NO3-N mg/L	LQC	Source	Test C11
Units								mg/L	mg/L				mg/L	mg/L	Within			mg/L					mg/L				mg/L					mg/L
Test								>LL	<UL				>LL	<UL	range			<UL					<UL				<UL					>LL
Limit: Regional Aquifer								4.6	70				8.66	24.1				3.75					0.53				4.81					0.1
Limit: Intermediate								1.4	72				4.39	17.3				1.75					0.23				6.12					0.1
CdV-R-15-3	1640	6	20-Jan-06	19	22			P	P	9.4			Yes	Yes	P	1.61		P		0.24			P	2.9			P	<	0.02	U		Fail
CdV-R-15-3	1640	6	29-Mar-06	20	20			P	P	9.0			Yes	Yes	P	1.34		P	<	0.24			P	2.8			P	<	0.01	U		Fail
CdV-R-37-2	1200	2	28-Jan-02	1	93			P	Fail	19.4			Yes	Yes	P	2.85		P		0.20			P	4.7			P	<	0.05	U		Fail
CdV-R-37-2	1200	2	23-Apr-02	2	140			P	Fail	20.3			Yes	Yes	P	2.88		P		0.30			P	5.2			Fail	<	0.05	U		Fail
CdV-R-37-2	1200	2	18-Jul-02	3	163			P	Fail	21.3			Yes	Yes	P	2.78		P		0.27			P	5.8			Fail	<	0.02	U		Fail
CdV-R-37-2	1200	2	18-Sep-02	4	194			P	Fail	21.8			Yes	Yes	P	2.77		P		0.26			P	5.9			Fail		0.01	J		Fail
CdV-R-37-2	1200	2	21-Jan-03	5	218			P	Fail	22.3			Yes	Yes	P	2.82		P		0.22			P	6.2			Fail	<	0.02	J		Fail
CdV-R-37-2	1200	2	6-May-03	6	234			P	Fail	24.1			Yes	Yes	P	2.65		P		0.23			P	6.9			Fail	<	0.05	U		Fail
CdV-R-37-2	1200	2	5-Aug-03	7	226			P	Fail	22.4			Yes	Yes	P	—		ND		—			ND	6.6			Fail		—			ND
CdV-R-37-2	1200	2	2-Dec-03	8	254			P	Fail	23.4			Yes	Yes	P	2.75		P		0.17			P	7.0			Fail	<	0.01	U		Fail
CdV-R-37-2	1200	2	13-Apr-04	9	260			P	Fail	24.1			Yes	Yes	P	2.34		P		0.21			P	7.2			Fail	<	0.01	U		Fail
CdV-R-37-2	1200	2	26-Oct-04	10	249			P	Fail	22.9			Yes	Yes	P	2.42		P		0.21			P	7.1			Fail	<	0.003	U		Fail
CdV-R-37-2	1200	2	29-Mar-05	11	238			P	Fail	20.0			Yes	Yes	P	2.41		P		0.16			P	6.1			Fail	<	0.003	U		Fail
CdV-R-37-2	1200	2	6-Jul-05	12	205			P	Fail	17.2			Yes	Yes	P	2.75		P		0.25			P	5.0			Fail	<	0.017	U		Fail
CdV-R-37-2	1200	2	12-Oct-05	13	188			P	Fail	16.0			Yes	Yes	P	2.75		P		0.20			P	4.5			P	<	0.017	U		Fail
CdV-R-37-2	1200	2	9-Jan-06	14	186			P	Fail	15.0			Yes	Yes	P	2.78		P		0.21			P	4.2			P	<	0.017	U		Fail
CdV-R-37-2	1200	2	21-Mar-06	15	173			P	Fail	13.7			Yes	Yes	P	2.73		P		0.23			P	3.9			P	<	0.017	U		Fail
CdV-R-37-2	1359	3	29-Jan-02	1	13			P	P	10.4			Yes	Yes	P	1.68		P		0.20			P	3.1			P		0.460			P
CdV-R-37-2	1359	3	24-Apr-02	2	13			P	P	10.0			Yes	Yes	P	1.68		P		0.30			P	3.0			P		0.410			P
CdV-R-37-2	1359	3	19-Jul-02	3	12			P	P	10.1			Yes	Yes	P	1.75		P		0.21			P	3.1			P		0.370			P
CdV-R-37-2	1359	3	24-Sep-02	4	11			P	P	9.8			Yes	Yes	P	1.85		P		0.21			P	3.1			P		0.270			P
CdV-R-37-2	1359	3	22-Jan-03	5	12			P	P	10.3			Yes	Yes	P	1.76		P		0.20			P	3.0			P		0.350			P
CdV-R-37-2	1359	3	7-May-03	6	11			P	P	10.3			Yes	Yes	P	1.66		P		0.23			P	3.1			P		0.350			P
CdV-R-37-2	1359	3	6-Aug-03	7	12			P	P	9.9			Yes	Yes	P	—		ND		—			ND	3.0			P		—			ND
CdV-R-37-2	1359	3	3-Dec-03	8	13			P	P	10.0			Yes	Yes	P	1.81		P		0.19			P	3.0			P		0.390			P
CdV-R-37-2	1359	3	13-Apr-04	9	14			P	P	10.4			Yes	Yes	P	1.65		P		0.23			P	3.1			P		0.360			P
CdV-R-37-2	1359	3	27-Oct-04	10	10			P	P	9.6			Yes	Yes	P	1.74		P		0.23			P	2.8			P		0.36			P
CdV-R-37-2	1359	3	30-Mar-05	11	17			P	P	10.1			Yes	Yes	P	1.49		P		0.18			P	3.0			P		0.25			P
CdV-R-37-2	1359	3	7-Jul-05	12	11			P	P	10.1			Yes	Yes	P	1.56		P	<	0.03	U		P	3.0			P		0.26			P
CdV-R-37-2	1359	3	12-Oct-05	13	10			P	P	9.9			Yes	Yes	P	1.65		P		0.21			P	2.9			P		0.30			P
CdV-R-37-2	1359	3	10-Jan-06	14	9			P	P	9.5			Yes	Yes	P	1.70		P		0.23			P	2.9			P		0.30			P
CdV-R-37-2	1359	3	22-Mar-06	15	11			P	P	9.9			Yes	Yes	P	1.69		P		0.24			P	2.9			P		0.28			P
CdV-R-37-2	1551	4	30-Jan-02	1	26			P	P	10.8			Yes	Yes	P	2.45		P	<	0.10	U		P	3.1			P	<	0.05	U		Fail
CdV-R-37-2	1551	4	25-Apr-02	2	23			P	P	8.8			Yes	Yes	P	—		ND		0.19			P	2.6			P	<	0.03	J		Fail

Table C-5a (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	Ba mg/L	UF?	Source	Test D3	Test E2	Ca mg/L	UF?	Source	Test E1a	Test E1b	E1	Cl mg/L	Source	Test A1		F mg/L	LQ C	Source	Test A2	Mg mg/L	UF?	Source	Test E4		NO3-N mg/L	LQC	Source	Test C11
Units								**mg/L**	**mg/L**				**mg/L**	**mg/L**	**Within**			**mg/L**					**mg/L**				**mg/L**					**mg/L**
Test								**>LL**	**<UL**				**>LL**	**<UL**	**range**			**<UL**					**<UL**				**<UL**					**>LL**
Limit: Regional Aquifer								**4.6**	**70**				**8.66**	**24.1**				**3.75**					**0.53**				**4.81**					**0.1**
Limit: Intermediate								**1.4**	**72**				**4.39**	**17.3**				**1.75**					**0.23**				**6.12**					**0.1**
CdV-R-37-2	1551	4	22-Jul-02	3	19			P	P	8.4			No	Yes	Fail	1.75		P		0.19			P	2.6			P	<	0.02	J		Fail
CdV-R-37-2	1551	4	26-Sep-02	4	17			P	P	7.8			No	Yes	Fail	1.79		P		0.23			P	2.4			P	<	0.02	J		Fail
CdV-R-37-2	1551	4	23-Jan-03	5	17			P	P	7.8			No	Yes	Fail	1.80		P		0.17			P	2.5			P	<	0.02	J		Fail
CdV-R-37-2	1551	4	8-May-03	6	17	E		P	P	8.0			No	Yes	Fail	1.78		P		0.19			P	2.6			P	<	0.05	U		Fail
CdV-R-37-2	1551	4	6-Aug-03	7	17			P	P	8.2			No	Yes	Fail	—		ND		—			ND	2.7			P		—			ND
CdV-R-37-2	1551	4	3-Dec-03	8	17			P	P	8.3			No	Yes	Fail	1.81		P		0.19			P	2.8			P	<	0.01	U		Fail
CdV-R-37-2	1551	4	15-Apr-04	9	18			P	P	9.1			Yes	Yes	P	1.99		P		0.27			P	3.0			P	<	0.01	U		Fail
CdV-R-37-2	1551	4	27-Oct-04	10	14			P	P	8.1			No	Yes	Fail	1.75		P		0.22			P	2.6			P	<	0.003	U		Fail
CdV-R-37-2	1551	4	31-Mar-05	11	14			P	P	8.3			No	Yes	Fail	1.62		P		0.26			P	2.7			P	<	0.003	U		Fail
CdV-R-37-2	1551	4	8-Jul-05	12	15			P	P	8.3			No	Yes	Fail	1.40		P	<	0.03	U		P	2.7			P		0			Fail
CdV-R-37-2	1551	4	13-Oct-05	13	12			P	P	8.8			Yes	Yes	P	1.61		P		0.19			P	2.8			P	<	0.017	U		Fail
CdV-R-37-2	1551	4	11-Jan-06	14	12			P	P	8.8			Yes	Yes	P	1.61		P		0.22			P	2.8			P	<	0.017	U		Fail
CdV-R-37-2	1551	4	22-Mar-06	15	13			P	P	8.7			Yes	Yes	P	1.60		P		0.23			P	2.8			P	<	0.017	U		Fail
R-17	1057	1	24-Feb-06	1	35	UF		P	P	8.5	UF		No	Yes	Fail	2.54		P		0.21			P	2.5		UF	P		0.19			P
R-17	1057	1	19-Oct-06	2	21			P	P	10.4			Yes	Yes	P	1.99		P	<	0.31			P	2.9			P		0.15			P
R-17	1124	2	17-Oct-06	1	19			P	P	9.1			Yes	Yes	P	1.76		P	<	0.29			P	2.6			P		0.25			P
R-18	1358	1	25-Aug-05	1	20			P	P	9.6			Yes	Yes	P	1.21		P		0.17			P	3.2			P		0.39			P
R-18	1358	1	1-Dec-05	2	20			P	P	9.4			Yes	Yes	P	1.29		P		0.16			P	3.1			P		0.40			P
R-18	1358	1	7-Mar-06	3	21			P	P	9.8			Yes	Yes	P	1.20		P	<	0.14			P	3.3			P		0.49			P
R-18	1358	1	16-May-06	4	21			P	P	9.3			Yes	Yes	P	1.22		P	<	0.15			P	3.0			P		0.54			P
R-18	1358	1	15-Aug-06	5	21			P	P	9.6			Yes	Yes	P	1.27		P		0.10			P	3.1			P		0.57			P
R-18	1358	1	18-Dec-06	6	19			P	P	9.4			Yes	Yes	P	1.33		P		0.10			P	3.1			P		0.633			P
R-19	909	2	22-Sep-00	1	32			P	P	16.0			Yes	Yes	P	2.80		Fail		0.49			Fail	3.0			P		0.69			P
R-19	909	2	10-Apr-01	2	23			P	P	18.0			Yes	No	Fail	2.50		Fail		0.71			Fail	3.0			P		0.32			P
R-19	909	2	5-Jul-01	3	24			P	P	19.0			Yes	No	Fail	2.80		Fail		0.70			Fail	3.2			P		0.33			P
R-19	909	2	13-Sep-01	4	27			P	P	21.1			Yes	No	Fail	2.18		Fail		0.57			Fail	3.5			P		0.34			P
R-19	909	2	20-Aug-02	5	27	UF		P	P	19.5	UF		Yes	No	Fail	2.33		Fail		0.55			Fail	3.1	UF		P		0.34			P
R-19	909	2	15-Dec-03	6	24	UF		P	P	17.7	UF		Yes	No	Fail	2.70		Fail		0.56			Fail	3.0	UF		P		0.38			P
R-19	909	2	10-Jun-04	7	27	UF		P	P	16.8	UF		Yes	No	P	3.07		Fail		0.67			Fail	2.7	UF		P		0.36			P
R-19	909	2	21-Jul-05	8	22			P	P	14.9			Yes	Yes	P	2.42		Fail		0.41			Fail	2.5			P		0.27			P
R-19	909	2	18-Aug-06	9	25			P	P	16.1			Yes	Yes	P	3.76		Fail		0.64			Fail	2.7			P		0.24			P
R-19	909	2	11-Dec-06	10	25		IP	P	P	14.3		IP	Yes	Yes	P	5.19	IP	Fail		0.79		IP	Fail	2.5		IP	P		0.24		IP	P
R-19	1191	3	26-Sep-00	1	24			P	P	12.0			Yes	Yes	P	2.60		P		0.33			P	3.0			P		0.34			P
R-19	1191	3	9-Apr-01	2	19			P	P	12.0			Yes	Yes	P	1.90		P		0.53			P	2.9			P		0.27			P

Table C-5a (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	Ba mg/L	UF?	Source	Test D3	Test E2	Ca mg/L	UF?	Source	Test E1a	Test E1b	E1	Cl mg/L	Source	Test A1		F mg/L	LQ C	Source	Test A2	Mg mg/L	UF?	Source	Test E4		NO3-N mg/L	LQC	Source	Test C11
			Units					**mg/L**	**mg/L**				**mg/L**	**mg/L**	**Within**			**mg/L**					**mg/L**				**mg/L**					**mg/L**
			Test					**>LL**	**<UL**				**>LL**	**<UL**	**range**			**<UL**					**<UL**				**<UL**					**>LL**
			Limit: Regional Aquifer					**4.6**	**70**				**8.66**	**24.1**				**3.75**					**0.53**				**4.81**					**0.1**
			Limit: Intermediate					**1.4**	**72**				**4.39**	**17.3**				**1.75**					**0.23**				**6.12**					**0.1**
R-19	1191	3	10-Jul-01	3	19			P	P	12.0			Yes	Yes	P	2.30		P		0.48			P	2.9			P		0.26			P
R-19	1191	3	18-Sep-01	4	22			P	P	13.4			Yes	Yes	P	1.73		P		0.36			P	3.3			P		0.25			P
R-19	1191	3	22-Aug-02	5	20	UF		P	P	12.7	UF		Yes	Yes	P	1.69		P		0.39			P	3.1	UF		P		0.26			P
R-19	1191	3	15-Dec-03	6	19	UF		P	P	12.3	UF		Yes	Yes	P	1.93		P		0.34			P	3.1	UF		P		0.28			P
R-19	1191	3	14-Jun-04	7	18	UF		P	P	11.9	UF		Yes	Yes	P	1.96		P		0.44			P	2.9	UF		P		0.25			P
R-19	1191	3	21-Jul-05	8	19			P	P	11.5			Yes	Yes	P	1.70		P		0.19			P	2.9			P		0.23			P
R-19	1191	3	15-Aug-06	9	20			P	P	11.9			Yes	Yes	P	2.74		P		0.41			P	3.0			P	<	0.002			Fail
R-19	1191	3	11-Dec-06	10	19		IP	P	P	11.4		IP	Yes	Yes	P	3.89	IP	Fail		0.52		IP	P	2.8		IP	P		0.02		IP	Fail
R-19	1413	4	6-Apr-01	1	35			P	P	9.2			Yes	Yes	P	1.70		P		0.40			P	2.7			P		0.29			P
R-19	1413	4	11-Jul-01	2	31			P	P	8.4			No	Yes	Fail	2.00		P		0.19			P	2.5			P		0.35			P
R-19	1413	4	19-Sep-01	3	37		GR	P	P	9.4		GR	Yes	Yes	P	1.50	GR	P		0.30			P	2.8		GR	P		0.34		GR	P
R-19	1413	4	26-Aug-02	4	30	UF		P	P	9.1	UF		Yes	Yes	P	1.64		P		0.22			P	2.8	UF		P		0.32			P
R-19	1413	4	16-Dec-03	5	28	UF		P	P	9.0	UF		Yes	Yes	P	1.70		P		0.18			P	2.8	UF		P		0.35			P
R-19	1413	4	15-Jun-04	6	28	UF		P	P	9.1	UF		Yes	Yes	P	1.53		P	<	0.06	U		P	2.7	UF		P		0.26			P
R-19	1413	4	28-Jul-05	7	28			P	P	9.0			Yes	Yes	P	1.55		P		0.23			P	2.7			P		0.24			P
R-19	1413	4	16-Aug-06	8	25			P	P	8.2			No	Yes	Fail	1.66		P		0.226			P	2.44			P		0.34			P
R-19	1413	4	12-Dec-06	9	28			P	P	8.9			Yes	Yes	P	1.64		P		0.19			P	2.7			P		0.332			P
R-19	1586	5	4-Apr-01	1	110			P	Fail	33.0			Yes	No	Fail	2.10		P		0.31			P	5.2			Fail	<	0.01	U		Fail
R-19	1586	5	12-Jul-01	2	100			P	Fail	31.0			Yes	No	Fail	2.10		P		0.36			P	4.8			P	<	0.05	U		Fail
R-19	1586	5	20-Sep-01	3	110			P	Fail	31.6			Yes	No	Fail	1.91		P		0.32			P	4.9			Fail		0.01	J		Fail
R-19	1586	5	23-Aug-02	4	118	UF		P	Fail	31.2	UF		Yes	No	Fail	2.26		P		0.29			P	5.0	UF		Fail	<	0.01	U		Fail
R-19	1586	5	16-Dec-03	5	103	UF		P	Fail	29.7	UF		Yes	No	Fail	2.25		P		0.22			P	4.5	UF		P	<	0.01	U		Fail
R-19	1586	5	17-Aug-06	6	91			P	Fail	28.9			Yes	No	Fail	2.88		P		0.25			P	4.1			P		0.012			Fail
R-19	1586	5	11-Dec-06	7	93		IP	P	Fail	28.1		IP	Yes	No	Fail	4.10	IP	Fail		0.36		IP	P	4.0		IP	P	<	0.002		IP	Fail
R-19	1730	6	4-Oct-00	1	38			P	P	11.4			Yes	Yes	P	1.80		P		0.26			P	2.8			P	<	0.050	U		Fail
R-19	1730	6	2-Apr-01	2	20			P	P	6.2			No	Yes	Fail	2.00		P		0.28			P	1.7			P	<	0.010	U		Fail
R-19	1730	6	16-Jul-01	3	14			P	P	4.7			No	Yes	Fail	2.30		P		0.26			P	1.3			P	<	0.050	U		Fail
R-19	1730	6	21-Sep-01	4	14			P	P	5.1			No	Yes	Fail	1.70		P		0.28			P	1.4			P	<	0.007	U		Fail
R-19	1730	6	27-Aug-02	5	13	UF		P	P	5.1	UF		No	Yes	Fail	1.95		P		0.23			P	1.6	UF		P	<	0.01	U		Fail
R-19	1730	6	16-Dec-03	6	11	UF		P	P	4.7	UF		No	Yes	Fail	2.03		P		0.21			P	1.5	UF		P	<	0.01	U		Fail
R-19	1730	6	17-Aug-06	7	20			P	P	6.5			No	Yes	Fail	2.72		P		0.20			P	1.9			P	<	0.002	U		Fail
R-19	1730	6	11-Dec-06	8	13		IP	P	P	5.0		IP	No	Yes	Fail	3.79	IP	Fail		0.27		IP	P	1.6		IP	P	<	0.002	U	IP	Fail
R-19	1835	7	3-Oct-00	1	25			P	P	6.8			No	Yes	Fail	2.90		P		0.47			P	1.8			P	<	0.050	U		Fail
R-19	1835	7	29-Mar-01	2	24			P	P	4.1			No	Yes	Fail	2.33		P		0.66			Fail	0.9			P	<	0.100	U		Fail

Table C-5a (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	Ba mg/L	UF?	Source	Test D3	Test E2	Ca mg/L	UF?	Source	Test E1a	Test E1b	E1	Cl mg/L	Source	Test A1		F mg/L	LQ C	Source	Test A2	Mg mg/L	UF?	Source	Test E4		NO3-N mg/L	LQC	Source	Test C11
Units								**mg/L**	**mg/L**				**mg/L**	**mg/L**	**Within**			**mg/L**					**mg/L**				**mg/L**					**mg/L**
Test								**>LL**	**<UL**				**>LL**	**<UL**	**range**			**<UL**					**<UL**				**<UL**					**>LL**
Limit: Regional Aquifer								**4.6**	**70**				**8.66**	**24.1**				**3.75**					**0.53**				**4.81**					**0.1**
Limit: Intermediate								**1.4**	**72**				**4.39**	**17.3**				**1.75**					**0.23**				**6.12**					**0.1**
R-19	1835	7	17-Jul-01	3	11			P	P	2.9			No	Yes	Fail	2.60		P		0.67			Fail	0.8			P	<	0.050	U		Fail
R-19	1835	7	24-Sep-01	4	10			P	P	2.8			No	Yes	Fail	2.11		P		0.59			Fail	0.8			P	<	0.007	U		Fail
R-19	1835	7	26-Aug-02	5	15	UF		P	P	3.4	UF		No	Yes	Fail	2.74		P		0.61			Fail	0.9	UF		P	<	0.01	J		Fail
R-19	1835	7	17-Dec-03	6	28	UF		P	P	3.7	UF		No	Yes	Fail	2.63		P		0.55			Fail	1.6	UF		P		0.020	J		Fail
R-19	1835	7	16-Jun-04	7	15	UF		P	P	3.3	UF		No	Yes	Fail	2.34		P		0.48			P	1.0	UF		P		0.030	J		Fail
R-19	1835	7	28-Jul-05	8	7			P	P	2.3			No	Yes	Fail	2.16		P		0.49			P	0.7			P		0.034	J		Fail
R-19	1835	7	18-Aug-06	9	9			P	P	2.8			No	Yes	Fail	3.42		P		0.57			Fail	0.9			P	<	0.002	U		Fail
R-19	1835	7	13-Dec-06	10	8		IP	P	P	2.6		IP	No	Yes	Fail	4.78	IP	Fail		0.70		IP	Fail	0.8		IP	P	<	0.002	U	IP	Fail
R-25	755	1	14-Nov-00	1	7			P	P	22.0			Yes	No	Fail	11.00		Plm		0.12			P	5.9			P		1.1			Plm
R-25	755	1	3-May-01	2	7			P	P	26.0			Yes	No	Fail	12.00		Plm		0.22			P	5.6			P		0.99			Plm
R-25	755	1	13-Aug-01	3	9			P	P	26.0			Yes	No	Fail	13.00		Plm		0.13			P	6.2			Fail		1.1			Plm
R-25	755	1	4-Feb-02	4	8			P	P	26.1			Yes	No	Fail	10.50		Plm		0.16			P	6.2			Fail		0.99			Plm
R-25	755	1	7-Aug-02	5	10	UF		P	P	26.1	UF		Yes	No	Fail	12.20		Plm		0.15			P	5.9	UF		P		1.07			Plm
R-25	755	1	11-Dec-03	6	10	UF		P	P	21.5	UF		Yes	No	Fail	12.10		Plm		0.09			P	5.6	UF		P		1.15			Plm
R-25	755	1	1-Sep-04	7	10	UF		P	P	17.9	UF		Yes	No	Fail	16.60		Plm		0.13			P	5.2	UF		P		1.06			Plm
R-25	755	1	2-Aug-05	8	8			P	P	18.2			Yes	No	Fail	13.5		Plm		0.12			P	6.1			P		1.04			Plm
R-25	892	2	15-Nov-00	1	3			P	P	8.4			Yes	Yes	P	10.0		Plm		0.18			P	2.3			P	<	0.10	U		Fail
R-25	892	2	4-May-01	2	3			P	P	6.6			Yes	Yes	P	11.0		Plm		0.19			P	1.2			P	<	0.10	U		Fail
R-25	892	2	14-Aug-01	3	3			P	P	6.7			Yes	Yes	P	12.0		Plm		0.11			P	1.3			P	<	0.05	U		Fail
R-25	892	2	5-Feb-02	4	2			P	P	8.6			Yes	Yes	P	9.9		Plm		0.07	J		P	1.5			P	<	0.05	U		Fail
R-25	892	2	8-Aug-02	5	5	UF		P	P	10.1	UF		Yes	Yes	P	10.7		Plm	<	0.06	U		P	1.7	UF		P	<	0.030	J		Fail
R-25	892	2	10-Dec-03	6	7	UF		P	P	10.9	UF		Yes	Yes	P	13.0		Plm	<	0.06	U		P	1.4	UF		P	<	0.01	U		Fail
R-25	892	2	3-Aug-05	7	< 1			Fail	P	15.1			Yes	Yes	P	13.4		Plm	<	0.03	U		P	2.4			P		0.083			Fail
R-25	1192	4	4-Dec-00	1	25			P	P	140.0			Yes	No	Fail	5.7		Plm	<	0.10	U		P	4.8			P		0.61			P
R-25	1192	4	7-May-01	2	18			P	P	73.0			Yes	No	Fail	5.4		Plm		0.12			P	4.3			P		0.73			P
R-25	1192	4	14-Aug-01	3	26			P	P	82.0			Yes	No	Fail	6.2		Plm	<	0.10	U		P	4.8			P	<	0.05	U		Fail
R-25	1192	4	6-Feb-02	4	19			P	P	49.8			Yes	No	Fail	4.8		Plm		0.08	J		P	4.7			P		0.62			P
R-25	1192	4	8-Aug-02	5	19	UF		P	P	27.0	UF		Yes	No	Fail	5.1		Plm	<	0.06	U		P	4.4	UF		P		0.75			P
R-25	1192	4	10-Dec-03	6	20	UF		P	P	19.0	UF		Yes	No	Fail	6.3		Plm	<	0.06	U		P	4.8	UF		P	<	0.01	U		Fail
R-25	1192	4	4-Aug-05	7	21			P	P	106.0			Yes	No	Fail	6.5		Plm		0.10			P	4.9			P		0.70			P
R-25	1303	5	7-Dec-00	1	8			P	P	22.0			Yes	Yes	P	5.6		Fail		0.11			P	4.7			P	<	0.10	U		Fail
R-25	1303	5	8-May-01	2	15			P	P	20.0			Yes	Yes	P	3.2		P		0.13			P	4.5			P		0.14			P
R-25	1303	5	15-Aug-01	3	10			P	P	21.0			Yes	Yes	P	4.0		P		0.14			P	4.8			P	<	0.05	U		Fail
R-25	1303	5	7-Feb-02	4	13			P	P	21.8			Yes	Yes	P	3.0		P		0.12			P	4.5			P		0.18			P

Table C-5a (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	Ba mg/L	UF?	Source	Test D3	Test E2	Ca mg/L	UF?	Source	Test E1a	Test E1b	E1	Cl mg/L	Source	Test A1		F mg/L	LQC	Source	Test A2	Mg mg/L	UF?	Source	Test E4		NO3-N mg/L	LQC	Source	Test C11
			Units					**mg/L**	**mg/L**				**mg/L**	**mg/L**	**Within**			**mg/L**					**mg/L**				**mg/L**					**mg/L**
			Test					**>LL**	**<UL**				**>LL**	**<UL**	**range**			**<UL**					**<UL**				**<UL**					**>LL**
			Limit: Regional Aquifer					**4.6**	**70**				**8.66**	**24.1**				**3.75**					**0.53**				**4.81**					**0.1**
			Limit: Intermediate					**1.4**	**72**				**4.39**	**17.3**				**1.75**					**0.23**				**6.12**					**0.1**
R-25	1303	5	9-Aug-02	5	22	UF		P	P	22.7	UF		Yes	Yes	P	2.9		P		0.11			P	4.7	UF		P	<	0.030	J		Fail
R-25	1303	5	9-Dec-03	6	82	UF		P	Fail	23.6	UF		Yes	Yes	P	3.2		P		0.12			P	4.2	UF		P		0.01	J		Fail
R-25	1303	5	31-Aug-04	7	56	UF		P	P	22.4	UF		Yes	Yes	P	—		ND		—			ND	4.0	UF		P	<	0.016	J		Fail
R-25	1303	5	9-Aug-05	8	5			P	P	18.5			Yes	Yes	P	—		ND		—			ND	2.3			P		—			ND
R-25	1406	6	8-Dec-00	1	8			P	P	23.0			Yes	Yes	P	4.90		Fail	<	0.10	U		P	4.6			P		0.44			P
R-25	1406	6	9-May-01	2	14			P	P	21.0			Yes	Yes	P	2.80		P		0.11			P	3.9			P		0.36			P
R-25	1406	6	16-Aug-01	3	16			P	P	20.0			Yes	Yes	P	2.36		P		0.13			P	4.0			P		0.33			P
R-25	1406	6	8-Feb-02	4	19			P	P	19.0			Yes	Yes	P	4.82		Fail		0.17			P	3.7			P		0.28			P
R-25	1406	6	12-Aug-02	5	23	UF		P	P	18.4	UF		Yes	Yes	P	1.68		P	<	0.06	U		P	3.6	UF		P		0.28			P
R-25	1406	6	9-Dec-03	6	28	UF		P	P	17.7	UF		Yes	Yes	P	1.44		P	<	0.06	U		P	3.5	UF		P		0.29			P
R-25	1606	7	11-Dec-00	1	16			P	P	18.0			Yes	Yes	P	6.50		Fail	<	0.10	U		P	4.5			P		0.61			P
R-25	1606	7	11-May-01	2	19			P	P	12.0			Yes	Yes	P	3.00		P		0.16			P	2.9			P		0.38			P
R-25	1606	7	17-Aug-01	3	24			P	P	11.0			Yes	Yes	P	1.68		P	<	0.01	U		P	2.9			P		0.36			P
R-25	1606	7	11-Feb-02	4	34			P	P	11.2			Yes	Yes	P	1.59		P		0.15			P	2.9			P		0.28			P
R-25	1606	7	12-Aug-02	5	42	UF		P	P	11.1	UF		Yes	Yes	P	1.49		P		0.12			P	2.9	UF		P		0.31			P
R-25	1606	7	8-Dec-03	6	55	UF		P	P	10.8	UF		Yes	Yes	P	1.42		P		0.09			P	2.9	UF		P		0.30			P
R-25	1796	8	12-Dec-00	1	25			P	P	17.0			Yes	Yes	P	7.90		Fail	<	0.10	U		P	4.3			P		0.28			P
R-25	1796	8	14-May-01	2	17			P	P	11.0			Yes	Yes	P	2.80		P		0.18			P	2.5			P		0.43			P
R-25	1796	8	20-Aug-01	3	16			P	P	11.0			Yes	Yes	P	2.60		P	<	0.10	U		P	2.7			P		0.37			P
R-25	1796	8	12-Feb-02	4	18			P	P	11.0			Yes	Yes	P	1.70		P		0.22			P	2.6			P		0.39			P
R-25	1796	8	14-Aug-02	5	21	UF		P	P	11.5	UF		Yes	Yes	P	1.54		P		0.12			P	2.8	UF		P		0.30			P
R-25	1796	8	4-Dec-03	6	25	UF		P	P	11.8	UF		Yes	Yes	P	1.50		P		0.10	J		P	2.9	UF		P		0.30			P
R-25	1796	8	10-Aug-05	7	25			P	P	12.0			Yes	Yes	P	1.37		P		0.15			P	2.9			P		0.25			P
R-26	659	1	13-Apr-05	1	8			P	P	7.4			Yes	Yes	P	1.17		P		0.11			P	2.9			P		0.26			P
R-26	659	1	27-Jul-05	2	8			P	P	7.4			Yes	Yes	P	1.06		P	<	0.03	U		P	2.9			P		0.30			P
R-26	659	1	2-Nov-05	3	7			P	P	7.3			Yes	Yes	P	1.13		P		0.14			P	2.8			P		0.26			P
R-26	659	1	22-Feb-06	4	8			P	P	7.6			Yes	Yes	P	1.12		P	<	0.17			P	3.0			P		0.31			P
R-27	852	1	14-Nov-05	1	23	UF		P	P	9.3	UF		Yes	Yes	P	1.64		P		0.20			P	2.7	UF		P		0.17			P
R-27	852	1	1-Jul-06	2	26			P	P	10.2			Yes	Yes	P	1.54		P		0.27			P	2.9			P		0.26			P

Data source: WQDB except where indicated otherwise

Notes: Pass and fail outcomes for each sample are determined by comparison against test threshold criteria. From top to bottom in the column headers above are listed the indicator name and associated test identifier, units of measurement, type of test threshold, and threshold values for the regional aquifer and perched intermediate aquifer, respectively. The user should assume that the measurements of dissolved oxygen (DO) and oxidation reduction potential (ORP) reported in this table are uncertain and potentially biased on the high (oxidizing) side relative to in-situ conditions, to the extent that the sample may have been exposed to the atmosphere prior to the analysis.

LL=lower limit, UL=upper limit, P=pass; UF=unfiltered

Table C-5b
General Inorganic (non-metal) Indicators

Well	Port Depth (ft)	Scr	Sample Date	Event	ORP	Source	Test C3	DO	Source	Test C12		ClO4 ug/L	LQC	Test C6		PO4-P	LQC	Source	Test A3	Na mg/L	UF?	Source	Test A4		SO4 mg/L	LQC	Source	Test C1	Test A5	Sulfide	Source	Test C2
			Units				**mV**			**mg/L**				**µg/L**					**mg/L**				**mg/L**					**mg/L**	**mg/L**			**mg/L**
			Test				**>LL**			**>LL**				**>LL**					**<UL**				**<UL**					**>LL**	**<UL**			**<UL**
			Limit: Regional Aquifer				**0**			**2**				**0.17**					**0.3**				**28.55**					**0.8**	**6.22**			**0.01**
			Limit: Intermediate				**0**			**2**				**0.17**					**0.08**				**12.19**					**1.07**	**4.48**			**0.01**
CdV-16-1(i)	624	1	1-Jun-05	1	67		P	8.0		P		0.489		P		0.049	J		P	10.3			P		10.3			P	Plm	0.057		Fail
CdV-16-1(i)	624	1	29-Aug-05	2	149		P	4.8		P		0.488	H	P		0.107			Fail	11.4			P		12.5			P	Plm	0.006		P
CdV-16-1(i)	624	1	7-Dec-05	3	130		P			Err		0.531		P		0.041	J		P	12.7			Fail		11.9			P	Plm	0.001		P
CdV-16-1(i)	624	1	9-Mar-06	4	252		P	4.7		P		0.487		P	<	0.051			P	12.7			Fail		12.2			P	Plm	0.01	FP	P
CdV-16-2(i)r	850	1	14-Sep-05	1	—		ND	—		ND	<	0.5		DL		0.036			P	22.3	UF		Fail		6.89			P	Fail	—		ND
CdV-16-2(i)r	850	1	15-Dec-05	2	213		P	5.1		P		0.288		P		0.154			Fail	19.3			Fail		7.08			P	Fail	0.193		Fail
CdV-16-2(i)r	850	1	15-Mar-06	3	226		P	5.6		P		0.252		P	<	0.042	J		P	15.1			Fail		3.75			P	P	0.069	FP	Fail
CdV-16-2(i)r	850	1	17-May-06	4	164		P	5.3		P		0.249		P	<	0.039	J		P	13.6			Fail		4.32			P	P	—		ND
CdV-R-15-3	1254	4	3-Jan-01	1	—		ND	—		ND		—		ND		—			ND	7.9			P		1.5			P	P	—		ND
CdV-R-15-3	1254	4	23-Apr-01	2	—		ND	—		ND		—		ND		—			ND	8			P		1.8			P	P	—		ND
CdV-R-15-3	1254	4	18-Jul-01	3	—		ND	—		ND	<	4	U	DL		—			ND	9.6			P		1.35			P	P	—		ND
CdV-R-15-3	1254	4	9-Oct-01	4	—		ND	—		ND		1.07	J	P		0.09			P	—			ND		1.62			P	P	—		ND
CdV-R-15-3	1254	4	4-Jan-02	5	—		ND	2.8		P	<	4	U	DL	<	0.05	U		P	10.4			P		1.58			P	P	—		ND
CdV-R-15-3	1254	4	15-Apr-02	6	—		ND	3.3		P		—		ND		0.04	J		P	10.4			P		1.65			P	P	—		ND
CdV-R-15-3	1254	4	16-Jul-02	7	123		P	4.2		P		—		ND	<	0.05	U		P	10.4			P		1.51			P	P	0.001		P
CdV-R-15-3	1254	4	16-Sep-02	8	—		ND	3	FN	P		—		ND		0.06			P	10.4			P		1.5			P	P	—		ND
CdV-R-15-3	1254	4	14-Jan-03	9	—		ND	4.4	FN	P		—		ND		0.03	J		P	10.9			P		1.5			P	P	—		ND
CdV-R-15-3	1254	4	1-May-03	10	—		ND	4.4	FN	P		—		ND	<	0.05	U		P	10.4			P		1.72			P	P	—		ND
CdV-R-15-3	1254	4	30-Jul-03	11	—		ND	4.3	FN	P		—		ND		—			ND	10.5			P		—			ND	ND	—		ND
CdV-R-15-3	1254	4	6-Jan-04	12	-25	FN	Fail	5.8	FN	P		0.228		P	<	0.011	U		P	11.1			P		1.63			P	P	—		ND
CdV-R-15-3	1254	4	20-Apr-04	13	56.3	FP	P	6.6		P		0.228		P		0.03	J		P	9.85			P		1.64			P	P	0		P
CdV-R-15-3	1254	4	6-Jul-04	14	24.8	FN	P	4.4	FN	P		0.248		P		0.033	J		P	9.98			P		1.37			P	P	0	FN	P
CdV-R-15-3	1254	4	19-Oct-04	15	—		ND	7.6		P		0.262		P	<	0.033	J		P	10.5			P		1.47			P	P	0.001		P
CdV-R-15-3	1254	4	4-Apr-05	16	-10		Fail	1.2		Fail		0.231		P	<	0.047	J		P	10.2			P		1.31			P	P	0		P
CdV-R-15-3	1254	4	12-Jul-05	17	208		P	4.5		P		0.277		P	<	0.076			P	10			P		1.25			P	P	—		ND
CdV-R-15-3	1254	4	18-Oct-05	18	—		ND	4.8		P		0.254		P		0.129			P	10.2			P		1.53			P	P	0		P
CdV-R-15-3	1254	4	19-Jan-06	19	—		ND	4.6	FP	P		0.226		P	<	0.038	UH		P	9.95			P		1.53			P	P	0	FP	P
CdV-R-15-3	1254	4	27-Mar-06	20	—		ND	5.0	FP	P		0.232		P	<	0.028	J		P	10			P	<	1.65			P	P	0	FP	P
CdV-R-15-3	1350	5	4-Jan-01	1	—		ND	—		ND		—		ND		—			ND	37			Fail	<	1	U		Fail	Red	—		ND
CdV-R-15-3	1350	5	25-Apr-01	2	—		ND	—		ND		—		ND		—			ND	26			P	<	1	U		Fail	Red	—		ND
CdV-R-15-3	1350	5	19-Jul-01	3	—		ND	—		ND	<	4	U	DL		—			ND	18			P	<	1	U		Fail	Red	—		ND

Table C-5b (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	ORP	Source	Test C3	DO	Source	Test C12		ClO4 ug/L	LQC	Test C6		PO4-P	LQC	Source	Test A3	Na mg/L	UF?	Source	Test A4		SO4 mg/L	LQC	Source	Test C1	Test A5	Sulfide	Source	Test C2
			Units				**mV**			**mg/L**				**µg/L**					**mg/L**				**mg/L**					**mg/L**	**mg/L**			**mg/L**
			Test				**>LL**			**>LL**				**>LL**					**<UL**				**<UL**					**>LL**	**<UL**			**<UL**
			Limit: Regional Aquifer				**0**			**2**				**0.17**					**0.3**				**28.55**					**0.8**	**6.22**			**0.01**
			Limit: Intermediate				**0**			**2**				**0.17**					**0.08**				**12.19**					**1.07**	**4.48**			**0.01**
CdV-R-15-3	1350	5	11-Oct-01	4	—		ND	—		ND	<	4	U	DL		1.37			Err	17.2			P		1.15			P	P	—		ND
CdV-R-15-3	1350	5	15-Jan-02	5	—		ND	4.7		P	<	4	U	DL	<	0.05	U		P	17.7			P		1.09			P	P	—		ND
CdV-R-15-3	1350	5	15-Apr-02	6	—		ND	3.9		P		—		ND	<	0.1			P	16.6			P		1.11			P	P	—		ND
CdV-R-15-3	1350	5	16-Jul-02	7	-188		Fail	3.9		P		—		ND		0.05			P	15.2			P		1.1			P	P	0.072		Fail
CdV-R-15-3	1350	5	17-Sep-02	8	—		ND	2.1	FN	P		—		ND		0.02	J		P	14			P		1.17			P	P	—		ND
CdV-R-15-3	1350	5	15-Jan-03	9	—		ND	4.3	FN	P		—		ND	<	0.02	J		P	14.5			P		0.62			Fail	Red	—		ND
CdV-R-15-3	1350	5	2-May-03	10	—		ND	2.6	FN	P		—		ND		0.02	J		P	16.8			P	<	0.4	U		Fail	Red	—		ND
CdV-R-15-3	1350	5	7-Jan-04	11	-141	FN	Fail	3.4	FN	P	<	0.05	U	Fail	<	0.05			P	17.7			P		0.432			Fail	Red	—		ND
CdV-R-15-3	1350	5	21-Apr-04	12	-91	FP	Fail	6.1		P		0.059	J	Fail		0.057			P	15.5			P	<	0.193	U		Fail	Red	0.118		Fail
CdV-R-15-3	1350	5	7-Jul-04	13	-113	FN	Fail	5.3		P	<	0.05	U	Fail		0.049	J		P	15.6			P		0.245			Fail	Red	0.129		Fail
CdV-R-15-3	1350	5	20-Oct-04	14	—		ND	13.3		P	<	0.05	U	Fail	<	0.055			P	14.9			P		0.307			Fail	Red	0.232		Fail
CdV-R-15-3	1350	5	5-Apr-05	15	-99		Fail	7.4		P	<	0.05	U	Fail		0.08			P	18.3			P		0.953			P	P	0.28		Fail
CdV-R-15-3	1350	5	12-Jul-05	16	-59		Fail	4.3		P	<	0.05	U	Fail	<	0.094			P	12			P		7.82			Err	Err	—		ND
CdV-R-15-3	1350	5	18-Oct-05	17	—		ND	4.1		P	<	0.05	U	Fail		0.16			P	10.6			P		1.2			P	P	0.031		Fail
CdV-R-15-3	1350	5	20-Jan-06	18	—		ND	5.6	FP	P	<	0.05	U	Fail	<	0.038	UH		P	10.7			P		1.12			P	P	0.056	FP	Fail
CdV-R-15-3	1350	5	28-Mar-06	19	—		ND	—		ND	<	0.05	U	Fail		0.035	J		P	10.5			P	<	1.37			P	P	0.09	FP	Fail
CdV-R-15-3	1640	6	3-Jan-01	1	—		ND	—		ND		—		ND		—			ND	20			P	<	1	U		Fail	Red	—		ND
CdV-R-15-3	1640	6	25-Apr-01	2	—		ND	—		ND		—		ND		—			ND	16			P	<	1	U		Fail	Red	—		ND
CdV-R-15-3	1640	6	20-Jul-01	3	—		ND	—		ND	<	4	U	DL		—			ND	14			P		0.519			Fail	Red	—		ND
CdV-R-15-3	1640	6	12-Oct-01	4	—		ND	—		ND	<	4	U	DL		0.05			P	15.8			P	<	0.2	U		Fail	Red	—		ND
CdV-R-15-3	1640	6	15-Jan-02	5	—		ND	8.3	FP	P	<	4	U	DL		0.05			P	15.3			P	<	0.2	U		Fail	Red	—		ND
CdV-R-15-3	1640	6	16-Apr-02	6	—		ND	7.2		P		—		ND	<	0.07			P	14.4			P		0.492			Fail	Red	—		ND
CdV-R-15-3	1640	6	17-Jul-02	7	-120		Fail	6.6		P		—		ND		0.06			P	16			P		0.649			Fail	Red	0.06		Fail
CdV-R-15-3	1640	6	18-Sep-02	8	—		ND	7.9	FN	P		—		ND		0.06			P	14.5			P		0.56			Fail	Red	—		ND
CdV-R-15-3	1640	6	16-Jan-03	9	—		ND	7.2	FN	P		—		ND	<	0.05			P	14.5			P		0.73			Fail	Red	—		ND
CdV-R-15-3	1640	6	5-May-03	10	—		ND	11.4	FN	P		—		ND	<	0.05	U		P	13.9			P		0.99			P	P	—		ND
CdV-R-15-3	1640	6	31-Jul-03	11	—		ND	8.2	FN	P		—		ND		—			ND	13.3			P		—			ND	ND	—		ND
CdV-R-15-3	1640	6	8-Jan-04	12	-73	FN	Fail	9.3	FN	P	<	0.2	U	Fail	<	0.026	J		P	12.7			P		1.32			P	P	—		ND
CdV-R-15-3	1640	6	21-Apr-04	13	-63	FP	Fail	13.8		P	<	0.2	U	Fail	<	0.151	UH		P	12.9			P		1.6			P	P	0.007		P
CdV-R-15-3	1640	6	8-Jul-04	14	206	FN	Err	9.8		P		0.199	J	Err	<	0.192	HJ		P	12			P		1.16			P	P	0.006		P
CdV-R-15-3	1640	6	21-Oct-04	15	-63	FP	Fail	13.0	FN	P	<	0.05	U	Fail	<	0.024	J		P	12.3			P		1.07			P	P	0.005		P
CdV-R-15-3	1640	6	6-Apr-05	16	-85		Fail	11.0		P	<	0.05	U	Fail	<	0.031	J		P	12.3			P		1.01			P	P	0.014		Fail
CdV-R-15-3	1640	6	13-Jul-05	17	28		P	5.9		P	<	0.05	U	Fail	<	0.051			P	12.5			P		1.05			P	P	—		ND
CdV-R-15-3	1640	6	19-Oct-05	18	—		ND	5.5		P	<	0.05	U	Fail	<	0.072			P	12.1			P		1.27			P	P	0.012		Fail

Table C-5b (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	ORP	Source	Test C3	DO	Source	Test C12		ClO4 ug/L	LQC	Test C6		PO4-P	LQC	Source	Test A3	Na mg/L	UF?	Source	Test A4		SO4 mg/L	LQC	Source	Test C1	Test A5	Sulfide	Source	Test C2
			Units				**mV**			**mg/L**				**µg/L**					**mg/L**				**mg/L**					**mg/L**	**mg/L**			**mg/L**
			Test				**>LL**			**>LL**				**>LL**					**<UL**				**<UL**					**>LL**	**<UL**			**<UL**
			Limit: Regional Aquifer				**0**			**2**				**0.17**					**0.3**				**28.55**					**0.8**	**6.22**			**0.01**
			Limit: Intermediate				**0**			**2**				**0.17**					**0.08**				**12.19**					**1.07**	**4.48**			**0.01**
CdV-R-15-3	1640	6	20-Jan-06	19	—		ND	4.9	FP	P	<	0.05	U	Fail	<	0.038	UH		P	12.4			P		1.42			P	P	0.009	FP	P
CdV-R-15-3	1640	6	29-Mar-06	20	—		ND	—		ND	<	0.05	U	Fail	<	0.01	U		P	10.8			P	<	1.48			P	P	0.005	FP	P
CdV-R-37-2	1200	2	28-Jan-02	1	—		ND	2.2	FN	P		—		ND	<	0.05	U		P	14.1	E		P		0.58			Fail	Red	—		ND
CdV-R-37-2	1200	2	23-Apr-02	2	—		ND	1.7		Fail		—		ND	<	0.03	J		P	13.9			P	<	0.4	U		Fail	Red	—		ND
CdV-R-37-2	1200	2	18-Jul-02	3	—		ND	1.9	FN	Fail		—		ND	<	0.05	U		P	15.8			P	<	0.4	U		Fail	Red	—		ND
CdV-R-37-2	1200	2	18-Sep-02	4	—		ND	1.8	FN	Fail		—		ND	<	0.05	U		P	16.5			P		0.45			Fail	Red	—		ND
CdV-R-37-2	1200	2	21-Jan-03	5	—		ND	2.2	FN	P		—		ND		0.04	J		P	17.1			P		0.36	J		Fail	Red	—		ND
CdV-R-37-2	1200	2	6-May-03	6	—		ND	1.5	FN	Fail		—		ND	<	0.05	U		P	18.3			P	<	0.4	U		Fail	Red	—		ND
CdV-R-37-2	1200	2	5-Aug-03	7	—		ND	1.0	FN	Fail		—		ND		—			ND	17.7			P		—			ND	ND	—		ND
CdV-R-37-2	1200	2	2-Dec-03	8	—		ND	1.5	FN	Fail	<	0.2	U	Fail	<	0.014	J		P	18.6			P		0.38	J		Fail	Red	—		ND
CdV-R-37-2	1200	2	13-Apr-04	9	-57	FN	Fail	4.0	FP	P	<	0.2	U	Fail	<	0.151	UH		P	18.5			P		0.57			Fail	Red	0.004	FN	P
CdV-R-37-2	1200	2	26-Oct-04	10	—		ND	6.1	FN	P	<	0.05	U	Fail	<	0.015	J		P	16.8			P		0.48			Fail	Red	0.001	FN	P
CdV-R-37-2	1200	2	29-Mar-05	11	-67	FP	Fail	8.4	FN	P	<	0.05	U	Fail	<	0.029	J		P	15.5			P		0.16			Fail	Red	0.004	FN	P
CdV-R-37-2	1200	2	6-Jul-05	12	-70		Fail	3.1		P	<	0.05	U	Fail	<	0.08			P	13.7			P		0.38			Fail	Red	—		ND
CdV-R-37-2	1200	2	12-Oct-05	13	—		ND	1.9		Fail	<	0.05	U	Fail		0.168			P	12.5			P		0.38			Fail	Red	0.005		P
CdV-R-37-2	1200	2	9-Jan-06	14	—		ND	2.6	FP	P	<	0.05	U	Fail		0.171			P	12.7			P		0.41			Fail	Red	0.011	FP	Fail
CdV-R-37-2	1200	2	21-Mar-06	15	—		ND	—		ND	<	0.05	U	Fail	<	0.072			P	12.8			P		0.49			Fail	Red	—		ND
CdV-R-37-2	1359	3	29-Jan-02	1	—		ND	6.9		P		—		ND	<	0.05	U		P	13.4	E		P		1.82			P	P	—		ND
CdV-R-37-2	1359	3	24-Apr-02	2	—		ND	8.1		P		—		ND	<	0.04	J		P	12.2			P		1.61			P	P	—		ND
CdV-R-37-2	1359	3	19-Jul-02	3	—		ND	7.8	FN	P		—		ND	<	0.05	U		P	12.2			P		1.53			P	P	—		ND
CdV-R-37-2	1359	3	24-Sep-02	4	—		ND	7.3	FN	P		—		ND	<	0.03	J		P	12			P		1.62			P	P	—		ND
CdV-R-37-2	1359	3	22-Jan-03	5	—		ND	10.2	FN	P		—		ND		0.03	J		P	11.9			P		1.68			P	P	—		ND
CdV-R-37-2	1359	3	7-May-03	6	—		ND	10.8	FN	P		—		ND	<	0.05	U		P	11.6			P		1.62			P	P	—		ND
CdV-R-37-2	1359	3	6-Aug-03	7	—		ND	7.0	FN	P		—		ND		—			ND	11.5			P		—			ND	ND	—		ND
CdV-R-37-2	1359	3	3-Dec-03	8	—		ND	11.8	FN	P		0.258		P	<	0.035	J		P	11.5			P		1.85			P	P	—		ND
CdV-R-37-2	1359	3	13-Apr-04	9	162	FN	P	8.0	FP	P		0.262		P	<	0.011	U		P	11.3			P		1.93			P	P	0.002	FN	P
CdV-R-37-2	1359	3	27-Oct-04	10	—		ND	9.1	FN	P		0.277		P	<	0.036	J		P	11.1			P		2.02			P	P	0.01	FN	P
CdV-R-37-2	1359	3	30-Mar-05	11	4.4	FP	P	12.1	FN	P		0.289		P	<	0.052			P	11.2			P		1.42			P	P	0	FN	P
CdV-R-37-2	1359	3	7-Jul-05	12	264		P	11.4		P		0.306		P	<	0.069			P	11.3			P		1.4			P	P	—		ND
CdV-R-37-2	1359	3	12-Oct-05	13	—		ND	6.3		P		0.265		P		0.218			P	11.6			P		1.62			P	P	0.006		P
CdV-R-37-2	1359	3	10-Jan-06	14	—		ND	6.5	FP	P		0.265		P		0.126			P	11.1			P		1.68			P	P	0	FP	P
CdV-R-37-2	1359	3	22-Mar-06	15	—		ND	—		ND		0.308		P	<	0.038	J		P	11.4			P		1.74			P	P	0.031	FP	Fail
CdV-R-37-2	1551	4	30-Jan-02	1	—		ND	4.8		P		—		ND		0.13			P	14.3			P	<	0.4	U		Fail	Red	—		ND
CdV-R-37-2	1551	4	25-Apr-02	2	—		ND	7.6		P		—		ND		0.14			P	11.5			P		0.942			Fail	Red	—		ND

Table C-5b (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	ORP	Source	Test C3	DO	Source	Test C12		ClO4 ug/L	LQC	Test C6		PO4-P	LQC	Source	Test A3	Na mg/L	UF?	Source	Test A4		SO4 mg/L	LQC	Source	Test C1	Test A5	Sulfide	Source	Test C2
			Units				**mV**			**mg/L**				**µg/L**					**mg/L**				**mg/L**					**mg/L**	**mg/L**			**mg/L**
			Test				**>LL**			**>LL**				**>LL**					**<UL**				**<UL**					**>LL**	**<UL**			**<UL**
			Limit: Regional Aquifer				**0**			**2**				**0.17**					**0.3**				**28.55**					**0.8**	**6.22**			**0.01**
			Limit: Intermediate				**0**			**2**				**0.17**					**0.08**				**12.19**					**1.07**	**4.48**			**0.01**
CdV-R-37-2	1551	4	22-Jul-02	3	—		ND	7.9	FN	P		—		ND		0.06			P	11.3			P		0.55			Fail	Red	—		ND
CdV-R-37-2	1551	4	26-Sep-02	4	—		ND	6.7	FN	P		—		ND	<	0.07			P	10.4			P		0.72			Fail	Red	—		ND
CdV-R-37-2	1551	4	23-Jan-03	5	—		ND	9	FN	P		—		ND		0.05			P	10.6			P		0.82			P	P	—		ND
CdV-R-37-2	1551	4	8-May-03	6	—		ND	9.8	FN	P		—		ND		0.02	J		P	10.6	E		P		1.07			P	P	—		ND
CdV-R-37-2	1551	4	6-Aug-03	7	—		ND	8.3	FN	P		—		ND		—			ND	10.7			P		—			ND	ND	—		ND
CdV-R-37-2	1551	4	3-Dec-03	8	—		ND	12.3	FN	P	<	0.2	U	Fail	<	0.017	J		P	10.7			P		1.43			P	P	—		ND
CdV-R-37-2	1551	4	15-Apr-04	9	-53	FN	Fail	8.69	FP	P		0.561		Err		0.033	J		P	11.1			P		2.77			P	P	0.068	FN	P
CdV-R-37-2	1551	4	27-Oct-04	10	—		ND	12.6	FN	P	<	0.05	U	Fail	<	0.035	J		P	10.4			P		1.95			P	P	0.002	FN	P
CdV-R-37-2	1551	4	31-Mar-05	11	-14	FP	Fail	<13	FN	P	<	0.05	U	Fail	<	0.034	J		P	10.1			P		1.79			P	P	0.006	FN	P
CdV-R-37-2	1551	4	8-Jul-05	12	16		P	8.8		P	<	0.05	U	Fail	<	0.079			P	10.7			P		1.46			P	P	—		ND
CdV-R-37-2	1551	4	13-Oct-05	13	—		ND	4.3		P	<	0.05	U	Fail		0.137			P	10.7			P		1.81			P	P	0.008		P
CdV-R-37-2	1551	4	11-Jan-06	14	—		ND	4.5	FP	P	<	0.05	U	Fail		0.071			P	11.3			P		1.84			P	P	0.032	FP	Fail
CdV-R-37-2	1551	4	22-Mar-06	15	—		ND	—		ND	<	0.05	U	Fail	<	0.036	J		P	10.7			P		1.96			P	P	0.006	FP	P
R-17	1057	1	24-Feb-06	1	—		ND	—		ND		—		ND		0.024			P	11.7	UF		P		3.25			P	P	—		ND
R-17	1057	1	19-Oct-06	2	225		P	3.2		P		0.223		P	<	0.028	J		P	12			P		2.35			P	P	0.021		Fail
R-17	1124	2	17-Oct-06	1	204		P	3.2		P		0.21		P		0.043	J		P	10.7			P		1.97			P	P	0.01		P
R-18	1358	1	25-Aug-05	1	156		P	4.6		P		0.268	H	P	<	0.047	J		P	8.58			P		1.73			P	P	0.005		P
R-18	1358	1	1-Dec-05	2	195		P	4.6		P		0.218		P		0.022			P	8.4			P		1.74			P	P	0		P
R-18	1358	1	7-Mar-06	3	226		P	4.7		P		0.243		P	<	0.055			P	8.98			P	<	1.6			P	P	0		P
R-18	1358	1	16-May-06	4	230		P	4.3		P		0.242		P		0.019	J		P	8.43			P		1.67			P	P	0.002		P
R-18	1358	1	15-Aug-06	5	267		P	4.4		P		0.243		P	<	0.034	J		P	8.88			P		1.72			P	P	—		ND
R-18	1358	1	18-Dec-06	6	65.7		P	5.4		P		0.237		P		0.071		IP	P	8.38			P		1.8			P	P			ND
R-19	909	2	22-Sep-00	1	—		ND	—		ND	<	1.04	U	DL		0.052			P	13			Fail		3.3			P	P	—		ND
R-19	909	2	10-Apr-01	2	—		ND	—		ND	<	0.801	U	DL		0.058			P	15			Fail		2.9			P	P	—		ND
R-19	909	2	5-Jul-01	3	—		ND	—		ND	<	0.958	U	DL		0.055			P	14			Fail		2.8			P	P	—		ND
R-19	909	2	13-Sep-01	4	—		ND	—		ND	<	4	U	DL		0.05			P	14.7			Fail		2.56			P	P	—		ND
R-19	909	2	20-Aug-02	5	165	FP	P	4.6		P	<	1.45	U	DL		0.03	J		P	14.6	UF		Fail		2.81			P	P	—		ND
R-19	909	2	15-Dec-03	6	—		ND	—		ND	<	4	U	DL	<	0.073			P	14.8	UF		Fail		3.07			P	P	—		ND
R-19	909	2	10-Jun-04	7	—		ND	—		ND		0.299		P	<	0.067			P	14.2	UF		Fail		3.29			P	P	—		ND
R-19	909	2	21-Jul-05	8	245	FP	P	5.0	FP	P		0.325		P	<	0.051			P	13.1			Fail		2.57			P	P	—		ND
R-19	909	2	18-Aug-06	9	—		ND	—		ND	<	0.5	U	DL	<	0.01	U		P	15.5			Fail		4.18			P	P	—		ND
R-19	909	2	11-Dec-06	10	—		ND	—		ND	<	1	U	DL	<	0.01		IP	P	14.3		IP	Fail		5.69		IP	P	Fail	—		ND
R-19	1191	3	26-Sep-00	1	—		ND	—		ND	<	1.04	U	DL	<	0.05	U		P	9			P		2			P	P	—		ND
R-19	1191	3	9-Apr-01	2	—		ND	—		ND	<	0.801	U	DL	<	0.05	U		P	11			P		1.8			P	P	—		ND

Table C-5b (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	ORP	Source	Test C3	DO	Source	Test C12		ClO4 ug/L	LQC	Test C6		PO4-P	LQC	Source	Test A3	Na mg/L	UF?	Source	Test A4		SO4 mg/L	LQC	Source	Test C1	Test A5	Sulfide	Source	Test C2
Units							mV			mg/L				μg/L					mg/L				mg/L					mg/L	mg/L			mg/L
Test							>LL			>LL				>LL					<UL				<UL					>LL	<UL			<UL
Limit: Regional Aquifer							0			2				0.17					0.3				28.55					0.8	6.22			0.01
Limit: Intermediate							0			2				0.17					0.08				12.19					1.07	4.48			0.01
R-19	1191	3	10-Jul-01	3	—		ND	—		ND	<	0.958	U	DL	<	0.05	U		P	10			P		1.9			P	P	—		ND
R-19	1191	3	18-Sep-01	4	—		ND	—		ND	<	0.958	U	DL		0.06			P	10.7			P		1.71			P	P	—		ND
R-19	1191	3	22-Aug-02	5	159	FP	P	5.7		P	<	1.45	U	DL	<	0.011	U		P	11	UF		P		1.89			P	P	—		ND
R-19	1191	3	15-Dec-03	6	—		ND	—		ND	<	4	U	DL	<	0.027	J		P	10.6	UF		P		1.91			P	P	—		ND
R-19	1191	3	14-Jun-04	7	—		ND	—		ND		0.225		P	<	0.049	J		P	10.4	UF		P		2.07			P	P	—		ND
R-19	1191	3	21-Jul-05	8	174	FP	P	5.2	FP	P		0.229		P		0.091			P	9.89			P	<	0.057	U		Fail	Red	—		ND
R-19	1191	3	15-Aug-06	9	—		ND	—		ND	<	0.5	U	DL	<	0.01	U		P	10.6			P		2.43			P	P	—		ND
R-19	1191	3	11-Dec-06	10	—		ND	—		ND	<	1	U	DL	<	0.01		IP	P	10.3		IP	P		3.38		IP	P	P	—		ND
R-19	1413	4	6-Apr-01	1	—		ND	—		ND	<	0.801	U	DL	<	0.05	U		P	11			P		1.6			P	P	—		ND
R-19	1413	4	11-Jul-01	2	—		ND	—		ND	<	0.958	U	DL	<	0.05	U		P	10			P		1.6			P	P	—		ND
R-19	1413	4	19-Sep-01	3	—		ND	—		ND	<	0.958	U	DL	<	0.019			P	10.6		GR	P		1.6		GR	P	P	—		ND
R-19	1413	4	26-Aug-02	4	180	FP	P	8.6		P	<	1.45	U	DL	<	0.011	U		P	10.7	UF		P		1.37			P	P	—		ND
R-19	1413	4	16-Dec-03	5	—		ND	—		ND	<	4	U	DL	<	0.038	J		P	9.54	UF		P		1.54			P	P	—		ND
R-19	1413	4	15-Jun-04	6	—		ND	—		ND		0.257		P	<	0.036	J		P	10.6	UF		P		1.23			P	P	—		ND
R-19	1413	4	28-Jul-05	7	208	FP	P	5.5	FP	P		0.257		P	<	0.053			P	9.6			P		1.44			P	P	—		ND
R-19	1413	4	16-Aug-06	8	—		ND	—		ND		0.229		P	<	0.049	J		P	9.74			P		1.5			P	P	—		ND
R-19	1413	4	12-Dec-06	9	—		ND	—		ND		0.233		P	<	0.051			P	9.7			P		1.4			P	P	—		ND
R-19	1586	5	4-Apr-01	1	—		ND	—		ND	<	0.801	U	DL		0.075			P	14			P	<	0.062	U		Fail	Red	—		ND
R-19	1586	5	12-Jul-01	2	—		ND	—		ND	<	0.958	U	DL	<	0.05	U		P	14			P	<	0.062	U		Fail	Red	—		ND
R-19	1586	5	20-Sep-01	3	—		ND	—		ND	<	0.958	U	DL		0.06			P	14.8			P	<	0.062	U		Fail	Red	—		ND
R-19	1586	5	23-Aug-02	4	-114		Fail	3.0		P	<	1.45	U	DL	<	0.011	U		P	15.9	UF		P	<	0.193	U		Fail	Red	—		ND
R-19	1586	5	16-Dec-03	5	—		ND	—		ND	<	4	U	DL	<	0.024	J		P	13.2	UF		P		0.38	J		Fail	Red	—		ND
R-19	1586	5	17-Aug-06	6	—		ND	—		ND	<	1	U	DL	<	0.01			P	15.1			P		0.5			Fail	Red	—		ND
R-19	1586	5	11-Dec-06	7	—		ND	—		ND	<	2	U	DL	<	0.01		IP	P	15.6		IP	P		0.58		IP	Fail	Red	—		ND
R-19	1730	6	4-Oct-00	1	—		ND	—		ND	<	1.04	U	DL		0.122			P	35.5			Fail	<	0.5	U		Fail	Red	—		ND
R-19	1730	6	2-Apr-01	2	—		ND	—		ND	<	0.801	U	DL		0.11			P	30			Fail		0.312			Fail	Red	—		ND
R-19	1730	6	16-Jul-01	3	—		ND	—		ND	<	0.958	U	DL		0.12			P	23			P	<	1	U		Fail	Red	—		ND
R-19	1730	6	21-Sep-01	4	—		ND	—		ND	<	0.958	U	DL		0.1			P	20.2			P	<	0.062	U		Fail	Red	—		ND
R-19	1730	6	27-Aug-02	5	-76		Fail	6.2		P	<	1.45	U	DL		0.08			P	15.4	UF		P	<	0.193	U		Fail	Red	—		ND
R-19	1730	6	16-Dec-03	6	—		ND	—		ND	<	4	U	DL	<	0.039	J		P	11.6	UF		P		0.781			Fail	Red	—		ND
R-19	1730	6	17-Aug-06	7	—		ND	—		ND	<	0.5	U	DL	<	0.01	U		P	13.7			P		2.71			P	P	—		ND
R-19	1730	6	11-Dec-06	8	—		ND	—		ND	<	1	U	DL	<	0.01	U	IP	P	11.6		IP	P		3.68		IP	P	P	—		ND
R-19	1835	7	3-Oct-00	1	—		ND	—		ND	<	1.04	U	DL	<	0.1	U		P	49			Fail		33			P	Fail	—		ND
R-19	1835	7	29-Mar-01	2	—		ND	—		ND	<	801	U	Err		0.14			P	99			Fail		45.5			P	Fail	—		ND

Table C-5b (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	ORP	Source	Test C3	DO	Source	Test C12		ClO4 ug/L	LQC	Test C6		PO4-P	LQC	Source	Test A3	Na mg/L	UF?	Source	Test A4		SO4 mg/L	LQC	Source	Test C1	Test A5	Sulfide	Source	Test C2
Units							mV			mg/L				μg/L					mg/L				mg/L					mg/L	mg/L			mg/L
Test							>LL			>LL				>LL					<UL				<UL					>LL	<UL			<UL
Limit: Regional Aquifer							0			2				0.17					0.3				28.55					0.8	6.22			0.01
Limit: Intermediate							0			2				0.17					0.08				12.19					1.07	4.48			0.01
R-19	1835	7	17-Jul-01	3	—		ND	—		ND	<	0.958	U	DL		0.2			P	110			Fail		43			P	Fail	—		ND
R-19	1835	7	24-Sep-01	4	—		ND	—		ND	<	0.958	U	DL		0.16			P	109			Fail		34.6			P	Fail	—		ND
R-19	1835	7	26-Aug-02	5	-2		Fail	6.6		P	<	1.45	U	DL	<	0.1			P	131	UF		Fail		43.6			P	Fail	—		ND
R-19	1835	7	17-Dec-03	6	—		ND	—		ND	<	4	U	DL	<	0.11	J		P	87.3	UF		Fail		38.8			P	Fail	—		ND
R-19	1835	7	16-Jun-04	7	—		ND	—		ND		0.063	J	Fail		0.134			P	86.1	UF		Fail		34.1			P	Fail	—		ND
R-19	1835	7	28-Jul-05	8	154	FP	P	4.4	FP	P	<	0.05	U	Fail	<	0.138			P	68			Fail		23.4			P	Fail	—		ND
R-19	1835	7	18-Aug-06	9	—		ND	—		ND	<	0.5	U	DL	<	0.01	U		P	72.9			Fail		30.3			P	Fail	—		ND
R-19	1835	7	13-Dec-06	10	—		ND	—		ND	<	2	U	DL		0.334		IP	Fail	71.8		IP	Fail		31.6		IP	P	Fail	—		ND
R-25	755	1	14-Nov-00	1	—		ND	—		ND	<	1.04	U	DL		0.25			Fail	9.9			P		10			P	Plm	—		ND
R-25	755	1	3-May-01	2	—		ND	—		ND	<	2.37	J	Err		0.13			Fail	9.4			P		12			P	Plm	—		ND
R-25	755	1	13-Aug-01	3	—		ND	—		ND	<	0.958	U	DL		0.081			Fail	9.7			P		11			P	Plm	—		ND
R-25	755	1	4-Feb-02	4	—		ND	5.4	FN	P	<	0.873	J	Err	<	0.05	U		P	10.5			P		9.42			P	Plm	—		ND
R-25	755	1	7-Aug-02	5	165		P	5.0		P	<	1.45	U	DL	<	0.09			Fail	9.8	UF		P		9.51			P	Plm	—		ND
R-25	755	1	11-Dec-03	6	—		ND	—		ND	<	4	U	DL	<	0.011	U		P	10.1	UF		P		8.32			P	Plm	—		ND
R-25	755	1	1-Sep-04	7	—		ND	—		ND		0.645		P	<	0.024	J		P	8.85	UF		P		10.7			P	Plm	—		ND
R-25	755	1	2-Aug-05	8	255		P	5.2		P		0.577		P	<	0.041	J		P	9.77			P		8.48			P	Plm	—		ND
R-25	892	2	15-Nov-00	1	—		ND	—		ND	<	1.04	U	DL		9.7			Fail	52			Fail		14			P	Fail	—		ND
R-25	892	2	4-May-01	2	—		ND	—		ND	<	1.85	J	Err		19			Fail	77			Fail		15			P	Fail	—		ND
R-25	892	2	14-Aug-01	3	—		ND	—		ND	<	0.958	U	DL		19			Fail	90			Fail		13			P	Fail	—		ND
R-25	892	2	5-Feb-02	4	—		ND	7		P	<	1.68	J	Err		18.1			Fail	108			Fail		11.6			P	Fail	—		ND
R-25	892	2	8-Aug-02	5	131		P	4.5		P	<	1.45	U	DL		10.5			Fail	112	UF		Fail		9.63			P	Fail	—		ND
R-25	892	2	10-Dec-03	6	—		ND	—		ND	<	4	U	DL		15.2			Fail	102	UF		Fail		8.94			P	Fail	—		ND
R-25	892	2	3-Aug-05	7	-9		Fail	4.0		P		0.138	J	Fail		7.38			Fail	36.9			Fail		7.79			P	Fail	—		ND
R-25	1192	4	4-Dec-00	1	—		ND	—		ND	<	2.26	J	DL		0.8			Fail	11			P		280			P	Fail	—		ND
R-25	1192	4	7-May-01	2	—		ND	—		ND	<	3.4	J	Err		0.14			Fail	8.3			P		130			P	Fail	—		ND
R-25	1192	4	14-Aug-01	3	—		ND	—		ND	<	0.958	U	DL		0.45			Fail	8.9			P		150			P	Fail	—		ND
R-25	1192	4	6-Feb-02	4	—		ND	5.0		P	<	2.25	J	Err		0.1			Fail	8.8			P		81.5			P	Fail	—		ND
R-25	1192	4	8-Aug-02	5	-52		Fail	5.7		P	<	1.45	U	DL		0.06			P	9.26	UF		P		27.2			P	Fail	—		ND
R-25	1192	4	10-Dec-03	6	—		ND	—		ND	<	4	U	DL		3.35			Err	9.74	UF		P		11.8			P	Fail	—		ND
R-25	1192	4	4-Aug-05	7	320		P	4.6		P		0.511		P		0.092			Fail	9.51			P		207			Err	Err	—		ND
R-25	1303	5	7-Dec-00	1	—		ND	—		ND	<	1.04	U	DL		2.8			Fail	14			P		9.6			P	Fail	—		ND
R-25	1303	5	8-May-01	2	—		ND	—		ND	<	1.93	J	Err		3.2			Fail	16			P		8.9			P	Fail	—		ND
R-25	1303	5	15-Aug-01	3	—		ND	—		ND	<	0.958	U	DL		3			Fail	16			P		8.5			P	Fail	—		ND
R-25	1303	5	7-Feb-02	4	—		ND	3.0	FP	P	<	4	U	Err		3.45			Fail	23.9			P		8.79			P	Fail	—		ND

Table C-5b (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	ORP	Source	Test C3	DO	Source	Test C12		ClO4 ug/L	LQC	Test C6		PO4-P	LQC	Source	Test A3	Na mg/L	UF?	Source	Test A4		SO4 mg/L	LQC	Source	Test C1	Test A5	Sulfide	Source	Test C2
Units							**mV**			**mg/L**				**µg/L**					**mg/L**				**mg/L**					**mg/L**	**mg/L**			**mg/L**
Test							**>LL**			**>LL**				**>LL**					**<UL**				**<UL**					**>LL**	**<UL**			**<UL**
Limit: Regional Aquifer							**0**			**2**				**0.17**					**0.3**				**28.55**					**0.8**	**6.22**			**0.01**
Limit: Intermediate							**0**			**2**				**0.17**					**0.08**				**12.19**					**1.07**	**4.48**			**0.01**
R-25	1303	5	9-Aug-02	5	76		P	4.1		P	<	1.45	U	DL		4.7			Fail	20.8	UF		P		9.16			P	Fail	—		ND
R-25	1303	5	9-Dec-03	6	—		ND	—		ND	<	4	U	DL		4.96			Fail	1640	UF		Err		9.96			P	Fail	—		ND
R-25	1303	5	31-Aug-04	7	—		ND	—		ND	<	0.05	U	Fail		5.01			Fail	19.7	UF		P		—			ND	ND	—		ND
R-25	1303	5	9-Aug-05	8	—		ND	2.8		P		—		ND		—			ND	18	UF		P		—			ND	ND	—		ND
R-25	1406	6	8-Dec-00	1	—		ND	—		ND	<	1.04	U	DL		8.4			Fail	15			P		7.8			P	Fail	—		ND
R-25	1406	6	9-May-01	2	—		ND	—		ND	<	2.62	J	Err		6.9			Fail	14			P		6.5			P	Fail	—		ND
R-25	1406	6	16-Aug-01	3	—		ND	—		ND	<	0.958	U	DL		6.2			Fail	13			P		4.55			P	P	—		ND
R-25	1406	6	8-Feb-02	4	—		ND	6.5		P	<	1.07	U	DL		4.2			Fail	12.6			P		3.91			P	P	—		ND
R-25	1406	6	12-Aug-02	5	233		P	6.3		P	<	1.45	U	DL		3.75			Fail	12.6	UF		P		3.26			P	P	—		ND
R-25	1406	6	9-Dec-03	6	—		ND	—		ND	<	4	U	DL		2.08			Fail	534	UF		Err		2.89			P	P	—		ND
R-25	1606	7	11-Dec-00	1	—		ND	—		ND	<	1.04	U	DL		1			Fail	12			P		9.4			P	Fail	—		ND
R-25	1606	7	11-May-01	2	—		ND	—		ND	<	2.49	J	Err		0.82			Fail	10			P		3.7			P	P	—		ND
R-25	1606	7	17-Aug-01	3	—		ND	—		ND	<	0.958	U	DL		0.74			Fail	9.4			P		2.8			P	P	—		ND
R-25	1606	7	11-Feb-02	4	—		ND	8.1		P	<	4	U	DL		0.49			Fail	10.9			P		2.18			P	P	—		ND
R-25	1606	7	12-Aug-02	5	206		P	6.3		P	<	1.45	U	DL		0.4			Fail	10.6	UF		P		1.87			P	P	—		ND
R-25	1606	7	8-Dec-03	6	—		ND	—		ND	<	4	U	DL		0.319			Fail	10.2	UF		P		1.76			P	P	—		ND
R-25	1796	8	12-Dec-00	1	—		ND	—		ND	<	1.04	U	DL		0.95			Fail	18			P		13			P	Fail	—		ND
R-25	1796	8	14-May-01	2	—		ND	—		ND	<	1.86	J	Err		1.1			Fail	13			P		4.2			P	P	—		ND
R-25	1796	8	20-Aug-01	3	—		ND	—		ND	<	0.958	U	DL		0.88			Fail	12			P		3.1			P	P	—		ND
R-25	1796	8	12-Feb-02	4	—		ND	8.9		P	<	4	U	DL		0.53			Fail	13.4			P		2.38			P	P	—		ND
R-25	1796	8	14-Aug-02	5	170		P	8.5		P	<	1.45	U	DL		0.49			Fail	12.5	UF		P		2.23			P	P	—		ND
R-25	1796	8	4-Dec-03	6	—		ND	—		ND	<	4	U	DL		0.354			Fail	11.1	UF		P		1.92			P	P	—		ND
R-25	1796	8	10-Aug-05	7	—		ND	6.6		P		0.238		P		0.339			Fail	10.5			P		1.82			P	P	—		ND
R-26	659	1	13-Apr-05	1	-0.4		Fail	8.9	FN	P		0.21		P	<	0.04	J		P	8.55			P		1.12			P	P	0.001	FN	P
R-26	659	1	27-Jul-05	2	173		P	5.7		P		0.22		P		0.111			Fail	8.33			P		0.799			Fail	Red	—		ND
R-26	659	1	2-Nov-05	3	—		ND	6.8		P		0.244		P		0.11			Fail	8.55			P		1.07			P	P	0		P
R-26	659	1	22-Feb-06	4	—		ND	6.6		P		0.239		P	<	0.06			P	8.82			P		1.12			P	P	—		ND
R-27	852	1	14-Nov-05	1	—		ND	—		ND		—		ND		—			ND	10.7	UF		P		1.48			P	P	—		ND
R-27	852	1	1-Jul-06	2	161		P	5.6		P		0.219		P	<	0.01	U		P	10.1			P		1.52			P	P	0.001		P

Data source: WQDB except where indicated otherwise

Notes: Pass and fail outcomes for each sample are determined by comparison against test threshold criteria. From top to bottom in the column headers above are listed the indicator name and associated test identifier, units of measurement, type of test threshold, and threshold values for the regional aquifer and perched intermediate aquifer, respectively. The user should assume that the sulfide (S) measurements reported in this table are uncertain and potentially biased on the low (oxidizing) side relative to in-situ conditions, to the extent that the sample may have been exposed to the atmosphere prior to analysis.

LL=lower limit, UL=upper limit, P=pass; UF=unfiltered

Table C-6a
Trace Metal Indicators

Well	Port Depth (ft)	Scr	Sample Date	Event		Cr (F) µg/L	LQC	UF?	Source	Test C10		Cr (NF) µg/L	LQC	Source	Test F3	Ratio Cr (NF/F)	Test F4		Fe (F) µg/L	LQC	UF?	Source	Test C4		Fe (NF) µg/L	LQC	Source	Test F1	Ratio Fe (NF/F)	Test F2		Mn (F) µg/L	LQC	UF?		Test C5
Units										**µg/L**					**µg/L**		**Ratio**						**µg/L**					**µg/L**		**Ratio**						**µg/L**
Test										**>LL**					**<UL**		**<UL**						**<UL**					**<UL**		**<UL**						**<UL**
Limit: Regional Aquifer										**1**					**10**		**5**						**102**					**500**		**10**						**16**
Limit: Intermediate										**1**					**5**		**5**						**102**					**500**		**10**						**16**
CdV-16-1(i)	624	1	1-Jun-05	1	<	1	U			Fail	<	2.2	J		P	2.2	NA		29.4	J			P		488			Yes	16.6	NA		5.5				P
CdV-16-1(i)	624	1	29-Aug-05	2	<	1	U			Fail		3.7	J		P	3.7	NA		41.5	J			P		2750			No	66.3	Fail		10.8				P
CdV-16-1(i)	624	1	7-Dec-05	3	<	1	U			Fail		1.5	J		P	1.5	NA	<	18	U			P		333			Yes	18.5	NA		8.4				P
CdV-16-1(i)	624	1	9-Mar-06	4	<	1	U			Fail	<	1	U		P	1.0	NA	<	42.3	J			P		110			Yes	2.6	NA		3	J			P
CdV-16-2(i)r	850	1	14-Sep-05	1	<	1	U	UF		Fail	<	1	U		P	—	NA	<	10	U	UF		P	<	10	U		Yes	—	NA		15		UF		P
CdV-16-2(i)r	850	1	15-Dec-05	2	<	1	U			Fail		6.5			Fail	6.5	DL		24.2	J			P		836			No	34.5	Fail		8.7				P
CdV-16-2(i)r	850	1	15-Mar-06	3	<	1	U			Fail		21			Fail	20.6	DL		20.2	J			P		2010			No	99.5	Fail		13				P
CdV-16-2(i)r	850	1	17-May-06	4	<	1	U			Fail		15			Fail	15.3	DL		23.5	J			P		506			No	21.5	Fail		5.7	J			P
CdV-R-15-3	1254	4	3-Jan-01	1	<	0.96	B			Fail	<	6.8	B		P	7.1	NA		36	B			P		88	B		Yes	2.4	NA		9.5	B			P
CdV-R-15-3	1254	4	23-Apr-01	2	<	0.27	B			Fail	<	0.9	B		P	3.3	NA		100	E			P		130	E		Yes	1.3	NA		72				Fail
CdV-R-15-3	1254	4	18-Jul-01	3	<	0.67	B			Fail	<	1.3	B		P	1.9	NA		100				P		140			Yes	1.4	NA		16				P
CdV-R-15-3	1254	4	9-Oct-01	4	<	5	U			DL		1.9	B		P	0.4	NA	<	50	U			P	<	13.7	B		Yes	0.3	NA		13.6				P
CdV-R-15-3	1254	4	4-Jan-02	5	<	5	U			DL		2.7	B		P	0.5	NA	<	50	U			P		211			Yes	4.2	NA		5.04	E			P
CdV-R-15-3	1254	4	15-Apr-02	6	<	0.9	B			Fail	<	1.9	B		P	2.1	NA	<	50	U			P		204			Yes	4.1	NA		5.65				P
CdV-R-15-3	1254	4	16-Jul-02	7	<	1.01	B			P	<	2.4	B		P	2.4	NA	<	50	U			P	<	23.9	B		Yes	0.5	NA	<	2.4	B			P
CdV-R-15-3	1254	4	16-Sep-02	8		0.85	B			Fail		1.3	B		P	1.5	NA		14.1	B			P		17.1	B		Yes	1.2	NA		2.13	B			P
CdV-R-15-3	1254	4	14-Jan-03	9		1.94	B			P		2.4	B		P	1.2	NA	<	100	U			P		20.2	B		Yes	0.2	NA		1.86	B			P
CdV-R-15-3	1254	4	1-May-03	10		0.89	B			Fail		6.4			P	7.1	NA	<	100	U			P		37.9	B		Yes	0.4	NA		2.17	B			P
CdV-R-15-3	1254	4	30-Jul-03	11		1.02	B			P		1.8	B		P	1.8	NA	<	100	U			P	<	100	U		Yes	1.0	NA		3.11	B			P
CdV-R-15-3	1254	4	6-Jan-04	12		1.36				P		1.1			P	0.8	NA	<	12.6	U			P	<	12.6	U		Yes	1.0	NA		3.1				P
CdV-R-15-3	1254	4	20-Apr-04	13		1.4	B			P		1.2	B		P	0.9	NA	<	12.6	U			P		17.5	B		Yes	1.4	NA		2.7	B			P
CdV-R-15-3	1254	4	6-Jul-04	14		1.16	B			P		2.5	B		P	2.2	NA	<	12.6	U			P	<	13.2	B		Yes	1.0	NA		0.647	B			P
CdV-R-15-3	1254	4	19-Oct-04	15		2	J			P		1.8	J		P	0.9	NA	<	12.6	U			P		17.2	J		Yes	1.4	NA		1.8	J			P
CdV-R-15-3	1254	4	4-Apr-05	16	<	1.6	J			P	<	1.9	J		P	1.2	NA	<	18	U			P	<	18	U		Yes	1.0	NA		1.8	J			P
CdV-R-15-3	1254	4	12-Jul-05	17	<	2.4	J			P	<	2.4	J		P	1.0	NA	<	18	U	UF		P	<	18	U		Yes	—	NA		2.9	J			P
CdV-R-15-3	1254	4	18-Oct-05	18		1.7	J			P		6.4			P	3.8	NA	<	18	U			P		25.8	J		Yes	1.4	NA		1	J			P
CdV-R-15-3	1254	4	19-Jan-06	19		1.2	J			P		2.1	J		P	1.8	NA		23.3	J			P	<	18	U		Yes	0.8	NA	<	2	U			P
CdV-R-15-3	1254	4	27-Mar-06	20		1.6	J			P		4	J		P	2.5	NA	<	18	U			P		23.1	J		Yes	1.3	NA	<	2	U			P
CdV-R-15-3	1350	5	4-Jan-01	1	<	0.52	U			Fail	<	1.5	B		P	2.9	NA		390				Fail		480			Yes	1.2	NA		270				Fail
CdV-R-15-3	1350	5	25-Apr-01	2	<	0.21	U			Fail	<	3.5	B		P	16.7	NA		210	E			Fail		320			Yes	1.5	NA		230				Fail
CdV-R-15-3	1350	5	19-Jul-01	3	<	0.65	B			Fail	<	0.4	U		P	0.5	NA		290				Fail		390			Yes	1.3	NA		280				Fail
CdV-R-15-3	1350	5	11-Oct-01	4	<	5	U			DL		3.1	B		P	0.6	NA		177				Fail		281			Yes	1.6	NA		261				Fail

Table C-6a (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Cr (F) µg/L	LQC	UF?	Source	Test C10		Cr (NF) µg/L	LQC	Source	Test F3	Ratio Cr (NF/F)	Test F4		Fe (F) µg/L	LQC	UF?	Source	Test C4		Fe (NF) µg/L	LQC	Source	Test F1	Ratio Fe (NF/F)	Test F2		Mn (F) µg/L	LQC	UF?		Test C5
Units										µg/L					µg/L		Ratio						µg/L					µg/L		Ratio						µg/L
Test										>LL					<UL		<UL						<UL					<UL		<UL						<UL
Limit: Regional Aquifer										1					10		5						102					500		10						16
Limit: Intermediate										1					5		5						102					500		10						16
CdV-R-15-3	1350	5	15-Jan-02	5	<	5	U			DL		2.2	B		P	0.4	NA		200				Fail		408			Yes	2.0	NA		268				Fail
CdV-R-15-3	1350	5	15-Apr-02	6	<	5	U			DL		1.5	B		P	0.3	NA		171				Fail		190			Yes	1.1	NA		244				Fail
CdV-R-15-3	1350	5	16-Jul-02	7	<	5	U			DL		5.7			P	1.1	NA		146				Fail		230			Yes	1.6	NA		237				Fail
CdV-R-15-3	1350	5	17-Sep-02	8	<	5	U			DL	<	5	U		P	1.0	NA		148				Fail		199			Yes	1.3	NA		239				Fail
CdV-R-15-3	1350	5	15-Jan-03	9		0.9	B			Fail		3.3	B		P	3.7	NA		143				Fail		157			Yes	1.1	NA		235				Fail
CdV-R-15-3	1350	5	2-May-03	10	<	5	U			DL		0.7	B		P	0.1	NA		161				Fail		171			Yes	1.1	NA		219				Fail
CdV-R-15-3	1350	5	7-Jan-04	11	<	0.5	U			Fail	<	0.5	U		P	1.0	NA		137				Fail		151			Yes	1.1	NA		183				Fail
CdV-R-15-3	1350	5	21-Apr-04	12	<	0.5	U			Fail		1.2	B		P	2.4	NA		140				Fail		129			Yes	0.9	NA		226				Fail
CdV-R-15-3	1350	5	7-Jul-04	13	<	0.5	U			Fail	<	0.5	U		P	1.0	NA		145				Fail		147			Yes	1.0	NA		219				Fail
CdV-R-15-3	1350	5	20-Oct-04	14	<	0.5	U			Fail		2.6	J		P	5.2	NA		146				Fail		174			Yes	1.2	NA		187				Fail
CdV-R-15-3	1350	5	5-Apr-05	15	<	1	U			Fail		1.5	J		P	1.5	NA		145				Fail		133			Yes	0.9	NA		141				Fail
CdV-R-15-3	1350	5	12-Jul-05	16	<	1	U			Fail		3.9	J		P	3.9	NA		123				Fail		247			Yes	2.0	NA		214	E			Fail
CdV-R-15-3	1350	5	18-Oct-05	17	<	1	U			Fail		6.6			P	6.6	NA		131				Fail		166			Yes	1.3	NA		208				Fail
CdV-R-15-3	1350	5	20-Jan-06	18	<	1	U			Fail		8.6			P	8.6	NA		148				Fail		170			Yes	1.1	NA		295				Fail
CdV-R-15-3	1350	5	28-Mar-06	19	<	1	U			Fail		5.5			P	5.5	NA		148				Fail		166			Yes	1.1	NA		295				Fail
CdV-R-15-3	1640	6	3-Jan-01	1	<	0.59	B			Fail	<	7.2	B		P	12.2	NA		2300				Fail		2500			No	1.1	P		380				Fail
CdV-R-15-3	1640	6	25-Apr-01	2	<	0.21	U			Fail	<	0.2	U		P	1.0	NA		1500	E			Fail		1700	E		No	1.1	P		480				Fail
CdV-R-15-3	1640	6	20-Jul-01	3	<	0.35	U			Fail	<	2.4	B		P	6.9	NA		1400				Fail		1400			No	1.0	P		450				Fail
CdV-R-15-3	1640	6	12-Oct-01	4	<	5	U			DL		—			ND	—	ND		1240				Fail		—			ND	—	ND		258				Fail
CdV-R-15-3	1640	6	15-Jan-02	5	<	5	U			DL		12			Fail	—	DL		1110				Fail		1140			No	1.0	P		386				Fail
CdV-R-15-3	1640	6	16-Apr-02	6	<	5	U			DL		6.5			P	1.3	NA		897				Fail		968			No	1.1	P		450				Fail
CdV-R-15-3	1640	6	17-Jul-02	7	<	5	U			DL	<	5	U		P	1.0	NA		830				Fail		893			No	1.1	P		342				Fail
CdV-R-15-3	1640	6	18-Sep-02	8	<	5	U			DL	<	5	U		P	1.0	NA		833				Fail		862			No	1.0	P		374				Fail
CdV-R-15-3	1640	6	16-Jan-03	9		0.95	B			Fail		2.2	B		P	2.3	NA		684				Fail		711			No	1.0	P		328				Fail
CdV-R-15-3	1640	6	5-May-03	10	<	5	U			DL	<	5	U		P	1.0	NA		650				Fail		731			No	1.1	P		322				Fail
CdV-R-15-3	1640	6	31-Jul-03	11	<	5	U			DL	<	5	U		P	1.0	NA		418				Fail		542			No	1.3	P		259				Fail
CdV-R-15-3	1640	6	8-Jan-04	12	<	0.5	U			Fail	<	0.5	U		P	1.0	NA		315				Fail		410			Yes	1.3	NA		176				Fail
CdV-R-15-3	1640	6	21-Apr-04	13	<	0.5	U			Fail		1	B		P	2.0	NA		288				Fail		286			Yes	1.0	NA		164				Fail
CdV-R-15-3	1640	6	8-Jul-04	14	<	0.5	U			Fail		2.1	B		P	4.3	NA		203				Fail		301			Yes	1.5	NA		132				Fail
CdV-R-15-3	1640	6	21-Oct-04	15	<	0.78	J			Fail	<	0.5	U		P	0.6	NA		17.1	J			Err		341			Yes	—	NA		26.2				Err
CdV-R-15-3	1640	6	6-Apr-05	16	<	1	U			Fail		2.2	J		P	2.2	NA		178				Fail		271			Yes	1.5	NA		151				Fail
CdV-R-15-3	1640	6	13-Jul-05	17	<	1	U			Fail		3.2	J		P	3.2	NA		157				Fail		234			Yes	1.5	NA		137	E			Fail
CdV-R-15-3	1640	6	19-Oct-05	18	<	1	U			Fail		18			Fail	18.3	DL		149				Fail		243			Yes	1.6	NA		126	E			Fail
CdV-R-15-3	1640	6	20-Jan-06	19	<	1	U			Fail	<	1	U		P	1.0	NA		125				Fail		161			Yes	1.3	NA		137				Fail

Table C-6a (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Cr (F) µg/L	LQC	UF?	Source	Test C10		Cr (NF) µg/L	LQC	Source	Test F3	Ratio Cr (NF/F)	Test F4		Fe (F) µg/L	LQC	UF?	Source	Test C4		Fe (NF) µg/L	LQC	Source	Test F1	Ratio Fe (NF/F)	Test F2		Mn (F) µg/L	LQC	UF?		Test C5
Units										µg/L					µg/L		Ratio						µg/L					µg/L		Ratio						µg/L
Test										>LL					<UL		<UL						<UL					<UL		<UL						<UL
Limit: Regional Aquifer										1					10		5						102					500		10						16
Limit: Intermediate										1					5		5						102					500		10						16
CdV-R-15-3	1640	6	29-Mar-06	20	<	1	U			Fail		1.4	J		P	1.4	NA		102				P		162			Yes	1.6	NA		129				Fail
CdV-R-37-2	1200	2	28-Jan-02	1	<	5	U			DL		1.6	B		P	0.3	NA		14800				Fail		18300			No	1.2	P		2330				Fail
CdV-R-37-2	1200	2	23-Apr-02	2	<	5	U			DL		5.4			P	1.1	NA		17200				Fail		19700			No	1.1	P		3190				Fail
CdV-R-37-2	1200	2	18-Jul-02	3	<	5	U			DL	<	5	U		P	1.0	NA		16400				Fail		21800			No	1.3	P		296				Err
CdV-R-37-2	1200	2	18-Sep-02	4	<	5	U			DL	<	5	U		P	1.0	NA		16400				Fail		20300			No	1.2	P		3360				Fail
CdV-R-37-2	1200	2	21-Jan-03	5		0.52	B			Fail		1.8	B		P	3.5	NA		15500				Fail		18900			No	1.2	P		3720				Fail
CdV-R-37-2	1200	2	6-May-03	6		0.66	B			Fail		0.8	B		P	1.2	NA		12300				Fail		16300			No	1.3	P		3600				Fail
CdV-R-37-2	1200	2	5-Aug-03	7	<	1.58	B			P	<	2.5	B		P	1.6	NA		12100				Fail		15200			No	1.3	P		3540				Fail
CdV-R-37-2	1200	2	2-Dec-03	8	<	2.61	B			P	<	2.6	B		P	1.0	NA		9750				Fail		14200			No	1.5	P		3450				Fail
CdV-R-37-2	1200	2	13-Apr-04	9	<	1.8	B			P	<	3.8	B		P	2.1	NA		9950				Fail		11600			No	1.2	P		3420				Fail
CdV-R-37-2	1200	2	26-Oct-04	10	<	0.5	U			Fail	<	0.5	U		P	1.0	NA		7910	EN			Fail		13000	EN		No	1.6	P		2930				Fail
CdV-R-37-2	1200	2	29-Mar-05	11		1.4	J			P		1	U		P	0.7	NA		13400				Fail		16800			No	1.3	P		2290				Fail
CdV-R-37-2	1200	2	6-Jul-05	12		1.3	J			P		6.1			P	4.7	NA		15800				Fail		17100			No	1.1	P		2200				Fail
CdV-R-37-2	1200	2	12-Oct-05	13	<	1	U			Fail		10			P	10.0	NA		14800				Fail		16500			No	1.1	P		2250				Fail
CdV-R-37-2	1200	2	9-Jan-06	14	<	1	U			Fail	<	1.4	J		P	1.4	NA		16100				Fail		16200			No	1.0	P		2020				Fail
CdV-R-37-2	1200	2	21-Mar-06	15	<	1	U			Fail		13			Fail	13.1	Fail		14800				Fail		15000			No	1.0	P		1860				Fail
CdV-R-37-2	1359	3	29-Jan-02	1	<	5	U			DL		3	B		P	0.6	NA		209				Fail		163			Yes	0.8	NA		32.3				Fail
CdV-R-37-2	1359	3	24-Apr-02	2	<	5	U			DL		4.7	B		P	0.9	NA		208				Fail		589			No	2.8	P		24				Fail
CdV-R-37-2	1359	3	19-Jul-02	3	<	5	U			DL	<	4.1	B		P	0.8	NA		167				Fail		588			No	3.5	P		23.2				Fail
CdV-R-37-2	1359	3	24-Sep-02	4	<	5	U			DL		4.2	B		P	0.8	NA		37.7	B			P		358			Yes	9.5	NA		11.4				P
CdV-R-37-2	1359	3	22-Jan-03	5		2.6	B			P		3.7	B		P	1.4	NA		41.7	B			P		221			Yes	5.3	NA		9.69				P
CdV-R-37-2	1359	3	7-May-03	6		1.38	B			P		4.7	B		P	3.4	NA		29.2	B			P		101			Yes	3.5	NA		6.68				P
CdV-R-37-2	1359	3	6-Aug-03	7		1.39	B			P		2	B		P	1.5	NA		16.2	B			P		27	B		Yes	1.7	NA		7.48				P
CdV-R-37-2	1359	3	3-Dec-03	8	<	4.54	B			P	<	4.2	B		P	0.9	NA	<	12.6	U			P		46.3	B		Yes	3.7	NA		5.66				P
CdV-R-37-2	1359	3	13-Apr-04	9	<	2.6	B			P	<	2.8	B		P	1.1	NA	<	12.6	U			P		21.1	B		Yes	1.7	NA		10.2				P
CdV-R-37-2	1359	3	27-Oct-04	10	<	2.6	J			P		7.2			P	2.8	NA	<	12.6	U			P		49	J		Yes	3.9	NA		4.6	J			P
CdV-R-37-2	1359	3	30-Mar-05	11		2.3	J			P		1.8	J		P	0.8	NA	<	18	U			P	<	18	U		Yes	1.0	NA		2.8	J			P
CdV-R-37-2	1359	3	7-Jul-05	12		1.8	J			P		4.7	J		P	2.6	NA	<	18	U			P		84.3	J		Yes	4.7	NA		2.5	J			P
CdV-R-37-2	1359	3	12-Oct-05	13		2	J			P		3.1	J		P	1.6	NA	<	18	U			P	<	18	U		Yes	1.0	NA		3.6	J			P
CdV-R-37-2	1359	3	10-Jan-06	14	<	1.7	J			P	<	1.5	J		P	0.9	NA	<	18	U			P	<	18	U		Yes	1.0	NA		2.3	J			P
CdV-R-37-2	1359	3	22-Mar-06	15	<	2.5	J			P		28			Fail	11.3	Fail	<	18	U			P		159			Yes	8.8	NA	<	2	U			P
CdV-R-37-2	1551	4	30-Jan-02	1		0.88	B			Fail		4.2	B		P	4.8	NA		13700				Fail		14600			No	1.1	P		318				Fail
CdV-R-37-2	1551	4	25-Apr-02	2	<	5	U			DL		2.9	B		P	0.6	NA		7910				Fail		7510			No	0.9	P		216				Fail
CdV-R-37-2	1551	4	22-Jul-02	3	<	5	U			DL	<	5	U		P	1.0	NA		6320				Fail		7000			No	1.1	P		185				Fail

Table C-6a (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Cr (F) µg/L	LQC	UF?	Source	Test C10		Cr (NF) µg/L	LQC	Source	Test F3	Ratio Cr (NF/F)	Test F4		Fe (F) µg/L	LQC	UF?	Source	Test C4		Fe (NF) µg/L	LQC	Source	Test F1	Ratio Fe (NF/F)	Test F2		Mn (F) µg/L	LQC	UF?		Test C5
Units										**µg/L**					**µg/L**		**Ratio**						**µg/L**					**µg/L**		**Ratio**						**µg/L**
Test										**>LL**					**<UL**		**<UL**						**<UL**					**<UL**		**<UL**						**<UL**
Limit: Regional Aquifer										**1**					**10**		**5**						**102**					**500**		**10**						**16**
Limit: Intermediate										**1**					**5**		**5**						**102**					**500**		**10**						**16**
CdV-R-37-2	1551	4	26-Sep-02	4	<	5	U			DL	<	5	U		P	1.0	NA		6010				Fail		5460			No	0.9	P		168	E			Fail
CdV-R-37-2	1551	4	23-Jan-03	5	<	5	U			DL		2.4	B		P	0.5	NA		4420				Fail		4820			No	1.1	P		166				Fail
CdV-R-37-2	1551	4	8-May-03	6	<	5	U			DL	<	2.9	B		P	0.6	NA		3690				Fail		3650			No	1.0	P		123				Fail
CdV-R-37-2	1551	4	6-Aug-03	7	<	5	U			DL		1	B		P	0.2	NA		3340				Fail		3500			No	1.0	P		114				Fail
CdV-R-37-2	1551	4	3-Dec-03	8	<	1.54	B			P	<	2.5	B		P	1.6	NA		2890				Fail		2790			No	1.0	P		103				Fail
CdV-R-37-2	1551	4	15-Apr-04	9	<	1.4	B			P	<	2.2	B		P	1.6	NA		3660				Fail		3990			No	1.1	P		113				Fail
CdV-R-37-2	1551	4	27-Oct-04	10	<	1.4	J			P	<	3.9	J		P	2.8	NA		2070				Fail		2280			No	1.1	P		71				Fail
CdV-R-37-2	1551	4	31-Mar-05	11	<	1	U			Fail	<	1.1	J		P	1.1	NA		1740				Fail		2010			No	1.2	P		60.8				Fail
CdV-R-37-2	1551	4	8-Jul-05	12	<	1	U			Fail		3.3	J		P	3.3	NA		1450				Fail		1920			No	1.3	P		55.9				Fail
CdV-R-37-2	1551	4	13-Oct-05	13	<	1	U			Fail		4.1	J		P	4.1	NA		1260				Fail		1460			No	1.2	P		42.7				Fail
CdV-R-37-2	1551	4	11-Jan-06	14	<	1	U			Fail	<	1	U		P	1.0	NA		1160				Fail		1250			No	1.1	P		43				Fail
CdV-R-37-2	1551	4	22-Mar-06	15	<	1	U			Fail		16			Fail	15.6	Fail		972				Fail		1340			No	1.4	P		41.3				Fail
R-17	1057	1	24-Feb-06	1		1.6		UF		UF		1.6			P	—	NA		140		UF		Fail		140			Yes	—	NA		17		UF		Fail
R-17	1057	1	19-Oct-06	2		1.7	J			P		3.8			P	2.2	NA		1510	N			Fail		4740	N		No	3.1	P		22.5				Fail
R-17	1124	2	17-Oct-06	1		2	J			P		2.7	J		P	1.4	NA		370				Fail		1250			No	3.4	P		16.2				Fail
R-18	1358	1	25-Aug-05	1		1.5	J			P		1.9	J		P	1.3	NA	<	18	U			P	<	18	U		Yes	1.0	NA	<	1	U			P
R-18	1358	1	1-Dec-05	2	<	1	U			Fail		1.3			P	1.3	NA	<	18	U			P	<	18	U		Yes	1.0	NA	<	1	U			P
R-18	1358	1	7-Mar-06	3	<	1	U			Fail	<	1	U		P	1.0	NA	<	18	U			P	<	18	U		Yes	1.0	NA	<	2	U			P
R-18	1358	1	16-May-06	4		1.1	J			P		4.6	J		P	4.2	NA		18.9	J			P		56.7	J		Yes	3.0	NA	<	2	U			P
R-18	1358	1	15-Aug-06	5		2.5	J			P		4.6			P	1.8	NA		33.7	J			P		46	J		Yes	1.4	NA	<	2	U			P
R-18	1358	1	18-Dec-06	6	<	5	U			DL	<	5	U		P		NA	<	18	U			P	<	18	U		Yes		NA	<	2	U			P
R-19	909	2	22-Sep-00	1	<	0.33	U			Fail		1.4		GR	P	4.2	NA		260				Fail		480		GR	Yes	1.8	NA		160				Fail
R-19	909	2	10-Apr-01	2		0.78	B			Fail		1.1	B		P	1.4	NA	<	120	E			Fail	<	110	E		Yes	0.9	NA		23	E			Fail
R-19	909	2	5-Jul-01	3		0.54	B			Fail	<	0.4	U		P	0.6	NA	<	63	BE			P		4000	E		Err	—	NA		7.6	B			P
R-19	909	2	13-Sep-01	4	<	1.21	B			P	<	1.5	B		P	1.2	NA	<	9.06	B			P	<	2.24	U		Yes	0.2	NA		3.81	BE			P
R-19	909	2	20-Aug-02	5	<	1.88	B	UF		UF	<	1.9	B		P	—	NA	<	18.1	B	UF		P	<	18.1	B		Yes	—	NA		2.97	B	UF		P
R-19	909	2	15-Dec-03	6		4.02	B	UF		UF		4	B		P	—	NA	<	52.4	B	UF		P	<	52.4	B		Yes	—	NA	<	1.89	B	UF		P
R-19	909	2	10-Jun-04	7		1.5	B	UF		UF		1.5	B		P	—	NA	<	12.6	U	UF		P	<	12.6	U		Yes	—	NA	<	1	B	UF		P
R-19	909	2	21-Jul-05	8	<	1	U			Fail		4.7	J		P	4.7	NA		26	J			P		25.9	J		Yes	1.0	NA	<	2	U			P
R-19	909	2	18-Aug-06	9		1.47				P		1.4			P	1.0	NA	<	10	U			P	<	10	U		Yes	1.0	NA		3.1				P
R-19	909	2	11-Dec-06	10		—				ND		—			ND	—	ND	<	10	U		IP	P		17.4		IP	Yes	1.7	NA		13.9			IP	P
R-19	1191	3	26-Sep-00	1		1.6	B			P		1.6	B		P	1.0	NA		1100	J+			Fail	<	200	N		Yes	0.2	NA		32				Fail
R-19	1191	3	9-Apr-01	2		1.6	B			P		29			P	18.1	NA	<	100	E			P	<	210	E		Yes	2.1	NA		10	E			P
R-19	1191	3	10-Jul-01	3		1.4	B			P		2.5	B		P	1.8	NA	<	88	BE			P	<	130			Yes	1.5	NA		7.5	B			P

Table C-6a (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Cr (F) µg/L	LQC	UF?	Source	Test C10		Cr (NF) µg/L	LQC	Source	Test F3	Ratio Cr (NF/F)	Test F4		Fe (F) µg/L	LQC	UF?	Source	Test C4		Fe (NF) µg/L	LQC	Source	Test F1	Ratio Fe (NF/F)	Test F2		Mn (F) µg/L	LQC	UF?		Test C5
Units										µg/L					µg/L		Ratio						µg/L					µg/L		Ratio						µg/L
Test										>LL					<UL		<UL						<UL					<UL		<UL						<UL
Limit: Regional Aquifer										1					10		5						102					500		10						16
Limit: Intermediate										1					5		5						102					500		10						16
R-19	1191	3	18-Sep-01	4	<	2	B			P		4.7	B		P	2.3	NA	<	2.24	U			P	<	23.9	B		Yes	10.7	NA		4.57	BE			P
R-19	1191	3	22-Aug-02	5	<	2.16	B	UF		UF	<	2.2	B		P	—	NA	<	19	B	UF		P	<	19	B		Yes	—	NA		6.02	B	UF		P
R-19	1191	3	15-Dec-03	6		5.01		UF		UF		5			P	—	ND	<	16.6	B	UF		P	<	16.6	B		Yes	—	NA		4.39	B	UF		P
R-19	1191	3	14-Jun-04	7		4.79	B	UF		UF		4.8	B		P	—	NA		39.2	B	UF		P		39.2	B		Yes	—	NA		2.8	B	UF		P
R-19	1191	3	21-Jul-05	8		2	J			P		4.1	J		P	2.1	NA	<	18	U			P	<	18	U		Yes	1.0	NA		9	J			P
R-19	1191	3	15-Aug-06	9		1.72				P		1.7			P	1.0	NA	<	10	U			P	<	10	U		Yes	1.0	NA		9.3				P
R-19	1191	3	11-Dec-06	10		—				ND		—			ND	—	ND	<	10	U		IP	P		14.95		IP	Yes	1.5	NA		5			IP	P
R-19	1413	4	6-Apr-01	1		1.4	B			P		11			P	7.9	Fail	<	86	BE			P	<	110			Yes	1.3	NA		23	E			Fail
R-19	1413	4	11-Jul-01	2		2.8	B			P		2.4	B		P	0.9	NA	<	80	BE			P	<	77	BE		Yes	1.0	NA		4.3	B			P
R-19	1413	4	19-Sep-01	3	<	2.69	U		GR	DL		3.8		GR	P	1.4	NA	<	2.24	U		GR	P	<	2.24	U	GR	Yes	—	NA		2			GR	P
R-19	1413	4	26-Aug-02	4	<	2.67	B	UF		UF	<	2.7	B		ND	—	ND		18.6	B	UF		P		18.4	B		Yes	—	NA		2.87	B	UF		P
R-19	1413	4	16-Dec-03	5		8.54		UF		UF		8.5			P	—	NA	<	35.4	B	UF		P	<	35.4			Yes	—	NA		1.36	B	UF		P
R-19	1413	4	15-Jun-04	6		22		UF		UF		22			Fail	—	ND		87.6	B	UF		P		87.6			Yes	—	NA		1.75	B	UF		P
R-19	1413	4	28-Jul-05	7		2.7	J			P		7.9			P	2.9	NA	<	18	U			P		24.8	J		Yes	1.4	NA		3.8	J			P
R-19	1413	4	16-Aug-06	8		4				P		37			Fail	9.3	Fail		35.4	J			P		107			Yes	3.0	NA		10.5				P
R-19	1413	4	12-Dec-06	9		2.9	J			P		9.1			P	3.1	NA	<	18	U			P		37	J		Yes	2.1	NA	<	2	U			P
R-19	1586	5	4-Apr-01	1	<	0.34	U			Fail		7.5	B		P	22.1	NA		5700				Fail		8200			No	1.4	P		940				Fail
R-19	1586	5	12-Jul-01	2		0.75	B			Fail		9.2	B		P	12.3	NA		4000				Fail		7600			No	1.9	P		890				Fail
R-19	1586	5	20-Sep-01	3	<	0.57	U			Fail	<	2	B		P	3.5	NA		5180				Fail		7190			No	1.4	P		850				Fail
R-19	1586	5	23-Aug-02	4		4.92	B	UF		UF		4.9	B		P	—	NA		5840		UF		Fail		5840			No	—	ND		1050		UF		Fail
R-19	1586	5	16-Dec-03	5		3.6	B	UF		UF		3.6	B		P	—	NA		992		UF		Fail		992			No	—	ND		1020		UF		Fail
R-19	1586	5	17-Aug-06	6		2.79				P		2.4			P	0.8	NA		361				Fail		296			Yes	0.8	NA		894				Fail
R-19	1586	5	11-Dec-06	7		—				ND		—			ND		ND		305.5			IP	Fail		376.3		IP	Yes	1.2	NA		903			IP	Fail
R-19	1730	6	4-Oct-00	1		0.93	B			Fail	<	3.2	B		P	3.4	NA		1860	N			Fail		2000			No	1.1	P		339				Fail
R-19	1730	6	2-Apr-01	2		0.8	B			Fail		1.2	B		P	1.5	NA		4200				Fail		4200			No	1.0	P		440				Fail
R-19	1730	6	16-Jul-01	3	<	0.35	U			Fail		1.3	B		P	3.7	NA		3700				Fail		3500			No	0.9	P		400				Fail
R-19	1730	6	21-Sep-01	4	<	0.57	U			Fail	<	1.3	B		P	2.3	NA		4080				Fail		4100			No	1.0	P		409				Fail
R-19	1730	6	27-Aug-02	5	<	0.5	U	UF		Fail	<	0.5	U		P	—	NA		3430		UF		Fail		3430			No	—	ND		421		UF		Fail
R-19	1730	6	16-Dec-03	6	<	2.98	B	UF		UF	<	3	B		P	—	NA		1140		UF		Fail		1140			No	—	ND		303		UF		Fail
R-19	1730	6	17-Aug-06	7		1.11				P	<	1	U		P	0.9	NA		359				Fail		463			Yes	1.3	NA		169				Fail
R-19	1730	6	11-Dec-06	8		—				ND		—			ND		ND		270.4			IP	Fail		339.7		IP	Yes	1.3	NA		152			IP	Fail
R-19	1835	7	3-Oct-00	1		5.2	B			P					ND	—	ND		1600				Fail		—			ND	—	ND		150				Fail
R-19	1835	7	29-Mar-01	2	<	1.3	B			P		15			Fail	11.5	Fail	<	240				Fail		1400			No	5.8	P		150	E			Fail
R-19	1835	7	17-Jul-01	3		0.4	B			Fail		6.5	B		P	16.3	NA		310				Fail		890			No	2.9	P		110				Fail

Table C-6a (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Cr (F) µg/L	LQC	UF?	Source	Test C10		Cr (NF) µg/L	LQC	Source	Test F3	Ratio Cr (NF/F)	Test F4		Fe (F) µg/L	LQC	UF?	Source	Test C4		Fe (NF) µg/L	LQC	Source	Test F1	Ratio Fe (NF/F)	Test F2		Mn (F) µg/L	LQC	UF?		Test C5
			Units							µg/L					µg/L		Ratio						µg/L					µg/L		Ratio						µg/L
			Test							>LL					<UL		<UL						<UL					<UL		<UL						<UL
			Limit: Regional Aquifer							1					10		5						102					500		10						16
			Limit: Intermediate							1					5		5						102					500		10						16
R-19	1835	7	24-Sep-01	4	<	0.57	U			Fail	<	2.1	B		P	3.7	NA		109				Fail		1070			No	9.8	P		89.5				Fail
R-19	1835	7	26-Aug-02	5	<	1.09	B	UF		UF	<	1.1	B		P	—	NA		327		UF		Fail		327			Yes	—	NA		99.3		UF		Fail
R-19	1835	7	17-Dec-03	6		5.99		UF		UF		6			P	—	NA		1680		UF		Fail		1680			No	—	ND		116		UF		Fail
R-19	1835	7	16-Jun-04	7	<	0.55	B	UF		Fail	<	0.5	B		P	—	NA		413		UF		Fail		413			Yes	—	NA		95.6		UF		Fail
R-19	1835	7	28-Jul-05	8	<	1	U*			Fail		15	*		Fail	14.5	Fail		43.8	J			P		1600			No	36.5	Fail		60.6				Fail
R-19	1835	7	18-Aug-06	9	<	1	U			Fail	<	1	U		P	1.0	NA		229				Fail		720			No	3.1	P		69.5				Fail
R-19	1835	7	13-Dec-06	10		—				ND		—			ND		ND		81.99			IP	Fail		387.3		IP	Yes	4.7	NA		66.9			IP	Fail
R-25	755	1	14-Nov-00	1		2.2	B			P		3.3	B		P	1.5	NA	<	46	BE			P	<	63	BE		Yes	1.4	NA		6.9	B			P
R-25	755	1	3-May-01	2		0.82	B			Fail		19			Fail	23.2	Fail	<	47	B			P		890			No	18.9	Fail		43				Fail
R-25	755	1	13-Aug-01	3		1.8	B			P		17			Fail	9.4	Fail		27	B			P		850			No	31.5	Fail		86				Fail
R-25	755	1	4-Feb-02	4		2.14	B			P		18			Fail	8.2	Fail		30.3	B			P		773			No	25.5	Fail		112				Fail
R-25	755	1	7-Aug-02	5		30.7		UF		UF		31			Fail	—	ND		1100	*	UF		UF		1100	*		No	—	ND		188		UF		Fail
R-25	755	1	11-Dec-03	6		23		UF		UF		23			Fail	—	ND		1080		UF		UF		1080			No	—	ND		237		UF		Fail
R-25	755	1	1-Sep-04	7		44.8		UF		UF		45			Fail	—	ND		4410		UF		UF		4410			No	—	ND		409		UF		Fail
R-25	755	1	2-Aug-05	8		6.2				P		153			Fail	24.7	Fail		192				Fail		3770			No	19.6	Fail		183				Fail
R-25	892	2	15-Nov-00	1		0.71	B			Fail		26			Fail	36.6	Fail	<	99	BE			P		1000	E		No	10.1	Fail		16				P
R-25	892	2	4-May-01	2		1.5	B			P		6.7	B		Fail	4.5	P		310				Fail		730			No	2.4	P		9.1	B			P
R-25	892	2	14-Aug-01	3		1.1	B			P		15			Fail	13.6	Fail		140				Fail		650			No	4.6	P		9.5	B			P
R-25	892	2	5-Feb-02	4		23		UF		UF		23			Fail	—	ND		117				Fail		1810			No	15.5	Fail		19.4				Fail
R-25	892	2	8-Aug-02	5		11		UF		UF		11			Fail	—	ND		635		UF		UF		635			No	—	ND		31.5		UF		Fail
R-25	892	2	10-Dec-03	6		35.5		UF		UF		36			Fail	—	ND		1570		UF		UF		1570			No	—	ND		47.5		UF		Fail
R-25	892	2	3-Aug-05	7		1.9	J			P		71	J		Fail	37.1	Fail		2310				Fail		4370			No	1.9	P		150				Fail
R-25	1192	4	4-Dec-00	1	<	0.52	U			Fail		28			Fail	53.8	Fail	<	58	B			P		1200			No	20.7	Fail		130				Fail
R-25	1192	4	7-May-01	2		0.24	B			Fail		5.2	B		Fail	21.7	Fail	<	34	B			P	<	180			Yes	5.3	NA		25				Fail
R-25	1192	4	14-Aug-01	3		0.35	U			Fail		7.9	B		Fail	22.6	Fail		1200				Err		220			Yes	0.2	NA		140				Fail
R-25	1192	4	6-Feb-02	4		1.88	B			P		2.5	B		P	1.3	P		99.9				P		229			Yes	2.3	NA		30.7				Fail
R-25	1192	4	8-Aug-02	5		4.43	B	UF		UF		4.4	B		P	—	NA		444		UF		UF		444			Yes	—	NA		27.5		UF		Fail
R-25	1192	4	10-Dec-03	6	<	1.3	B	UF		UF	<	1.3	B		P	—	NA		210		UF		UF		210			Yes	—	NA		7.77	B	UF		P
R-25	1192	4	4-Aug-05	7	<	1	U			Fail		4	J		P	4.0	NA	<	18	U			P		153			Yes	8.5	NA		8	J			P
R-25	1303	5	7-Dec-00	1	<	0.52	U			Fail		9.4	B		P	18.1	NA	<	48	B			P	<	90	B		Yes	1.9	NA		210				Fail
R-25	1303	5	8-May-01	2		0.77	B			Fail		6.6	B		P	8.6	NA	<	47	B			P	<	110			Yes	2.3	NA		270				Fail
R-25	1303	5	15-Aug-01	3	<	0.35	U			Fail		7.7	B		P	22.0	NA	<	43	BE			P		260	E		Yes	6.0	NA		260	E			Fail
R-25	1303	5	7-Feb-02	4	<	5	U			DL		0.9	B		P	—	NA	<	50	U			P	<	50	E		Yes	1.0	NA		393				Fail
R-25	1303	5	9-Aug-02	5		139		UF		UF		139			Fail	—	ND		1400		UF		UF		1400			No	—	ND		264		UF		Fail

Table C-6a (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event		Cr (F) µg/L	LQC	UF?	Source	Test C10		Cr (NF) µg/L	LQC	Source	Test F3	Ratio Cr (NF/F)	Test F4		Fe (F) µg/L	LQC	UF?	Source	Test C4		Fe (NF) µg/L	LQC	Source	Test F1	Ratio Fe (NF/F)	Test F2		Mn (F) µg/L	LQC	UF?		Test C5
Units										**µg/L**					**µg/L**		**Ratio**						**µg/L**					**µg/L**		**Ratio**						**µg/L**
Test										**>LL**					**<UL**		**<UL**						**<UL**					**<UL**		**<UL**						**<UL**
Limit: Regional Aquifer										**1**					**10**		**5**						**102**					**500**		**10**						**16**
Limit: Intermediate										**1**					**5**		**5**						**102**					**500**		**10**						**16**
R-25	1303	5	9-Dec-03	6	<	1.9	B	UF		UF	<	1.9	B		P	—	NA		2780		UF		UF		2780			No	—	ND		177		UF		Fail
R-25	1303	5	31-Aug-04	7		0.58	B	UF		Fail		0.6	B		P	—	NA		2030		UF		UF		2030			No	—	ND		204		UF		Fail
R-25	1303	5	9-Aug-05	8		1.1	J			P		1.1	J		P	1.0	NA		664				Fail		1670			No	2.5	P		125				Fail
R-25	1406	6	8-Dec-00	1		4.2	B			P		17			Fail	4.0	P	<	48	B			P	<	95	B		Yes	2.0	NA		120				Fail
R-25	1406	6	9-May-01	2		0.45	B			Fail		3.6	B		P	8.0	NA	<	61	B			P	<	99	B		Yes	1.6	NA		14				P
R-25	1406	6	16-Aug-01	3	<	0.35	B			Fail					ND	—	ND	<	23	BE			P		—			ND	—	ND		0.7	BE			P
R-25	1406	6	8-Feb-02	4		0.88	B			Fail		6.9			P	7.8	NA	<	50	U			P		32.3	B		Yes	0.6	NA		1.01	B			P
R-25	1406	6	12-Aug-02	5		34.3		UF		UF		34			Fail	—	ND		184		UF		UF		184			Yes	—	NA		6.27	B	UF		P
R-25	1406	6	9-Dec-03	6		10.1		UF		UF		10			Fail	—	ND	<	61.9	B	UF		P	<	61.9	B		Yes	—	NA	<	1.63	B	UF		P
R-25	1606	7	11-Dec-00	1	<	0.52	U			Fail		43			Fail	82.7	Fail	<	59	B			P		320			Yes	5.4	NA		33				Fail
R-25	1606	7	11-May-01	2		1.7	B			P		41			Fail	24.1	Fail	<	100				P		410			Yes	4.1	NA		3.6	B			P
R-25	1606	7	17-Aug-01	3		0.4	B			Fail		2.2	B		P	5.5	NA	<	34	BE			P		190			Yes	5.6	NA		0.54	BE			P
R-25	1606	7	11-Feb-02	4		1.39	B			P		9.6			P	6.9	NA		22.9	B			P		123			Yes	5.4	NA		1.71	B			P
R-25	1606	7	12-Aug-02	5		9.16		UF		UF		9.2			P	—	NA		145		UF		UF		145			Yes	—	NA		2.65	B	UF		P
R-25	1606	7	8-Dec-03	6	<	4.45	B	UF		UF	<	4.5	B		P	—	NA		127		UF		UF		127			Yes	—	NA	<	1.55	B	UF		P
R-25	1796	8	12-Dec-00	1		2.5	B			P		33			Fail	13.2	Fail		1900				Fail		19000			No	10.0	Fail		42				Fail
R-25	1796	8	14-May-01	2		0.26	B			Fail		4.2	B		P	16.2	NA	<	120				Fail		640			No	5.3	P		1.5	B			P
R-25	1796	8	20-Aug-01	3		0.94	B			Fail		21			Fail	22.3	Fail	<	57	BE			P		610	E		No	10.7	Fail		0.62	BE			P
R-25	1796	8	12-Feb-02	4	<	5	U			DL		4.7	B		P	—	NA		21.1	B			P		207			Yes	9.8	NA		1.23	B			P
R-25	1796	8	14-Aug-02	5	<	1.91	B	UF		UF	<	1.9	B		P	—	NA		307		UF		UF		307			Yes	—	NA		2.9	B	UF		P
R-25	1796	8	4-Dec-03	6	<	3.66	B	UF		UF	<	3.7	B		P	—	NA		204		UF		UF		204			Yes	—	NA	<	2.53	B	UF		P
R-25	1796	8	10-Aug-05	7		1.8	J			P		2.8	J		P	1.6	NA		24.4	J			P		90.3	J		Yes	3.7	NA		12.2				P
R-26	659	1	13-Apr-05	1	<	1	U			Fail		1.8	J		P	1.8	NA	<	18	U			P	<	18	U		Yes	1.0	NA	<	1	U			P
R-26	659	1	27-Jul-05	2		1.6	J			P		1.8	J		P	1.1	NA	<	18	U			P	<	18	U		Yes	1.0	NA		1.5	J			P
R-26	659	1	2-Nov-05	3		2	J			P		7.6			Fail	3.8	P	<	18	U			P		24.8	J		Yes	1.4	NA		2.5	J			P
R-26	659	1	22-Feb-06	4	<	2	J			P	<	3.2	J		P	1.6	NA	<	18	U			P	<	18	U		Yes	1.0	NA	<	2	U			P
R-27	852	1	14-Nov-05	1	<	1	U	UF		Fail	<	1	U		P	—	NA		10		UF		P		10			Yes	—	NA		2.3		UF		P
R-27	852	1	1-Jul-06	2		3.8				P		3.9			P	1.0	NA		36	J			P		35.9	J		Yes	1.0	NA	<	2	U			P

Data source: WQDB except where indicated otherwise

Notes: Pass and fail outcomes for each sample are determined by comparison against test threshold criteria. From top to bottom in the column headers above are listed the indicator name and associated test identifier, units of measurement, type of test threshold, and threshold values for the regional aquifer and perched intermediate aquifer, respectively.

LL=lower limit, UL=upper limit, P=pass; UF=unfiltered

Table C-7
Summary of Test Outcomes

Water Quality Sample						General Indicators						Category A Inorganic Indicators					Category B Organic Indicators				Category C1 Redox (SO4)			Category C2 Redox (Fe/Mn)							Category C3 Redox (NO3)		Category D Adsorption				Category E Carbonate mineralogy							Category F Metal corrosion				
Row	Well	Port Depth (ft)	Screen	Sample Collection Date	Event Seq.	Mod Water	Low pH?	High pH?	Gen-1	Gen-2	Gen-3	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C9	C8	C7, D2	C10	C11	C12	D1	C7, D2	D3	D4	E1a	E1b	E1	E2	E3	E4	E5	F1	F2	F3	F4	F5
				Units		3H	pH	pH	pH	Alk	Turbid	Cl	F	PO4	Na	SO4	Acetone	NH3-N	TKN	TOC	SO4	S	ORP	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3-N	DO	Sr	U	Ba	Zn	Ca	Ca	Ca	Ba	Sr	Mg	U	FeT	FeR	CrT	CrR	Ni
				Test		>UL	>LL	<UL		<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	>LL	<UL	>LL	<UL	<UL	>LL	<UL	<UL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	<UL	In	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL
				Regional		1	6.94	8.65		105	5	3.75	0.53	0.3	28.6	6.22	5	0.05	0.28	1	0.8	0.01	0	102	16	0.17	4	2	0.2	1	0.1	2	44.88	0.2	4.6	1	8.66	24	range	70	180	4.81	1.52	500	10	10	5	50
				Perched		1	6.73	8.80		52	5	1.75	0.23	0.08	12.2	4.48	5	0.05	0.28	1	1.07	0.01	0	102	16	0.17	4	2	0.1	1	0.1	2	19.1	0.1	1.4	1	4.39	17		72	155	6.12	0.72	500	10	5	5	50
1	CdV-16-1(i)	624	1	1-Jun-05	1	No	No	Yes	Fail	Fail	Fail	Plm	P	P	P	Plm	Fail	P	P	Fail	P	Fail	P	P	P	P	P	Fail	P	Fail	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
2	CdV-16-1(i)	624	1	29-Aug-05	2	No	Yes	Yes	P	P	P	Plm	P	Fail	P	Plm	P	P	Fail	P	P	P	P	P	P	P	P	Fail	P	Fail	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	No	Fail	P	I-NA	P
3	CdV-16-1(i)	624	1	7-Dec-05	3	No	Yes	Yes	P	P	P	Plm	P	P	Fail	Plm	P	P	Fail	P	P	P	P	P	P	P	P	Fail	P	Fail	P	-Err-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
4	CdV-16-1(i)	624	1	9-Mar-06	4	No	Yes	Yes	P	P	P	Plm	P	P	Fail	Plm	P	P	P	P	P	P	P	P	P	P	P	Fail	P	Fail	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
6	CdV-16-2(i)r	850	1	14-Sep-05	1	-ND-	Yes	Yes	P	Fail	-ND-	Plm	P	P	Fail	Fail	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	P	P	-DL-	P	P	P	Fail	P	-ND-	P	P	P	I-NA	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
7	CdV-16-2(i)r	850	1	15-Dec-05	2	No	Yes	Yes	P	Fail	P	Plm	Fail	Fail	Fail	Fail	Fail	P	Fail	P	P	Fail	P	P	P	P	P	P	P	Fail	P	P	P	P	P	I-NA	Yes	Yes	P	P	P	P	P	No	Fail	Fail	-DL-	P
8	CdV-16-2(i)r	850	1	15-Mar-06	3	No	Yes	Yes	P	P	Fail	Plm	P	P	Fail	P	P	P	P	P	P	Fail	P	P	P	P	P	P	P	Fail	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	No	Fail	Fail	-DL-	P
9	CdV-16-2(i)r	850	1	17-May-06	4	No	No	Yes	Fail	P	P	Plm	Fail	P	Fail	P	P	-DL-	P	P	P	-ND-	P	P	P	P	P	P	P	Fail	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	No	Fail	Fail	-DL-	P
11	CdV-R-15-3	1254	4	3-Jan-01	1	-ND-	Yes	Yes	P	P	P	P	P	-ND-	P	P	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	P	P	-ND-	-ND-	P	P	Fail	P	-ND-	-ND-	P	P	P	Yes	Yes	P	P	-ND-	P	P	Yes	I-NA	P	I-NA	P
12	CdV-R-15-3	1254	4	23-Apr-01	2	-ND-	Yes	Yes	P	P	P	P	P	-ND-	P	P	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	P	Fail	-ND-	-ND-	P	P	Fail	Fail	-ND-	-ND-	P	P	P	Yes	Yes	P	P	-ND-	P	P	Yes	I-NA	P	I-NA	P
13	CdV-R-15-3	1254	4	18-Jul-01	3	No	Yes	Yes	P	P	P	P	P	-ND-	P	P	-DL-	-ND-	-ND-	P	P	-ND-	-ND-	P	P	-DL-	-ND-	P	P	Fail	Fail	-ND-	-ND-	P	P	Fail	Yes	Yes	P	P	-ND-	P	P	Yes	I-NA	P	I-NA	P
14	CdV-R-15-3	1254	4	9-Oct-01	4	Yes	Yes	Yes	P	P	P	P	P	P	-ND-	P	P	P	Fail	P	P	-ND-	-ND-	P	P	P	P	-DL-	P	-DL-	Fail	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
15	CdV-R-15-3	1254	4	4-Jan-02	5	Yes	Yes	Yes	P	P	P	P	Fail	P	P	P	P	P	Fail	P	P	-ND-	-ND-	P	P	-DL-	P	-DL-	P	-DL-	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
16	CdV-R-15-3	1254	4	15-Apr-02	6	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	-ND-	-ND-	P	P	-ND-	-ND-	-DL-	-ND-	Fail	P	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
17	CdV-R-15-3	1254	4	16-Jul-02	7	Yes	Yes	No	Fail	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	P	P	P	-ND-	-ND-	-DL-	-ND-	P	P	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
18	CdV-R-15-3	1254	4	16-Sep-02	8	Yes	Yes	No	Fail	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	-ND-	P	P	-ND-	-ND-	-DL-	-ND-	Fail	P	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
19	CdV-R-15-3	1254	4	14-Jan-03	9	Yes	Yes	No	Fail	P	P	P	P	P	P	P	-ND-	P	P	P	P	-ND-	-ND-	P	P	-ND-	-ND-	P	-ND-	P	P	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
20	CdV-R-15-3	1254	4	1-May-03	10	No	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	-ND-	-ND-	P	P	-ND-	-ND-	-DL-	-ND-	Fail	P	P	-ND-	-ND-	P	-ND-	Yes	Yes	P	P	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
21	CdV-R-15-3	1254	4	30-Jul-03	11	Yes	Yes	Yes	P	P	P	-ND-	-ND-	-ND-	P	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	P	P	-ND-	-ND-	P	-ND-	P	-ND-	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
22	CdV-R-15-3	1254	4	6-Jan-04	12	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	Fail	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
23	CdV-R-15-3	1254	4	20-Apr-04	13	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
24	CdV-R-15-3	1254	4	6-Jul-04	14	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Fail	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
25	CdV-R-15-3	1254	4	19-Oct-04	15	Yes	Yes	No	Fail	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
26	CdV-R-15-3	1254	4	4-Apr-05	16	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Fail	P	P	P	P	P	P	P	P	Fail	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
27	CdV-R-15-3	1254	4	12-Jul-05	17	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
28	CdV-R-15-3	1254	4	18-Oct-05	18	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
29	CdV-R-15-3	1254	4	19-Jan-06	19	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	-ND-	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
30	CdV-R-15-3	1254	4	27-Mar-06	20	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	-Err-	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
32	CdV-R-15-3	1350	5	4-Jan-01	1	-ND-	Yes	Yes	P	Fail	P	Fail	P	-ND-	Fail	-Red-	-ND-	-ND-	-ND-	-ND-	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	P	Fail	Fail	Fail	-ND-	-ND-	Fail	P	P	Yes	Yes	P	Fail	-ND-	P	-Red-	Yes	I-NA	P	I-NA	P
33	CdV-R-15-3	1350	5	25-Apr-01	2	-ND-	Yes	Yes	P	Fail	P	P	P	-ND-	P	-Red-	-ND-	-ND-	-ND-	-ND-	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	P	Fail	Fail	Fail	-ND-	-ND-	Fail	P	P	Yes	Yes	P	Fail	-ND-	P	-Red-	Yes	I-NA	P	I-NA	P
34	CdV-R-15-3	1350	5	19-Jul-01	3	Yes	Yes	Yes	P	P	P	P	P	-ND-	P	-Red-	-ND-	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	Fail	-DL-	-ND-	P	P	Fail	Fail	-ND-	-ND-	P	P	P	Yes	Yes	P	Fail	-ND-	P	-Red-	Yes	I-NA	P	I-NA	P

Table C-7 (continued)

Water Quality Sample						General Indicators						Category A Inorganic Indicators					Category B Organic Indicators				Category C1 Redox (SO4)			Category C2 Redox (Fe/Mn)							Category C3 Redox (NO3)		Category D Adsorption				Category E Carbonate mineralogy							Category F Metal corrosion				
Row	Well	Port Depth (ft)	Screen	Sample Collection Date	Event Seq.	Mod Water	Low pH?	High pH?	Gen-1	Gen-2	Gen-3	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C9	C8	C7, D2	C10	C11	C12	D1	C7, D2	D3	D4	E1a	E1b	E1	E2	E3	E4	E5	F1	F2	F3	F4	F5
				Units		3H	pH	pH	pH	Alk	Turbid	Cl	F	PO4	Na	SO4	Acetone	NH3-N	TKN	TOC	SO4	S	ORP	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3-N	DO	Sr	U	Ba	Zn	Ca	Ca	Ca	Ba	Sr	Mg	U	FeT	FeR	CrT	CrR	Ni
				Test		>UL	>LL	<UL		<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	>LL	<UL	>LL	<UL	<UL	>LL	<UL	<UL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	<UL	In	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL
				Regional		1	6.94	8.65		105	5	3.75	0.53	0.3	28.6	6.22	5	0.05	0.28	1	0.8	0.01	0	102	16	0.17	4	2	0.2	1	0.1	2	44.88	0.2	4.6	1	8.66	24	range	70	180	4.81	1.52	500	10	10	5	50
				Perched		1	6.73	8.80		52	5	1.75	0.23	0.08	12.2	4.48	5	0.05	0.28	1	1.07	0.01	0	102	16	0.17	4	2	0.1	1	0.1	2	19.1	0.1	1.4	1	4.39	17		72	155	6.12	0.72	500	10	5	5	50
35	CdV-R-15-3	1350	5	11-Oct-01	4	Yes	Yes	Yes	P	P	P	P	P	-Err-	P	P	Fail	Fail	Fail	Fail	P	-ND-	-ND-	Fail	Fail	-DL-	P	-DL-	P	-DL-	Fail	-ND-	P	P	P	P	Yes	Yes	P	Fail	Fail	P	-Red-	Yes	I-NA	P	I-NA	P
36	CdV-R-15-3	1350	5	15-Jan-02	5	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	Fail	Fail	Fail	P	-ND-	-ND-	Fail	Fail	-DL-	P	-DL-	Fail	-DL-	Fail	P	P	Fail	P	P	Yes	Yes	P	Fail	Fail	P	-Red-	Yes	I-NA	P	I-NA	P
37	CdV-R-15-3	1350	5	15-Apr-02	6	Yes	Yes	Yes	P	P	P	-Err-	Fail	P	P	P	Fail	Fail	P	Fail	P	-ND-	-ND-	Fail	Fail	-ND-	-ND-	-DL-	-ND-	-DL-	Fail	P	-ND-	-ND-	P	P	Yes	Yes	P	Fail	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
38	CdV-R-15-3	1350	5	16-Jul-02	7	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	Fail	P	Fail	P	Fail	Fail	Fail	Fail	-ND-	-ND-	-DL-	-ND-	-DL-	Fail	P	-ND-	-ND-	P	-DL-	Yes	Yes	P	Fail	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
39	CdV-R-15-3	1350	5	17-Sep-02	8	No	Yes	Yes	P	P	P	P	P	P	P	P	Fail	Fail	Fail	Fail	P	-ND-	-ND-	Fail	Fail	-ND-	-ND-	-DL-	-ND-	-DL-	Fail	P	-ND-	-ND-	P	P	Yes	Yes	P	Fail	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
40	CdV-R-15-3	1350	5	15-Jan-03	9	Yes	Yes	Yes	P	P	P	P	P	P	P	-Red-	-ND-	P	-Err-	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	P	-ND-	Fail	Fail	P	-ND-	-ND-	P	P	Yes	Yes	P	Fail	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
41	CdV-R-15-3	1350	5	2-May-03	10	Yes	Yes	Yes	P	P	P	P	P	P	P	-Red-	-ND-	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	P	-ND-	-DL-	Fail	P	-ND-	-ND-	P	-DL-	Yes	Yes	P	Fail	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
42	CdV-R-15-3	1350	5	7-Jan-04	11	Yes	Yes	Yes	P	P	P	P	P	P	P	-Red-	Fail	Fail	P	Fail	Fail	-ND-	Fail	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	P	Yes	Yes	P	Fail	Fail	P	-Red-	Yes	I-NA	P	I-NA	P
43	CdV-R-15-3	1350	5	21-Apr-04	12	Yes	Yes	Yes	P	P	P	P	P	P	P	-Red-	-ND-	Fail	P	Fail	Fail	Fail	Fail	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	P	Yes	Yes	P	Fail	Fail	P	-Red-	Yes	I-NA	P	I-NA	P
44	CdV-R-15-3	1350	5	7-Jul-04	13	Yes	Yes	Yes	P	P	P	P	P	P	P	-Red-	-ND-	Fail	P	Fail	Fail	Fail	Fail	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	Fail	Yes	Yes	P	Fail	Fail	P	-Red-	Yes	I-NA	P	I-NA	P
45	CdV-R-15-3	1350	5	20-Oct-04	14	Yes	Yes	Yes	P	P	P	P	P	P	P	-Red-	-ND-	Fail	P	Fail	Fail	Fail	-ND-	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	P	Yes	Yes	P	Fail	Fail	P	-Red-	Yes	I-NA	P	I-NA	P
46	CdV-R-15-3	1350	5	5-Apr-05	15	Yes	Yes	Yes	P	P	P	P	Fail	P	P	P	Fail	Fail	Fail	Fail	P	Fail	Fail	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	P	Yes	Yes	P	Fail	Fail	P	-Red-	Yes	I-NA	P	I-NA	P
47	CdV-R-15-3	1350	5	12-Jul-05	16	Yes	Yes	Yes	P	P	P	P	P	P	P	-Err-	Fail	Fail	Fail	Fail	-Err-	-ND-	Fail	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	P	Yes	Yes	P	Fail	Fail	P	-Red-	Yes	I-NA	P	I-NA	P
48	CdV-R-15-3	1350	5	18-Oct-05	17	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	Fail	P	Fail	P	Fail	-ND-	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	-DL-	Yes	Yes	P	Fail	Fail	P	-Red-	Yes	I-NA	P	I-NA	P
49	CdV-R-15-3	1350	5	20-Jan-06	18	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	Fail	P	-ND-	P	Fail	-ND-	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	P	Yes	Yes	P	Fail	Fail	P	-Red-	Yes	I-NA	P	I-NA	P
50	CdV-R-15-3	1350	5	28-Mar-06	19	Yes	No	Yes	Fail	P	P	P	P	P	P	P	Fail	Fail	P	Fail	P	Fail	-ND-	Fail	Fail	Fail	P	P	Fail	Fail	P	-ND-	P	Fail	P	P	Yes	Yes	P	Fail	Fail	P	-Red-	Yes	I-NA	P	I-NA	P
52	CdV-R-15-3	1640	6	3-Jan-01	1	-ND-	Yes	Yes	P	Fail	P	P	P	-ND-	P	-Red-	-ND-	-ND-	Fail	-ND-	Fail	-ND-	-ND-	Fail	Fail	-ND-	P	P	Fail	Fail	P	-ND-	-ND-	Fail	P	P	Yes	Yes	P	P	-ND-	P	-Red-	No	P	P	I-NA	P
53	CdV-R-15-3	1640	6	25-Apr-01	2	-ND-	Yes	Yes	P	P	P	P	P	-ND-	P	-Red-	-ND-	-ND-	-ND-	-ND-	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	P	Fail	Fail	-Err-	-ND-	-ND-	Fail	P	P	Yes	Yes	P	P	-ND-	P	-Red-	No	P	P	I-NA	P
54	CdV-R-15-3	1640	6	20-Jul-01	3	Yes	Yes	Yes	P	P	P	P	P	-ND-	P	-Red-	Fail	-ND-	-ND-	P	Fail	-ND-	-ND-	Fail	Fail	-DL-	-ND-	P	Fail	Fail	Fail	-ND-	-ND-	Fail	P	P	Yes	Yes	P	P	-ND-	P	-Red-	No	P	P	I-NA	P
55	CdV-R-15-3	1640	6	12-Oct-01	4	-ND-	Yes	Yes	P	P	P	P	P	P	P	-Red-	-ND-	Fail	-ND-	-ND-	Fail	-ND-	-ND-	Fail	Fail	-DL-	-ND-	-DL-	Fail	-DL-	Fail	-ND-	P	Fail	P	P	Yes	Yes	P	P	P	P	-Red-	-ND-	-ND-	-ND-	-ND-	P
56	CdV-R-15-3	1640	6	15-Jan-02	5	Yes	Yes	Yes	P	P	P	P	P	P	P	-Red-	P	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-DL-	P	P	Fail	-DL-	Fail	P	P	Fail	P	P	Yes	Yes	P	P	P	P	-Red-	No	P	Fail	-DL-	P
57	CdV-R-15-3	1640	6	16-Apr-02	6	Yes	Yes	Yes	P	P	P	-Err-	-Err-	P	P	-Red-	-ND-	Fail	P	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	-DL-	Fail	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	No	P	P	I-NA	P
58	CdV-R-15-3	1640	6	17-Jul-02	7	Yes	Yes	Yes	P	P	P	P	P	P	P	-Red-	-ND-	Fail	P	Fail	Fail	Fail	Fail	Fail	Fail	-ND-	-ND-	-DL-	-ND-	-DL-	Fail	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	No	P	P	I-NA	P
59	CdV-R-15-3	1640	6	18-Sep-02	8	No	Yes	Yes	P	P	P	P	P	P	P	-Red-	P	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	-DL-	-ND-	-DL-	Fail	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	No	P	P	I-NA	P
60	CdV-R-15-3	1640	6	16-Jan-03	9	Yes	Yes	Yes	P	P	P	P	P	P	P	-Red-	-ND-	P	-Err-	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	P	-ND-	Fail	Fail	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	No	P	P	I-NA	P
61	CdV-R-15-3	1640	6	5-May-03	10	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	Fail	Fail	P	P	-ND-	-ND-	Fail	Fail	-ND-	-ND-	P	-ND-	-DL-	Fail	P	-ND-	-ND-	P	-DL-	Yes	Yes	P	P	-ND-	P	-ND-	No	P	P	I-NA	P
62	CdV-R-15-3	1640	6	31-Jul-03	11	Yes	No	Yes	Fail	P	P	-ND-	-ND-	-ND-	P	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	Fail	Fail	-ND-	-ND-	P	-ND-	-DL-	-ND-	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	No	P	P	I-NA	P
63	CdV-R-15-3	1640	6	8-Jan-04	12	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	Fail	Fail	Fail	Fail	P	P	P	Fail	Fail	P	P	P	P	P	Yes	Yes	P	P	P	P	-Red-	Yes	I-NA	P	I-NA	P
64	CdV-R-15-3	1640	6	21-Apr-04	13	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	Fail	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	P	Yes	Yes	P	P	P	P	-Red-	Yes	I-NA	P	I-NA	P
65	CdV-R-15-3	1640	6	8-Jul-04	14	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	-Err-	Fail	Fail	-Err-	P	P	Fail	Fail	Fail	P	P	Fail	P	P	Yes	Yes	P	P	P	P	-Red-	Yes	I-NA	P	I-NA	P
66	CdV-R-15-3	1640	6	21-Oct-04	15	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	Fail	-Err-	-Err-	Fail	P	P	P	Fail	Fail	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
67	CdV-R-15-3	1640	6	6-Apr-05	16	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	Fail	Fail	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	-DL-	Yes	Yes	P	P	P	P	-Red-	Yes	I-NA	P	I-NA	P

Table C-7 (continued)

Water Quality Sample						General Indicators						Category A Inorganic Indicators					Category B Organic Indicators				Category C1 Redox (SO4)			Category C2 Redox (Fe/Mn)							Category C3 Redox (NO3)		Category D Adsorption				Category E Carbonate mineralogy							Category F Metal corrosion				
Row	Well	Port Depth (ft)	Screen	Sample Collection Date	Event Seq.	Mod Water	Low pH?	High pH?	Gen-1	Gen-2	Gen-3	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C9	C8	C7, D2	C10	C11	C12	D1	C7, D2	D3	D4	E1a	E1b	E1	E2	E3	E4	E5	F1	F2	F3	F4	F5
				Units		3H	pH	pH	pH	Alk	Turbid	Cl	F	PO4	Na	SO4	Acetone	NH3-N	TKN	TOC	SO4	S	ORP	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3-N	DO	Sr	U	Ba	Zn	Ca	Ca	Ca	Ba	Sr	Mg	U	FeT	FeR	CrT	CrR	Ni
				Test		>UL	>LL	<UL		<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	>LL	<UL	>LL	<UL	<UL	>LL	<UL	<UL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	<UL	In	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL
				Regional		1	6.94	8.65		105	5	3.75	0.53	0.3	28.6	6.22	5	0.05	0.28	1	0.8	0.01	0	102	16	0.17	4	2	0.2	1	0.1	2	44.88	0.2	4.6	1	8.66	24	range	70	180	4.81	1.52	500	10	10	5	50
				Perched		1	6.73	8.80		52	5	1.75	0.23	0.08	12.2	4.48	5	0.05	0.28	1	1.07	0.01	0	102	16	0.17	4	2	0.1	1	0.1	2	19.1	0.1	1.4	1	4.39	17		72	155	6.12	0.72	500	10	5	5	50
68	CdV-R-15-3	1640	6	13-Jul-05	17	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	-ND-	P	-ND-	P	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	P	Yes	Yes	P	P	P	P	-Red-	Yes	I-NA	P	I-NA	P
69	CdV-R-15-3	1640	6	19-Oct-05	18	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	Fail	P	Fail	-ND-	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	P	Yes	Yes	P	P	P	P	-Red-	Yes	I-NA	Fail	-DL-	P
70	CdV-R-15-3	1640	6	20-Jan-06	19	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	-ND-	P	P	-ND-	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	P	Fail	P	P	Yes	Yes	P	P	P	P	-Red-	Yes	I-NA	P	I-NA	P
71	CdV-R-15-3	1640	6	29-Mar-06	20	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	P	Fail	Fail	P	P	Fail	Fail	Fail	-ND-	P	Fail	P	P	Yes	Yes	P	P	P	P	-Red-	Yes	I-NA	P	I-NA	P
73	CdV-R-37-2	1200	2	28-Jan-02	1	Yes	Yes	Yes	P	Fail	Fail	P	P	P	P	-Red-	Fail	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	-DL-	Fail	P	-ND-	-ND-	P	P	Yes	Yes	P	Fail	-ND-	P	-ND-	No	P	P	I-NA	P
74	CdV-R-37-2	1200	2	23-Apr-02	2	Yes	No	Yes	Fail	P	Fail	P	P	P	P	-Red-	-ND-	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	-DL-	Fail	Fail	-ND-	-ND-	P	P	Yes	Yes	P	Fail	-ND-	Fail	-ND-	No	P	P	I-NA	P
75	CdV-R-37-2	1200	2	18-Jul-02	3	Yes	No	Yes	Fail	Fail	Fail	P	P	P	P	-Red-	-ND-	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	-Err-	-ND-	-ND-	Fail	-ND-	-DL-	Fail	Fail	-ND-	-ND-	P	P	Yes	Yes	P	Fail	-ND-	Fail	-ND-	No	P	P	I-NA	P
76	CdV-R-37-2	1200	2	18-Sep-02	4	Yes	Yes	Yes	P	Fail	Fail	P	P	P	P	-Red-	P	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	-DL-	Fail	Fail	-ND-	-ND-	P	P	Yes	Yes	P	Fail	-ND-	Fail	-ND-	No	P	P	I-NA	P
77	CdV-R-37-2	1200	2	21-Jan-03	5	Yes	Yes	Yes	P	Fail	Fail	P	P	P	P	-Red-	-ND-	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	Fail	Fail	P	-ND-	-ND-	P	P	Yes	Yes	P	Fail	-ND-	Fail	-ND-	No	P	P	I-NA	P
78	CdV-R-37-2	1200	2	6-May-03	6	Yes	No	Yes	Fail	Fail	Fail	P	P	P	P	-Red-	-ND-	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	Fail	Fail	Fail	-ND-	-ND-	P	P	Yes	Yes	P	Fail	-ND-	Fail	-ND-	No	P	P	I-NA	P
79	CdV-R-37-2	1200	2	5-Aug-03	7	Yes	No	Yes	Fail	P	Fail	-ND-	-ND-	-ND-	P	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	P	-ND-	Fail	-ND-	-ND-	P	P	Yes	Yes	P	Fail	-ND-	Fail	-ND-	No	P	P	I-NA	P
80	CdV-R-37-2	1200	2	2-Dec-03	8	Yes	Yes	Yes	P	Fail	Fail	P	P	P	P	-Red-	P	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	Fail	Fail	Fail	Fail	P	Fail	Fail	P	Fail	P	P	Yes	Yes	P	Fail	P	Fail	-Red-	No	P	P	I-NA	P
81	CdV-R-37-2	1200	2	13-Apr-04	9	Yes	Yes	Yes	P	Fail	Fail	P	P	P	P	-Red-	-ND-	Fail	Fail	Fail	Fail	P	Fail	Fail	Fail	Fail	Fail	Fail	Fail	P	Fail	P	P	Fail	P	P	Yes	Yes	P	Fail	P	Fail	-Red-	No	P	P	I-NA	P
82	CdV-R-37-2	1200	2	26-Oct-04	10	Yes	Yes	Yes	P	Fail	Fail	P	P	P	P	-Red-	-ND-	Fail	Fail	Fail	Fail	P	-ND-	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	P	P	Fail	P	P	Yes	Yes	P	Fail	P	Fail	-Red-	No	P	P	I-NA	P
83	CdV-R-37-2	1200	2	29-Mar-05	11	Yes	No	Yes	Fail	Fail	Fail	P	P	P	P	-Red-	P	Fail	Fail	Fail	Fail	P	Fail	Fail	Fail	Fail	Fail	Fail	Fail	P	Fail	P	P	Fail	P	P	Yes	Yes	P	Fail	P	Fail	-Red-	No	P	P	I-NA	P
84	CdV-R-37-2	1200	2	6-Jul-05	12	Yes	No	Yes	Fail	Fail	Fail	P	P	P	P	-Red-	P	Fail	Fail	Fail	Fail	-ND-	Fail	Fail	Fail	Fail	Fail	Fail	Fail	P	Fail	P	P	Fail	P	P	Yes	Yes	P	Fail	P	Fail	-Red-	No	P	P	I-NA	P
85	CdV-R-37-2	1200	2	12-Oct-05	13	Yes	Yes	Yes	P	Fail	Fail	P	P	P	P	-Red-	P	Fail	P	Fail	Fail	P	-ND-	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	P	Fail	P	-DL-	Yes	Yes	P	Fail	P	P	-Red-	No	P	P	I-NA	P
86	CdV-R-37-2	1200	2	9-Jan-06	14	Yes	Yes	Yes	P	P	Fail	P	P	P	P	-Red-	P	Fail	P	Fail	Fail	Fail	-ND-	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	P	P	Fail	P	-DL-	Yes	Yes	P	Fail	P	P	-Red-	No	P	P	I-NA	P
87	CdV-R-37-2	1200	2	21-Mar-06	15	Yes	No	Yes	Fail	P	P	P	P	P	P	-Red-	P	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	-ND-	P	Fail	P	P	Yes	Yes	P	Fail	P	P	-Red-	No	P	Fail	Fail	P
89	CdV-R-37-2	1359	3	29-Jan-02	1	Yes	Yes	Yes	P	P	P	P	P	P	P	P	Fail	P	P	P	P	-ND-	-ND-	Fail	Fail	-ND-	-ND-	-DL-	-ND-	-DL-	P	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
90	CdV-R-37-2	1359	3	24-Apr-02	2	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	-ND-	-ND-	Fail	Fail	-ND-	-ND-	P	-ND-	-DL-	P	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	No	P	P	I-NA	P
91	CdV-R-37-2	1359	3	19-Jul-02	3	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	-ND-	-ND-	Fail	Fail	-ND-	-ND-	-DL-	-ND-	-DL-	P	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	No	P	P	I-NA	P
92	CdV-R-37-2	1359	3	24-Sep-02	4	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	-ND-	P	P	-ND-	-ND-	-DL-	-ND-	-DL-	P	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
93	CdV-R-37-2	1359	3	22-Jan-03	5	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	-ND-	-ND-	P	P	-ND-	-ND-	P	-ND-	P	P	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
94	CdV-R-37-2	1359	3	7-May-03	6	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	-ND-	-ND-	P	P	-ND-	-ND-	P	-ND-	P	P	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
95	CdV-R-37-2	1359	3	6-Aug-03	7	Yes	Yes	Yes	P	P	P	-ND-	-ND-	-ND-	P	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	P	P	-ND-	-ND-	P	-ND-	P	-ND-	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	Yes	I-NA	P	I-NA	P
96	CdV-R-37-2	1359	3	3-Dec-03	8	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
97	CdV-R-37-2	1359	3	13-Apr-04	9	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	Fail	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
98	CdV-R-37-2	1359	3	27-Oct-04	10	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
99	CdV-R-37-2	1359	3	30-Mar-05	11	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
100	CdV-R-37-2	1359	3	7-Jul-05	12	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
101	CdV-R-37-2	1359	3	12-Oct-05	13	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P

Table C-7 (continued)

Water Quality Sample						General Indicators						Category A Inorganic Indicators					Category B Organic Indicators				Category C1 Redox (SO4)			Category C2 Redox (Fe/Mn)							Category C3 Redox (NO3)		Category D Adsorption				Category E Carbonate mineralogy							Category F Metal corrosion				
Row	Well	Port Depth (ft)	Screen	Sample Collection Date	Event Seq.	Mod Water	Low pH?	High pH?	Gen-1	Gen-2	Gen-3	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C9	C8	C7, D2	C10	C11	C12	D1	C7, D2	D3	D4	E1a	E1b	E1	E2	E3	E4	E5	F1	F2	F3	F4	F5
				Units		3H	pH	pH	pH	Alk	Turbid	Cl	F	PO4	Na	SO4	Acetone	NH3-N	TKN	TOC	SO4	S	ORP	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3-N	DO	Sr	U	Ba	Zn	Ca	Ca	Ca	Ba	Sr	Mg	U	FeT	FeR	CrT	CrR	Ni
				Test		>UL	>LL	<UL		<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	>LL	<UL	>LL	<UL	<UL	>LL	<UL	<UL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	<UL	In	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL
				Regional		1	6.94	8.65		105	5	3.75	0.53	0.3	28.6	6.22	5	0.05	0.28	1	0.8	0.01	0	102	16	0.17	4	2	0.2	1	0.1	2	44.88	0.2	4.6	1	8.66	24	range	70	180	4.81	1.52	500	10	10	5	50
				Perched		1	6.73	8.80		52	5	1.75	0.23	0.08	12.2	4.48	5	0.05	0.28	1	1.07	0.01	0	102	16	0.17	4	2	0.1	1	0.1	2	19.1	0.1	1.4	1	4.39	17		72	155	6.12	0.72	500	10	5	5	50
102	CdV-R-37-2	1359	3	10-Jan-06	14	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	Fail	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	-DL-	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
103	CdV-R-37-2	1359	3	22-Mar-06	15	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	Fail	-ND-	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	Fail	Fail	P
105	CdV-R-37-2	1551	4	30-Jan-02	1	Yes	Yes	Yes	P	P	P	P	P	P	P	-Red-	Fail	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	P	-ND-	Fail	Fail	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	No	P	P	I-NA	P
106	CdV-R-37-2	1551	4	25-Apr-02	2	Yes	No	Yes	Fail	P	P	-ND-	P	P	P	-Red-	-ND-	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	-DL-	Fail	P	-ND-	-ND-	P	P	Yes	Yes	P	P	-ND-	P	-ND-	No	P	P	I-NA	P
107	CdV-R-37-2	1551	4	22-Jul-02	3	Yes	No	Yes	Fail	P	P	P	P	P	P	-Red-	-ND-	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	-DL-	Fail	P	-ND-	-ND-	P	P	No	Yes	Fail	P	-ND-	P	-ND-	No	P	P	I-NA	P
108	CdV-R-37-2	1551	4	26-Sep-02	4	Yes	No	Yes	Fail	P	P	P	P	P	P	-Red-	P	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	-DL-	Fail	P	-ND-	-ND-	P	P	No	Yes	Fail	P	-ND-	P	-ND-	No	P	P	I-NA	P
109	CdV-R-37-2	1551	4	23-Jan-03	5	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	Fail	Fail	Fail	P	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	-DL-	Fail	P	-ND-	-ND-	P	P	No	Yes	Fail	P	-ND-	P	-ND-	No	P	P	I-NA	P
110	CdV-R-37-2	1551	4	8-May-03	6	Yes	No	Yes	Fail	P	P	P	P	P	P	P	-ND-	Fail	Fail	P	P	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	-DL-	Fail	P	-ND-	-ND-	P	P	No	Yes	Fail	P	-ND-	P	-ND-	No	P	P	I-NA	P
111	CdV-R-37-2	1551	4	6-Aug-03	7	Yes	No	Yes	Fail	P	P	-ND-	-ND-	-ND-	P	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	Fail	Fail	-ND-	-ND-	Fail	-ND-	-DL-	-ND-	P	-ND-	-ND-	P	P	No	Yes	Fail	P	-ND-	P	-ND-	No	P	P	I-NA	P
112	CdV-R-37-2	1551	4	3-Dec-03	8	Yes	No	Yes	Fail	P	P	P	P	P	P	P	P	Fail	Fail	Fail	P	-ND-	-ND-	Fail	Fail	Fail	P	Fail	Fail	P	Fail	P	Fail	Fail	P	P	No	Yes	Fail	P	P	P	-Red-	No	P	P	I-NA	P
113	CdV-R-37-2	1551	4	15-Apr-04	9	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	Fail	Fail	Fail	P	P	Fail	Fail	Fail	-Err-	P	P	Fail	P	Fail	P	P	Fail	P	P	Yes	Yes	P	P	P	P	-Red-	No	P	P	I-NA	P
114	CdV-R-37-2	1551	4	27-Oct-04	10	Yes	No	Yes	Fail	P	P	P	P	P	P	P	-ND-	Fail	P	P	P	P	-ND-	Fail	Fail	Fail	P	P	Fail	P	Fail	P	Fail	Fail	P	P	No	Yes	Fail	P	P	P	-Red-	No	P	P	I-NA	P
115	CdV-R-37-2	1551	4	31-Mar-05	11	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	Fail	Fail	Fail	P	P	Fail	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	Fail	Fail	P	P	No	Yes	Fail	P	P	P	-Red-	No	P	P	I-NA	P
116	CdV-R-37-2	1551	4	8-Jul-05	12	Yes	No	Yes	Fail	P	P	P	P	P	P	P	P	Fail	P	P	P	-ND-	P	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	Fail	Fail	P	P	No	Yes	Fail	P	P	P	-Red-	No	P	P	I-NA	P
117	CdV-R-37-2	1551	4	13-Oct-05	13	Yes	No	Yes	Fail	P	P	P	P	P	P	P	P	Fail	P	Fail	P	P	-ND-	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	Fail	Fail	P	P	Yes	Yes	P	P	P	P	-Red-	No	P	P	I-NA	P
118	CdV-R-37-2	1551	4	11-Jan-06	14	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	Fail	-ND-	Fail	Fail	Fail	P	P	Fail	Fail	Fail	P	Fail	Fail	P	-DL-	Yes	Yes	P	P	P	P	-Red-	No	P	P	I-NA	P
119	CdV-R-37-2	1551	4	22-Mar-06	15	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	Fail	Fail	Fail	P	P	Fail	Fail	Fail	-ND-	Fail	Fail	P	P	Yes	Yes	P	P	P	P	-Red-	No	P	Fail	Fail	P
121	R-17	1057	1	24-Feb-06	1	-ND-	Yes	Yes	P	P	-ND-	P	P	P	P	P	-ND-	-ND-	-ND-	P	P	-ND-	-ND-	Fail	Fail	-ND-	P	P	-UF-	-UF-	P	-ND-	Fail	-UF-	P	I-NA	No	Yes	Fail	P	P	P	P	Yes	I-NA	P	I-NA	P
122	R-17	1057	1	19-Oct-06	2	Yes	Yes	Yes	P	P	Fail	P	P	P	P	P	P	P	P	P	P	Fail	P	Fail	Fail	P	P	P	P	P	P	P	P	P	P	I-NA	Yes	Yes	P	P	P	P	P	No	P	P	I-NA	P
124	R-17	1124	2	17-Oct-06	1	Yes	Yes	Yes	P	P	Fail	P	P	P	P	P	P	P	P	P	P	P	P	Fail	Fail	P	P	Fail	P	P	P	P	Fail	P	P	I-NA	Yes	Yes	P	P	P	P	P	No	P	P	I-NA	P
126	R-18	1358	1	25-Aug-05	1	No	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
127	R-18	1358	1	1-Dec-05	2	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	Fail	Fail	P	P	P	P	P	P	P	P	P	Fail	P	P	P	P	P	-DL-	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
128	R-18	1358	1	7-Mar-06	3	No	Yes	Yes	P	P	P	P	P	P	P	P	P	P	Fail	-ND-	P	P	P	P	P	P	P	P	P	Fail	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
129	R-18	1358	1	16-May-06	4	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
130	R-18	1358	1	15-Aug-06	5	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
131	R-18	1358	1	18-Dec-06	6	-ND-	Yes	Yes	P	P	P	P	P	P	P	P	P	-Err-	P	P	P	-ND-	P	P	P	P	P	-DL-	P	-DL-	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
133	R-19	909	2	22-Sep-00	1	Yes	Yes	Yes	P	Fail	Fail	Fail	Fail	P	Fail	P	-DL-	P	P	Fail	P	-ND-	-ND-	Fail	Fail	-DL-	-DL-	Fail	P	Fail	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
134	R-19	909	2	10-Apr-01	2	Yes	Yes	No	P	Fail	P	Fail	Fail	P	Fail	P	-DL-	-DL-	P	Fail	P	-ND-	-ND-	Fail	Fail	-DL-	P	P	P	Fail	P	-ND-	P	P	P	P	Yes	No	Fail	P	P	P	P	Yes	I-NA	P	I-NA	P
135	R-19	909	2	5-Jul-01	3	Yes	Yes	No	Fail	Fail	P	Fail	Fail	P	Fail	P	-DL-	-DL-	P	P	P	-ND-	-ND-	P	P	-DL-	P	P	P	Fail	P	-ND-	P	P	P	Fail	Yes	No	Fail	P	P	P	P	-Err-	I-NA	P	I-NA	P
136	R-19	909	2	13-Sep-01	4	Yes	Yes	No	Fail	Fail	P	Fail	Fail	P	Fail	P	P	P	P	P	P	-ND-	-ND-	P	P	-DL-	P	P	P	P	P	-ND-	P	P	P	P	Yes	No	Fail	P	P	P	P	Yes	I-NA	P	I-NA	P
137	R-19	909	2	20-Aug-02	5	Yes	Yes	No	Fail	Fail	P	Fail	Fail	P	Fail	P	P	P	-ND-	P	P	-ND-	P	P	P	-DL-	P	P	-DL-	-UF-	P	P	P	-DL-	P	-UF-	Yes	No	Fail	P	P	P	-DL-	Yes	I-NA	P	I-NA	P
138	R-19	909	2	15-Dec-03	6	Yes	Yes	No	Fail	Fail	P	Fail	Fail	P	Fail	P	-ND-	P	-ND-	P	P	-ND-	-ND-	P	P	-DL-	P	Fail	P	-UF-	P	-ND-	P	P	P	-UF-	Yes	No	Fail	P	P	P	P	Yes	I-NA	P	I-NA	P

Table C-7 (continued)

Water Quality Sample						General Indicators						Category A Inorganic Indicators					Category B Organic Indicators				Category C1 Redox (SO4)			Category C2 Redox (Fe/Mn)							Category C3 Redox (NO3)		Category D Adsorption				Category E Carbonate mineralogy							Category F Metal corrosion				
Row	Well	Port Depth (ft)	Screen	Sample Collection Date	Event Seq.	Mod Water	Low pH?	High pH?	Gen-1	Gen-2	Gen-3	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C9	C8	C7, D2	C10	C11	C12	D1	C7, D2	D3	D4	E1a	E1b	E1	E2	E3	E4	E5	F1	F2	F3	F4	F5
				Units		3H	pH	pH	pH	Alk	Turbid	Cl	F	PO4	Na	SO4	Acetone	NH3-N	TKN	TOC	SO4	S	ORP	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3-N	DO	Sr	U	Ba	Zn	Ca	Ca	Ca	Ba	Sr	Mg	U	FeT	FeR	CrT	CrR	Ni
				Test		>UL	>LL	<UL		<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	>LL	<UL	>LL	<UL	<UL	>LL	<UL	<UL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	<UL	In	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL
				Regional		1	6.94	8.65		105	5	3.75	0.53	0.3	28.6	6.22	5	0.05	0.28	1	0.8	0.01	0	102	16	0.17	4	2	0.2	1	0.1	2	44.88	0.2	4.6	1	8.66	24	range	70	180	4.81	1.52	500	10	10	5	50
				Perched		1	6.73	8.80		52	5	1.75	0.23	0.08	12.2	4.48	5	0.05	0.28	1	1.07	0.01	0	102	16	0.17	4	2	0.1	1	0.1	2	19.1	0.1	1.4	1	4.39	17		72	155	6.12	0.72	500	10	5	5	50
139	R-19	909	2	10-Jun-04	7	-ND-	Yes	No	Fail	Fail	P	Fail	Fail	P	Fail	P	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	P	P	P	P	P	P	-UF-	P	-ND-	P	P	P	Fail	Yes	No	P	P	P	P	P	Yes	I-NA	P	I-NA	P
140	R-19	909	2	21-Jul-05	8	-ND-	Yes	Yes	P	Fail	P	Fail	Fail	P	Fail	P	-ND-	P	Fail	-ND-	P	-ND-	P	P	P	P	P	P	P	Fail	P	P	P	P	P	I-NA	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
141	R-19	909	2	18-Aug-06	9	Yes	Yes	Yes	P	Fail	P	Fail	Fail	P	Fail	P	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	P	P	-DL-	P	P	P	P	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
142	R-19	909	2	11-Dec-06	10	Yes	Yes	Yes	P	Fail	P	Fail	Fail	P	Fail	Fail	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	P	P	-DL-	P	-ND-	-ND-	-ND-	P	-ND-	P	-ND-	P	P	Yes	Yes	P	P	P	P	-ND-	Yes	I-NA	-ND-	-ND-	-ND-
144	R-19	1191	3	26-Sep-00	1	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-DL-	P	Fail	P	P	-ND-	-ND-	Fail	Fail	-DL-	P	P	P	P	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
145	R-19	1191	3	9-Apr-01	2	Yes	No	Yes	Fail	P	P	P	P	P	P	P	-DL-	-DL-	P	P	P	-ND-	-ND-	P	P	-DL-	P	P	P	P	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
146	R-19	1191	3	10-Jul-01	3	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-DL-	-DL-	P	P	P	-ND-	-ND-	P	P	-DL-	-DL-	P	P	P	P	-ND-	P	P	P	Fail	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
147	R-19	1191	3	18-Sep-01	4	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	-ND-	P	P	-DL-	P	P	P	P	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
148	R-19		3	22-Aug-02	5	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	-ND-	P	P	-ND-	P	P	P	-DL-	P	P	-DL-	-UF-	P	P	P	-DL-	P	-UF-	Yes	Yes	P	P	P	P	-DL-	Yes	I-NA	P	I-NA	P
149	R-19	1191	3	15-Dec-03	6	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	-ND-	P	P	-ND-	-ND-	P	P	-DL-	P	P	-UF-	-UF-	P	-ND-	P	-UF-	P	-UF-	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	-ND-	P
150	R-19	1191	3	14-Jun-04	7	-ND-	Yes	Yes	P	P	P	P	P	P	P	P	P	-ND-	-ND-	-ND-	P	-ND-	-ND-	P	P	P	P	Fail	-UF-	-UF-	P	-ND-	P	-UF-	P	Fail	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
151	R-19	1191	3	21-Jul-05	8	-ND-	Yes	Yes	P	P	P	P	P	P	P	-Red-	P	P	-Err-	-ND-	Fail	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
152	R-19	1191	3	15-Aug-06	9	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	P	P	-DL-	P	P	P	P	Fail	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
153	R-19	1191	3	11-Dec-06	10	Yes	Yes	Yes	P	P	P	Fail	P	P	P	P	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	P	P	-DL-	P	-ND-	-ND-	-ND-	Fail	-ND-	P	-ND-	P	P	Yes	Yes	P	P	P	P	-ND-	Yes	I-NA	-ND-	-ND-	-ND-
155	R-19	1413	4	6-Apr-01	1	Yes	Yes	No	Fail	P	P	P	P	P	P	P	-DL-	-DL-	P	P	P	-ND-	-ND-	P	Fail	-DL-	P	Fail	P	P	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	Fail	P
156	R-19	1413	4	11-Jul-01	2	Yes	Yes	Yes	P	P	Fail	P	P	P	P	P	-DL-	-DL-	P	P	P	-ND-	-ND-	P	P	-DL-	-DL-	P	P	P	P	-ND-	P	P	P	P	No	Yes	Fail	P	P	P	P	Yes	I-NA	P	I-NA	P
157	R-19	1413	4	19-Sep-01	3	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	P	P	P	-ND-	-ND-	P	P	-DL-	P	P	P	-DL-	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
158	R-19	1413	4	26-Aug-02	4	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	-ND-	P	P	-ND-	P	P	P	-DL-	P	P	-DL-	-UF-	P	P	Fail	-DL-	P	-UF-	Yes	Yes	P	P	P	P	-DL-	Yes	I-NA	-ND-	-ND-	P
159	R-19	1413	4	16-Dec-03	5	Yes	Yes	Yes	P	P	P	P	P	P	P	P	-ND-	P	-ND-	P	P	-ND-	-ND-	P	P	-DL-	P	Fail	-UF-	-UF-	P	-ND-	P	-UF-	P	-UF-	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
160	R-19	1413	4	15-Jun-04	6	-ND-	Yes	Yes	P	P	P	P	P	P	P	P	P	-ND-	-ND-	-ND-	P	-ND-	-ND-	P	P	P	P	P	-UF-	-UF-	P	-ND-	P	-UF-	P	-UF-	Yes	Yes	P	P	P	P	P	Yes	I-NA	Fail	-ND-	P
161	R-19	1413	4	28-Jul-05	7	-ND-	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	-ND-	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
162	R-19	1413	4	16-Aug-06	8	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	-ND-	P	P	P	P	P	P	P	P	-ND-	Fail	P	P	P	No	Yes	Fail	P	P	P	P	Yes	I-NA	Fail	Fail	P
163	R-19	1413	4	12-Dec-06	9	-ND-	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	-ND-	-ND-	P	P	P	P	P	P	P	P	-ND-	Fail	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
165	R-19	1586	5	4-Apr-01	1	Yes	Yes	Yes	P	Fail	Fail	P	P	P	P	-Red-	-DL-	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-DL-	Fail	Fail	Fail	Fail	Fail	-ND-	P	Fail	P	P	Yes	No	Fail	Fail	Fail	Fail	-Red-	No	P	P	I-NA	P
166	R-19	1586	5	12-Jul-01	2	Yes	No	Yes	Fail	Fail	Fail	P	P	P	P	-Red-	-DL-	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-DL-	-ND-	Fail	Fail	Fail	Fail	-ND-	P	Fail	P	Fail	Yes	No	Fail	Fail	Fail	Fail	-Red-	No	P	P	I-NA	P
167	R-19	1586	5	20-Sep-01	3	Yes	Yes	Yes	P	Fail	Fail	P	P	P	P	-Red-	Fail	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-DL-	Fail	P	Fail	Fail	Fail	-ND-	P	Fail	P	P	Yes	No	Fail	Fail	Fail	P	-Red-	No	P	P	I-NA	P
168	R-19	1586	5	23-Aug-02	4	Yes	No	Yes	Fail	Fail	P	P	P	P	P	-Red-	P	Fail	-ND-	Fail	Fail	-ND-	Fail	Fail	Fail	-DL-	Fail	Fail	-DL-	-UF-	Fail	P	P	-DL-	P	-UF-	Yes	No	Fail	Fail	Fail	Fail	-DL-	No	-ND-	P	I-NA	P
169	R-19	1586	5	16-Dec-03	5	Yes	No	Yes	Fail	Fail	P	P	P	P	P	-Red-	-ND-	Fail	-ND-	Fail	Fail	-ND-	-ND-	Fail	Fail	-DL-	Fail	Fail	Fail	-UF-	Fail	-ND-	P	Fail	P	-UF-	Yes	No	Fail	Fail	Fail	Fail	-Red-	No	-ND-	P	I-NA	P
170	R-19	1586	5	17-Aug-06	6	Yes	No	Yes	Fail	Fail	P	P	P	P	P	-Red-	-ND-	-ND-	-ND-	-ND-	Fail	-ND-	-ND-	Fail	Fail	-DL-	P	Fail	Fail	P	Fail	-ND-	P	Fail	P	-Err-	Yes	No	Fail	Fail	Fail	P	-Red-	Yes	I-NA	P	I-NA	P
171	R-19	1586	5	11-Dec-06	7	Yes	No	Yes	Fail	Fail	P	Fail	P	P	P	-Red-	-ND-	-ND-	-ND-	-ND-	Fail	-ND-	-ND-	Fail	Fail	-DL-	P	-ND-	-ND-	-ND-	Fail	-ND-	P	-ND-	P	P	Yes	No	Fail	Fail	Fail	P	-ND-	Yes	I-NA	-ND-	-ND-	-ND-
173	R-19	1730	6	4-Oct-00	1	Yes	Yes	Yes	P	Fail	P	P	P	P	Fail	-Red-	-DL-	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-DL-	Fail	Fail	-DL-	Fail	Fail	-ND-	P	-DL-	P	P	Yes	Yes	P	P	P	P	P	No	P	P	I-NA	P
174	R-19	1730	6	2-Apr-01	2	Yes	Yes	Yes	P	P	P	P	P	P	Fail	-Red-	-DL-	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-DL-	Fail	Fail	Fail	Fail	Fail	-ND-	Fail	Fail	P	P	No	Yes	Fail	P	P	P	-Red-	No	P	P	I-NA	P

Table C-7 (continued)

Water Quality Sample						General Indicators						Category A Inorganic Indicators					Category B Organic Indicators				Category C1 Redox (SO4)			Category C2 Redox (Fe/Mn)							Category C3 Redox (NO3)		Category D Adsorption				Category E Carbonate mineralogy							Category F Metal corrosion				
Row	Well	Port Depth (ft)	Screen	Sample Collection Date	Event Seq.	Mod Water	Low pH?	High pH?	Gen-1	Gen-2	Gen-3	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C9	C8	C7, D2	C10	C11	C12	D1	C7, D2	D3	D4	E1a	E1b	E1	E2	E3	E4	E5	F1	F2	F3	F4	F5
				Units		3H	pH	pH	pH	Alk	Turbid	Cl	F	PO4	Na	SO4	Acetone	NH3-N	TKN	TOC	SO4	S	ORP	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3-N	DO	Sr	U	Ba	Zn	Ca	Ca	Ca	Ba	Sr	Mg	U	FeT	FeR	CrT	CrR	Ni
				Test		>UL	>LL	<UL		<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	>LL	<UL	>LL	<UL	<UL	>LL	<UL	<UL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	<UL	In	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL
				Regional		1	6.94	8.65		105	5	3.75	0.53	0.3	28.6	6.22	5	0.05	0.28	1	0.8	0.01	0	102	16	0.17	4	2	0.2	1	0.1	2	44.88	0.2	4.6	1	8.66	24	range	70	180	4.81	1.52	500	10	10	5	50
				Perched		1	6.73	8.80		52	5	1.75	0.23	0.08	12.2	4.48	5	0.05	0.28	1	1.07	0.01	0	102	16	0.17	4	2	0.1	1	0.1	2	19.1	0.1	1.4	1	4.39	17		72	155	6.12	0.72	500	10	5	5	50
175	R-19	1730	6	16-Jul-01	3	Yes	Yes	Yes	P	P	Fail	P	P	P	P	-Red-	-DL-	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-DL-	Fail	Fail	Fail	Fail	Fail	-ND-	Fail	Fail	P	P	No	Yes	Fail	P	P	P	-Red-	No	P	P	I-NA	P
176	R-19	1730	6	21-Sep-01	4	Yes	Yes	Yes	P	P	P	P	P	P	P	-Red-	P	Fail	Fail	Fail	Fail	-ND-	-ND-	Fail	Fail	-DL-	Fail	P	Fail	Fail	Fail	-ND-	Fail	Fail	P	P	No	Yes	Fail	P	P	P	-Red-	No	P	P	I-NA	P
177	R-19	1730	6	27-Aug-02	5	Yes	Yes	Yes	P	P	P	P	P	P	P	-Red-	P	Fail	-ND-	Fail	Fail	-ND-	Fail	Fail	Fail	-DL-	P	P	-DL-	Fail	Fail	P	Fail	-DL-	P	-UF-	No	Yes	Fail	P	P	P	-DL-	No	-ND-	P	I-NA	P
178	R-19	1730	6	16-Dec-03	6	Yes	No	Yes	Fail	P	P	P	P	P	P	-Red-	-ND-	Fail	-ND-	P	Fail	-ND-	-ND-	Fail	Fail	-DL-	P	Fail	Fail	-UF-	Fail	-ND-	Fail	Fail	P	-UF-	No	Yes	Fail	P	P	P	-Red-	No	-ND-	P	I-NA	P
179	R-19	1730	6	17-Aug-06	7	Yes	No	Yes	Fail	P	P	P	P	P	P	P	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	Fail	Fail	-DL-	P	P	Fail	P	Fail	-ND-	Fail	Fail	P	P	No	Yes	Fail	P	P	P	-Red-	Yes	I-NA	P	I-NA	P
180	R-19	1730	6	11-Dec-06	8	Yes	No	Yes	Fail	P	P	Fail	P	P	P	P	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	Fail	Fail	-DL-	P	-ND-	-ND-	-ND-	Fail	-ND-	Fail	-ND-	P	P	No	Yes	Fail	P	P	P	-ND-	Yes	I-NA	-ND-	-ND-	-ND-
182	R-19	1835	7	3-Oct-00	1	Yes	Yes	Yes	P	Fail	Fail	P	P	P	Fail	Fail	-ND-	Fail	Fail	-ND-	P	-ND-	-ND-	Fail	Fail	-DL-	Fail	Fail	P	P	Fail	-ND-	P	P	P	I-NA	No	Yes	Fail	P	P	P	P	-ND-	-ND-	-ND-	-ND-	P
183	R-19	1835	7	29-Mar-01	2	Yes	Yes	Yes	P	Fail	Fail	P	Fail	P	Fail	Fail	-DL-	-DL-	Fail	-Err-	P	-ND-	-ND-	Fail	Fail	-Err-	Fail	P	P	P	Fail	-ND-	Fail	P	P	P	No	Yes	Fail	P	P	P	P	No	P	Fail	Fail	P
184	R-19	1835	7	17-Jul-01	3	Yes	Yes	Yes	P	Fail	Fail	P	Fail	P	Fail	Fail	Fail	Fail	Fail	Fail	P	-ND-	-ND-	Fail	Fail	-DL-	Fail	Fail	P	Fail	Fail	-ND-	Fail	P	P	P	No	Yes	Fail	P	P	P	P	No	P	P	I-NA	P
185	R-19	1835	7	24-Sep-01	4	Yes	Yes	Yes	P	Fail	Fail	P	Fail	P	Fail	Fail	Fail	Fail	Fail	Fail	P	-ND-	-ND-	Fail	Fail	-DL-	Fail	Fail	P	Fail	Fail	-ND-	Fail	P	P	P	No	Yes	Fail	P	P	P	P	No	P	P	I-NA	P
186	R-19	1835	7	26-Aug-02	5	Yes	Yes	Yes	P	Fail	Fail	P	Fail	P	Fail	Fail	P	Fail	-ND-	Fail	P	-ND-	Fail	Fail	Fail	-DL-	Fail	P	-DL-	-UF-	Fail	P	Fail	-DL-	P	I-NA	No	Yes	Fail	P	P	P	-DL-	Yes	I-NA	P	I-NA	P
187	R-19	1835	7	17-Dec-03	6	Yes	Yes	Yes	P	Fail	Fail	P	Fail	P	Fail	Fail	-ND-	Fail	-ND-	Fail	P	-ND-	-ND-	Fail	Fail	-DL-	Fail	Fail	P	-UF-	Fail	-ND-	Fail	P	P	I-NA	No	Yes	Fail	P	P	P	Fail	No	-ND-	P	I-NA	P
188	R-19	1835	7	16-Jun-04	7	-ND-	Yes	Yes	P	Fail	Fail	P	P	P	Fail	Fail	P	-ND-	-ND-	-ND-	P	-ND-	-ND-	Fail	Fail	Fail	Fail	Fail	P	Fail	Fail	-ND-	Fail	P	P	I-NA	No	Yes	Fail	P	P	P	Fail	Yes	I-NA	P	I-NA	P
189	R-19	1835	7	28-Jul-05	8	-ND-	Yes	Yes	P	Fail	Fail	P	P	P	Fail	Fail	P	Fail	Fail	-ND-	P	-ND-	P	P	Fail	Fail	Fail	P	P	Fail	Fail	P	Fail	P	P	P	No	Yes	Fail	P	P	P	P	No	Fail	Fail	Fail	P
190	R-19	1835	7	18-Aug-06	9	Yes	Yes	Yes	P	Fail	Fail	P	Fail	P	Fail	Fail	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	Fail	Fail	-DL-	Fail	Fail	P	Fail	Fail	-ND-	Fail	P	P	I-NA	No	Yes	Fail	P	P	P	P	No	P	P	I-NA	P
191	R-19	1835	7	13-Dec-06	10	-ND-	Yes	Yes	P	Fail	-ND-	Fail	Fail	Fail	Fail	Fail	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	Fail	Fail	-DL-	Fail	-ND-	-ND-	-ND-	Fail	-ND-	Fail	-ND-	P	P	No	Yes	Fail	P	P	P	-ND-	Yes	I-NA	-ND-	-ND-	-ND-
193	R-25	755	1	14-Nov-00	1	No	Yes	Yes	P	Fail	P	Plm	P	Fail	P	Plm	-DL-	-DL-	-ND-	Fail	P	-ND-	-ND-	P	P	-DL-	P	Fail	P	P	Plm	-ND-	P	P	P	P	Yes	No	Fail	P	P	P	Fail	Yes	I-NA	P	I-NA	P
194	R-25	755	1	3-May-01	2	No	Yes	Yes	P	Fail	P	Plm	P	Fail	P	Plm	-DL-	-DL-	-ND-	P	P	-ND-	-ND-	P	Fail	-Err-	P	Fail	P	Fail	Plm	-ND-	P	P	P	P	Yes	No	Fail	P	P	P	Fail	No	Fail	Fail	Fail	Fail
195	R-25	755	1	13-Aug-01	3	No	Yes	Yes	P	Fail	-ND-	Plm	P	Fail	P	Plm	-DL-	-DL-	-ND-	P	P	-ND-	-ND-	P	Fail	-DL-	-DL-	Fail	P	P	Plm	-ND-	P	P	P	P	Yes	No	Fail	P	P	Fail	Fail	No	Fail	Fail	Fail	Fail
196	R-25	755	1	4-Feb-02	4	No	Yes	Yes	P	Fail	Fail	Plm	P	P	P	Plm	P	P	Fail	Fail	P	-ND-	-ND-	P	Fail	-Err-	P	Fail	P	P	Plm	P	P	P	P	P	Yes	No	Fail	P	P	Fail	Fail	No	Fail	Fail	Fail	Fail
197	R-25	755	1	7-Aug-02	5	No	Yes	Yes	P	Fail	Fail	Plm	P	Fail	P	Plm	P	P	-ND-	Fail	P	-ND-	P	-UF-	Fail	-DL-	P	Fail	-DL-	-UF-	Plm	P	P	-DL-	P	-UF-	Yes	No	Fail	P	P	P	-DL-	No	-ND-	Fail	-ND-	Fail
198	R-25	755	1	11-Dec-03	6	No	Yes	Yes	P	Fail	Fail	Plm	P	P	P	Plm	P	P	-ND-	P	P	-ND-	-ND-	-UF-	Fail	-DL-	P	Fail	P	-UF-	Plm	-ND-	P	P	P	-UF-	Yes	No	Fail	P	P	P	P	No	-ND-	Fail	-ND-	Fail
199	R-25	755	1	1-Sep-04	7	No	Yes	Yes	P	P	Fail	Plm	P	P	P	Plm	P	-ND-	-ND-	-ND-	P	-ND-	-ND-	-UF-	Fail	P	P	Fail	P	-UF-	Plm	-ND-	P	P	P	I-NA	Yes	No	Fail	P	P	P	P	No	-ND-	Fail	-ND-	Fail
200	R-25	755	1	2-Aug-05	8	No	Yes	Yes	P	Fail	Fail	Plm	P	P	P	Plm	P	P	P	-ND-	P	-ND-	P	Fail	Fail	P	P	Fail	P	P	Plm	P	P	P	P	P	Yes	No	Fail	P	P	P	Fail	No	Fail	Fail	Fail	Fail
202	R-25	892	2	15-Nov-00	1	No	Yes	No	Fail	Fail	Fail	Plm	P	Fail	Fail	Fail	-DL-	-DL-	-ND-	Fail	P	-ND-	-ND-	P	P	-DL-	Fail	P	P	Fail	Fail	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	Fail	No	Fail	Fail	Fail	P
203	R-25	892	2	4-May-01	2	No	Yes	No	Fail	Fail	Fail	Plm	P	Fail	Fail	Fail	-DL-	-DL-	-ND-	Fail	P	-ND-	-ND-	Fail	P	-Err-	Fail	Fail	P	P	Fail	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	Fail	No	P	Fail	P	P
204	R-25	892	2	14-Aug-01	3	No	Yes	No	Fail	Fail	Fail	Plm	P	Fail	Fail	Fail	-DL-	Fail	-ND-	Fail	P	-ND-	-ND-	Fail	P	-DL-	Fail	Fail	P	P	Fail	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	No	P	Fail	Fail	P
205	R-25	892	2	5-Feb-02	4	No	Yes	Yes	P	Fail	Fail	Plm	P	Fail	Fail	Fail	Fail	P	P	Fail	P	-ND-	-ND-	Fail	Fail	-Err-	Fail	Fail	P	-UF-	Fail	P	P	P	P	P	Yes	Yes	P	P	P	P	P	No	Fail	Fail	-ND-	P
206	R-25	892	2	8-Aug-02	5	No	Yes	Yes	P	Fail	Fail	Plm	P	Fail	Fail	Fail	P	P	-ND-	Fail	P	-ND-	P	-UF-	Fail	-DL-	Fail	Fail	-DL-	-UF-	Fail	P	P	-DL-	P	-UF-	Yes	Yes	P	P	P	P	-DL-	No	-ND-	Fail	-ND-	P
207	R-25	892	2	10-Dec-03	6	No	Yes	Yes	P	Fail	Fail	Plm	P	Fail	Fail	Fail	P	P	-ND-	Fail	P	-ND-	-ND-	-UF-	Fail	-DL-	Fail	Fail	P	-UF-	Fail	-ND-	P	P	P	-UF-	Yes	Yes	P	P	P	P	P	No	-ND-	Fail	-ND-	Fail
208	R-25	892	2	3-Aug-05	7	No	Yes	Yes	P	Fail	Fail	Plm	P	Fail	Fail	Fail	P	Fail	P	-ND-	P	-ND-	Fail	Fail	Fail	Fail	Fail	Fail	Fail	P	Fail	P	P	Fail	Fail	P	Yes	Yes	P	P	P	P	-Red-	No	P	Fail	Fail	Fail
210	R-25	1192	4	4-Dec-00	1	No	Yes	Yes	P	Fail	Fail	Plm	P	Fail	P	Fail	-DL-	-DL-	-ND-	Fail	P	-ND-	-ND-	P	Fail	-DL-	P	Fail	P	Fail	P	-ND-	P	P	P	P	Yes	No	Fail	P	Fail	P	P	No	Fail	Fail	Fail	P

Table C-7 (continued)

Water Quality Sample						General Indicators						Category A Inorganic Indicators					Category B Organic Indicators				Category C1 Redox (SO4)			Category C2 Redox (Fe/Mn)							Category C3 Redox (NO3)		Category D Adsorption				Category E Carbonate mineralogy							Category F Metal corrosion				
Row	Well	Port Depth (ft)	Screen	Sample Collection Date	Event Seq.	Mod Water	Low pH?	High pH?	Gen-1	Gen-2	Gen-3	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C9	C8	C7, D2	C10	C11	C12	D1	C7, D2	D3	D4	E1a	E1b	E1	E2	E3	E4	E5	F1	F2	F3	F4	F5
				Units		3H	pH	pH	pH	Alk	Turbid	Cl	F	PO4	Na	SO4	Acetone	NH3-N	TKN	TOC	SO4	S	ORP	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3-N	DO	Sr	U	Ba	Zn	Ca	Ca	Ca	Ba	Sr	Mg	U	FeT	FeR	CrT	CrR	Ni
				Test		>UL	>LL	<UL		<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	>LL	<UL	>LL	<UL	<UL	>LL	<UL	<UL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	<UL	In	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL
				Regional		1	6.94	8.65		105	5	3.75	0.53	0.3	28.6	6.22	5	0.05	0.28	1	0.8	0.01	0	102	16	0.17	4	2	0.2	1	0.1	2	44.88	0.2	4.6	1	8.66	24	range	70	180	4.81	1.52	500	10	10	5	50
				Perched		1	6.73	8.80		52	5	1.75	0.23	0.08	12.2	4.48	5	0.05	0.28	1	1.07	0.01	0	102	16	0.17	4	2	0.1	1	0.1	2	19.1	0.1	1.4	1	4.39	17		72	155	6.12	0.72	500	10	5	5	50
211	R-25	1192	4	7-May-01	2	No	Yes	Yes	P	Fail	Fail	Plm	P	Fail	P	Fail	-DL-	-DL-	-ND-	Fail	P	-ND-	-ND-	P	Fail	-Err-	P	P	-Err-	Fail	P	-ND-	P	-Err-	P	P	Yes	No	Fail	P	Fail	P	-Err-	Yes	I-NA	Fail	Fail	P
212	R-25	1192	4	14-Aug-01	3	No	Yes	Yes	P	Fail	P	Plm	P	Fail	P	Fail	-DL-	Fail	-ND-	P	P	-ND-	-ND-	-Err-	Fail	-DL-	-DL-	Fail	P	Fail	Fail	-ND-	P	P	P	P	Yes	No	Fail	P	Fail	P	P	Yes	I-NA	Fail	Fail	P
213	R-25	1192	4	6-Feb-02	4	No	Yes	Yes	P	Fail	P	Plm	P	Fail	P	Fail	P	P	Fail	Fail	P	-ND-	-ND-	P	Fail	-Err-	P	P	P	P	P	P	P	P	P	P	Yes	No	Fail	P	Fail	P	P	Yes	I-NA	P	P	P
214	R-25	1192	4	8-Aug-02	5	No	Yes	Yes	P	P	P	Plm	P	P	P	Fail	P	P	-ND-	Fail	P	-ND-	Fail	-UF-	Fail	-DL-	P	Fail	-DL-	-UF-	P	P	P	-DL-	P	-UF-	Yes	No	Fail	P	P	P	-DL-	Yes	I-NA	P	I-NA	P
215	R-25	1192	4	10-Dec-03	6	No	Yes	Yes	P	Fail	P	Plm	P	-Err-	P	Fail	P	Fail	-ND-	P	P	-ND-	-ND-	-UF-	P	-DL-	P	P	P	-UF-	Fail	-ND-	P	P	P	-UF-	Yes	No	Fail	P	P	P	P	Yes	I-NA	P	I-NA	P
216	R-25	1192	4	4-Aug-05	7	No	Yes	Yes	P	Fail	Fail	Plm	P	Fail	P	-Err-	P	P	P	-ND-	-Err-	-ND-	P	P	P	P	P	Fail	P	Fail	P	P	P	P	P	P	Yes	No	Fail	P	Fail	P	P	Yes	I-NA	P	I-NA	P
218	R-25	1303	5	7-Dec-00	1	No	Yes	Yes	P	P	Fail	Fail	P	Fail	P	Fail	-DL-	-DL-	-ND-	Fail	P	-ND-	-ND-	P	Fail	-DL-	Fail	Fail	P	Fail	Fail	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	Fail	Yes	I-NA	P	I-NA	P
219	R-25	1303	5	8-May-01	2	No	Yes	Yes	P	P	P	P	P	Fail	P	Fail	-DL-	-DL-	-ND-	Fail	P	-ND-	-ND-	P	Fail	-Err-	Fail	P	P	Fail	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
220	R-25	1303	5	15-Aug-01	3	-ND-	Yes	Yes	P	P	P	P	P	Fail	P	Fail	-DL-	-DL-	-ND-	-ND-	P	-ND-	-ND-	P	Fail	-DL-	-DL-	Fail	-ND-	Fail	Fail	-ND-	P	-ND-	P	P	Yes	Yes	P	P	P	P	-ND-	Yes	I-NA	P	I-NA	P
221	R-25	1303	5	7-Feb-02	4	No	Yes	Yes	P	Fail	P	P	P	Fail	P	Fail	P	P	P	Fail	P	-ND-	-ND-	P	Fail	-Err-	Fail	Fail	P	-DL-	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
222	R-25	1303	5	9-Aug-02	5	No	Yes	Yes	P	Fail	P	P	P	Fail	P	Fail	P	P	-ND-	Fail	P	-ND-	P	-UF-	Fail	-DL-	Fail	Fail	-DL-	-UF-	Fail	P	P	-DL-	P	I-NA	Yes	Yes	P	P	P	P	-DL-	No	-ND-	Fail	-ND-	Fail
223	R-25	1303	5	9-Dec-03	6	No	Yes	Yes	P	P	P	P	P	Fail	-Err-	Fail	P	Fail	-ND-	Fail	P	-ND-	-ND-	-UF-	Fail	-DL-	Fail	Fail	Fail	-UF-	Fail	-ND-	P	Fail	P	-UF-	Yes	Yes	P	Fail	Fail	P	-Red-	No	-ND-	P	I-NA	P
224	R-25	1303	5	31-Aug-04	7	No	Yes	Yes	P	-ND-	P	-ND-	-ND-	Fail	P	-ND-	P	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-UF-	Fail	Fail	Fail	Fail	-ND-	Fail	Fail	-ND-	P	-ND-	P	-UF-	Yes	Yes	P	P	Fail	P	-ND-	No	-ND-	P	I-NA	P
225	R-25	1303	5	9-Aug-05	8	-ND-	Yes	Yes	P	-ND-	P	-ND-	-ND-	-ND-	P	-ND-	P	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	Fail	Fail	-ND-	Fail	Fail	Fail	P	-ND-	P	P	Fail	P	P	Yes	Yes	P	P	P	P	-Red-	No	P	P	I-NA	P
227	R-25	1406	6	8-Dec-00	1	No	Yes	Yes	P	P	P	Fail	P	Fail	P	Fail	-DL-	-DL-	-ND-	P	P	-ND-	-ND-	P	Fail	-DL-	Fail	Fail	P	P	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	Fail	P	P
228	R-25	1406	6	9-May-01	2	No	Yes	Yes	P	P	P	P	P	Fail	P	Fail	-DL-	-DL-	-ND-	Fail	P	-ND-	-ND-	P	P	-Err-	P	P	P	Fail	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
229	R-25	1406	6	16-Aug-01	3	-ND-	Yes	Yes	P	P	P	P	P	Fail	P	P	-ND-	-DL-	-ND-	-ND-	P	-ND-	-ND-	P	P	-DL-	-DL-	P	P	Fail	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	-ND-	-ND-	-ND-	-ND-	P
230	R-25	1406	6	8-Feb-02	4	No	Yes	Yes	P	P	P	Fail	P	Fail	P	P	P	P	P	P	P	-ND-	-ND-	P	P	-DL-	P	-DL-	P	Fail	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
231	R-25	1406	6	12-Aug-02	5	No	Yes	Yes	P	P	P	P	P	Fail	P	P	P	P	-ND-	P	P	-ND-	P	-UF-	P	-DL-	Fail	Fail	-DL-	-UF-	P	P	P	-DL-	P	-UF-	Yes	Yes	P	P	P	P	-DL-	Yes	I-NA	Fail	-ND-	P
232	R-25	1406	6	9-Dec-03	6	No	Yes	Yes	P	P	P	P	P	Fail	-Err-	P	P	P	-ND-	P	P	-ND-	-ND-	P	P	-DL-	P	Fail	P	-UF-	P	-ND-	P	P	P	-UF-	Yes	Yes	P	P	P	P	P	Yes	I-NA	Fail	-ND-	P
234	R-25	1606	7	11-Dec-00	1	No	Yes	Yes	P	P	Fail	Fail	P	Fail	P	Fail	-DL-	-DL-	-ND-	P	P	-ND-	-ND-	P	Fail	-DL-	Fail	Fail	P	Fail	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	Fail	Fail	P
235	R-25	1606	7	11-May-01	2	No	Yes	Yes	P	P	P	P	P	Fail	P	P	-DL-	-DL-	-ND-	Fail	P	-ND-	-ND-	P	P	-Err-	P	P	P	P	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	Fail	Fail	P
236	R-25	1606	7	17-Aug-01	3	No	Yes	Yes	P	P	P	P	P	Fail	P	P	-DL-	-DL-	-ND-	P	P	-ND-	-ND-	P	P	-DL-	-DL-	P	P	Fail	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
237	R-25	1606	7	11-Feb-02	4	No	Yes	Yes	P	P	P	P	P	Fail	P	P	P	P	P	P	P	-ND-	-ND-	P	P	-DL-	P	-DL-	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
238	R-25	1606	7	12-Aug-02	5	No	Yes	Yes	P	P	P	P	P	Fail	P	P	P	P	-ND-	P	P	-ND-	P	-UF-	P	-DL-	P	Fail	-DL-	-UF-	P	P	P	-DL-	P	-UF-	Yes	Yes	P	P	P	P	-DL-	Yes	I-NA	P	I-NA	P
239	R-25	1606	7	8-Dec-03	6	Yes	Yes	Yes	P	P	P	P	P	Fail	P	P	P	P	-ND-	P	P	-ND-	-ND-	-UF-	P	-DL-	P	P	-UF-	-UF-	P	-ND-	P	-UF-	P	-UF-	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
241	R-25	1796	8	12-Dec-00	1	No	Yes	Yes	P	P	Fail	Fail	P	Fail	P	Fail	-DL-	-DL-	-ND-	Fail	P	-ND-	-ND-	Fail	Fail	-DL-	Fail	Fail	P	P	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	Fail	No	Fail	Fail	Fail	P
242	R-25	1796	8	14-May-01	2	No	Yes	Yes	P	P	Fail	P	P	Fail	P	P	-DL-	-DL-	-ND-	-ND-	P	-ND-	-ND-	Fail	P	-Err-	P	Fail	P	Fail	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	No	P	P	I-NA	P
243	R-25	1796	8	20-Aug-01	3	No	Yes	Yes	P	P	Fail	P	P	Fail	P	P	-DL-	-DL-	-ND-	-Err-	P	-ND-	-ND-	P	P	-DL-	-DL-	P	P	Fail	P	-ND-	P	P	P	P	Yes	Yes	P	P	P	P	P	No	Fail	Fail	Fail	P
244	R-25	1796	8	12-Feb-02	4	No	Yes	Yes	P	P	P	P	P	Fail	P	P	P	P	P	P	P	-ND-	-ND-	P	P	-DL-	P	-DL-	P	-DL-	P	P	P	P	P	-DL-	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
245	R-25	1796	8	14-Aug-02	5	No	Yes	Yes	P	P	P	P	P	Fail	P	P	P	P	-ND-	P	P	-ND-	P	-UF-	P	-DL-	P	P	-DL-	-UF-	P	P	P	-DL-	P	-UF-	Yes	Yes	P	P	P	P	-DL-	Yes	I-NA	P	I-NA	P
246	R-25	1796	8	4-Dec-03	6	Yes	Yes	Yes	P	P	P	P	P	Fail	P	P	P	P	-ND-	P	P	-ND-	-ND-	-UF-	P	-DL-	P	P	P	-UF-	P	-ND-	P	P	P	-UF-	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P

Table C-7 (continued)

Water Quality Sample						General Indicators						Category A Inorganic Indicators					Category B Organic Indicators				Category C1 Redox (SO4)			Category C2 Redox (Fe/Mn)							Category C3 Redox (NO3)		Category D Adsorption				Category E Carbonate mineralogy							Category F Metal corrosion				
Row	Well	Port Depth (ft)	Screen	Sample Collection Date	Event Seq.	Mod Water	Low pH?	High pH?	Gen-1	Gen-2	Gen-3	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C9	C8	C7, D2	C10	C11	C12	D1	C7, D2	D3	D4	E1a	E1b	E1	E2	E3	E4	E5	F1	F2	F3	F4	F5
				Units		3H	pH	pH	pH	Alk	Turbid	Cl	F	PO4	Na	SO4	Acetone	NH3-N	TKN	TOC	SO4	S	ORP	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3-N	DO	Sr	U	Ba	Zn	Ca	Ca	Ca	Ba	Sr	Mg	U	FeT	FeR	CrT	CrR	Ni
				Test		>UL	>LL	<UL		<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	>LL	<UL	>LL	<UL	<UL	>LL	<UL	<UL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	>LL	<UL	In	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL	<UL
				Regional		1	6.94	8.65		105	5	3.75	0.53	0.3	28.6	6.22	5	0.05	0.28	1	0.8	0.01	0	102	16	0.17	4	2	0.2	1	0.1	2	44.88	0.2	4.6	1	8.66	24	range	70	180	4.81	1.52	500	10	10	5	50
				Perched		1	6.73	8.80		52	5	1.75	0.23	0.08	12.2	4.48	5	0.05	0.28	1	1.07	0.01	0	102	16	0.17	4	2	0.1	1	0.1	2	19.1	0.1	1.4	1	4.39	17		72	155	6.12	0.72	500	10	5	5	50
247	R-25	1796	8	10-Aug-05	7	Yes	Yes	Yes	P	P	Fail	P	P	Fail	P	P	P	P	P	-ND-	P	-ND-	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
249	R-26	659	1	13-Apr-05	1	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Fail	P	P	P	P	P	P	Fail	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
250	R-26	659	1	27-Jul-05	2	Yes	Yes	Yes	P	P	P	P	P	Fail	P	-Red-	P	P	P	P	Fail	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
251	R-26	659	1	2-Nov-05	3	Yes	Yes	Yes	P	P	P	P	P	Fail	P	P	P	P	Fail	P	P	P	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	P	Yes	Yes	P	P	P	P	P	Yes	I-NA	Fail	P	P
252	R-26	659	1	22-Feb-06	4	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	-ND-	P	-ND-	-ND-	P	P	P	P	P	P	P	P	P	P	P	P	-DL-	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
254	R-27	852	1	14-Nov-05	1	-ND-	Yes	Yes	P	P	-ND-	P	P	-ND-	P	P	-ND-	-ND-	-ND-	-ND-	P	-ND-	-ND-	P	P	-ND-	P	P	-UF-	Fail	P	-ND-	P	-UF-	P	I-NA	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P
255	R-27	852	1	1-Jul-06	2	Yes	Yes	Yes	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	I-NA	Yes	Yes	P	P	P	P	P	Yes	I-NA	P	I-NA	P

Source: Tables C-3 to C-6.

Notes: From top to bottom in the column headers above are listed the test identifier, indicator name, type of test threshold, and threshold values for the regional aquifer and perched intermediate aquifer, respectively.

Abbreviations for test indicators: Mod=Modern; Alk=alkalinity; Trb=turbidity; Ace=acetone; FeT=Fe (Total); FeR=Fe ratio (total/dissolved); CrT=Cr (Total); CrR=Cr ratio (total/dissolved)

Abbreviations for type of test threshold and outcome: LL=lower limit; UL=upper limit; P=pass

Table C-8
Summary of Pass/Fail Scores for each Sample

Well	Port Depth (ft)	Scr	Sample Date	Event	Tests Passed	Tests Failed	Total P/F Outcomes	% Passed
CdV-16-1(i)	624	1	1-Jun-05	1	24	8	32	75
CdV-16-1(i)	624	1	29-Aug-05	2	28	5	33	85
CdV-16-1(i)	624	1	7-Dec-05	3	27	4	31	87
CdV-16-1(i)	624	1	9-Mar-06	4	29	3	32	91
CdV-16-2(i)r	850	1	14-Sep-05	1	18	4	22	82
CdV-16-2(i)r	850	1	15-Dec-05	2	22	11	33	67
CdV-16-2(i)r	850	1	15-Mar-06	3	28	6	34	82
CdV-16-2(i)r	850	1	17-May-06	4	26	6	32	81
CdV-R-15-3	1254	4	3-Jan-01	1	21	1	22	95
CdV-R-15-3	1254	4	23-Apr-01	2	19	3	22	86
CdV-R-15-3	1254	4	18-Jul-01	3	20	3	23	87
CdV-R-15-3	1254	4	9-Oct-01	4	25	3	28	89
CdV-R-15-3	1254	4	4-Jan-02	5	26	3	29	90
CdV-R-15-3	1254	4	15-Apr-02	6	23	1	24	96
CdV-R-15-3	1254	4	16-Jul-02	7	25	1	26	96
CdV-R-15-3	1254	4	16-Sep-02	8	23	2	25	92
CdV-R-15-3	1254	4	14-Jan-03	9	24	1	25	96
CdV-R-15-3	1254	4	1-May-03	10	22	1	23	96
CdV-R-15-3	1254	4	30-Jul-03	11	16	0	16	100
CdV-R-15-3	1254	4	6-Jan-04	12	31	2	33	94
CdV-R-15-3	1254	4	20-Apr-04	13	33	0	33	100
CdV-R-15-3	1254	4	6-Jul-04	14	31	1	32	97
CdV-R-15-3	1254	4	19-Oct-04	15	30	1	31	97
CdV-R-15-3	1254	4	4-Apr-05	16	31	3	34	91
CdV-R-15-3	1254	4	12-Jul-05	17	32	1	33	97
CdV-R-15-3	1254	4	18-Oct-05	18	32	1	33	97
CdV-R-15-3	1254	4	19-Jan-06	19	31	0	31	100
CdV-R-15-3	1254	4	27-Mar-06	20	31	0	31	100
CdV-R-15-3	1350	5	4-Jan-01	1	10	10	20	50
CdV-R-15-3	1350	5	25-Apr-01	2	12	8	20	60
CdV-R-15-3	1350	5	19-Jul-01	3	14	7	21	67
CdV-R-15-3	1350	5	11-Oct-01	4	17	9	26	65
CdV-R-15-3	1350	5	15-Jan-02	5	19	9	28	68
CdV-R-15-3	1350	5	15-Apr-02	6	15	8	23	65
CdV-R-15-3	1350	5	16-Jul-02	7	16	8	24	67
CdV-R-15-3	1350	5	17-Sep-02	8	16	8	24	67

Table C-8 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	Tests Passed	Tests Failed	Total P/F Outcomes	% Passed
CdV-R-15-3	1350	5	15-Jan-03	9	16	7	23	70
CdV-R-15-3	1350	5	2-May-03	10	14	8	22	64
CdV-R-15-3	1350	5	7-Jan-04	11	18	13	31	58
CdV-R-15-3	1350	5	21-Apr-04	12	18	13	31	58
CdV-R-15-3	1350	5	7-Jul-04	13	16	14	30	53
CdV-R-15-3	1350	5	20-Oct-04	14	17	12	29	59
CdV-R-15-3	1350	5	5-Apr-05	15	17	16	33	52
CdV-R-15-3	1350	5	12-Jul-05	16	17	13	30	57
CdV-R-15-3	1350	5	18-Oct-05	17	20	11	31	65
CdV-R-15-3	1350	5	20-Jan-06	18	20	10	30	67
CdV-R-15-3	1350	5	28-Mar-06	19	18	12	30	60
CdV-R-15-3	1640	6	3-Jan-01	1	16	7	23	70
CdV-R-15-3	1640	6	25-Apr-01	2	15	5	20	75
CdV-R-15-3	1640	6	20-Jul-01	3	16	7	23	70
CdV-R-15-3	1640	6	12-Oct-01	4	15	6	21	71
CdV-R-15-3	1640	6	15-Jan-02	5	20	9	29	69
CdV-R-15-3	1640	6	16-Apr-02	6	15	7	22	68
CdV-R-15-3	1640	6	17-Jul-02	7	17	8	25	68
CdV-R-15-3	1640	6	18-Sep-02	8	17	7	24	71
CdV-R-15-3	1640	6	16-Jan-03	9	18	6	24	75
CdV-R-15-3	1640	6	5-May-03	10	19	5	24	79
CdV-R-15-3	1640	6	31-Jul-03	11	13	3	16	81
CdV-R-15-3	1640	6	8-Jan-04	12	26	6	32	81
CdV-R-15-3	1640	6	21-Apr-04	13	25	7	32	78
CdV-R-15-3	1640	6	8-Jul-04	14	25	5	30	83
CdV-R-15-3	1640	6	21-Oct-04	15	27	4	31	87
CdV-R-15-3	1640	6	6-Apr-05	16	24	8	32	75
CdV-R-15-3	1640	6	13-Jul-05	17	25	6	31	81
CdV-R-15-3	1640	6	19-Oct-05	18	23	9	32	72
CdV-R-15-3	1640	6	20-Jan-06	19	24	6	30	80
CdV-R-15-3	1640	6	29-Mar-06	20	25	5	30	83
CdV-R-37-2	1200	2	28-Jan-02	1	13	12	25	52
CdV-R-37-2	1200	2	23-Apr-02	2	11	13	24	46
CdV-R-37-2	1200	2	18-Jul-02	3	10	13	23	43
CdV-R-37-2	1200	2	18-Sep-02	4	12	13	25	48
CdV-R-37-2	1200	2	21-Jan-03	5	12	13	25	48
CdV-R-37-2	1200	2	6-May-03	6	10	15	25	40

Table C-8 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	Tests Passed	Tests Failed	Total P/F Outcomes	% Passed
CdV-R-37-2	1200	2	5-Aug-03	7	9	8	17	53
CdV-R-37-2	1200	2	2-Dec-03	8	16	15	31	52
CdV-R-37-2	1200	2	13-Apr-04	9	17	15	32	53
CdV-R-37-2	1200	2	26-Oct-04	10	16	15	31	52
CdV-R-37-2	1200	2	29-Mar-05	11	17	16	33	52
CdV-R-37-2	1200	2	6-Jul-05	12	16	16	32	50
CdV-R-37-2	1200	2	12-Oct-05	13	17	14	31	55
CdV-R-37-2	1200	2	9-Jan-06	14	18	13	31	58
CdV-R-37-2	1200	2	21-Mar-06	15	16	15	31	52
CdV-R-37-2	1359	3	29-Jan-02	1	21	3	24	88
CdV-R-37-2	1359	3	24-Apr-02	2	23	2	25	92
CdV-R-37-2	1359	3	19-Jul-02	3	22	2	24	92
CdV-R-37-2	1359	3	24-Sep-02	4	24	0	24	100
CdV-R-37-2	1359	3	22-Jan-03	5	25	0	25	100
CdV-R-37-2	1359	3	7-May-03	6	25	0	25	100
CdV-R-37-2	1359	3	6-Aug-03	7	16	0	16	100
CdV-R-37-2	1359	3	3-Dec-03	8	32	0	32	100
CdV-R-37-2	1359	3	13-Apr-04	9	32	1	33	97
CdV-R-37-2	1359	3	27-Oct-04	10	31	1	32	97
CdV-R-37-2	1359	3	30-Mar-05	11	34	0	34	100
CdV-R-37-2	1359	3	7-Jul-05	12	33	0	33	100
CdV-R-37-2	1359	3	12-Oct-05	13	33	0	33	100
CdV-R-37-2	1359	3	10-Jan-06	14	30	1	31	97
CdV-R-37-2	1359	3	22-Mar-06	15	30	3	33	91
CdV-R-37-2	1551	4	30-Jan-02	1	17	9	26	65
CdV-R-37-2	1551	4	25-Apr-02	2	14	9	23	61
CdV-R-37-2	1551	4	22-Jul-02	3	14	10	24	58
CdV-R-37-2	1551	4	26-Sep-02	4	15	10	25	60
CdV-R-37-2	1551	4	23-Jan-03	5	17	8	25	68
CdV-R-37-2	1551	4	8-May-03	6	17	8	25	68
CdV-R-37-2	1551	4	6-Aug-03	7	11	5	16	69
CdV-R-37-2	1551	4	3-Dec-03	8	20	12	32	63
CdV-R-37-2	1551	4	15-Apr-04	9	24	8	32	75
CdV-R-37-2	1551	4	27-Oct-04	10	23	9	32	72
CdV-R-37-2	1551	4	31-Mar-05	11	22	12	34	65
CdV-R-37-2	1551	4	8-Jul-05	12	23	10	33	70
CdV-R-37-2	1551	4	13-Oct-05	13	23	10	33	70

Table C-8 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	Tests Passed	Tests Failed	Total P/F Outcomes	% Passed
CdV-R-37-2	1551	4	11-Jan-06	14	23	8	31	74
CdV-R-37-2	1551	4	22-Mar-06	15	23	9	32	72
R-17	1057	1	24-Feb-06	1	18	4	22	82
R-17	1057	1	19-Oct-06	2	29	4	33	88
R-17	1124	2	17-Oct-06	1	28	5	33	85
R-18	1358	1	25-Aug-05	1	33	1	34	97
R-18	1358	1	1-Dec-05	2	29	4	33	88
R-18	1358	1	7-Mar-06	3	30	2	32	94
R-18	1358	1	16-May-06	4	32	0	32	100
R-18	1358	1	15-Aug-06	5	32	0	32	100
R-18	1358	1	18-Dec-06	6	29	0	29	100
R-19	909	2	22-Sep-00	1	18	10	28	64
R-19	909	2	10-Apr-01	2	18	9	27	67
R-19	909	2	5-Jul-01	3	19	8	27	70
R-19	909	2	13-Sep-01	4	24	6	30	80
R-19	909	2	20-Aug-02	5	20	6	26	77
R-19	909	2	15-Dec-03	6	18	7	25	72
R-19	909	2	10-Jun-04	7	19	6	25	76
R-19	909	2	21-Jul-05	8	24	6	30	80
R-19	909	2	18-Aug-06	9	22	4	26	85
R-19	909	2	11-Dec-06	10	15	5	20	75
R-19	1191	3	26-Sep-00	1	25	3	28	89
R-19	1191	3	9-Apr-01	2	26	1	27	96
R-19	1191	3	10-Jul-01	3	26	1	27	96
R-19	1191	3	18-Sep-01	4	30	0	30	100
R-19	1191	3	22-Aug-02	5	26	0	26	100
R-19	1191	3	15-Dec-03	6	24	0	24	100
R-19	1191	3	14-Jun-04	7	23	2	25	92
R-19	1191	3	21-Jul-05	8	28	1	29	97
R-19	1191	3	15-Aug-06	9	25	1	26	96
R-19	1191	3	11-Dec-06	10	17	3	20	85
R-19	1413	4	6-Apr-01	1	24	4	28	86
R-19	1413	4	11-Jul-01	2	25	2	27	93
R-19	1413	4	19-Sep-01	3	28	0	28	100
R-19	1413	4	26-Aug-02	4	24	1	25	96
R-19	1413	4	16-Dec-03	5	23	1	24	96
R-19	1413	4	15-Jun-04	6	23	1	24	96

Table C-8 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	Tests Passed	Tests Failed	Total P/F Outcomes	% Passed
R-19	1413	4	28-Jul-05	7	31	0	31	100
R-19	1413	4	16-Aug-06	8	27	4	31	87
R-19	1413	4	12-Dec-06	9	29	1	30	97
R-19	1586	5	4-Apr-01	1	12	16	28	43
R-19	1586	5	12-Jul-01	2	10	17	27	37
R-19	1586	5	20-Sep-01	3	13	16	29	45
R-19	1586	5	23-Aug-02	4	11	14	25	44
R-19	1586	5	16-Dec-03	5	10	13	23	43
R-19	1586	5	17-Aug-06	6	12	11	23	52
R-19	1586	5	11-Dec-06	7	9	10	19	47
R-19	1730	6	4-Oct-00	1	17	11	28	61
R-19	1730	6	2-Apr-01	2	15	13	28	54
R-19	1730	6	16-Jul-01	3	15	13	28	54
R-19	1730	6	21-Sep-01	4	18	11	29	62
R-19	1730	6	27-Aug-02	5	16	10	26	62
R-19	1730	6	16-Dec-03	6	13	10	23	57
R-19	1730	6	17-Aug-06	7	18	7	25	72
R-19	1730	6	11-Dec-06	8	13	7	20	65
R-19	1835	7	3-Oct-00	1	15	11	26	58
R-19	1835	7	29-Mar-01	2	16	13	29	55
R-19	1835	7	17-Jul-01	3	15	16	31	48
R-19	1835	7	24-Sep-01	4	15	16	31	48
R-19	1835	7	26-Aug-02	5	13	13	26	50
R-19	1835	7	17-Dec-03	6	11	14	25	44
R-19	1835	7	16-Jun-04	7	13	13	26	50
R-19	1835	7	28-Jul-05	8	19	15	34	56
R-19	1835	7	18-Aug-06	9	14	12	26	54
R-19	1835	7	13-Dec-06	10	8	11	19	42
R-25	755	1	14-Nov-00	1	17	6	23	74
R-25	755	1	3-May-01	2	14	11	25	56
R-25	755	1	13-Aug-01	3	13	11	24	54
R-25	755	1	4-Feb-02	4	17	13	30	57
R-25	755	1	7-Aug-02	5	13	9	22	59
R-25	755	1	11-Dec-03	6	15	7	22	68
R-25	755	1	1-Sep-04	7	15	6	21	71
R-25	755	1	2-Aug-05	8	19	11	30	63
R-25	892	2	15-Nov-00	1	15	13	28	54

Table C-8 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	Tests Passed	Tests Failed	Total P/F Outcomes	% Passed
R-25	892	2	4-May-01	2	16	12	28	57
R-25	892	2	14-Aug-01	3	16	13	29	55
R-25	892	2	5-Feb-02	4	17	13	30	57
R-25	892	2	8-Aug-02	5	14	10	24	58
R-25	892	2	10-Dec-03	6	13	11	24	54
R-25	892	2	3-Aug-05	7	15	17	32	47
R-25	1192	4	4-Dec-00	1	14	13	27	52
R-25	1192	4	7-May-01	2	13	11	24	54
R-25	1192	4	14-Aug-01	3	14	12	26	54
R-25	1192	4	6-Feb-02	4	22	9	31	71
R-25	1192	4	8-Aug-02	5	18	6	24	75
R-25	1192	4	10-Dec-03	6	18	5	23	78
R-25	1192	4	4-Aug-05	7	21	7	28	75
R-25	1303	5	7-Dec-00	1	17	10	27	63
R-25	1303	5	8-May-01	2	22	5	27	81
R-25	1303	5	15-Aug-01	3	17	6	23	74
R-25	1303	5	7-Feb-02	4	24	6	30	80
R-25	1303	5	9-Aug-02	5	16	9	25	64
R-25	1303	5	9-Dec-03	6	13	10	23	57
R-25	1303	5	31-Aug-04	7	11	7	18	61
R-25	1303	5	9-Aug-05	8	17	4	21	81
R-25	1406	6	8-Dec-00	1	22	6	28	79
R-25	1406	6	9-May-01	2	22	4	26	85
R-25	1406	6	16-Aug-01	3	22	2	24	92
R-25	1406	6	8-Feb-02	4	27	3	30	90
R-25	1406	6	12-Aug-02	5	22	3	25	88
R-25	1406	6	9-Dec-03	6	22	3	25	88
R-25	1606	7	11-Dec-00	1	19	9	28	68
R-25	1606	7	11-May-01	2	23	4	27	85
R-25	1606	7	17-Aug-01	3	24	2	26	92
R-25	1606	7	11-Feb-02	4	29	1	30	97
R-25	1606	7	12-Aug-02	5	23	2	25	92
R-25	1606	7	8-Dec-03	6	23	1	24	96
R-25	1796	8	12-Dec-00	1	17	12	29	59
R-25	1796	8	14-May-01	2	21	5	26	81
R-25	1796	8	20-Aug-01	3	21	6	27	78
R-25	1796	8	12-Feb-02	4	27	1	28	96

Table C-8 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	Tests Passed	Tests Failed	Total P/F Outcomes	% Passed
R-25	1796	8	14-Aug-02	5	24	1	25	96
R-25	1796	8	4-Dec-03	6	24	1	25	96
R-25	1796	8	10-Aug-05	7	28	2	30	93
R-26	659	1	13-Apr-05	1	31	3	34	91
R-26	659	1	27-Jul-05	2	29	3	32	91
R-26	659	1	2-Nov-05	3	30	4	34	88
R-26	659	1	22-Feb-06	4	29	0	29	100
R-27	852	1	14-Nov-05	1	20	1	21	95
R-27	852	1	1-Jul-06	2	32	0	32	100

Table C-9
Summary of Failed Criteria for Each Sample

Well	Port Depth (ft)	Scr	Sample Date	Event	General Indicators	Category A	Category B	Category C1	Category C2							Category C3	Category D	Category E	Category F
						Residual	Residual	Redox	Redox: Fe/Mn							Redox	Sorption	Carbonate	Metal
						Inorganics	Organics	SO4	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3		Minerals	Corrosion
CdV-16-1(i)	624	1	1-Jun-05	1	–pH, +Alk, Turb		Ace, TOC	S					Ni		Cr				
CdV-16-1(i)	624	1	29-Aug-05	2		PO4	TKN						Ni		Cr				FeR
CdV-16-1(i)	624	1	7-Dec-05	3		Na	TKN, TOC						Ni		Cr				
CdV-16-1(i)	624	1	9-Mar-06	4		Na							Ni		Cr				
CdV-16-2(i)r	850	1	14-Sep-05	1	+Alk	Na, SO4									Cr				
CdV-16-2(i)r	850	1	15-Dec-05	2	+Alk	F, Na, PO4, SO4	Ace, TKN	S							Cr				CrT, FeR
CdV-16-2(i)r	850	1	15-Mar-06	3	Turb	Na		S							Cr				CrT, FeR
CdV-16-2(i)r	850	1	17-May-06	4	–pH	F, Na									Cr				CrT, FeR
CdV-R-15-3	1254	4	3-Jan-01	1											Cr				
CdV-R-15-3	1254	4	23-Apr-01	2						Mn					Cr	NO3			
CdV-R-15-3	1254	4	18-Jul-01	3											Cr	NO3	Zn		
CdV-R-15-3	1254	4	9-Oct-01	4			TKN									NO3			
CdV-R-15-3	1254	4	4-Jan-02	5		F	TKN								Cr				
CdV-R-15-3	1254	4	15-Apr-02	6															
CdV-R-15-3	1254	4	16-Jul-02	7	+pH										Cr				
CdV-R-15-3	1254	4	16-Sep-02	8	+pH														
CdV-R-15-3	1254	4	14-Jan-03	9	+pH										Cr				
CdV-R-15-3	1254	4	1-May-03	10															
CdV-R-15-3	1254	4	30-Jul-03	11															
CdV-R-15-3	1254	4	6-Jan-04	12															
CdV-R-15-3	1254	4	20-Apr-04	13															
CdV-R-15-3	1254	4	6-Jul-04	14													Zn		
CdV-R-15-3	1254	4	19-Oct-04	15	+pH														
CdV-R-15-3	1254	4	4-Apr-05	16				ORP								DO			
CdV-R-15-3	1254	4	12-Jul-05	17															
CdV-R-15-3	1254	4	18-Oct-05	18															
CdV-R-15-3	1254	4	19-Jan-06	19															
CdV-R-15-3	1254	4	27-Mar-06	20			TKN												
CdV-R-15-3	1350	5	4-Jan-01	1	+Alk	Cl, Na		SO4	Fe	Mn				U	Cr	NO3		Ba	
CdV-R-15-3	1350	5	25-Apr-01	2	+Alk			SO4	Fe	Mn				U	Cr	NO3		Ba	
CdV-R-15-3	1350	5	19-Jul-01	3			TOC	SO4	Fe	Mn					Cr	NO3		Ba	
CdV-R-15-3	1350	5	11-Oct-01	4			Ace, NH3, TKN, TOC		Fe	Mn						NO3		Ba, Sr	
CdV-R-15-3	1350	5	15-Jan-02	5			NH3, TKN, TOC		Fe	Mn				U		NO3		Ba, Sr	
CdV-R-15-3	1350	5	15-Apr-02	6			Ace, NH3, TOC		Fe	Mn						NO3		Ba	
CdV-R-15-3	1350	5	16-Jul-02	7			NH3, TOC	S, ORP	Fe	Mn						NO3		Ba	

Table C-9 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	General Indicators	Category A	Category B	Category C1	Category C2							Category C3	Category D	Category E	Category F
						Residual	Residual	Redox	Redox: Fe/Mn							Redox	Sorption	Carbonate	Metal
						Inorganics	Organics	SO4	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3		Minerals	Corrosion
CdV-R-15-3	1350	5	17-Sep-02	8			Ace, NH3, TKN, TOC		Fe	Mn						NO3		Ba	
CdV-R-15-3	1350	5	15-Jan-03	9			TOC	SO4	Fe	Mn					Cr	NO3		Ba	
CdV-R-15-3	1350	5	2-May-03	10			NH3, TKN, TOC	SO4	Fe	Mn						NO3		Ba	
CdV-R-15-3	1350	5	7-Jan-04	11			Ace, NH3, TOC	SO4, ORP	Fe	Mn	ClO4			U	Cr	NO3		Ba, Sr	
CdV-R-15-3	1350	5	21-Apr-04	12			NH3, TOC	SO4, S, ORP	Fe	Mn	ClO4			U	Cr	NO3		Ba, Sr	
CdV-R-15-3	1350	5	7-Jul-04	13			NH3, TOC	SO4, S, ORP	Fe	Mn	ClO4			U	Cr	NO3	Zn	Ba, Sr	
CdV-R-15-3	1350	5	20-Oct-04	14			NH3, TOC	SO4, S	Fe	Mn	ClO4			U	Cr	NO3		Ba, Sr	
CdV-R-15-3	1350	5	5-Apr-05	15		F	Ace, NH3, TKN, TOC	ORP, S	Fe	Mn	ClO4			U	Cr	NO3		Ba, Sr	
CdV-R-15-3	1350	5	12-Jul-05	16			Ace, NH3, TKN, TOC	ORP	Fe	Mn	ClO4			U	Cr	NO3		Ba, Sr	
CdV-R-15-3	1350	5	18-Oct-05	17			NH3, TOC	S	Fe	Mn	ClO4			U	Cr	NO3		Ba, Sr	
CdV-R-15-3	1350	5	20-Jan-06	18			NH3	S	Fe	Mn	ClO4			U	Cr	NO3		Ba, Sr	
CdV-R-15-3	1350	5	28-Mar-06	19	–pH		Ace, NH3, TOC	S	Fe	Mn	ClO4			U	Cr			Ba, Sr	
CdV-R-15-3	1640	6	3-Jan-01	1	+Alk		TKN	SO4	Fe	Mn				U	Cr				
CdV-R-15-3	1640	6	25-Apr-01	2				SO4	Fe	Mn				U	Cr				
CdV-R-15-3	1640	6	20-Jul-01	3			Ace	SO4	Fe	Mn				U	Cr	NO3			
CdV-R-15-3	1640	6	12-Oct-01	4			NH3	SO4	Fe	Mn				U		NO3			
CdV-R-15-3	1640	6	15-Jan-02	5			NH3, TKN, TOC	SO4	Fe	Mn				U		NO3			CrT
CdV-R-15-3	1640	6	16-Apr-02	6			NH3, TOC	SO4	Fe	Mn			Ni			NO3			
CdV-R-15-3	1640	6	17-Jul-02	7			NH3, TOC	SO4, S, ORP	Fe	Mn						NO3			
CdV-R-15-3	1640	6	18-Sep-02	8			NH3, TKN, TOC	SO4	Fe	Mn						NO3			
CdV-R-15-3	1640	6	16-Jan-03	9			TOC	SO4	Fe	Mn					Cr	NO3			
CdV-R-15-3	1640	6	5-May-03	10			NH3, TKN		Fe	Mn						NO3			
CdV-R-15-3	1640	6	31-Jul-03	11	–pH				Fe	Mn						NO3			
CdV-R-15-3	1640	6	8-Jan-04	12				ORP	Fe	Mn	ClO4				Cr	NO3			
CdV-R-15-3	1640	6	21-Apr-04	13				ORP	Fe	Mn	ClO4			U	Cr	NO3			
CdV-R-15-3	1640	6	8-Jul-04	14					Fe	Mn				U	Cr	NO3			
CdV-R-15-3	1640	6	21-Oct-04	15				ORP			ClO4				Cr	NO3			
CdV-R-15-3	1640	6	6-Apr-05	16				ORP, S	Fe	Mn	ClO4			U	Cr	NO3			
CdV-R-15-3	1640	6	13-Jul-05	17					Fe	Mn	ClO4			U	Cr	NO3			
CdV-R-15-3	1640	6	19-Oct-05	18			TOC	S	Fe	Mn	ClO4			U	Cr	NO3			CrT
CdV-R-15-3	1640	6	20-Jan-06	19					Fe	Mn	ClO4			U	Cr	NO3			
CdV-R-15-3	1640	6	29-Mar-06	20						Mn	ClO4			U	Cr	NO3			
CdV-R-37-2	1200	2	28-Jan-02	1	+Alk, Turb		Ace, NH3, TKN, TOC	SO4	Fe	Mn			Ni			NO3		Ba	
CdV-R-37-2	1200	2	23-Apr-02	2	–pH, Turb		NH3, TKN, TOC	SO4	Fe	Mn			Ni			NO3, DO		Ba, Mg	

Table C-9 (continued)

						Category A	Category B	Category C1	Category C2							Category C3	Category D	Category E	Category F
						Residual	Residual	Redox	Redox: Fe/Mn							Redox	Sorption	Carbonate	Metal
Well	Port Depth (ft)	Scr	Sample Date	Event	General Indicators	Inorganics	Organics	SO4	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3		Minerals	Corrosion
CdV-R-37-2	1200	2	18-Jul-02	3	–pH, +Alk, Turb		NH3, TKN, TOC	SO4	Fe				Ni			NO3, DO		Ba, Mg	
CdV-R-37-2	1200	2	18-Sep-02	4	+Alk, Turb		NH3, TKN, TOC	SO4	Fe	Mn			Ni			NO3, DO		Ba, Mg	
CdV-R-37-2	1200	2	21-Jan-03	5	+Alk, Turb		NH3, TKN, TOC	SO4	Fe	Mn			Ni		Cr	NO3		Ba, Mg	
CdV-R-37-2	1200	2	6-May-03	6	–pH, +Alk, Turb		NH3, TKN, TOC	SO4	Fe	Mn			Ni		Cr	NO3, DO		Ba, Mg	
CdV-R-37-2	1200	2	5-Aug-03	7	–pH, Turb			SO4	Fe	Mn			Ni			DO		Ba, Mg	
CdV-R-37-2	1200	2	2-Dec-03	8	+Alk, Turb		NH3, TKN, TOC	SO4	Fe	Mn	ClO4	Mo	Ni	U		NO3, DO		Ba, Mg	
CdV-R-37-2	1200	2	13-Apr-04	9	+Alk, Turb		NH3, TKN, TOC	SO4, ORP	Fe	Mn	ClO4	Mo	Ni	U		NO3		Ba, Mg	
CdV-R-37-2	1200	2	26-Oct-04	10	+Alk, Turb		NH3, TKN, TOC	SO4	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3		Ba, Mg	
CdV-R-37-2	1200	2	29-Mar-05	11	–pH, +Alk, Turb		NH3, TKN, TOC	SO4, ORP	Fe	Mn	ClO4	Mo	Ni	U		NO3		Ba, Mg	
CdV-R-37-2	1200	2	6-Jul-05	12	–pH, +Alk, Turb		NH3, TKN, TOC	SO4, ORP	Fe	Mn	ClO4	Mo	Ni	U		NO3		Ba, Mg	
CdV-R-37-2	1200	2	12-Oct-05	13	+Alk, Turb		NH3, TOC	SO4	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3, DO		Ba	
CdV-R-37-2	1200	2	9-Jan-06	14	Turb		NH3, TOC	SO4, S	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3		Ba	
CdV-R-37-2	1200	2	21-Mar-06	15	–pH		NH3, TKN, TOC	SO4	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3		Ba	CrT
CdV-R-37-2	1359	3	29-Jan-02	1			Ace		Fe	Mn									
CdV-R-37-2	1359	3	24-Apr-02	2					Fe	Mn									
CdV-R-37-2	1359	3	19-Jul-02	3					Fe	Mn									
CdV-R-37-2	1359	3	24-Sep-02	4															
CdV-R-37-2	1359	3	22-Jan-03	5															
CdV-R-37-2	1359	3	7-May-03	6															
CdV-R-37-2	1359	3	6-Aug-03	7															
CdV-R-37-2	1359	3	3-Dec-03	8															
CdV-R-37-2	1359	3	13-Apr-04	9			TKN												
CdV-R-37-2	1359	3	27-Oct-04	10															
CdV-R-37-2	1359	3	30-Mar-05	11															
CdV-R-37-2	1359	3	7-Jul-05	12															
CdV-R-37-2	1359	3	12-Oct-05	13															
CdV-R-37-2	1359	3	10-Jan-06	14			TKN												
CdV-R-37-2	1359	3	22-Mar-06	15				S											CrT, CrR
CdV-R-37-2	1551	4	30-Jan-02	1			Ace, NH3, TKN, TOC	SO4	Fe	Mn					Cr	NO3			
CdV-R-37-2	1551	4	25-Apr-02	2	–pH		NH3, TKN, TOC	SO4	Fe	Mn			Ni			NO3			
CdV-R-37-2	1551	4	22-Jul-02	3	–pH		NH3, TKN, TOC	SO4	Fe	Mn			Ni			NO3		–Ca	
CdV-R-37-2	1551	4	26-Sep-02	4	–pH		NH3, TKN, TOC		Fe	Mn			Ni			NO3		–Ca	
CdV-R-37-2	1551	4	23-Jan-03	5			NH3, TKN, TOC		Fe	Mn			Ni			NO3		–Ca	
CdV-R-37-2	1551	4	8-May-03	6	–pH		NH3, TKN		Fe	Mn			Ni			NO3		–Ca	
CdV-R-37-2	1551	4	6-Aug-03	7	–pH				Fe	Mn			Ni				Sr	–Ca	
CdV-R-37-2	1551	4	3-Dec-03	8	–pH		NH3, TKN, TOC		Fe	Mn	ClO4		Ni	U		NO3		–Ca	

Table C-9 (continued)

						Category A	Category B	Category C1	Category C2							Category C3	Category D	Category E	Category F
	Port Depth				General	Residual	Residual	Redox	Redox: Fe/Mn							Redox	Sorption	Carbonate	Metal
Well	(ft)	Scr	Sample Date	Event	Indicators	Inorganics	Organics	SO4	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3		Minerals	Corrosion
CdV-R-37-2	1551	4	15-Apr-04	9			NH3, TKN, TOC	S, ORP	Fe	Mn				U		NO3	Sr		
CdV-R-37-2	1551	4	27-Oct-04	10	–pH		NH3		Fe	Mn	ClO4			U		NO3	Sr	–Ca	
CdV-R-37-2	1551	4	31-Mar-05	11			NH3, TKN, TOC	ORP	Fe	Mn	ClO4			U	Cr	NO3	Sr	–Ca	
CdV-R-37-2	1551	4	8-Jul-05	12	–pH		NH3		Fe	Mn	ClO4			U	Cr	NO3	Sr	–Ca	
CdV-R-37-2	1551	4	13-Oct-05	13	–pH		NH3, TOC		Fe	Mn	ClO4			U	Cr	NO3	Sr		
CdV-R-37-2	1551	4	11-Jan-06	14				S	Fe	Mn	ClO4			U	Cr	NO3	Sr		
CdV-R-37-2	1551	4	22-Mar-06	15					Fe	Mn	ClO4			U	Cr	NO3	Sr		CrT
R-17	1057	1	24-Feb-06	1					Fe	Mn							Sr	–Ca	
R-17	1057	1	19-Oct-06	2	Turb			S	Fe	Mn									
R-17	1124	2	17-Oct-06	1	Turb				Fe	Mn			Ni				Sr		
R-18	1358	1	25-Aug-05	1								Mo							
R-18	1358	1	1-Dec-05	2			TKN, TOC					Mo			Cr				
R-18	1358	1	7-Mar-06	3			TKN								Cr				
R-18	1358	1	16-May-06	4															
R-18	1358	1	15-Aug-06	5															
R-18	1358	1	18-Dec-06	6															
R-19	909	2	22-Sep-00	1	+Alk, Turb	Cl, F, Na	TOC		Fe	Mn			Ni		Cr				
R-19	909	2	10-Apr-01	2	+Alk	Cl, F, Na	TOC		Fe	Mn					Cr			+Ca	
R-19	909	2	5-Jul-01	3	+Alk, +pH	Cl, F, Na									Cr		Zn	+Ca	
R-19	909	2	13-Sep-01	4	+Alk, +pH	Cl, F, Na												+Ca	
R-19	909	2	20-Aug-02	5	+Alk, +pH	Cl, F, Na												+Ca	
R-19	909	2	15-Dec-03	6	+Alk, +pH	Cl, F, Na							Ni					+Ca	
R-19	909	2	10-Jun-04	7	+Alk, +pH	Cl, F, Na											Zn		
R-19	909	2	21-Jul-05	8	+Alk	Cl, F, Na	TKN								Cr				
R-19	909	2	18-Aug-06	9	+Alk	Cl, F, Na													
R-19	909	2	11-Dec-06	10	+Alk	Cl, F, Na, SO4													
R-19	1191	3	26-Sep-00	1					Fe	Mn									
R-19	1191	3	9-Apr-01	2	–pH														
R-19	1191	3	10-Jul-01	3													Zn		
R-19	1191	3	18-Sep-01	4															
R-19	1191	3	22-Aug-02	5															
R-19	1191	3	15-Dec-03	6															
R-19	1191	3	14-Jun-04	7									Ni				Zn		
R-19	1191	3	21-Jul-05	8				SO4											
R-19	1191	3	15-Aug-06	9												NO3			
R-19	1191	3	11-Dec-06	10		Cl										NO3			

Table C-9 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	General Indicators	Category A	Category B	Category C1	Category C2							Category C3	Category D	Category E	Category F
						Residual	Residual	Redox	Redox: Fe/Mn							Redox	Sorption	Carbonate	Metal
						Inorganics	Organics	SO4	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3		Minerals	Corrosion
R-19	1413	4	6-Apr-01	1	+pH					Mn			Ni						CrR
R-19	1413	4	11-Jul-01	2	Turb														
R-19	1413	4	19-Sep-01	3															
R-19	1413	4	26-Aug-02	4													Sr		
R-19	1413	4	16-Dec-03	5									Ni						
R-19	1413	4	15-Jun-04	6															CrT
R-19	1413	4	28-Jul-05	7															
R-19	1413	4	16-Aug-06	8													Sr	–Ca	CrT, CrR
R-19	1413	4	12-Dec-06	9													Sr		
R-19	1586	5	4-Apr-01	1	+Alk, Turb		NH3, TKN, TOC	SO4	Fe	Mn		Mo	Ni	U	Cr	NO3		Ba, +Ca, Mg, Sr	
R-19	1586	5	12-Jul-01	2	–pH, +Alk, Turb		NH3, TKN, TOC	SO4	Fe	Mn			Ni	U	Cr	NO3	Zn	Ba, +Ca, Sr	
R-19	1586	5	20-Sep-01	3	+Alk, Turb		Ace, NH3, TKN, TOC	SO4	Fe	Mn		Mo		U	Cr	NO3		Ba, +Ca, Mg, Sr	
R-19	1586	5	23-Aug-02	4	–pH, +Alk		NH3, TOC	ORP, SO4	Fe	Mn		Mo	Ni			NO3		Ba, +Ca, Mg, Sr	
R-19	1586	5	16-Dec-03	5	–pH, +Alk		NH3, TOC	SO4	Fe	Mn		Mo	Ni	U		NO3		Ba, +Ca, Sr	
R-19	1586	5	17-Aug-06	6	–pH, +Alk			SO4	Fe	Mn			Ni	U		NO3		Ba, +Ca, Sr	
R-19	1586	5	11-Dec-06	7	–pH, +Alk	Cl		SO4	Fe	Mn						NO3		Ba, +Ca, Sr	
R-19	1730	6	4-Oct-00	1	+Alk	Na	NH3, TKN, TOC	SO4	Fe	Mn		Mo	Ni		Cr	NO3			
R-19	1730	6	2-Apr-01	2		Na	NH3, TKN, TOC	SO4	Fe	Mn		Mo	Ni	U	Cr	NO3	Sr	–Ca	
R-19	1730	6	16-Jul-01	3	Turb		NH3, TKN, TOC	SO4	Fe	Mn		Mo	Ni	U	Cr	NO3	Sr	–Ca	
R-19	1730	6	21-Sep-01	4			NH3, TKN, TOC	SO4	Fe	Mn		Mo		U	Cr	NO3	Sr	–Ca	
R-19	1730	6	27-Aug-02	5			NH3, TOC	ORP, SO4	Fe	Mn					Cr	NO3	Sr	–Ca	
R-19	1730	6	16-Dec-03	6	–pH		NH3	SO4	Fe	Mn			Ni	U		NO3	Sr	–Ca	
R-19	1730	6	17-Aug-06	7	–pH				Fe	Mn				U		NO3	Sr	–Ca	
R-19	1730	6	11-Dec-06	8	–pH	Cl			Fe	Mn						NO3	Sr	–Ca	
R-19	1835	7	3-Oct-00	1	+Alk, Turb	Na, SO4	NH3, TKN		Fe	Mn		Mo	Ni			NO3		–Ca	
R-19	1835	7	29-Mar-01	2	+Alk, Turb	F, Na, SO4	TKN		Fe	Mn		Mo				NO3	Sr	–Ca	CrT, CrR
R-19	1835	7	17-Jul-01	3	+Alk, Turb	F, Na, SO4	Ace, NH3, TKN, TOC		Fe	Mn		Mo	Ni		Cr	NO3	Sr	–Ca	
R-19	1835	7	24-Sep-01	4	+Alk, Turb	F, Na, SO4	Ace, NH3, TKN, TOC		Fe	Mn		Mo	Ni		Cr	NO3	Sr	–Ca	
R-19	1835	7	26-Aug-02	5	+Alk, Turb	F, Na, SO4	NH3, TOC	ORP	Fe	Mn		Mo				NO3	Sr	–Ca	
R-19	1835	7	17-Dec-03	6	+Alk, Turb	F, Na, SO4	NH3, TOC		Fe	Mn		Mo	Ni			NO3	Sr	–Ca, +U	
R-19	1835	7	16-Jun-04	7	+Alk, Turb	Na, SO4			Fe	Mn	ClO4	Mo	Ni		Cr	NO3	Sr	–Ca, +U	
R-19	1835	7	28-Jul-05	8	+Alk, Turb	Na, SO4	NH3, TKN			Mn	ClO4	Mo			Cr	NO3	Sr	–Ca	CrT, CrR, FeR
R-19	1835	7	18-Aug-06	9	+Alk, Turb	F, Na, SO4			Fe	Mn		Mo	Ni		Cr	NO3	Sr	–Ca	
R-19	1835	7	13-Dec-06	10	+Alk	Cl, F, PO4, Na, SO4			Fe	Mn		Mo				NO3	Sr	–Ca	
R-25	755	1	14-Nov-00	1	+Alk	PO4	TOC						Ni					+Ca, +U	
R-25	755	1	3-May-01	2	+Alk	PO4				Mn			Ni		Cr			+Ca, +U	CrT, CrR, FeR, Ni

Table C-9 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	General Indicators	Category A	Category B	Category C1	Category C2							Category C3	Category D	Category E	Category F
						Residual	Residual	Redox	Redox: Fe/Mn							Redox	Sorption	Carbonate	Metal
						Inorganics	Organics	SO4	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3		Minerals	Corrosion
R-25	755	1	13-Aug-01	3	+Alk	PO4				Mn			Ni					+Ca, Mg, +U	CrT, CrR, FeR, Ni
R-25	755	1	4-Feb-02	4	+Alk, Turb		TKN, TOC			Mn			Ni					+Ca	CrT, CrR, FeR, Ni
R-25	755	1	7-Aug-02	5	+Alk, Turb	PO4	TOC			Mn			Ni					+Ca	CrT, Ni
R-25	755	1	11-Dec-03	6	+Alk, Turb					Mn			Ni					+Ca	CrT, Ni
R-25	755	1	1-Sep-04	7	Turb					Mn			Ni					+Ca	CrT, Ni
R-25	755	1	2-Aug-05	8	+Alk, Turb				Fe	Mn			Ni					+Ca, +U	CrT, CrR, FeR, Ni
R-25	892	2	15-Nov-00	1	+pH, +Alk, Turb	Na, PO4, SO4	TOC					Mo			Cr	NO3		+U	FeR, CrT, CrR
R-25	892	2	4-May-01	2	+pH, +Alk, Turb	Na, PO4, SO4	TOC		Fe			Mo	Ni			NO3		+U	CrT
R-25	892	2	14-Aug-01	3	+pH, +Alk, Turb	Na, PO4, SO4	NH3, TOC		Fe			Mo	Ni			NO3			CrT, CrR
R-25	892	2	5-Feb-02	4	+Alk, Turb	Na, PO4, SO4	Ace, TOC		Fe	Mn		Mo	Ni			NO3			CrT, FeR
R-25	892	2	8-Aug-02	5	+Alk, Turb	Na, PO4, SO4	TOC			Mn		Mo	Ni			NO3			CrT
R-25	892	2	10-Dec-03	6	+Alk, Turb	Na, PO4, SO4	TOC			Mn		Mo	Ni			NO3			CrT, Ni
R-25	892	2	3-Aug-05	7	+Alk, Turb	Na, PO4, SO4	NH3	ORP	Fe	Mn	ClO4	Mo	Ni	U		NO3	Ba		CrT, CrR, Ni
R-25	1192	4	4-Dec-00	1	+Alk, Turb	PO4, SO4	TOC			Mn			Ni		Cr			+Ca, +Sr,	FeR, CrT, CrR
R-25	1192	4	7-May-01	2	+Alk, Turb	PO4, SO4	TOC			Mn					Cr			+Ca, +Sr	CrT, CrR
R-25	1192	4	14-Aug-01	3	+Alk	PO4, SO4	NH3			Mn			Ni		Cr	NO3		+Ca, +Sr	CrT, CrR
R-25	1192	4	6-Feb-02	4	+Alk		TKN, TOC			Mn								+Ca, +Sr	
R-25	1192	4	8-Aug-02	5		SO4	TOC	ORP	Fe	Mn			Ni					+Ca	
R-25	1192	4	10-Dec-03	6	+Alk	SO4	NH3		Fe							NO3		+Ca	
R-25	1192	4	4-Aug-05	7	+Alk, Turb	PO4							Ni		Cr			+Ca, +Sr	
R-25	1303	5	7-Dec-00	1	Turb	Cl, PO4, SO4	TOC			Mn		Mo	Ni		Cr	NO3		+U	
R-25	1303	5	8-May-01	2		PO4, SO4	TOC			Mn		Mo			Cr				
R-25	1303	5	15-Aug-01	3		PO4, SO4				Mn			Ni		Cr	NO3			
R-25	1303	5	7-Feb-02	4	+Alk	PO4, SO4	TOC			Mn		Mo	Ni						
R-25	1303	5	9-Aug-02	5	+Alk	PO4, SO4	TOC			Mn		Mo	Ni			NO3			CrT, Ni
R-25	1303	5	9-Dec-03	6		PO4, SO4	NH3, TOC			Mn		Mo	Ni	U		NO3		+Ba, +Sr	
R-25	1303	5	31-Aug-04	7		PO4				Mn	ClO4	Mo	Ni		Cr	NO3		+Sr	
R-25	1303	5	9-Aug-05	8					Fe	Mn		Mo	Ni	U					
R-25	1406	6	8-Dec-00	1		Cl, PO4, SO4				Mn		Mo	Ni						CrT
R-25	1406	6	9-May-01	2		PO4, SO4	TOC								Cr				
R-25	1406	6	16-Aug-01	3		PO4									Cr				
R-25	1406	6	8-Feb-02	4		Cl, PO4									Cr				
R-25	1406	6	12-Aug-02	5		PO4						Mo	Ni						CrT
R-25	1406	6	9-Dec-03	6		PO4							Ni						CrT
R-25	1606	7	11-Dec-00	1	Turb	Cl, PO4, SO4				Mn		Mo	Ni		Cr				CrR, Ni
R-25	1606	7	11-May-01	2		PO4	TOC												CrR, Ni

Table C-9 (continued)

Well	Port Depth (ft)	Scr	Sample Date	Event	General Indicators	Category A	Category B	Category C1	Category C2							Category C3	Category D	Category E	Category F
						Residual	Residual	Redox	Redox: Fe/Mn							Redox	Sorption	Carbonate	Metal
						Inorganics	Organics	SO4	Fe	Mn	ClO4	Mo	Ni	U	Cr	NO3		Minerals	Corrosion
R-25	1606	7	17-Aug-01	3		PO4									Cr				
R-25	1606	7	11-Feb-02	4		PO4													
R-25	1606	7	12-Aug-02	5		PO4							Ni						
R-25	1606	7	8-Dec-03	6		PO4													
R-25	1796	8	12-Dec-00	1	Turb	Cl, PO4, SO4	TOC		Fe	Mn		Mo	Ni					+U	FeR, CrT, CrR
R-25	1796	8	14-May-01	2	Turb	PO4			Fe				Ni		Cr				
R-25	1796	8	20-Aug-01	3	Turb	PO4									Cr				FeR, CrT, CrR
R-25	1796	8	12-Feb-02	4		PO4													
R-25	1796	8	14-Aug-02	5		PO4													
R-25	1796	8	4-Dec-03	6		PO4													
R-25	1796	8	10-Aug-05	7	Turb	PO4													
R-26	659	1	13-Apr-05	1				ORP							Cr				
R-26	659	1	27-Jul-05	2		PO4		SO4											
R-26	659	1	2-Nov-05	3		PO4	TKN												CrT
R-26	659	1	22-Feb-06	4															
R-27	852	1	14-Nov-05	1											Cr				
R-27	852	1	1-Jul-06	2															

Appendix D

Comparison of Water-Quality Data with Test Criteria

The following figures are included in this appendix:

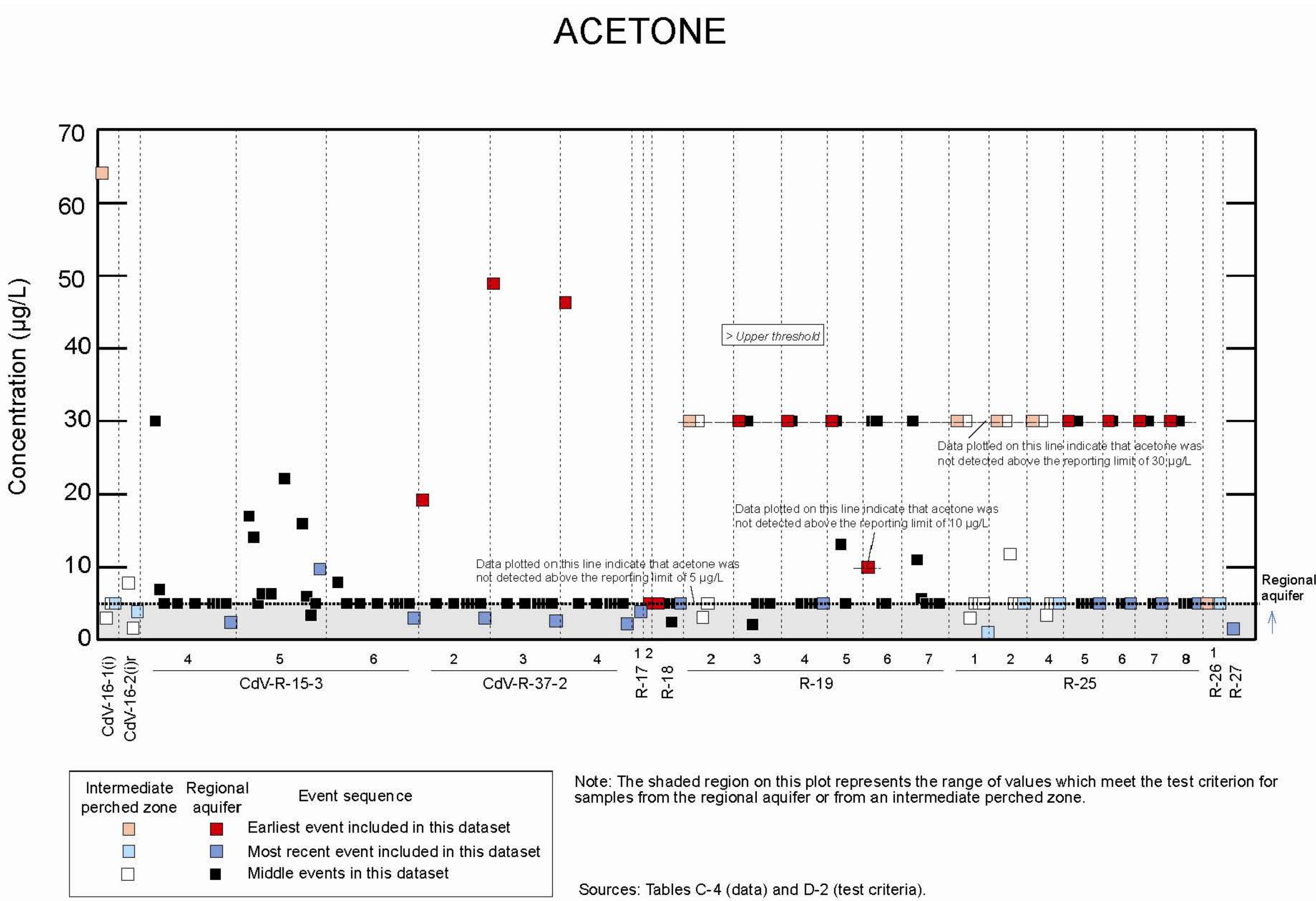
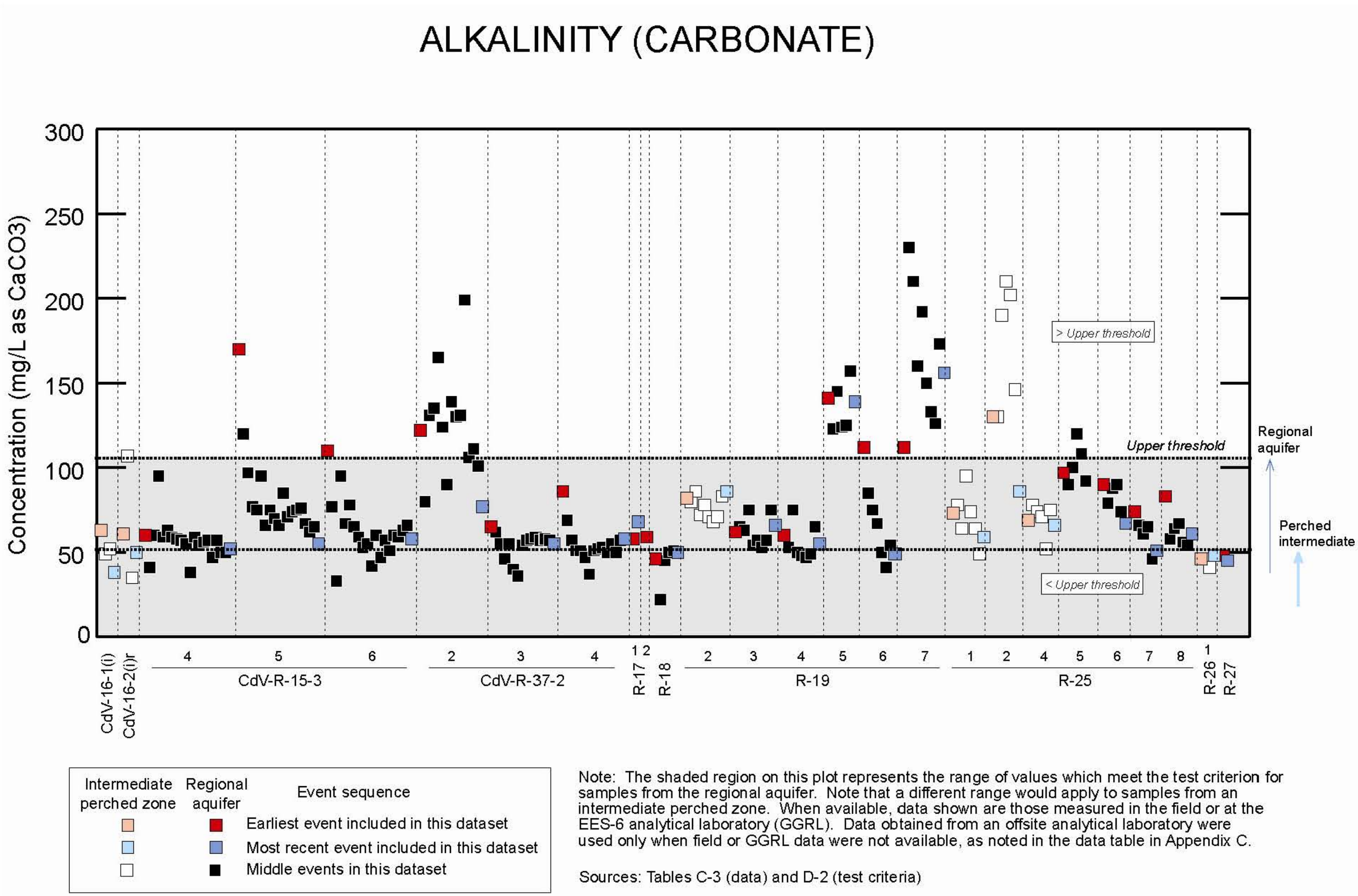


Figure D-1 Comparison of water-quality data against test criteria: acetone



Note: The shaded region on this plot represents the range of values which meet the test criterion for samples from the regional aquifer. Note that a different range would apply to samples from an intermediate perched zone. When available, data shown are those measured in the field or at the EES-6 analytical laboratory (GGRL). Data obtained from an offsite analytical laboratory were used only when field or GGRL data were not available, as noted in the data table in Appendix C.

Sources: Tables C-3 (data) and D-2 (test criteria)

Figure D-2 Comparison of water-quality data against test criteria: alkalinity

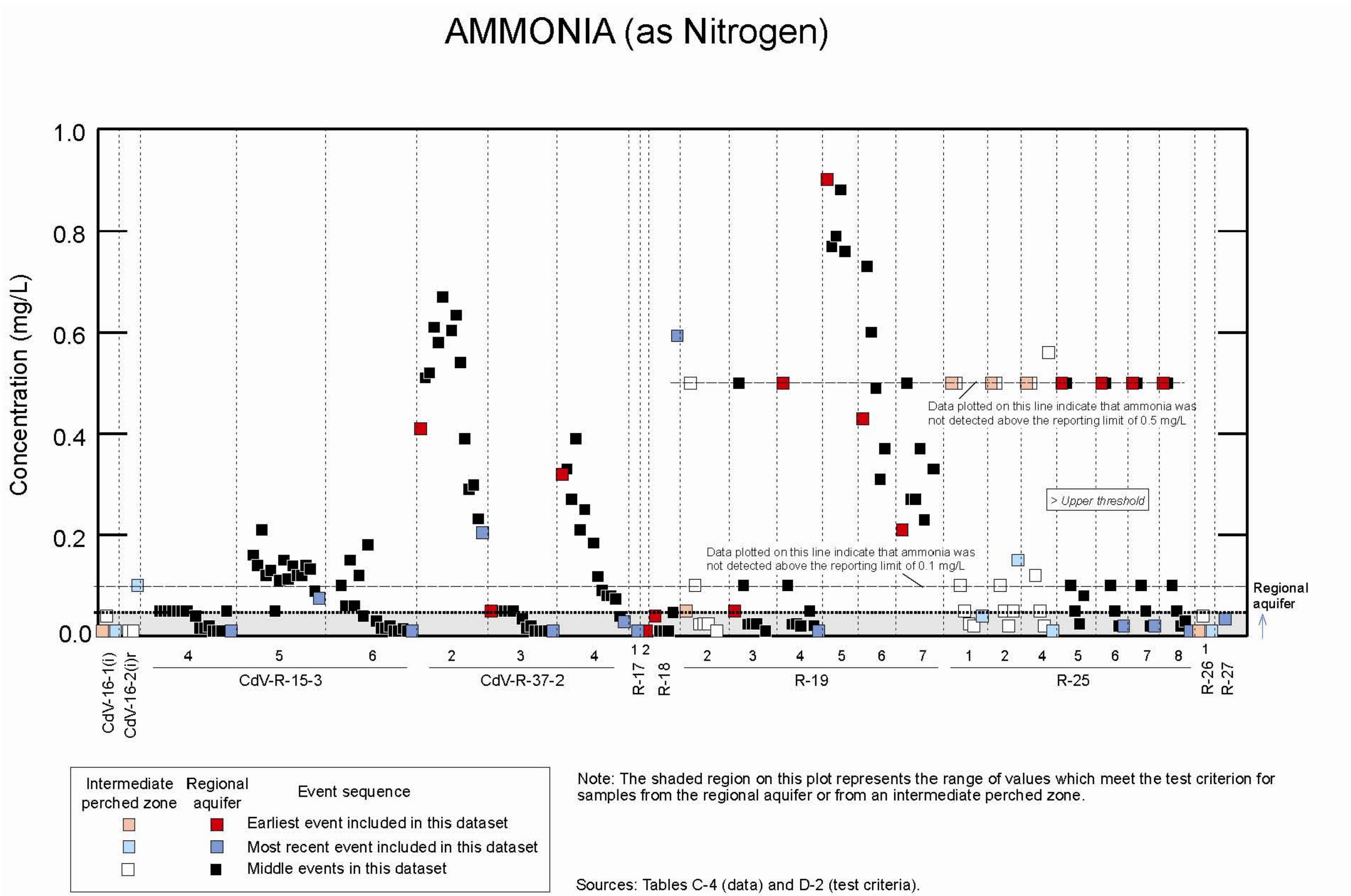


Figure D-3 **Comparison of water-quality data against test criteria: ammonia**

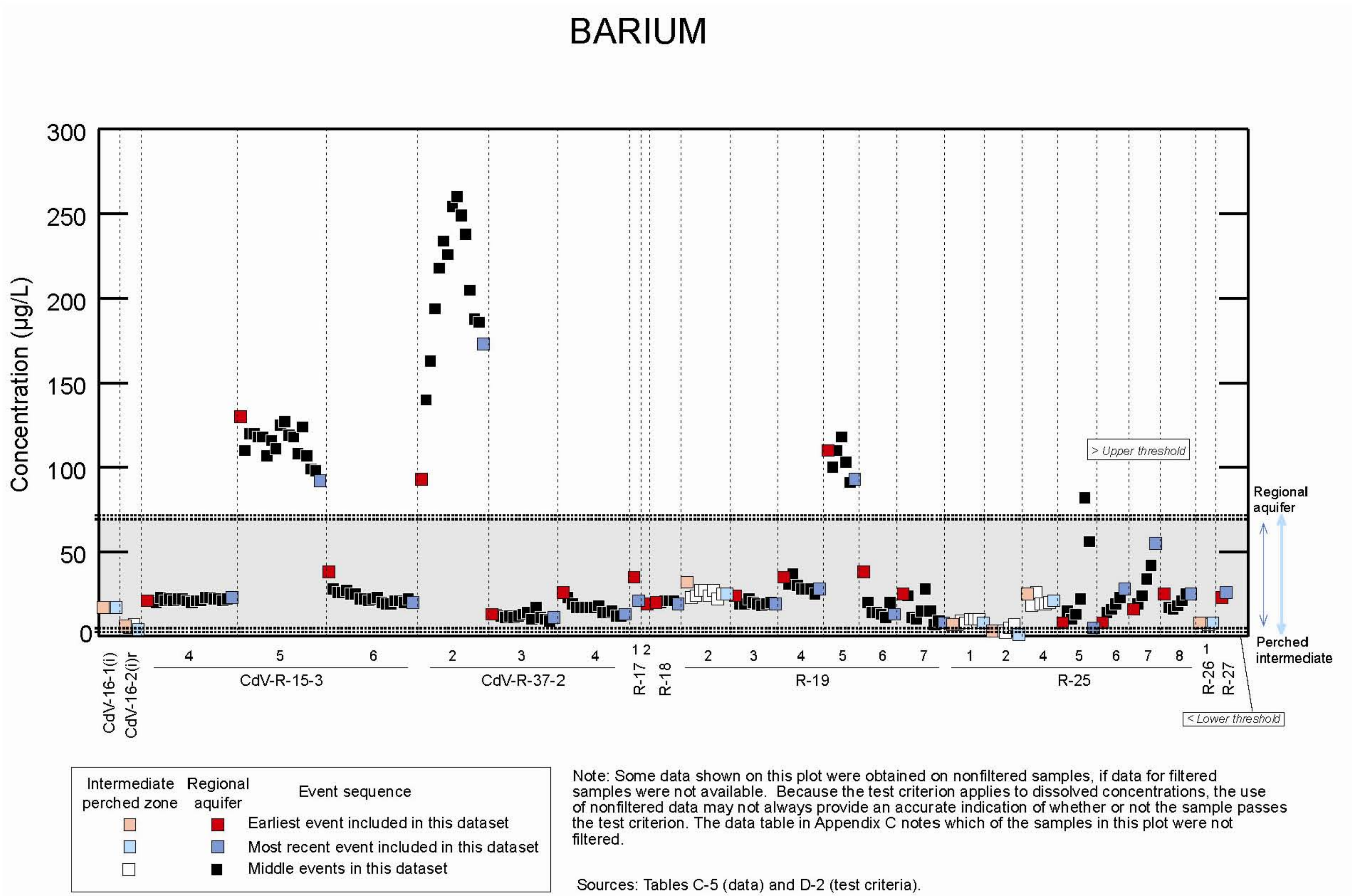
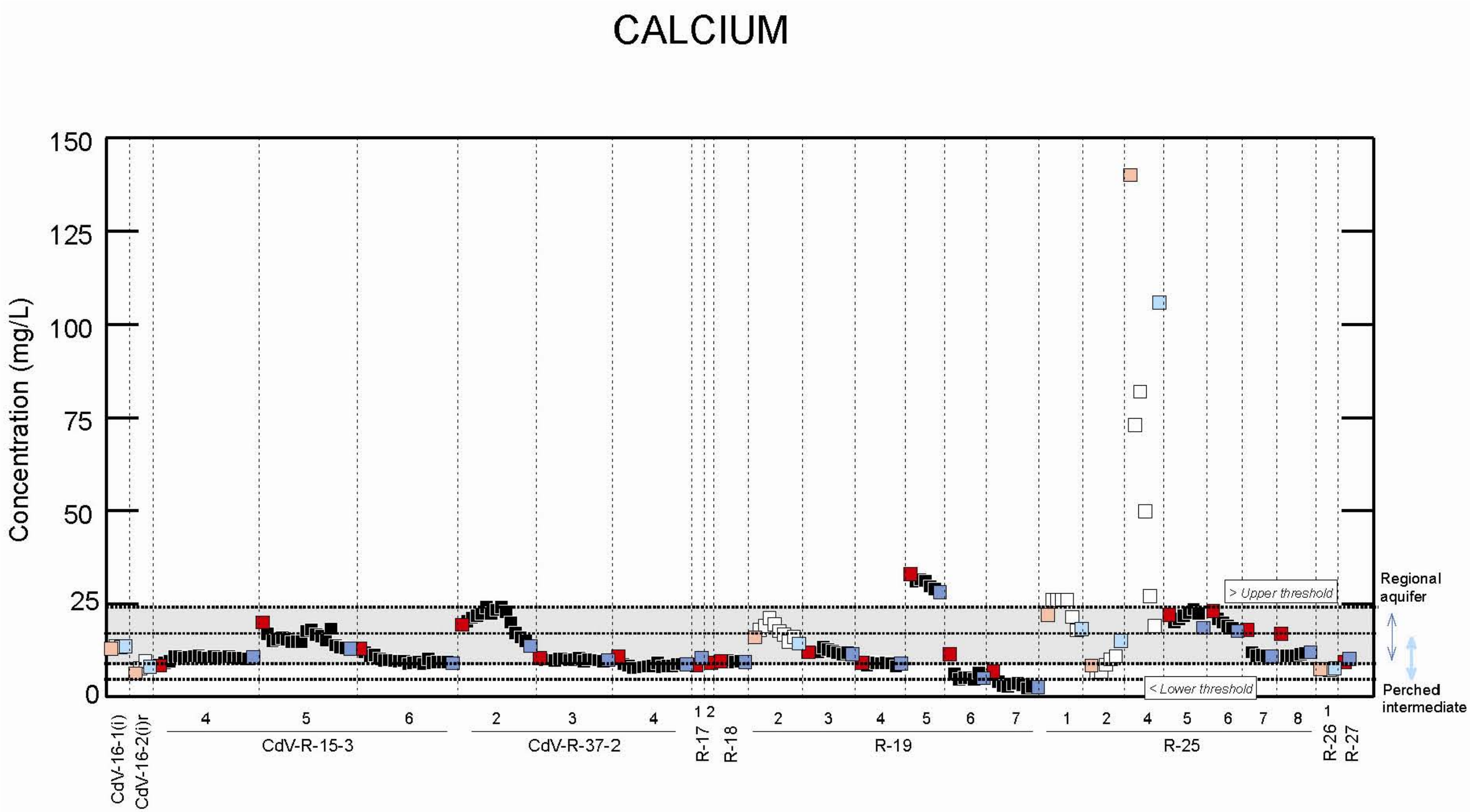


Figure D-4 Comparison of water-quality data against test criteria: barium



Intermediate perched zone	Regional aquifer	Event sequence
■ (light orange)	■ (red)	Earliest event included in this dataset
■ (light blue)	■ (blue)	Most recent event included in this dataset
□	■	Middle events in this dataset

Note: Some data shown on this plot were obtained on nonfiltered samples, if data for filtered samples were not available. Because the test criterion applies to dissolved concentrations, the use of nonfiltered data may not always provide an accurate indication of whether or not the sample passes the test criterion. The data table in Appendix C notes which of the samples in this plot were not filtered.

Sources: Tables C-5 (data) and D-2 (test criteria).

Figure D-5 Comparison of water-quality data against test criteria: calcium

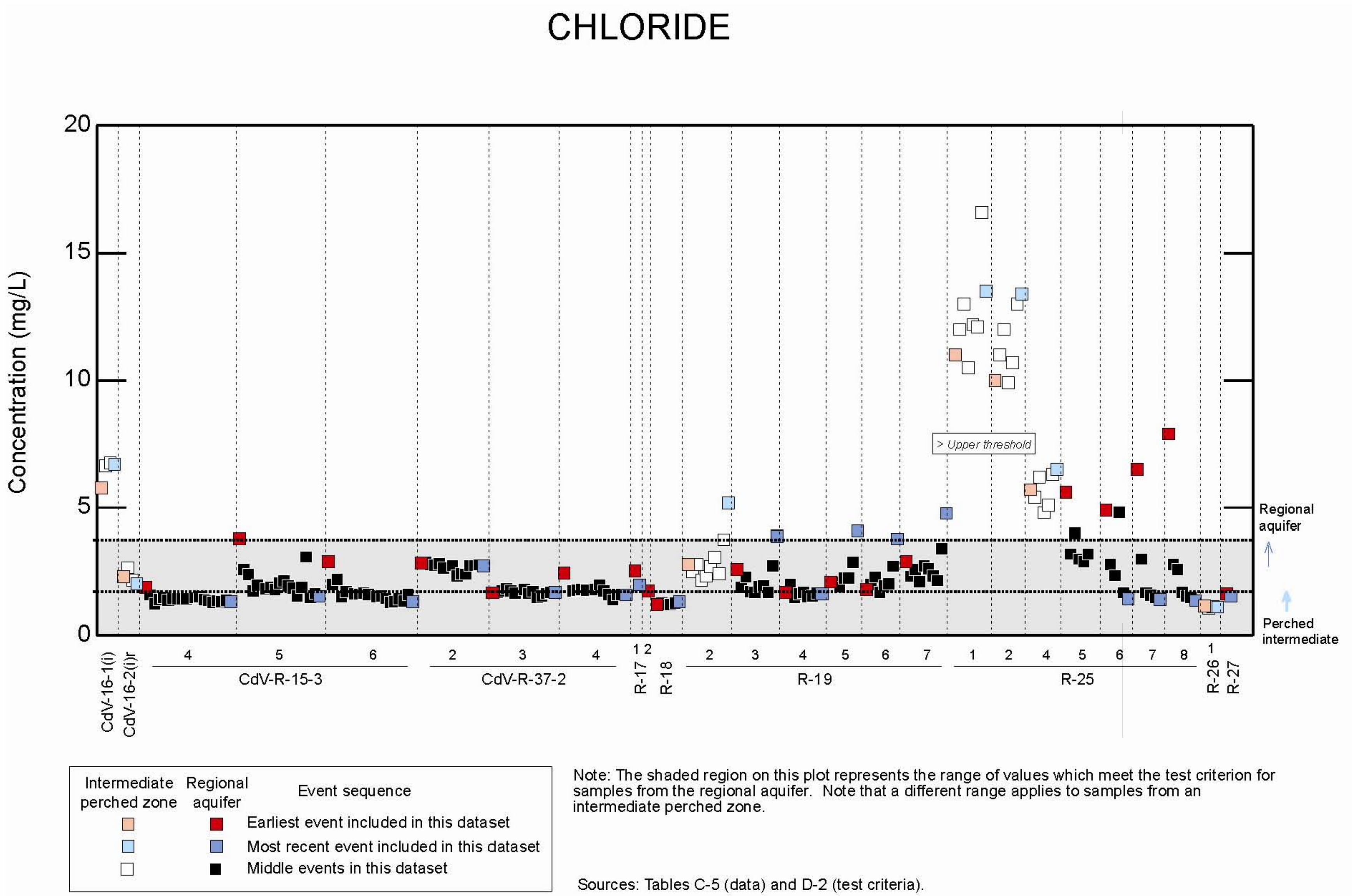


Figure D-6 Comparison of water-quality data against test criteria: chloride

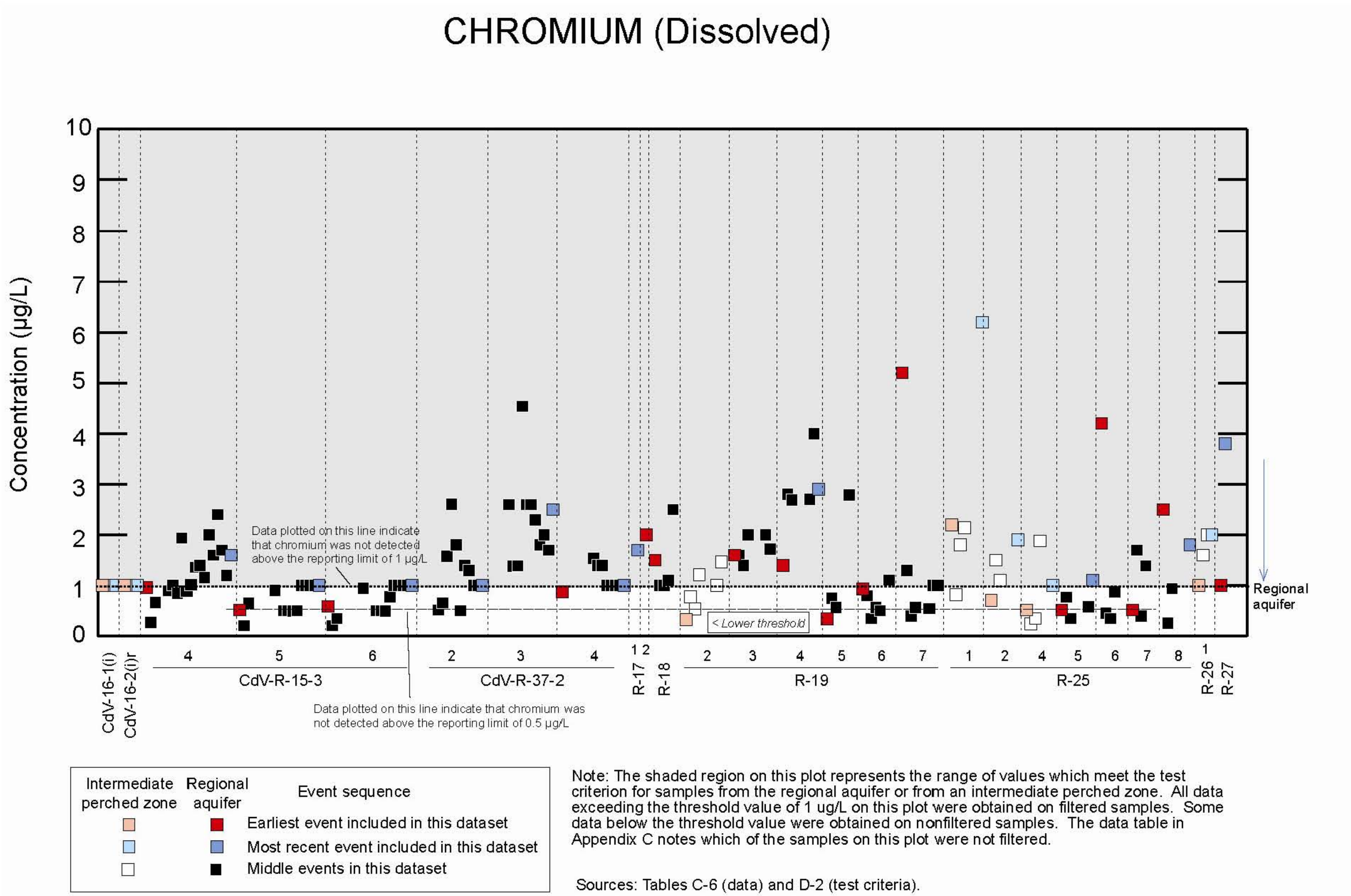


Figure D-7 **Comparison of water-quality data against test criteria: chromium (dissolved)**

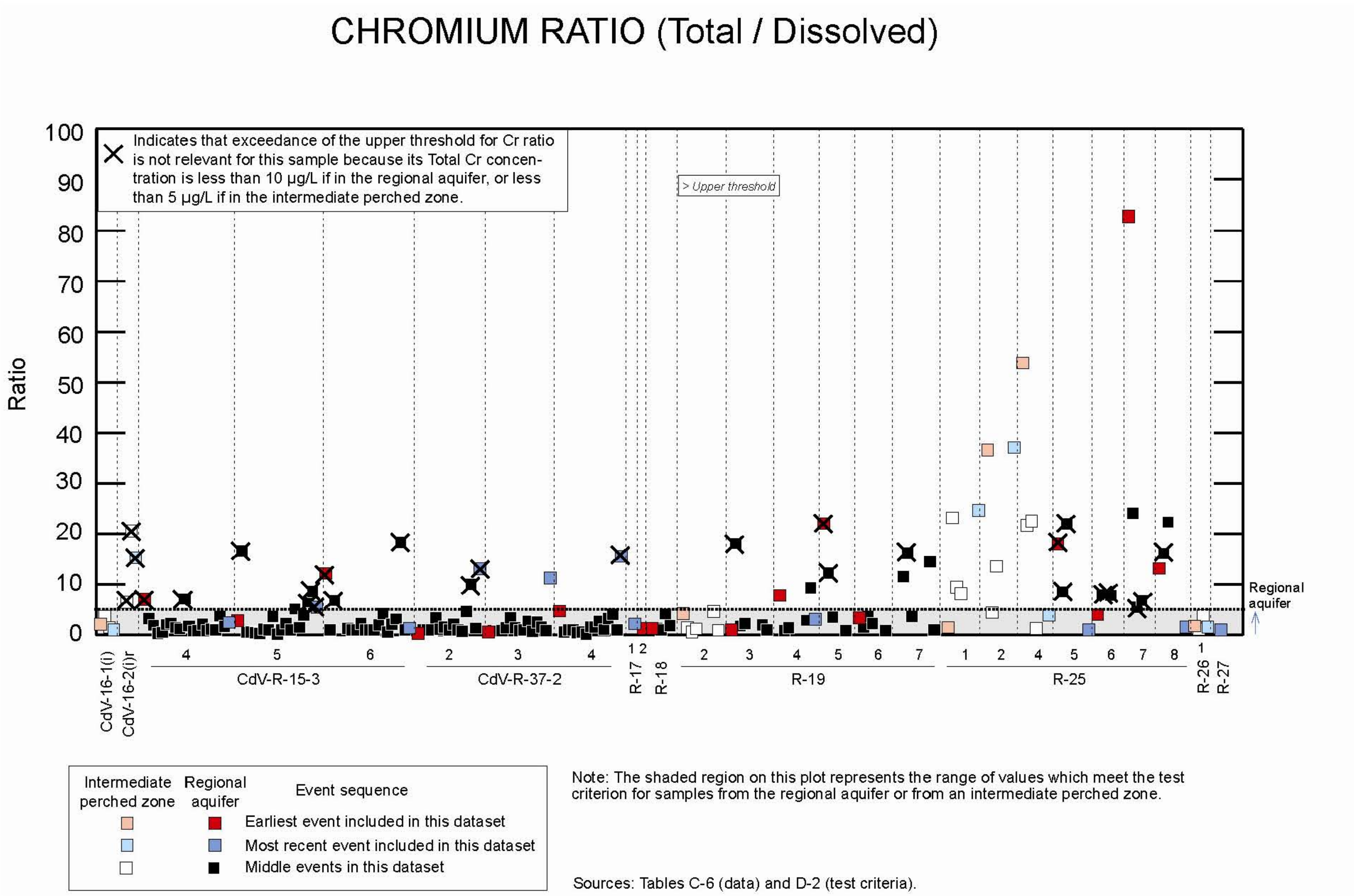


Figure D-8 Comparison of water-quality data against test criteria: chromium ratio (total/dissolved)

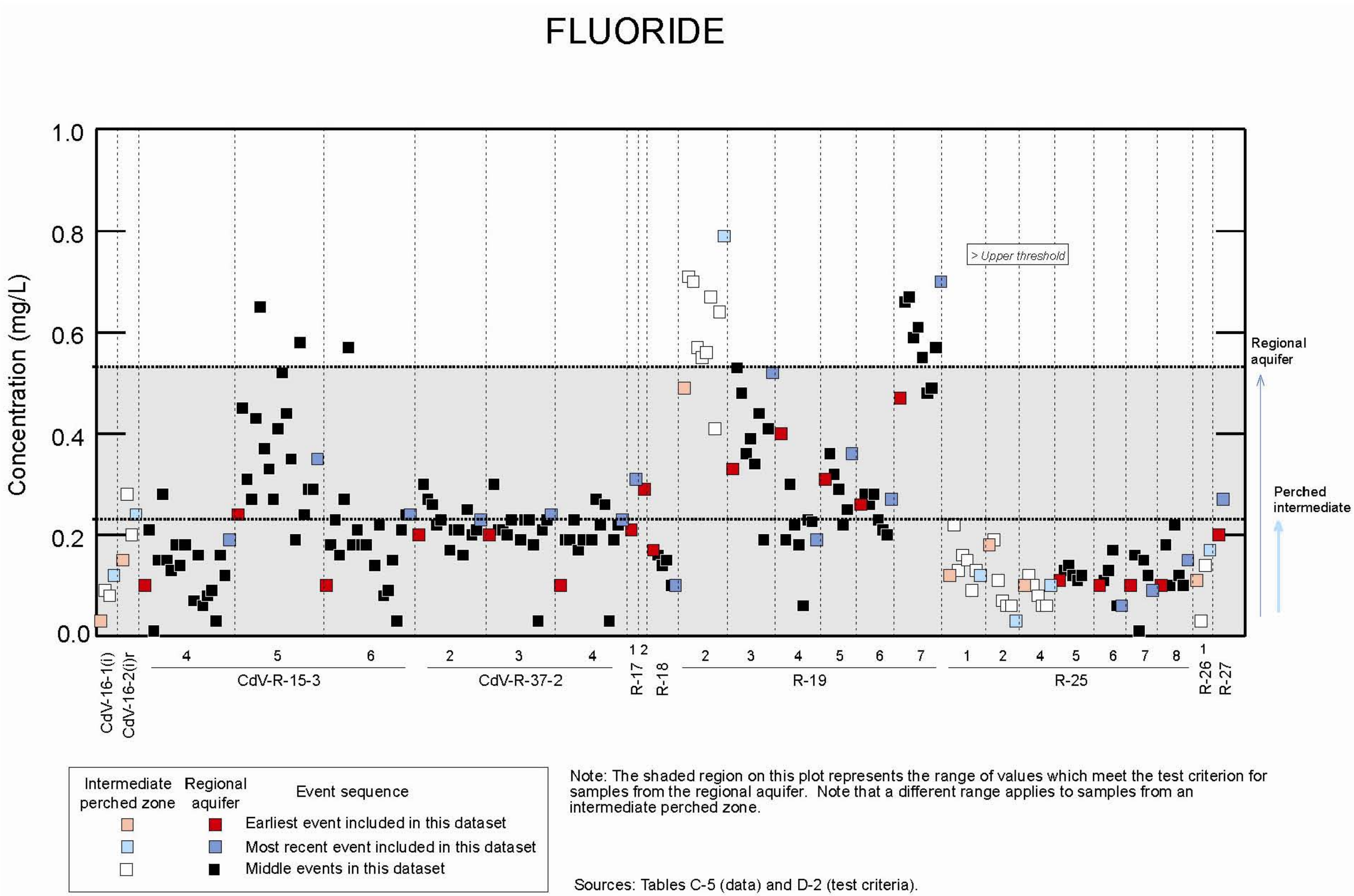
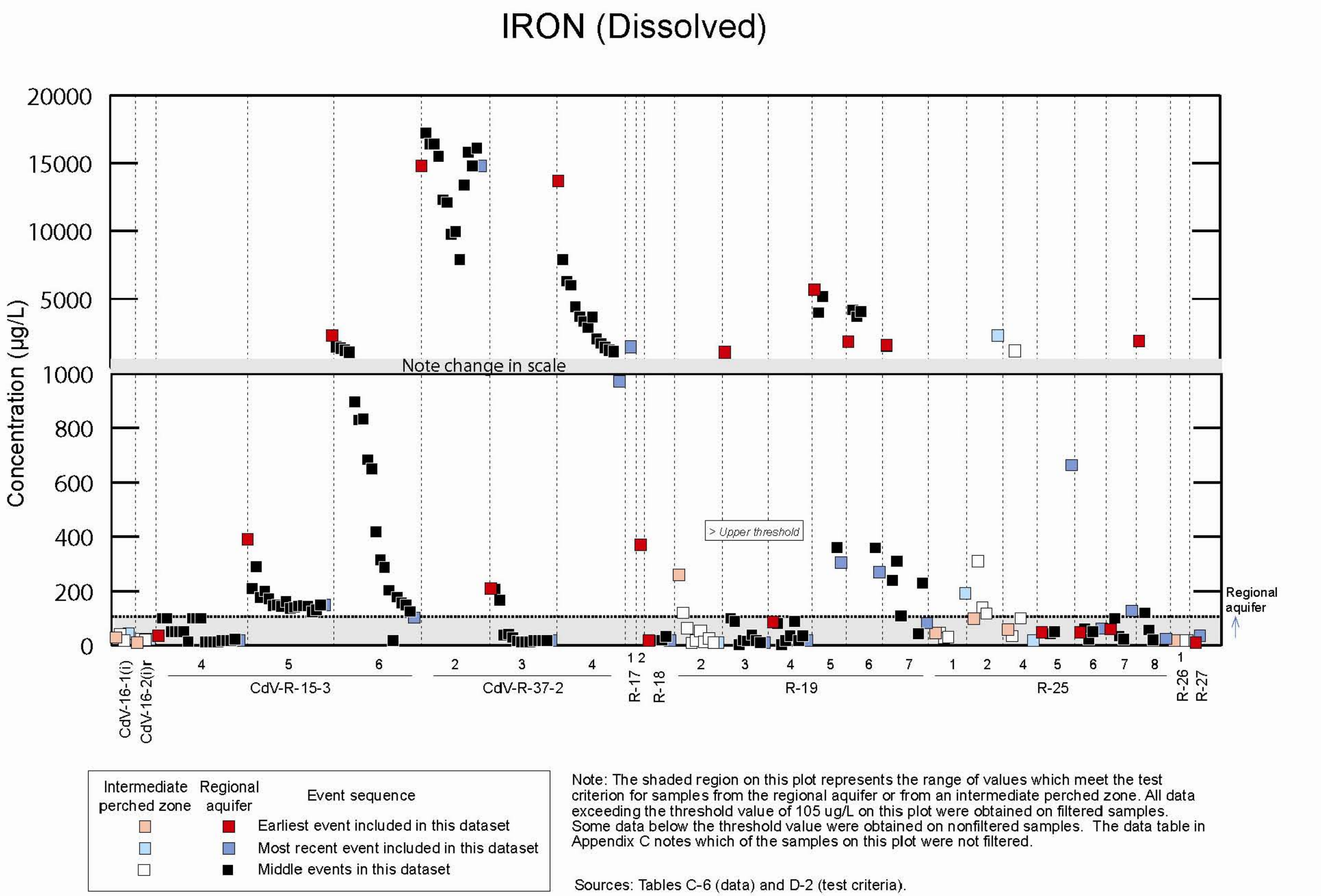


Figure D-9 Comparison of water-quality data against test criteria: fluoride



Note: The shaded region on this plot represents the range of values which meet the test criterion for samples from the regional aquifer or from an intermediate perched zone. All data exceeding the threshold value of 105 ug/L on this plot were obtained on filtered samples. Some data below the threshold value were obtained on nonfiltered samples. The data table in Appendix C notes which of the samples on this plot were not filtered.

Sources: Tables C-6 (data) and D-2 (test criteria).

Figure D-10 Comparison of water-quality data against test criteria: iron (dissolved)

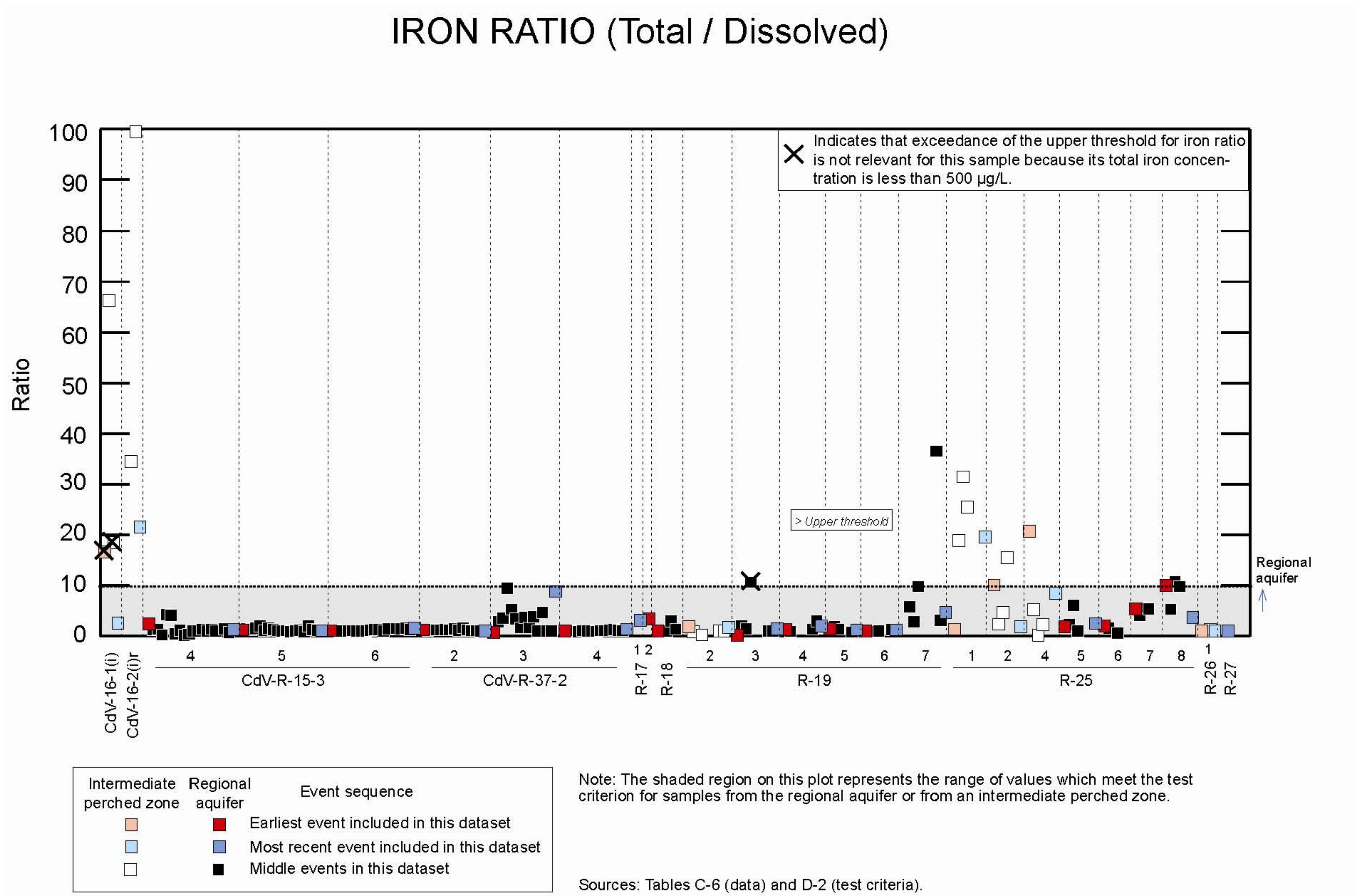
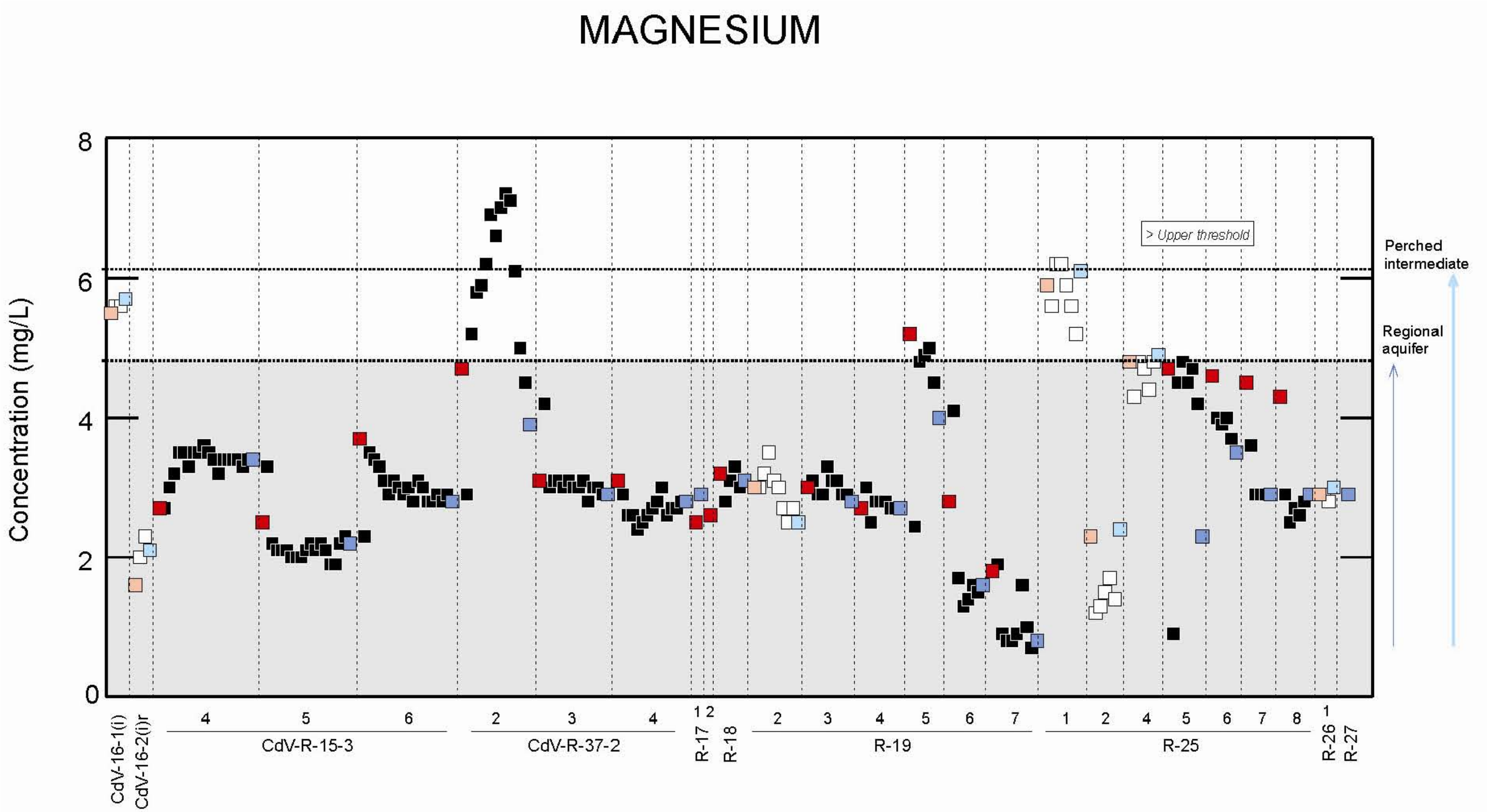


Figure D-11 **Comparison of water-quality data against test criteria: iron ratio (total/dissolved)**



Intermediate perched zone	Regional aquifer	Event sequence
■ (light red)	■ (red)	Earliest event included in this dataset
■ (light blue)	■ (blue)	Most recent event included in this dataset
□	■	Middle events in this dataset

Note: Some data shown on this plot were obtained on nonfiltered samples, if data for filtered samples were not available. Because the test criterion applies to dissolved concentrations, the use of nonfiltered data may not always provide an accurate indication of whether or not the sample passes the test criterion. The data table in Appendix C notes which of the samples in this plot were not filtered.

Sources: Tables C-5 (data) and D-2 (test criteria).

Figure D-12 Comparison of water-quality data against test criteria: magnesium

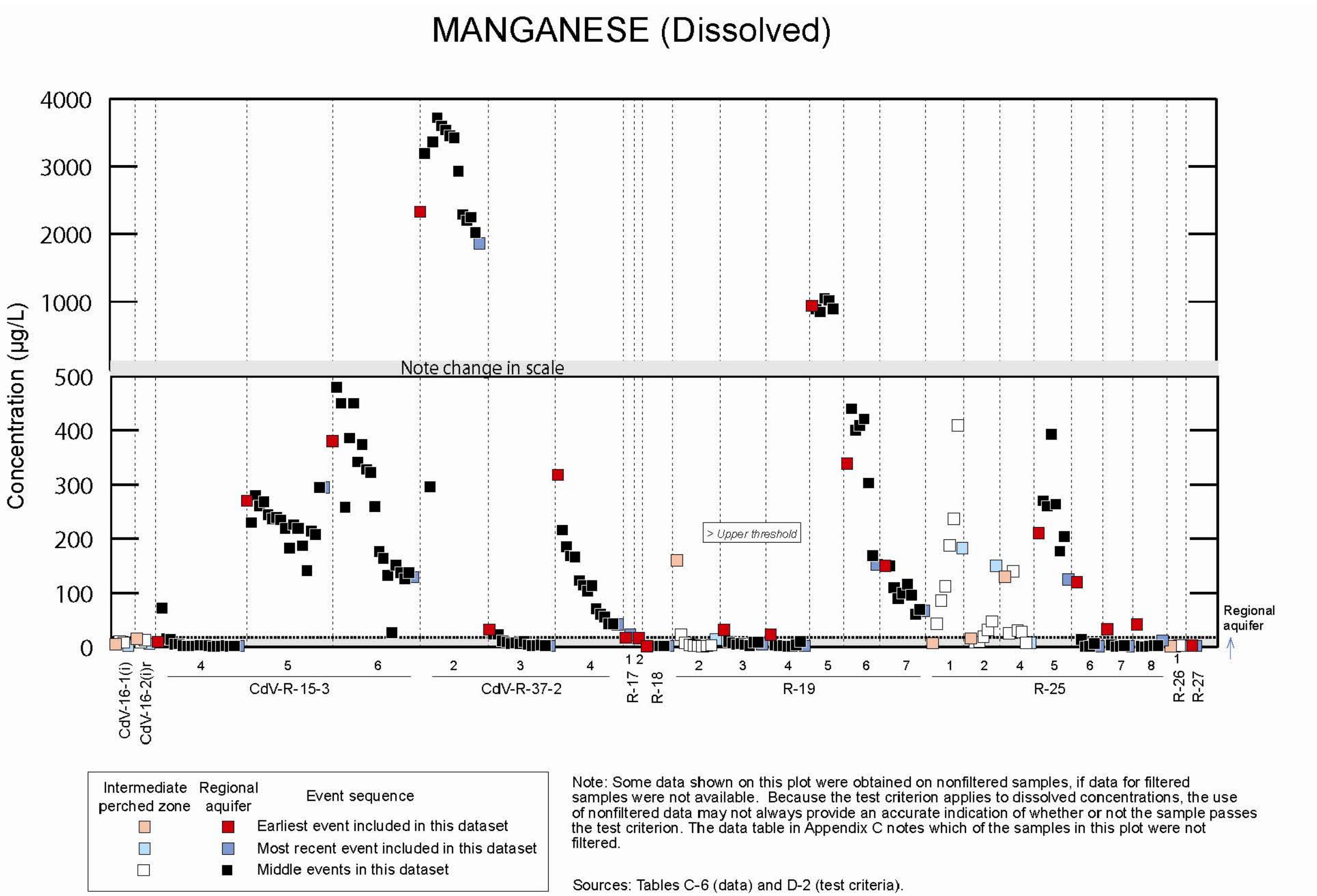
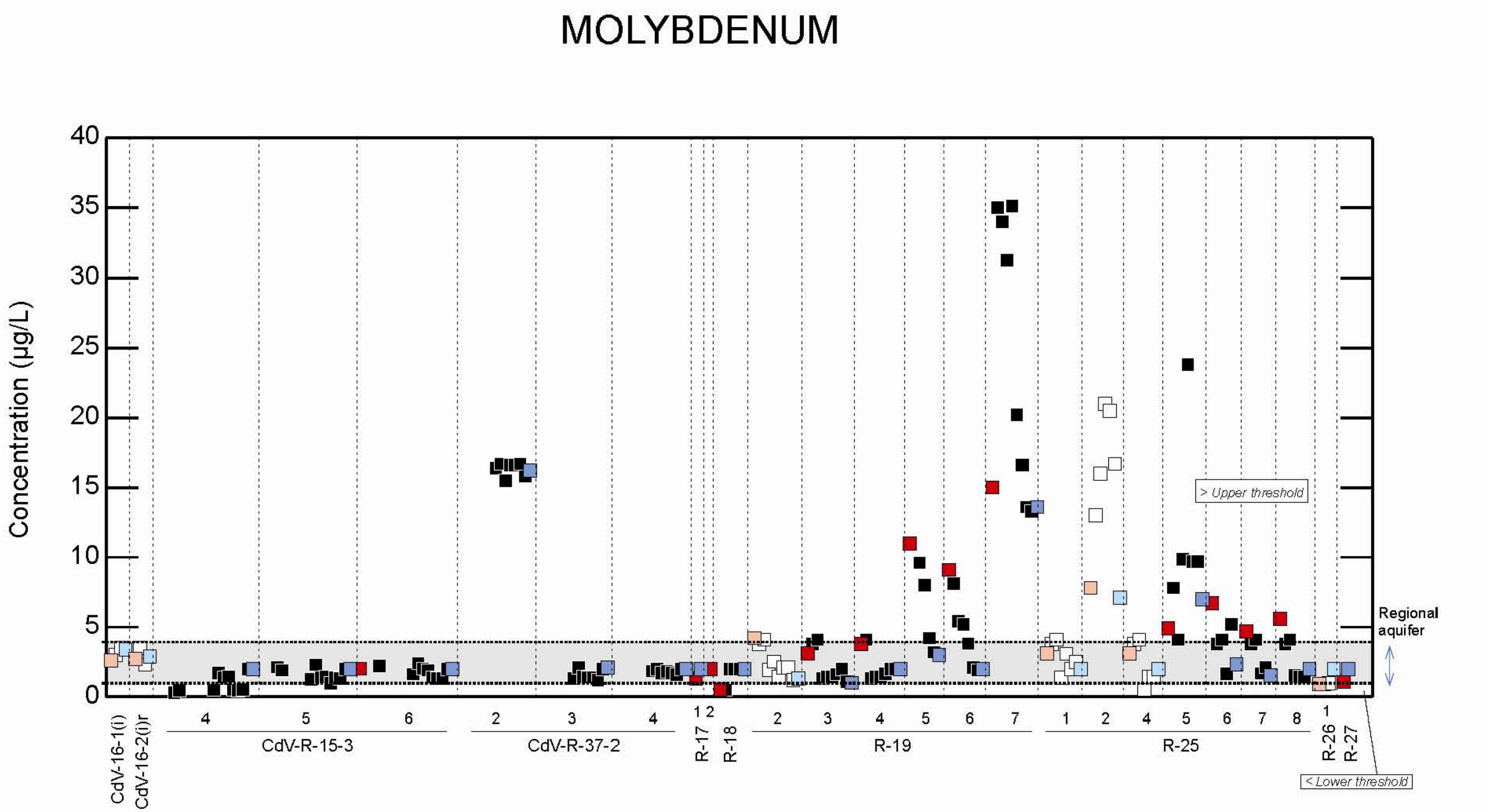


Figure D-13 Comparison of water-quality data against test criteria: manganese (dissolved)

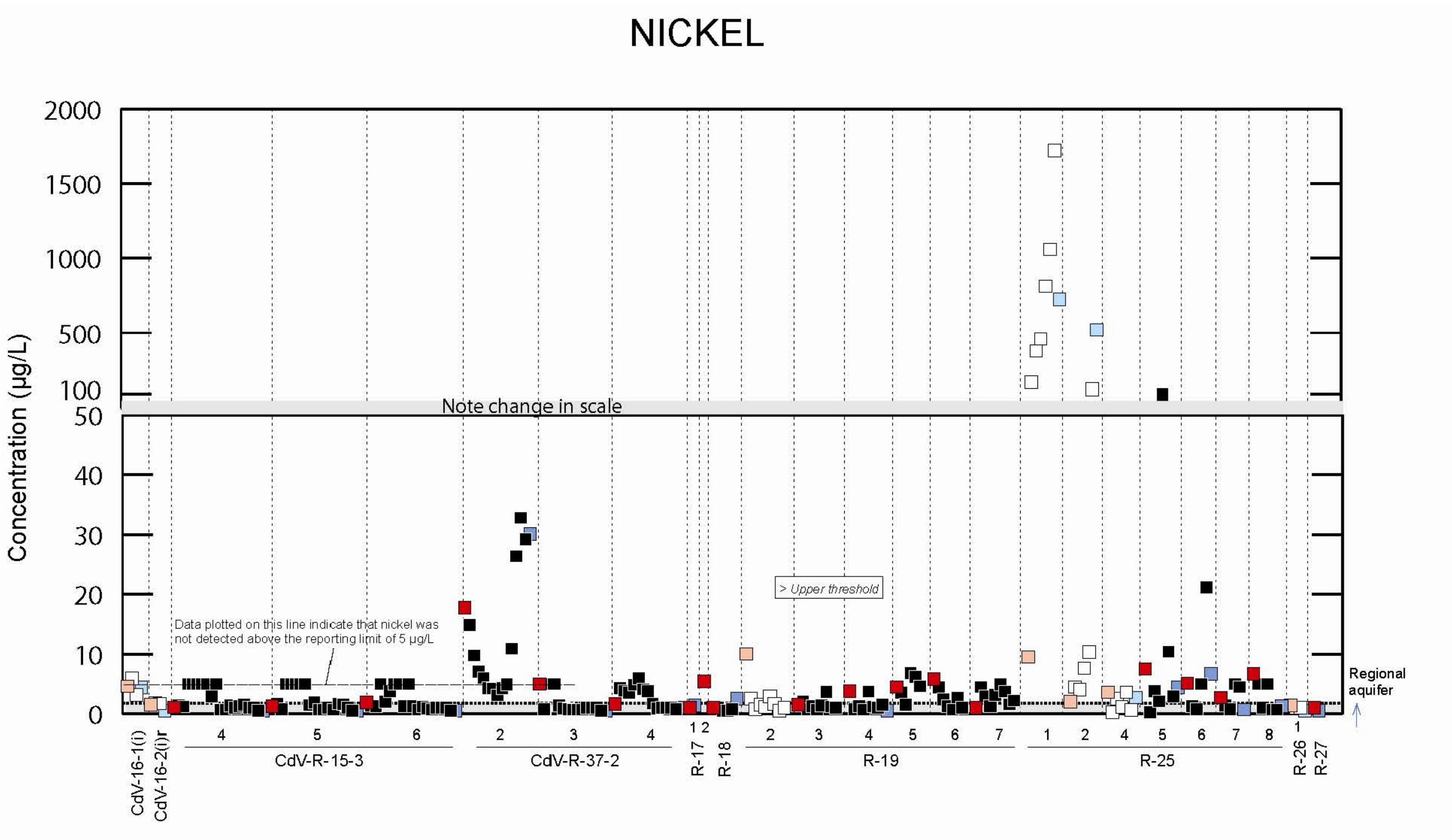


Intermediate perched zone	Regional aquifer	Event sequence
◼ (light orange)	◼ (red)	Earliest event included in this dataset
◼ (light blue)	◼ (blue)	Most recent event included in this dataset
□	■	Middle events in this dataset

Note: Some data shown on this plot were obtained on nonfiltered samples, if data for filtered samples were not available. Because the test criterion applies to dissolved concentrations, the use of nonfiltered data may not always provide an accurate indication of whether or not the sample passes the test criterion. The data table in Appendix C notes which of the samples in this plot were not filtered.

Sources: Tables C-6 (data) and D-2 (test criteria).

Figure D-14 Comparison of water-quality data against test criteria: molybdenum



Intermediate perched zone	Regional aquifer	Event sequence
■ (light orange)	■ (red)	Earliest event included in this dataset
■ (light blue)	■ (blue)	Most recent event included in this dataset
□	■	Middle events in this dataset

Note: Some data shown on this plot were obtained on nonfiltered samples, if data for filtered samples were not available. Because the test criterion applies to dissolved concentrations, the use of nonfiltered data may not always provide an accurate indication of whether or not the sample passes the test criterion. The data table in Appendix C notes which of the samples in this plot were not filtered.

Sources: Tables C-6 (data) and D-2 (test criteria).

Figure D-15 Comparison of water-quality data against test criteria: nickel

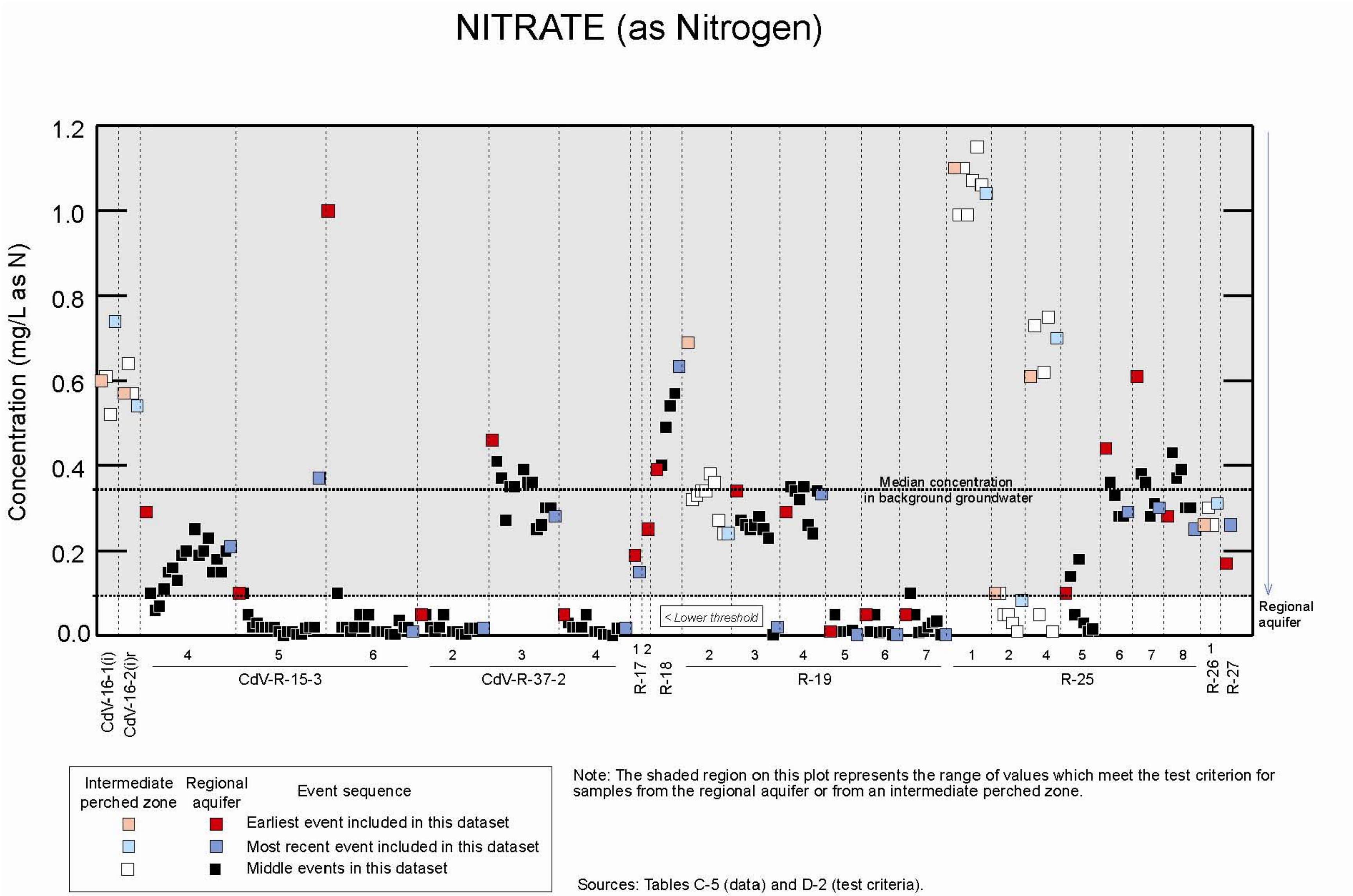


Figure D-16 Comparison of water-quality data against test criteria: nitrate

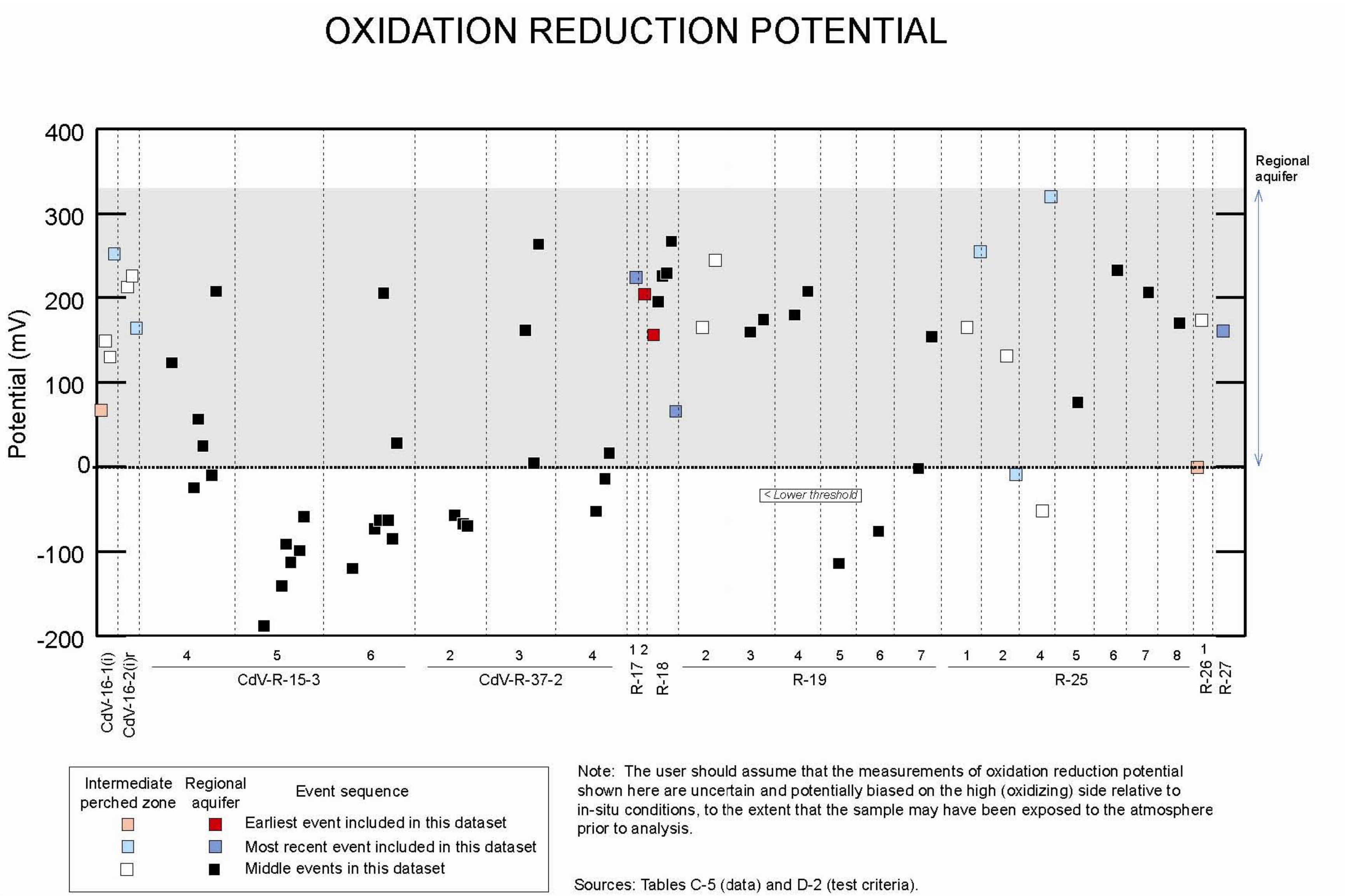


Figure D-17 Comparison of water-quality data against test criteria: oxidation reduction potential

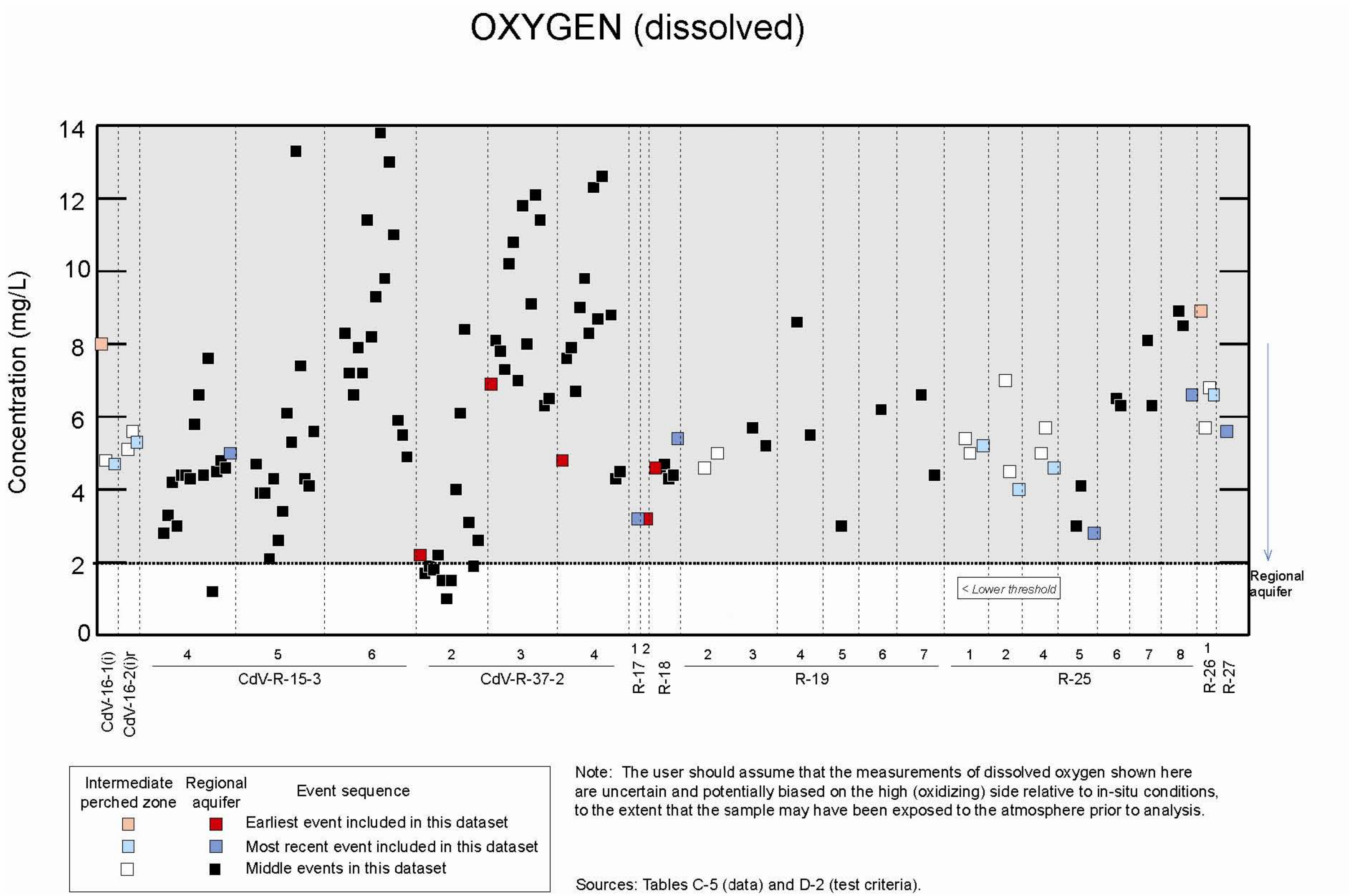


Figure D-18 Comparison of water-quality data against test criteria: oxygen (dissolved)

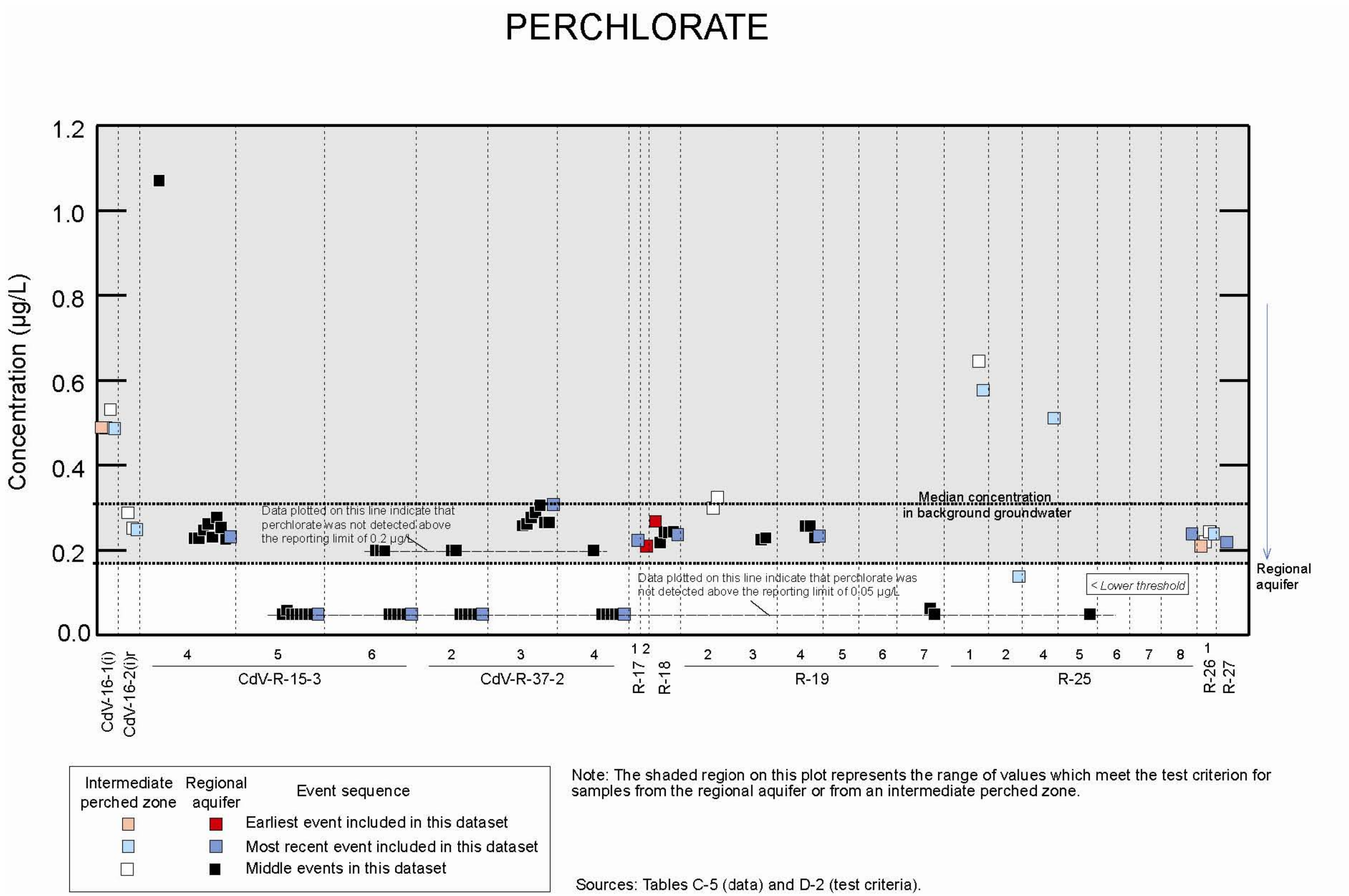
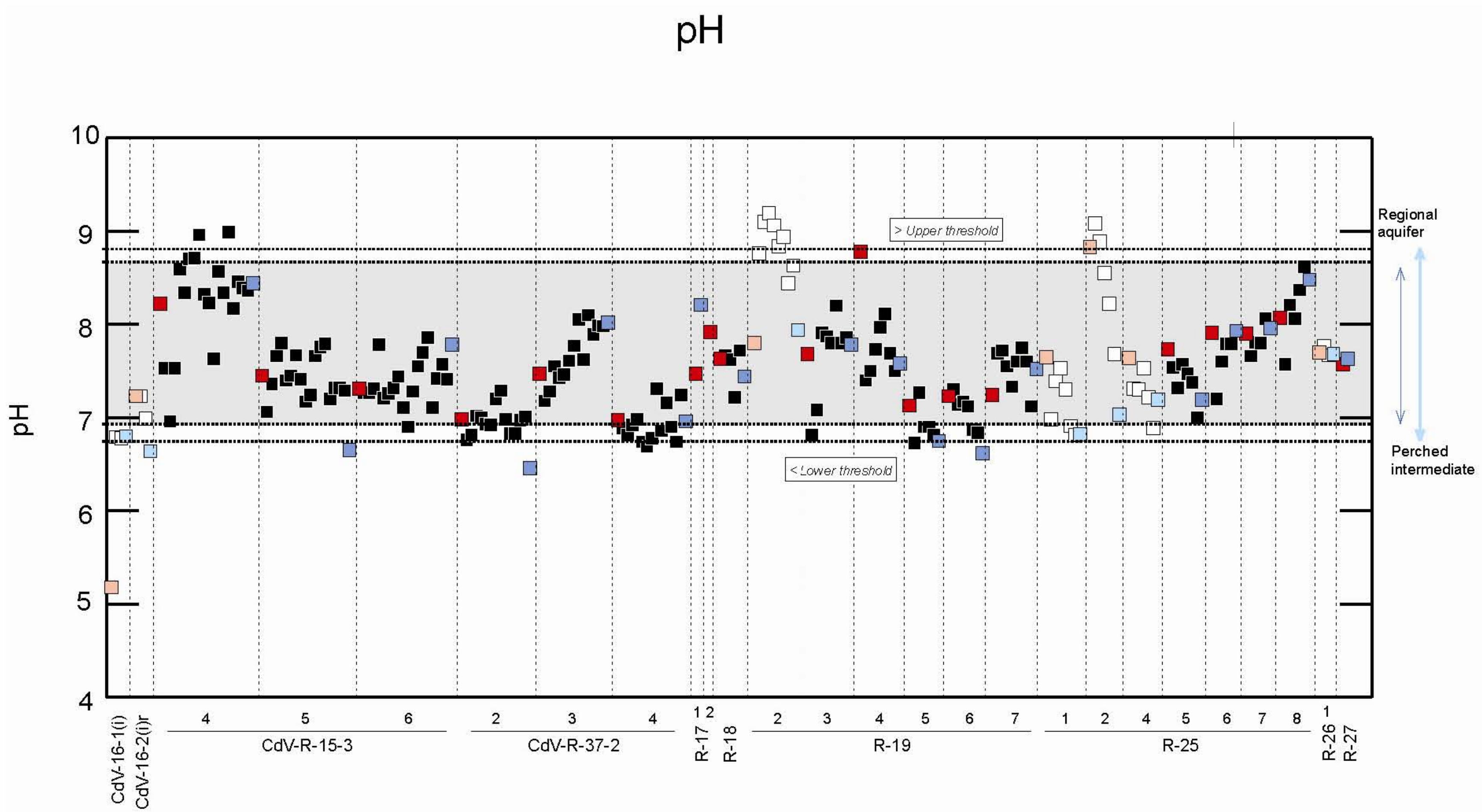


Figure D-19 Comparison of water-quality data against test criteria: perchlorate



Intermediate perched zone	Regional aquifer	Event sequence
(light red)	(red)	Earliest event included in this dataset
(light blue)	(blue)	Most recent event included in this dataset
(white)	(black)	Middle events in this dataset

Note: The shaded region on this plot represents the range of values which meet the test criterion for samples from the regional aquifer. Note that a different range applies to samples from an intermediate perched zone. When available, data shown are those measured in the field or at the EES-6 analytical laboratory (GGRL). Data obtained from an offsite analytical laboratory were used only when field or GGRL data were not available, as noted in the data table in Appendix C.

Sources: Tables C-3 (data) and D-2 (test criteria).

Figure D-20 Comparison of water-quality data against test criteria: pH

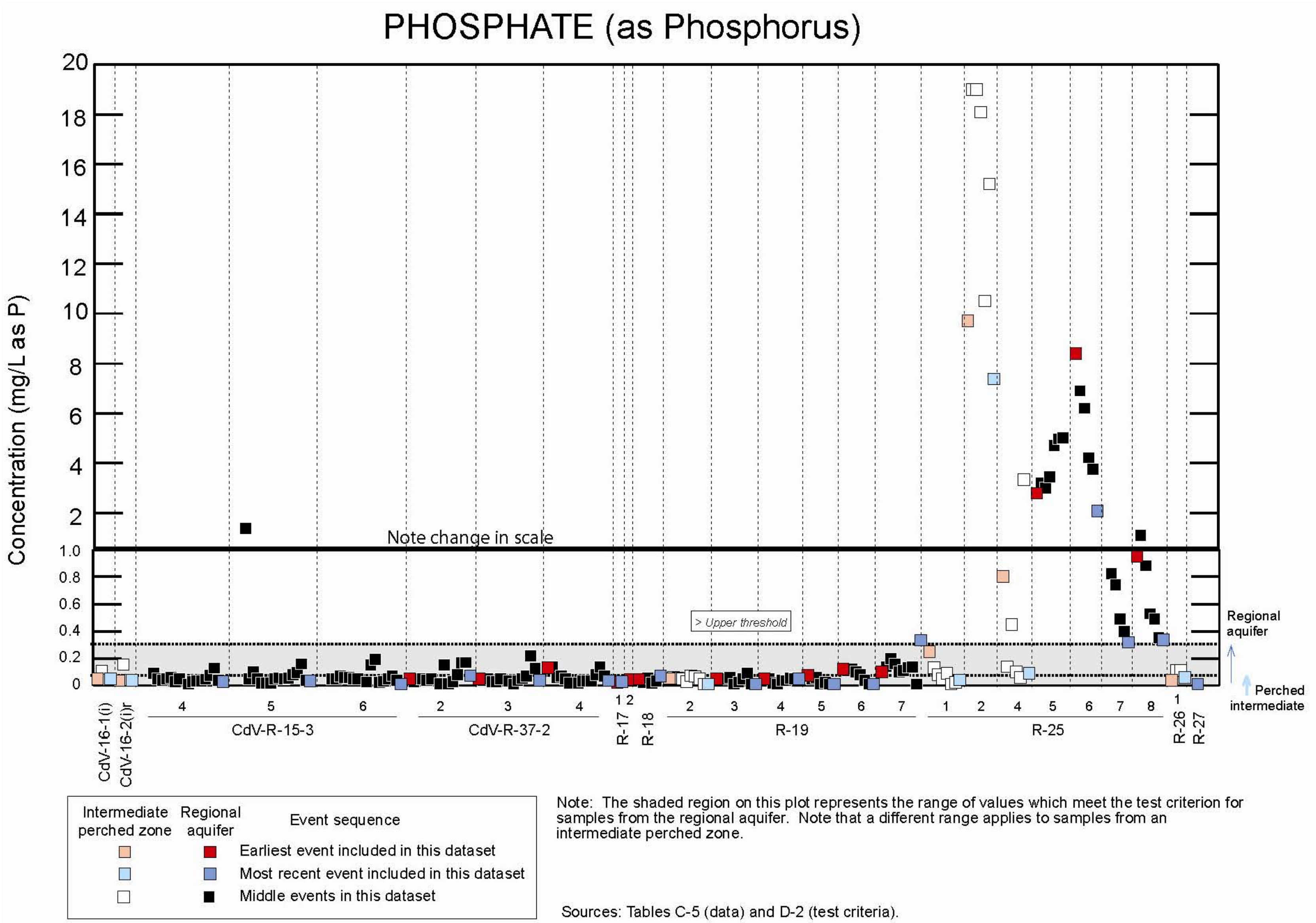
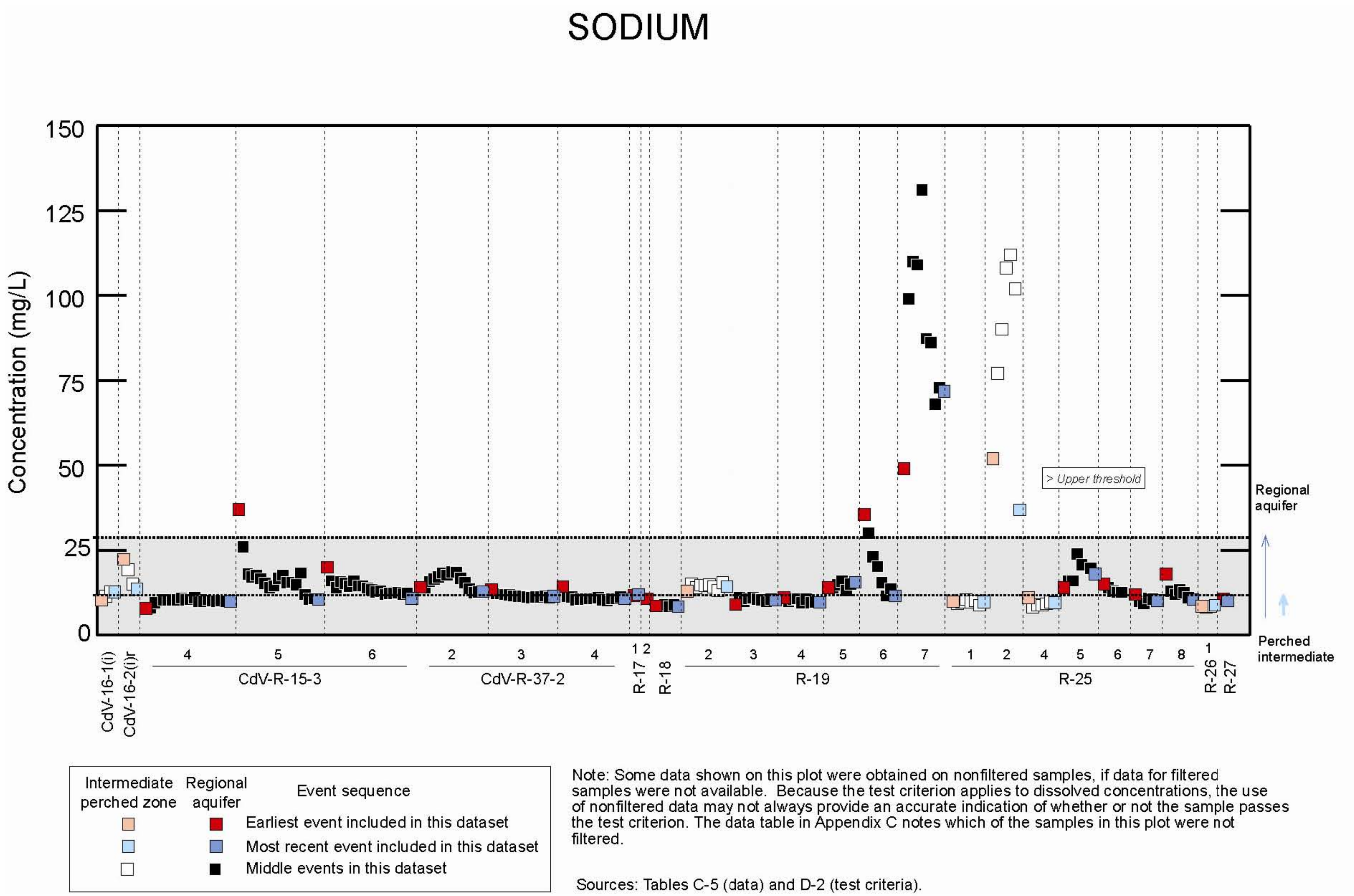


Figure D-21 Comparison of water-quality data against test criteria: phosphate



Note: Some data shown on this plot were obtained on nonfiltered samples, if data for filtered samples were not available. Because the test criterion applies to dissolved concentrations, the use of nonfiltered data may not always provide an accurate indication of whether or not the sample passes the test criterion. The data table in Appendix C notes which of the samples in this plot were not filtered.

Sources: Tables C-5 (data) and D-2 (test criteria).

Figure D-22 Comparison of water-quality data against test criteria: sodium

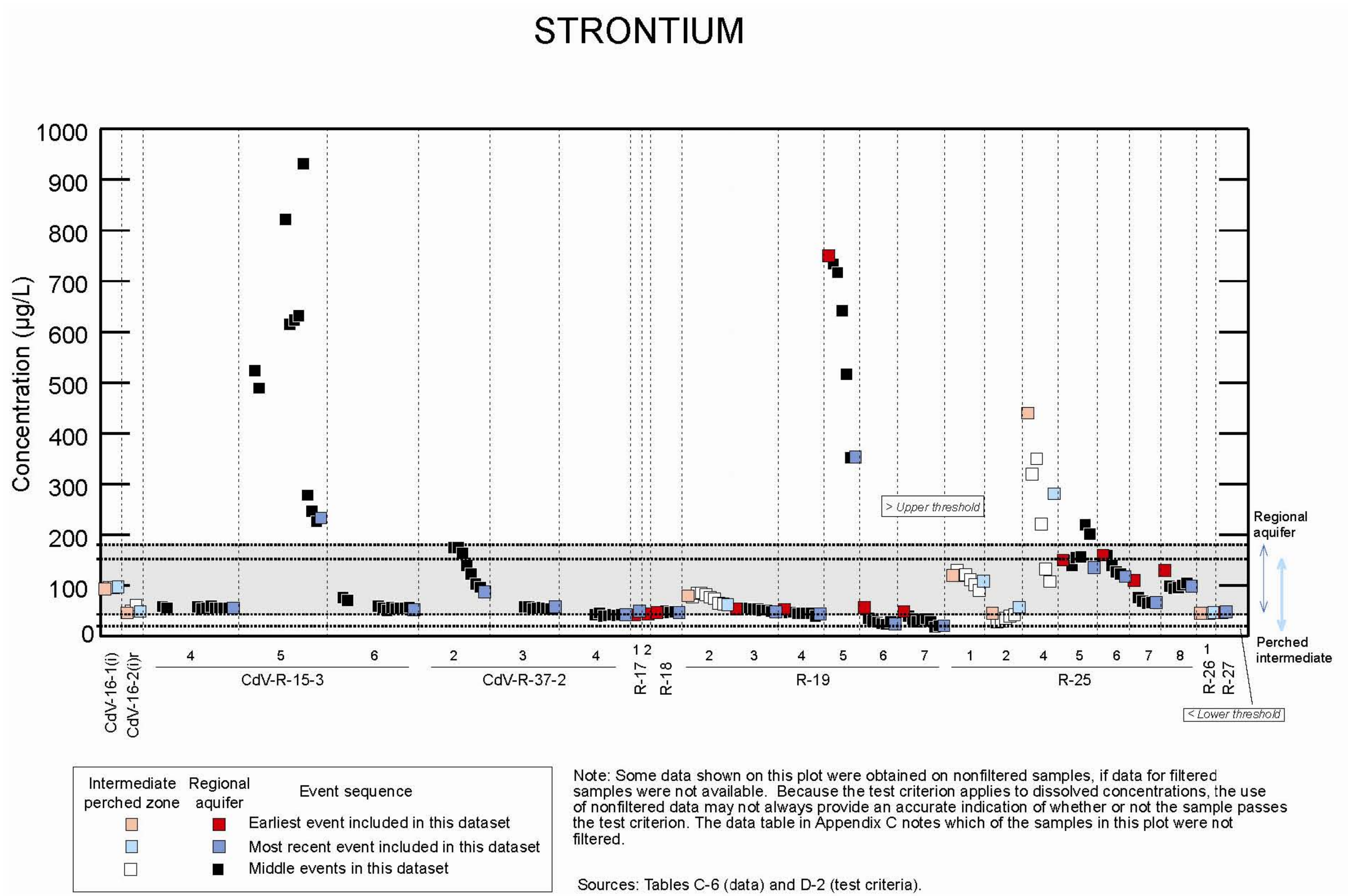


Figure D-23 Comparison of water-quality data against test criteria: strontium

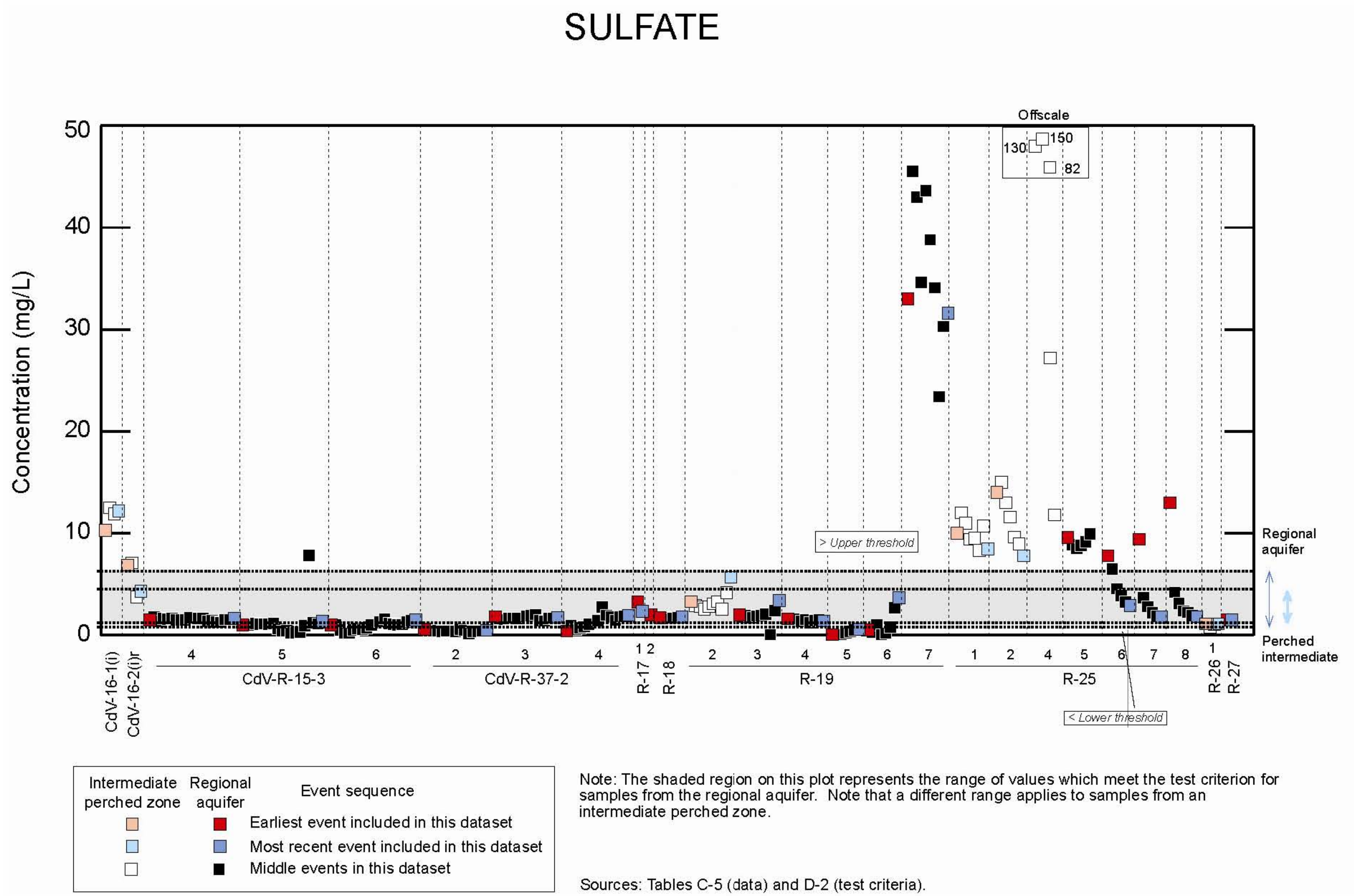


Figure D-24 Comparison of water-quality data against test criteria: sulfate

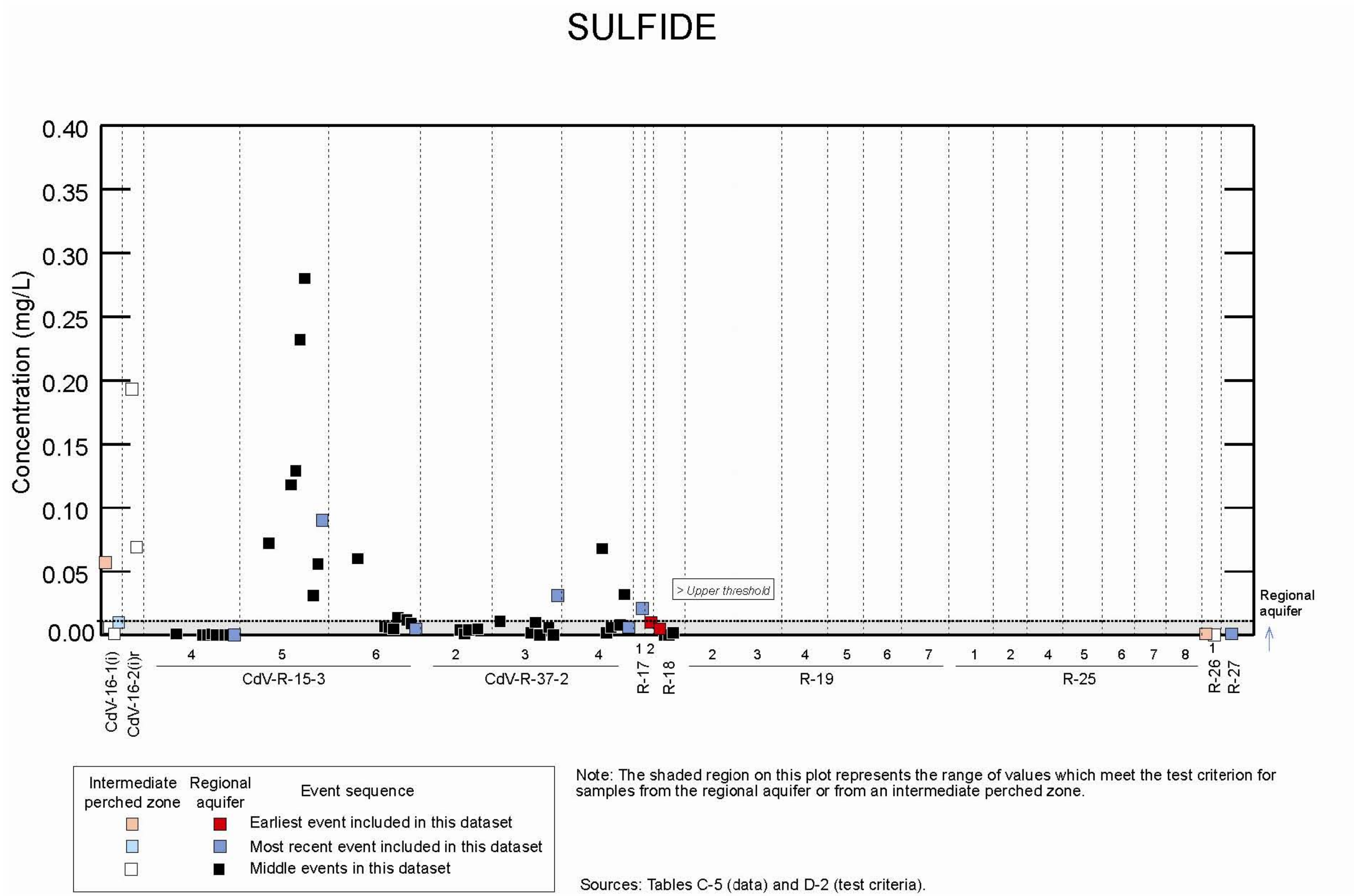


Figure D-25 Comparison of water-quality data against test criteria: sulfide

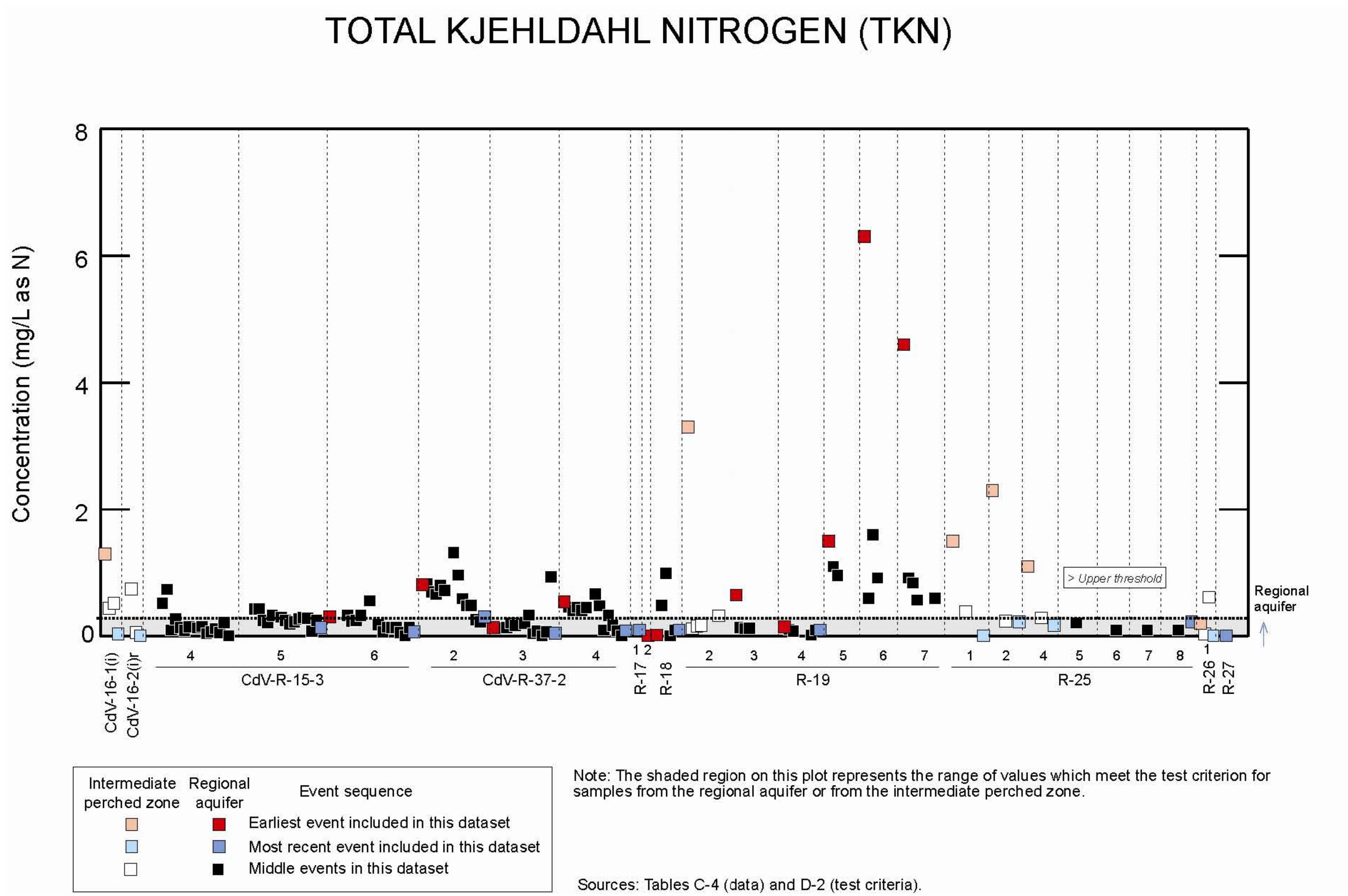


Figure D-26 Comparison of water-quality data against test criteria: total Kjehldahl nitrogen

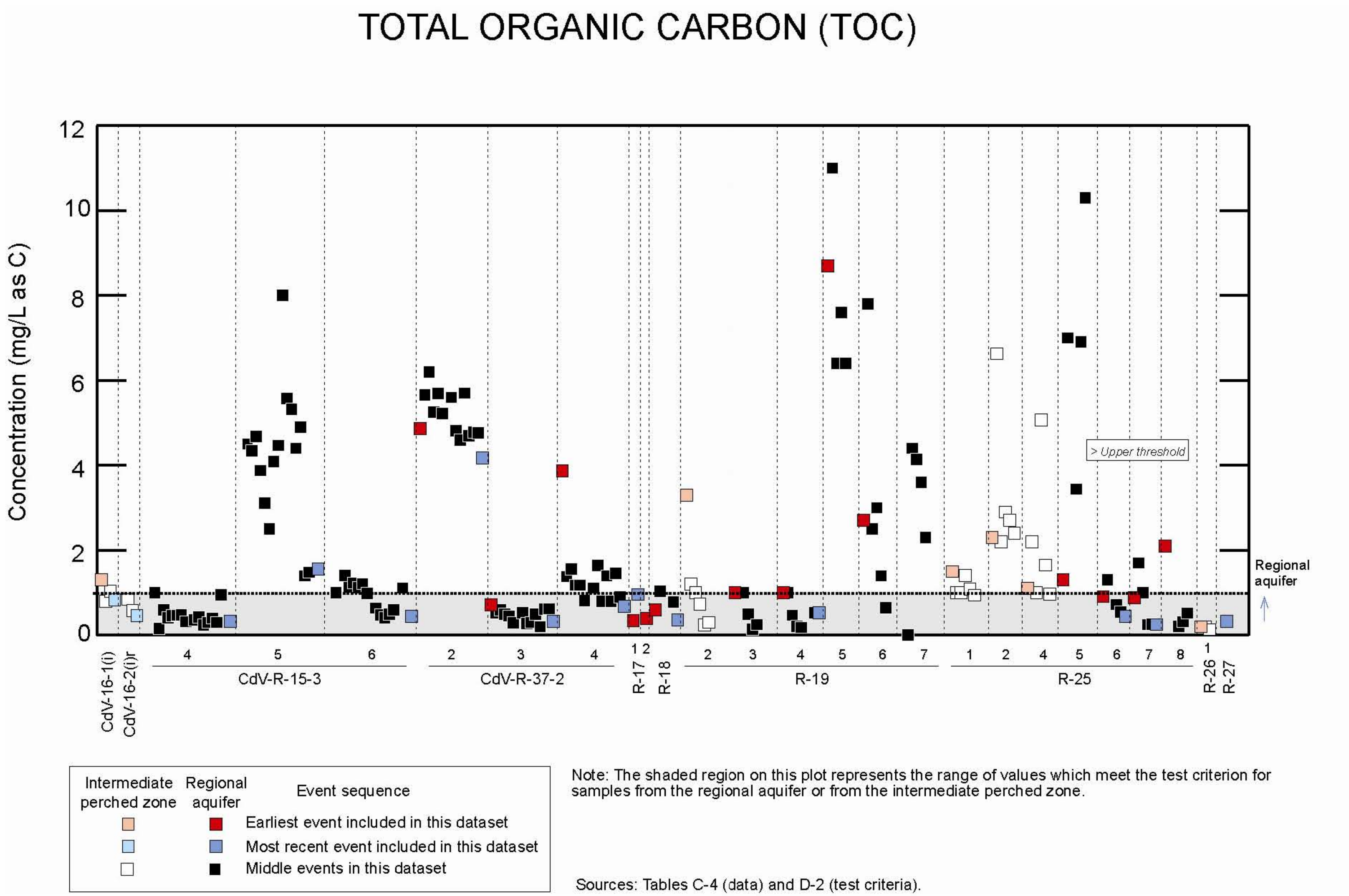


Figure D-27 Comparison of water-quality data against test criteria: total organic carbon

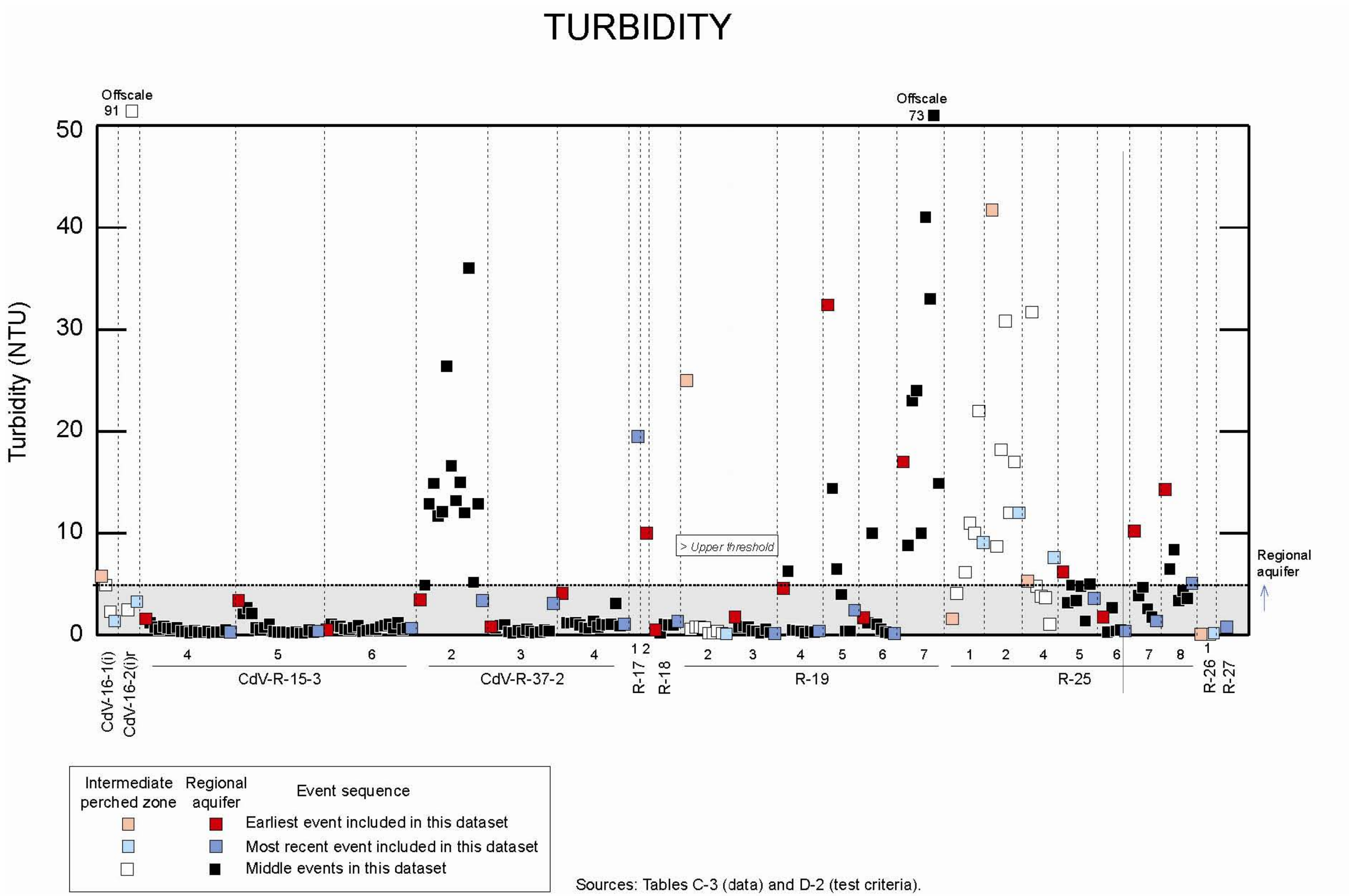
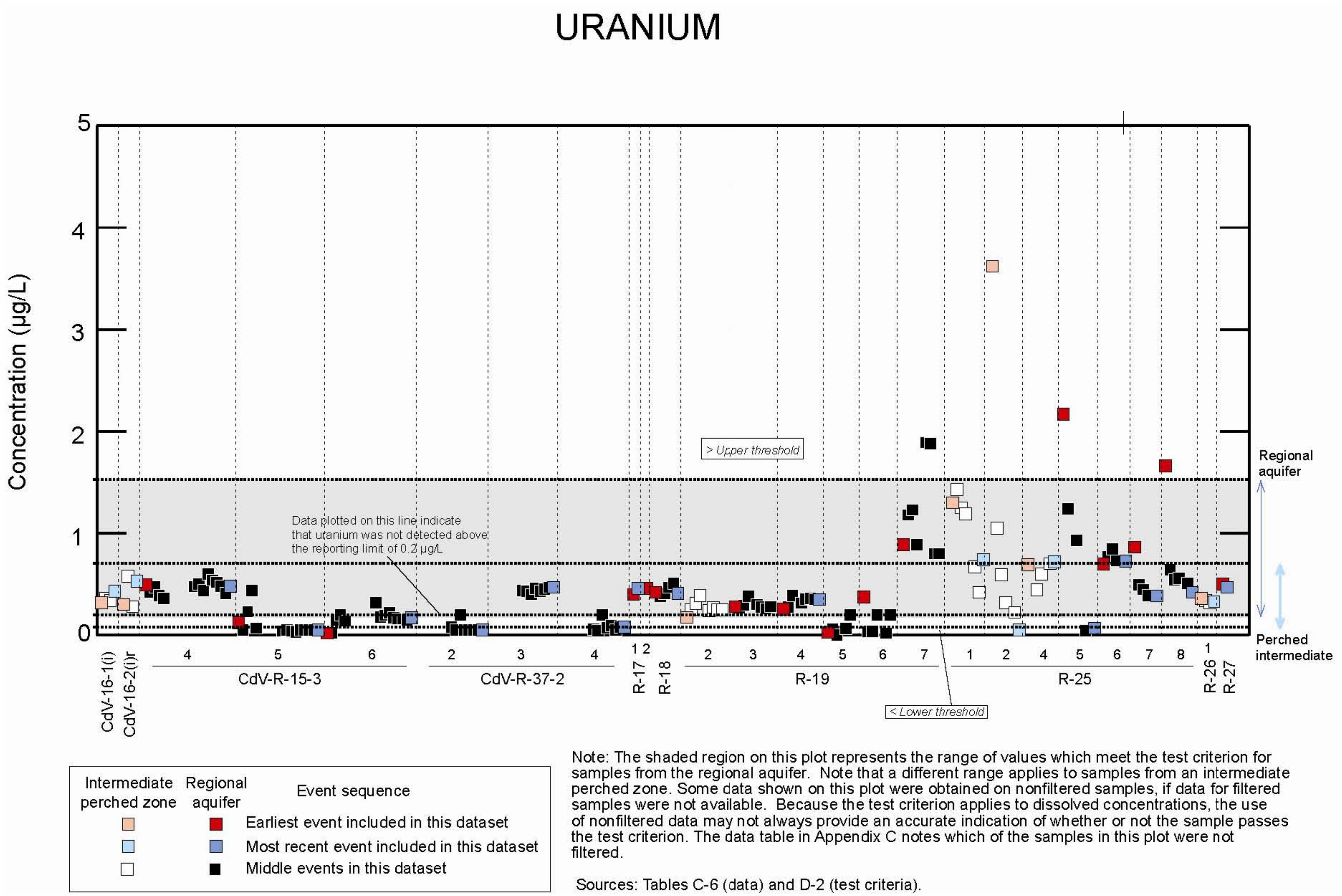


Figure D-28 **Comparison of water-quality data against test criteria: turbidity**



Note: The shaded region on this plot represents the range of values which meet the test criterion for samples from the regional aquifer. Note that a different range applies to samples from an intermediate perched zone. Some data shown on this plot were obtained on nonfiltered samples, if data for filtered samples were not available. Because the test criterion applies to dissolved concentrations, the use of nonfiltered data may not always provide an accurate indication of whether or not the sample passes the test criterion. The data table in Appendix C notes which of the samples in this plot were not filtered.

Sources: Tables C-6 (data) and D-2 (test criteria).

Figure D-29 Comparison of water-quality data against test criteria: uranium

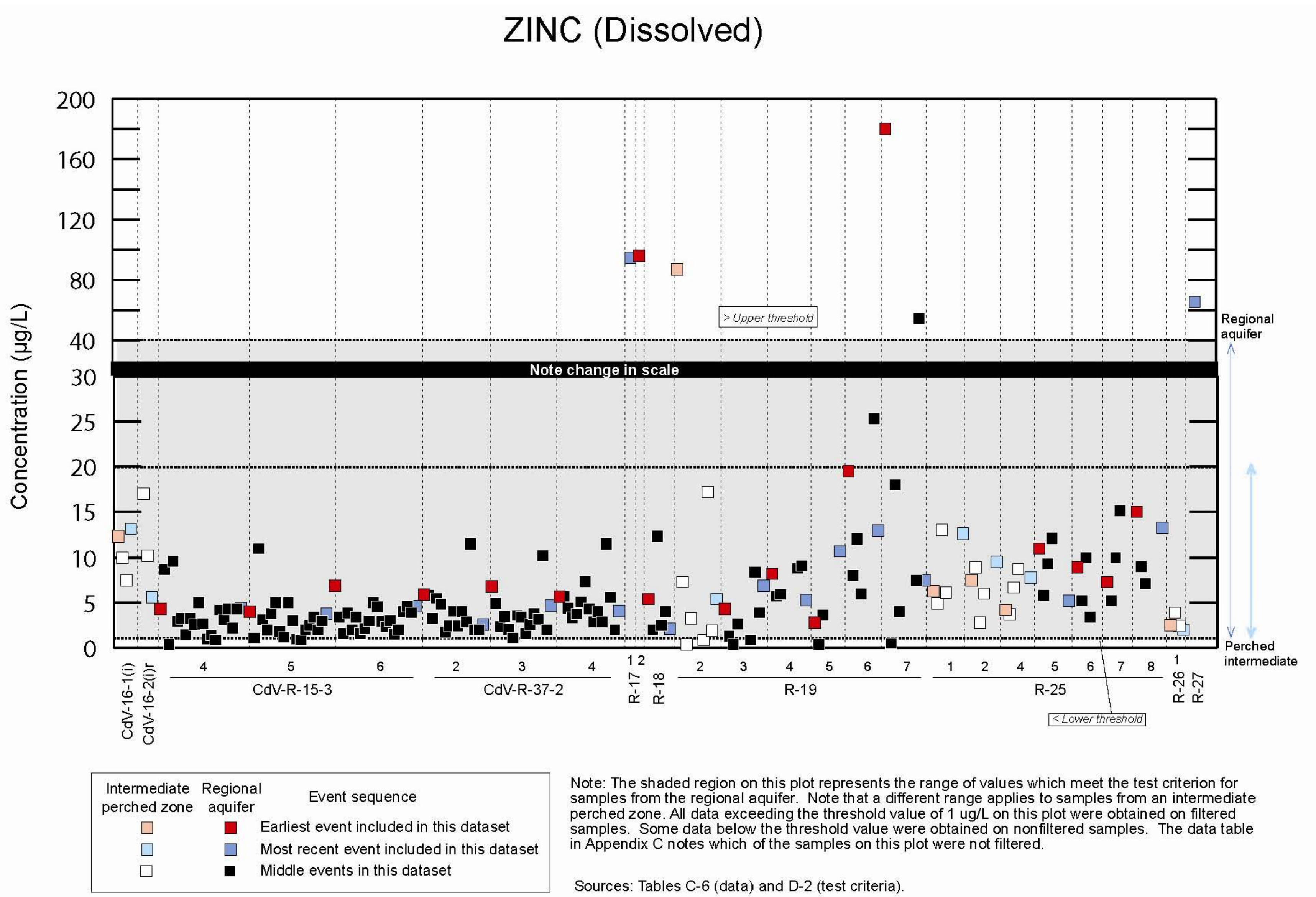


Figure D-30 Comparison of water-quality data against test criteria: zinc (dissolved)

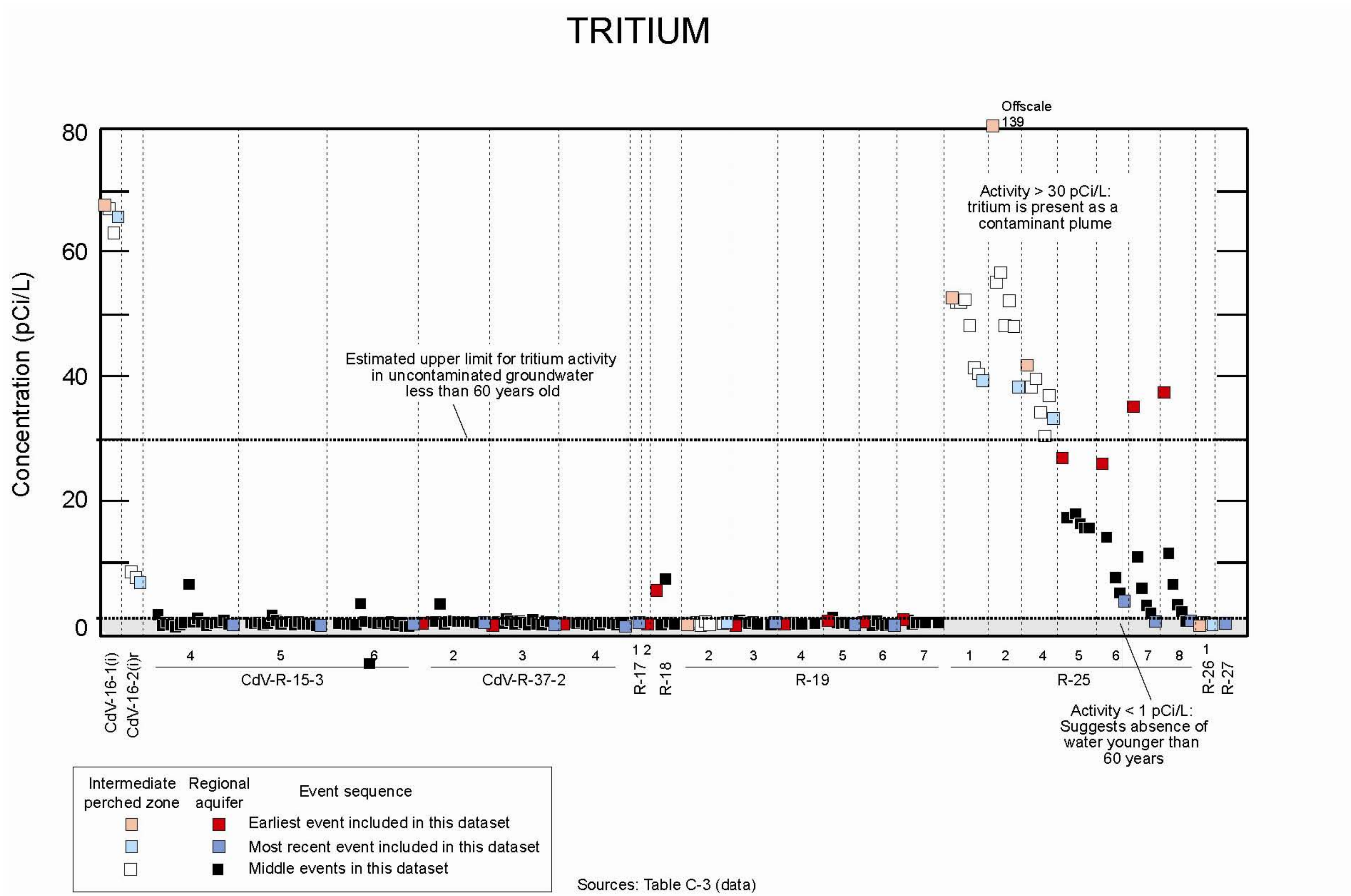


Figure D-31 Tritium activities in water-quality samples

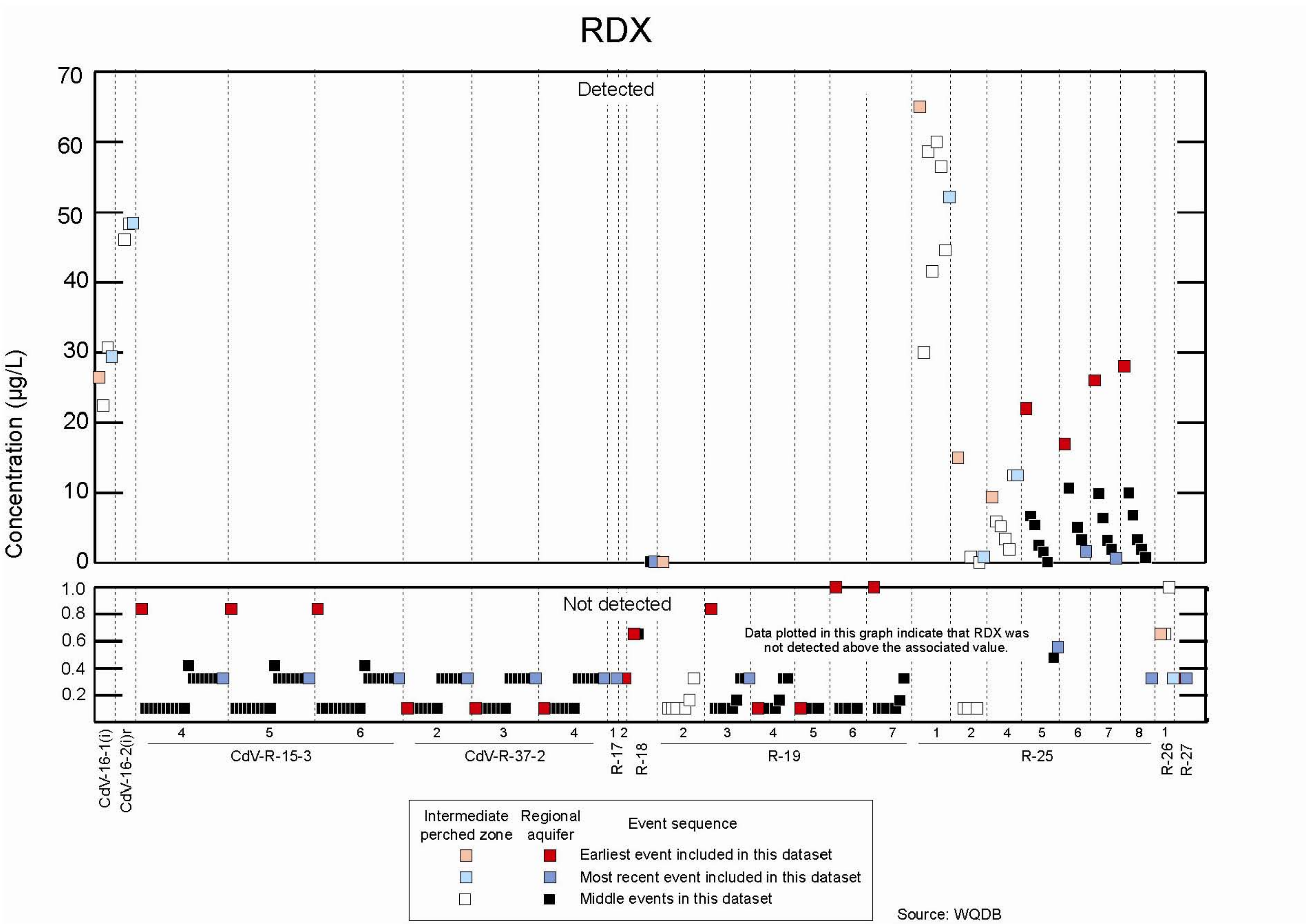


Figure D-32 RDX concentrations in water-quality samples

Table D-1
Key to Plotting Order of Screens in Appendix D Figures

Screen ID[a]	Well	Screen #	Zone of Saturation[b]	Geologic Unit[b]	Primary Drilling Fluid[b]
1	CdV-16-1(i)	1	Intermediate	Otowi Member, Bandelier Tuff	QUIK-FOAM, EZ-MUD
2	CdV-16-2(i)r	2	Intermediate	Puye Formation	QUIK-FOAM, EZ-MUD
3	CdV-R-15-3	4	Regional top	Puye Formation	QUIK-FOAM, EZ-MUD
4	CdV-R-15-3	5	Regional aquifer	Puye Formation	QUIK-FOAM, EZ-MUD
5	CdV-R-15-3	6	Regional aquifer	Puye Formation	QUIK-FOAM, EZ-MUD
6	CdV-R-37-2	2	Regional top	Tschicoma Formation Dacitic Lavas	QUIK-FOAM, EZ-MUD
7	CdV-R-37-2	3	Regional aquifer	Tschicoma Formation Dacitic Lavas	QUIK-FOAM, EZ-MUD
8	CdV-R-37-2	4	Regional aquifer	Tschicoma Formation Dacitic Lavas	QUIK-FOAM, EZ-MUD
9	R-17	1	Regional top	Puye Formation	QUIK-FOAM, EZ-MUD
10	R-17	2	Regional aquifer	Puye Formation	QUIK-FOAM, EZ-MUD
11	R-18	1	Regional top	Puye Formation	QUIK-FOAM, EZ-MUD
12	R-19	2	Intermediate	Puye Formation	QUIK-FOAM, EZ-MUD
13	R-19	3	Regional top	Puye Formation	QUIK-FOAM, EZ-MUD
14	R-19	4	Regional aquifer	Puye Formation	QUIK-FOAM, EZ-MUD
15	R-19	5	Regional aquifer	Unassigned sedimentary deposits	QUIK-FOAM, EZ-MUD
16	R-19	6	Regional aquifer	Unassigned sedimentary deposits	QUIK-FOAM, EZ-MUD
17	R-19	7	Regional aquifer	Unassigned sedimentary deposits	QUIK-FOAM, EZ-MUD
18	R-25	1	Intermediate	Otowi Member, Bandelier Tuff	QUIK-FOAM, EZ-MUD
19	R-25	2	Intermediate	Puye Formation (fanglomerate facies)	QUIK-FOAM, EZ-MUD
20	R-25	4	Intermediate	Puye Formation (fanglomerate facies)	QUIK-FOAM, EZ-MUD
21	R-25	5	Regional top	Puye Formation (fanglomerate facies)	QUIK-FOAM, EZ-MUD
22	R-25	6	Regional aquifer	Puye Formation (fanglomerate facies)	QUIK-FOAM, EZ-MUD
23	R-25	7	Regional aquifer	Puye Formation (fanglomerate facies)	QUIK-FOAM, EZ-MUD
24	R-25	8	Regional aquifer	Puye Formation (fanglomerate facies)	QUIK-FOAM, EZ-MUD
25	R-26	1	Intermediate	Cerro Toledo interval	QUIK-FOAM, EZ-MUD
26	R-27	1	Regional top	Lower Puye Formation	QUIK-FOAM, EZ-MUD

[a] Screen ID—unique identifier assigned to each screen addressed by this report in order to simplify management of information, including the order that data are plotted on the figures in this appendix.

[b] Data source: Tables B-2 and B-4.

Table D-2
Summary of Categories and Indicators of Residual Drilling Effects on Water Quality

Screening Question	Assessment Criteria[a]
Category A Residual Water-Soluble Inorganic Constituents of Drilling Fluids	**Issue: Have residual inorganic constituents been sufficiently removed such that they do not modify transport characteristics of contaminants in the screen interval?**
Are concentrations of the following species all below the upper threshold value representative of maximum background concentrations in groundwater?	• A1—Is Chloride less than 3.8 mg/L (1.75 mg/L)? • A2—Is Fluoride less than 0.53 mg/L (0.23 mg/L)? • A3—Is Phosphate (as P) less than 0.3 mg/L (0.08 mg/L)? • A4—Is Sodium less than 29 mg/L (12 mg/L)? • A5—Is Sulfate less than 6.2 mg/L (4.5 mg/L)? • Gen1—Is pH within the range representative of background groundwater? • Gen2—Is Alkalinity (HCO3+CO3) less than 106 mg/L as CaCO3 (52 mg/L)?
Category B Residual Organic Constituents of Drilling Fluids	**Issue: Have residual organic drilling fluids been sufficiently removed such that groundwater samples are reliable and representative of the groundwater?**
Are concentrations of the following organic indicators all below the threshold value representative of background concentrations in groundwater?	Are <u>all</u> of the following conditions met? • B1—Is acetone either below the method detection limit or less than 5 µg/L? • B2—Is ammonium (as N) less than 0.05 mg/L? • B3—Is total Kjeldahl nitrogen (TKN) less than 0.28 mg/L? • B4—Is total organic carbon (TOC) below 1 mg/L?
Category C Redox Conditions	**Issue: Have oxidizing conditions been re-established such that groundwater samples are reliable and representative of the groundwater?**
Is sulfur present in its oxidized (SO_4) form?	Are all the following conditions met? • C1—Is sulfate present above 0.8 mg/L (1.0 mg/L)? • C2—Is sulfide less than 0.01 mg/L? • C3—Is oxidation-reduction potential (ORP) greater than 0 mV?
Have redox conditions been restored to oxidizing conditions with respect to sulfate, iron, and manganese?	Are all the following conditions met? • C4—Is dissolved iron less than 102 µg/L? • C5—Is dissolved manganese less than 14 µg/L? • C6—Is perchlorate detected above 0.17 µg/L? • C7—Is uranium detected above 0.17 µg/L (0.1 µg/L)? • C8—Is dissolved nickel less than 5 µg/L (3 µg/L)? • C9—Is dissolved molybdenum less than 4 µg/L? • C10—Is dissolved chromium greater than 1 µg/L?
Have redox conditions been restored to oxidizing conditions with respect to nitrate and dissolved oxygen?	Are the following conditions met? • C11—Is nitrate + nitrite detected above 0.1 mg/L as N? • C12—Is dissolved oxygen greater than 2 mg/L?
Category D Changes in adsorption capacities of surface-active minerals	**Issue: Have residual surface-active minerals (primarily bentonite clay) been sufficiently removed such that they do not interfere with transport of contaminants into the screen interval?**
Are water-quality data reliable and representative for general inorganics, metals, and radionuclides that would adsorb onto residual bentonite if present?	• D1—Is the concentration of dissolved strontium above the minimum background concentration for groundwater (45 µg/L, 19 µg/L for perched intermediate zone)?
	• D2—Is the concentration of dissolved uranium above the minimum background concentration (0.17 µg/L for regional aquifer, 0.1 µg/L for perched intermediate zone)?

Table D-2 (continued)

Screening Question	Assessment Criteria[a]
Category D (continued)	• D3—Is the concentration of dissolved barium above the minimum background concentration (4.7 µg/L for regional aquifer, 1.4 µg/L for perched intermediate zone)? • D4—Is the concentration of dissolved zinc above the instrument detection limit? Note: Zn is considered here to be an appropriate indicator species for the adsorption behavior of metal cations and Cs-137, Co-60, Eu isotopes, La-140, and Nd-147.
Category E **Enhanced Precipitation or Dissolution of Carbonate Minerals**	**Issue: Are carbonate minerals stable in the screen interval such that groundwater samples are reliable and representative of predrilling groundwater?**
Are the following indicators of carbonate mineral stability representative of background conditions in groundwater?	• E1—Is dissolved barium within the range considered representative of background groundwater (4.7<x<69 µg/L; 1.4<x<71 µg/L)? • E2 Is dissolved calcium within the range considered representative of background groundwater (8.7<x<25 mg/L; 4.4<x<18 mg/L)? • E3—Is dissolved magnesium within the range considered representative of background groundwater (<6.1 mg/L, <4.8 mg/L)? • E4—Is dissolved strontium within the range considered representative of background groundwater (<180 µg/L; <155 µg/L)? • E5—Is dissolved uranium within the range considered representative of background groundwater (<1.8 µg/L; <0.72 µg/L)? • Gen1—Is pH within the range considered representative of background groundwater? • Gen2—Is alkalinity within the range considered representative of background groundwater (<105 mg/L, <52 mg/L)?
Category F **Metal Corrosion of Well Components**	**Issue: Is the integrity of the well casing and screen intact such that groundwater samples are reliable and representative of the groundwater?**
Are concentrations of the following indicators of stainless steel corrosion all below the threshold value representative of background concentrations in groundwater?	• F1[b]—Is total iron less than 500 µg/L? • F2—If NO to the above question, then is the ratio of total to dissolved iron less than 10? • F3[b]—Is total chromium less than the upper threshold limit for background (10 µg/L, 5 µg/L)? • F4—If NO to the above question, then is the ratio of total chromium to dissolved chromium less than 5? • F5—Is dissolved nickel less than 50 µg/L? • F6[c]—Is turbidity less than 5 NTU?

Note: A particular category of effects is assumed not to be present if the response to each of the test criteria for that category is "yes."

[a] The assessment criteria list the threshold value for the regional aquifer first, followed by a value for the perched intermediate aquifer shown in parentheses, if different. Values are taken from the "Well Screen Analysis Report Revision 1" (LANL 2007, 095043, Tables 4-3a and 4-3b).

[b] This test is a qualifying condition that establishes whether or not the following test criterion is applicable.

[c] This test is neither required nor sufficient to establish the presence or absence of metal corrosion. However, it can determine the level of confidence that one should have in the outcome of the other test criteria.

Appendix E

Evaluation of Location of
Monitoring Well Networks for Technical Area 16

E-1.0 INTRODUCTION

This appendix describes an assessment of the existing regional monitoring well network's ability to detect contaminant plumes from Technical Area (TA) 16, at Los Alamos National Laboratory (the Laboratory), originating beneath Cañon de Valle and S-Site (Martin Spring) Canyon. The objective of the regional monitoring network is to detect at least 95% of the potential plumes before they arrive at a production well.

Contaminant transport through the vadose zone is not explicitly considered in the applied numerical models. Instead, potential contaminants are assumed to migrate vertically from the high-explosives-contaminated canyons to the regional water table. The time required for transport of contaminants through the vadose zone is not taken into account; thus, modeling of contaminant transport begins at the regional water table.

E-2.0 MONITORING WELL NETWORK EVALUATION

For each source region evaluation, contaminant transport in the regional aquifer is modeled from an anticipated breakthrough location defined as the approximate projections of the canyon release zones vertically downward onto the regional water table (Figure E-2.0-1). The simulated plumes migrate in the regional aquifer from these release zones until they intercept a production well. The simulations are performed separately assuming two alternative water-table models, as presented in Figures E-2.0-2a and E-2.0-2b, respectively.

The model simulates potential contaminant transport in the regional groundwater beneath TA-16. Simulated contaminant plumes are computed assuming an instantaneous unit-mass source at each of the two breakthrough areas (Figure E-2.0-1). The model calculates arrival times of the peak concentration at monitoring and production wells and accounts for dilution and dispersion within the upper portion of the regional aquifer. In recognition of uncertainty in key model parameters, a Monte Carlo analysis based on stratified Latin Hypercube sampling is performed using 1000 sets of parameter input values for 1000 simulations. The results consist of 1000 possible contaminant-plume distributions in the regional aquifer for each of the two canyon source regions. The results are used to evaluate the monitoring efficiency for locations of the existing and proposed regional wells in and near TA-16.

The groundwater-flow model is two-dimensional and assumes that most contaminants flow laterally along the top of the water table (see section 4 of this document for further discussion). The potential effects of pumping of water-supply wells on contaminant transport are simulated by defining a variable and uncertain capture radius for each pumping well. This capture radius varied from 25 to 1000 m. Thus, while the hydraulic effects of pumping are not explicitly stated in this model, the potential for water-supply wells to capture nearby plumes is included.

No analytical detection limits or regulatory health limits are used in this analysis because the numerical model assumes unit-mass at the regional water table. Therefore, the results do not represent actual contaminant concentrations, nor do they indicate whether any of the plumes have concentrations that would exceed regulatory standards or analytical detection limits. Instead, the results are useful for assessing monitoring-well locations relative to plume trajectories and arrival at supply wells.

E-3.0 MONITORING METRICS

An efficient monitoring location must intercept a contaminant plume before it arrives at one of the production wells. There are a number of possible scenarios for each simulation (or plume).

- *Nondetects* are plumes that reach a production well without being detected by a monitoring well.
- *Successful detections* are plumes that first reach a monitoring well and then reach a production well.
- *Failed detections* are plumes that first reach a production well and then later arrive at a monitoring well.
- *False positives* are plumes that are detected by the monitoring wells but that never reach a production well.
- *Detected plumes* are plumes that arrive at the monitoring wells. They include successful detections and failed detections.

Finally, *efficiency* is computed as the number of successful detections divided by the number of simulated plumes (1000 plumes). The metric applied in this analysis to estimate the different scenarios is called a total breakthrough curve test. This test is the most conservative in a range of tests tried for these types of analyses.

E-4.0 TOTAL BREAKTHROUGH CURVE TEST

To estimate monitoring efficiency, the model-predicted contaminant breakthrough concentration curves at the monitoring wells and the water-supply wells are compared using a test called a total breakthrough curve test. The test can be defined as follows. If at any given moment in time t_i, the concentration at a given water-supply well $C_W(t_i)$ is lower than the maximum concentrations already observed up to the given moment t_i at a given monitoring well $C_{Rmax}(t_i)$, the production well is protected by the monitoring wells, and the test is successful. Examples of cases in which a given monitoring well successfully protects a given water supply well are presented in Figure E-4.0-1a. If at a given moment in time t_i, the concentration at a given water-supply well $C_W(t_i)$ is higher than the maximum concentration already observed up to the given moment t_i at a given monitoring well $C_{Rmax}(t_i)$, the production well is not protected by the monitoring well, and the test has failed. Examples of cases in which a given monitoring well fails to protect a given water-supply well are presented in Figure E-4.0-1b. The total breakthrough curve test can be expressed mathematically as follows:

$$C_{R\max}(t_i) = \max\left[C_{R\max}(t_1), C_{R\max}(t_2), \ldots, C_{R\max}(t_i)\right];$$

$$\mathrm{F}_{RW} = \begin{cases} 1 & \text{if } C_{R\max}(t_i) > C_W(t_i) \quad \forall i \\ 0 & \text{if } C_{R\max}(t_i) \le C_W(t_i) \quad \exists i \end{cases}$$

F_{RW} is the test function and is equal to 1 if the test is successful or equal to 0 it fails. This test is repeated for all pairs of water-supply and monitoring wells. For a given water-supply well, if at least one test is successful, the monitoring network is successfully protecting this well; if all the tests fail, the monitoring network is not successfully protecting this water-supply well. The analysis for all the sources is performed separately.

There are many other possible ways to compare breakthrough concentration curves at the monitoring wells and the water-supply wells. A wide range of possible tests have been explored, but the total breakthrough curve test is the most conservative.

E-5.0 RESULTS

The efficiencies of the regional monitoring network to detect plumes before they arrive at the production wells are shown in Tables E-5.0-1, E-5.0-2 and E-5.0-3 for Cañon de Valle (Tables E-5.0-1 and E-5.0-2) and for S-Site (Martin Spring) Canyon sources (Table E-5.0-3). The two tables for the Cañon de Valle source are associated with the two alternative water-table models (Figures E-2.0-2a and E-2.0-2b). There are no substantial differences between the results for S-Site (Martin Spring) Canyon using the two alternative water-table models. Thus, only the results associated with the first model are presented. Different combinations of subsets of monitoring wells are also evaluated to determine the network efficiency, and the results are presented in Tables E-5.0-1 through E-5.0-3.

In the case of Cañon de Valle and water-table model 1, a monitoring network consisting of all of the wells analyzed (Table E-5.0-1) has an efficiency of detection ranging from 97.6% (for production well PM-2) to 100% (for production wells O-1, O-4, PM-1, PM-3, and PM-5). A similar analysis for water-table model 2 (Table E-5.0-2) yields efficiencies ranging from 95.1% (in PM-2) to 100% (in O-1, O-4, PM-1, PM-3, and PM-5). The analysis of the S-Site (Martin Spring) Canyon source (Table E-5.0-3) yields efficiencies ranging from 99.8% (in PM-2) to 100% (in all the other production wells). A network consisting of only three downgradient wells (CdV-16-3i, CdV-R-15-3, CdV-R-37-2) yields low probabilities of plume detection in the Cañon de Valle scenarios. In all scenarios, PM-2 is the well that is the least protected. Adding R-18 to the network improves the efficiency, but the detections are below 95% for PM-2 (Cañon de Valle scenarios) and PM-4 (CdV model 2). Adding wells R-17, R-19, and R-27 produces satisfactory protection in all the cases.

Details of efficiency calculations related to individual monitoring wells are presented for each of the three scenarios in Tables E-5.0-4, E-5.0-5, and E-5.0-6, respectively. The tables include many of the R-wells, all the test wells, and the wells drilled specifically to evaluate contaminant migration from TA-16 [CdV-16-3(i), CdV-R-15-3 and CdV-R-37-2]. Detection efficiencies range from a low of 0% (for several wells located in the eastern portions of the Laboratory) to 97.99 % (at R-25). Other than R-25 (under the water table 1 scenario), the highest contributor to the detection efficiency is CdV-R-15-3 (ranging from 68.8% to 80.8%). The most significant contributors to the protectiveness of these networks are wells CdV-R-15-3, R-18, R-17 and R-19 for the Cañon de Valle-sourced plumes (Tables E-5.0-4 and E-5.0-5) and CdV-16-3(i), CdV-R-37-2, R-19, CdV-R-15-3, and R-27 for the S-Site (Martin Spring) Canyon-sourced plumes (Table E-5.0-6). It is interesting to note the sensitivity of the calculated protectiveness of near-field wells such as CdV-16-3(i), R-18 and R-25 to the two different water table scenarios.

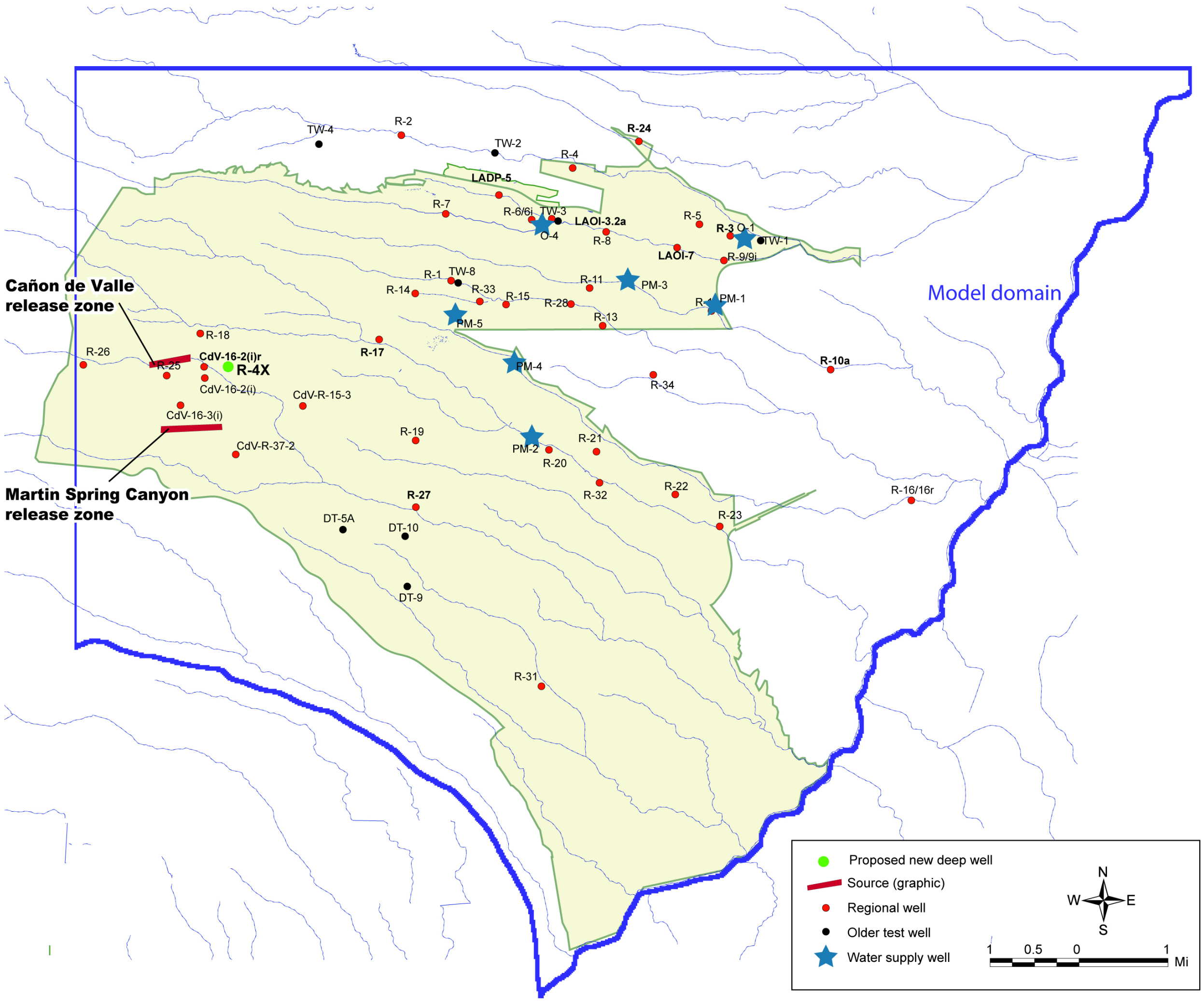
In the case of the CdV source, all of these networks containing both near-field (R-18, CdV-16-3i, CdV-R-15-3, and CdV-R-37-2) and far-field (R-17, R-19, and R-27) monitoring wells provide network efficiencies greater than 95% for all of the production wells (Table E-5.0-1 through E-5.0-3). However, these larger networks include monitoring wells greater than 2 mi downgradient of the TA-16 sources (Figure E-2.0-1); they will not detect releases of contaminants from TA-16 until long after those releases have passed the TA-16 boundary, making containment of such plumes difficult. Mean travel times to detection in all of the wells are presented in Table E-5.0-7 through E-5.0-9.

Hence, an additional goal for a TA-16 monitoring well network is to detect contamination leaving that site with sufficient lead time (greater than ~20 yr) before the plume impinges on the production wells. Review of Tables E-5.0-7 through E-5.0-9 suggests that a near-field well network consisting of wells R-18, CdV-R-15-3, CdV-16-3(i), and CdV-R-37-2 would detect contaminants released from Cañon de Valle in ~10 yr, and a similar network would detect contaminants released at S-Site (Martin Spring) Canyon in less than ~10 yr. This estimate is significantly more rapid than the approximately 20-30 yr required to reach the nearest production wells from a CdV source (e.g., the mean travel time to PM-5 is 24 yr for a CdV source) or an S-Site (Martin Spring) source (e.g., the mean travel time to PM-4 is 27 yr for an S-Site [Martin Spring] Canyon source).

An efficiency analysis of this near-field monitoring network yields slightly lower (as low as 92%) detection efficiencies (Table E-5.0-2) for both a Cañon de Valle source and an S-Site (Martin Spring) Canyon source. The lowest values are 91.7% for PM-2 for a Cañon de Valle-sourced plume. The near-field network protects the S-Site (Martin Spring) Canyon-sourced plume with an efficiency greater than 95%. A 95% detection efficiency is a conservative goal for a network efficiency; thus, an evaluation of an additional well has been performed.

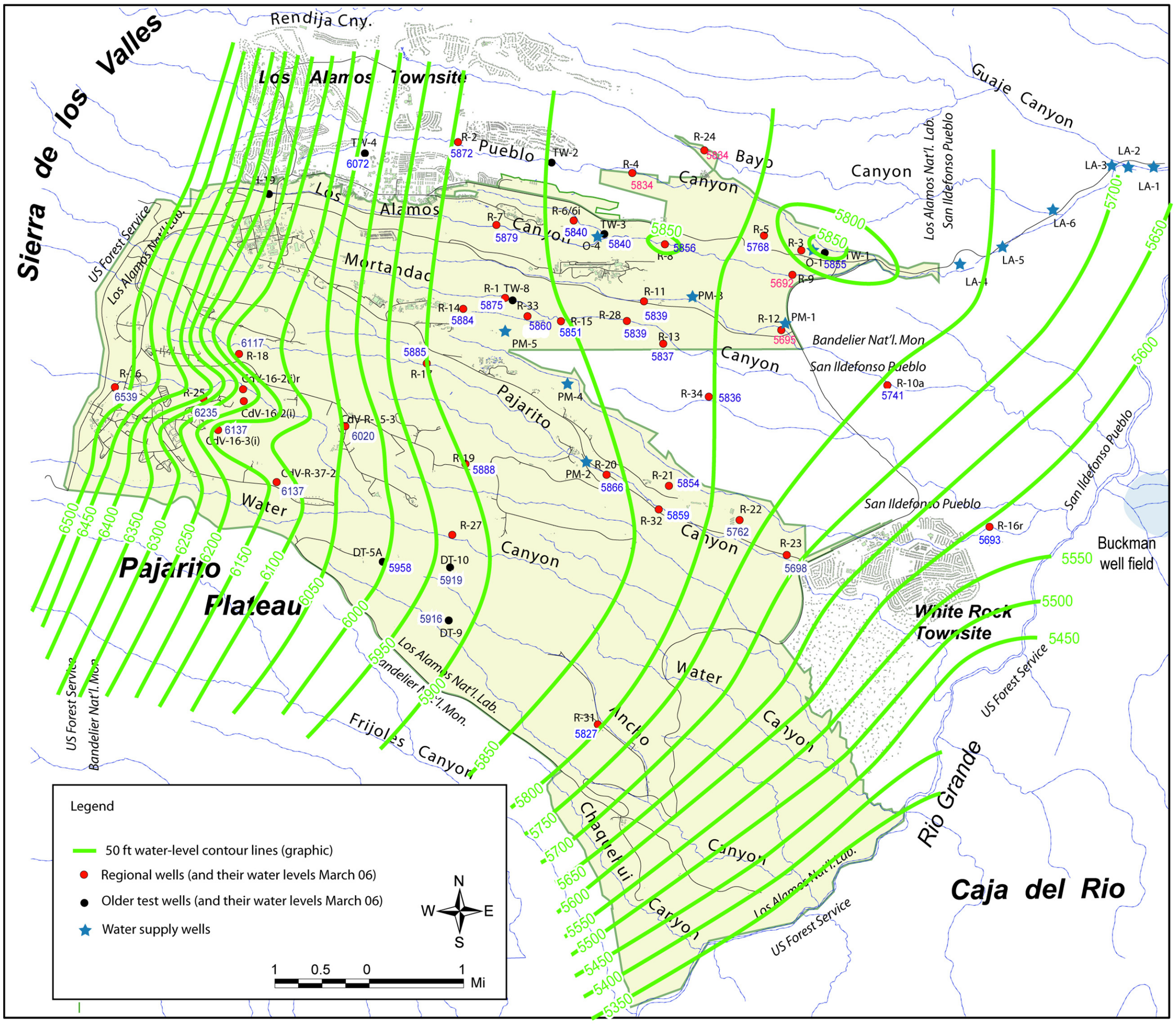
A new well has been added to the network (R-4X with coordinates x=493427 m and y=537854 m in the state plane coordinate system). The location of the new well is shown in Figure E-2.0-1. The new well substantially improves the monitoring efficiency, and a network consisting of only five near-field monitoring wells (CdV-16-3i, CdV-R-15-3, CdV-R-37-2, R-18, and R-4X) can detect all the plumes originating at the CdV source with a greater than 95% efficiency long before they are potentially captured by the production wells.

Addition of this single well northeast of CdV-R-15-3 (Figure E-2.0-1) and its inclusion in a near-field well network (Tables E-5.0-1 and E-5.0-2) yields a detection efficiency of greater than 95%. Mean travel times to this well are under 5 yr. Such near-field well networks provides high-detection efficiencies (>95%) with rapid (less than ~10 yr) travel times to the monitoring wells.



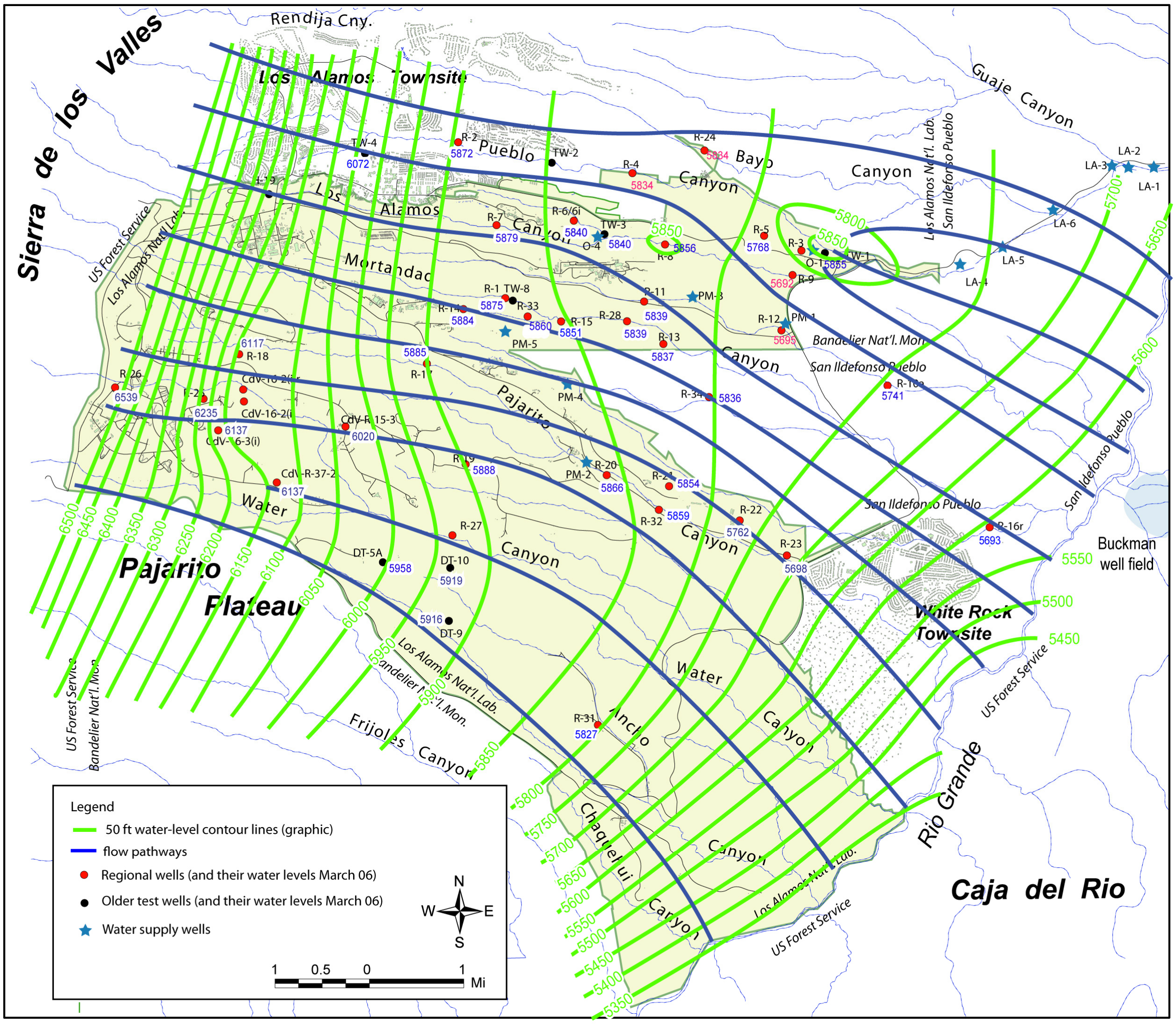
Note: Figure also shows regional head gradients and plume-flow lines.

Figure E-2.0-1 Locations of monitoring wells, test wells, and production wells in and around Los Alamos



(a)

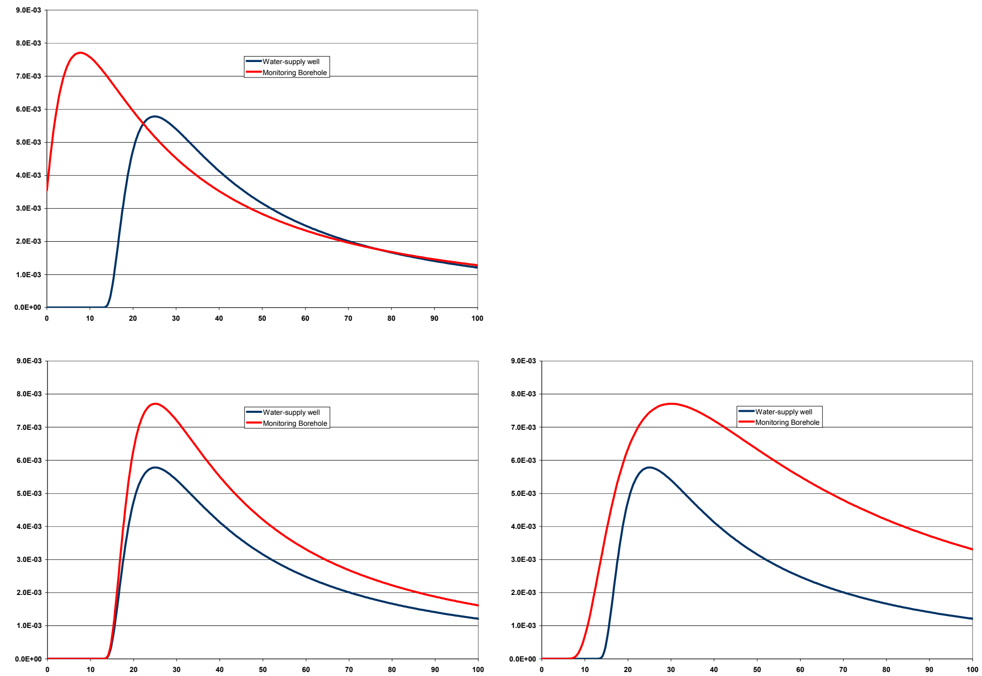
Figure E-2.0-2 Contour maps of average water-table elevations in March 2006; it is assumed that water level at R-25 is defined by either (a) Screen 5 or (b) Screen 4



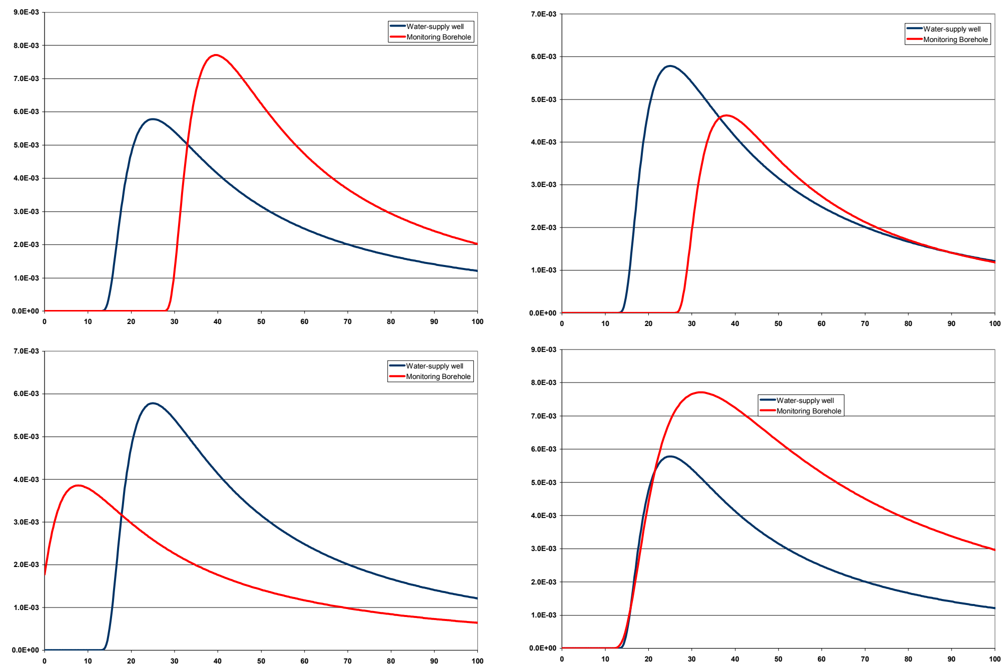
(b)

Note: The second map (b) also shows the potential flow directions. The data values in red are uncertain (after LANL 2007, 095364).

Figure E-2.0-2 (continued) Contour maps of average water-table elevations in March 2006; it is assumed that water level at R-25 is defined by either (a) Screen 5 or (b) Screen 4



(a)



(b)

Figure E-4.0-1 Possible relations between breakthrough curves at a water-supply well and a monitoring borehole. Plot (a) shows example cases of monitoring successes because at any given moment of time the concentration at the water-supply well is lower than the concentrations at the monitoring well already observed up to that moment. Plot (b) shows example cases of monitoring failures because at a given moment of time the concentration at the water-supply well exceeds the concentrations at the monitoring well already observed up to that moment.

Table E-5.0-1
Efficiency for the Regional Monitoring Network to Detect Plumes Originating at Cañon de Valle Source Area Before Being Observed at the Water-Supply Wells for the Case of Water-Table Model 1

O-1	O-4	PM-1	PM-2	PM-3	PM-4	PM-5	Comment
1	1	1	0.976	1	0.987	1	All wells
0.997	0.943	0.958	0.898	0.93	0.903	0.912	Only CdV wells
0.999	0.991	0.976	0.949	0.974	0.964	0.977	Only CdV wells and R-18
1	1	0.999	0.994	0.999	0.994	0.999	Only CdV wells and R-18, R-17, R-19
1	1	0.999	0.995	0.999	0.994	0.999	Only CdV wells and R-18, R-17, R-19, R-27
1	1	1	1	0.999	1	1	Only CdV wells, R-18 and a new well

Table E-5.0-2
Efficiency for the Regional Monitoring Network to Detect Plumes Originating at Cañon de Valle Source Area Before Being Observed at the Water-Supply Wells for the Case of Water-Table Model 2

O-1	O-4	PM-1	PM-2	PM-3	PM-4	PM-5	Comment
1	1	1	0.951	1	0.969	1	All wells
0.998	0.935	0.921	0.785	0.896	0.817	0.872	Only CdV wells
0.999	0.993	0.973	0.917	0.974	0.949	0.985	Only CdV wells and R-18
1	1	0.993	0.984	0.997	0.989	1	Only CdV wells and R-18, R-17, R-19
1	1	0.998	0.996	0.999	0.996	1	Only CdV wells and R-18, R-17, R-19, R-27
1	1	0.995	0.98	0.998	0.994	0.999	Only CdV wells, R-18 and a new well

Table E-5.0-3
Efficiency for the Regional Monitoring Network to Detect Plumes Originating at S-Site (Martin Spring) Canyon Source Area Before Being Observed at the Water-Supply Wells for the Case of Water-Table Model 1

O-1	O-4	PM-1	PM-2	PM-3	PM-4	PM-5	Comment
1	1	1	0.998	1	1	1	All wells
1	1	1	0.996	1	1	1	Only CdV wells
1	1	1	0.996	1	1	1	Only CdV wells and R-18

Table E-5.0-4
Details of Efficiency Calculations for the
Cañon de Valle Source Area and Water-Table Model 1

Monitoring Well	Total Detections	Successful Detections	Failed Detections	False Positives	Efficiency
CdV-16-3i	790	503	287	0	50.50%
CdV-R-15-3	937	805	129	3	80.82%
CdV-R-37-2	338	99	239	0	9.94%
DT-05	214	85	127	2	8.53%
DT-09	155	75	77	3	7.53%
DT-10	284	142	139	3	14.26%
R-01	418	3	415	0	0.30%
R-11	704	0	704	0	0.00%
R-12	805	0	805	0	0.00%
R-13	852	0	852	0	0.00%
R-14	582	53	529	0	5.32%
R-15	611	0	611	0	0.00%
R-16	524	0	523	1	0.00%
R-17	823	443	380	0	44.48%
R-18	791	522	268	1	52.41%
R-19	956	479	477	0	48.09%
R-20	969	30	938	1	3.01%
R-21	908	53	852	3	5.32%
R-22	871	134	734	3	13.45%
R-23	936	109	824	3	10.94%
R-25	1000	976	21	3	97.99%
R-27	471	209	259	3	20.98%
R-28	726	0	726	0	0.00%
R-31	141	52	88	1	5.22%
R-32	873	134	736	3	13.45%
R-33	518	0	518	0	0.00%
R-34	946	1	944	1	0.10%
R-35	832	0	832	0	0.00%
R-36	865	0	865	0	0.00%
R-4X	983	964	16	3	96.79%

Table E-5.0-5
Details of Efficiency Calculations for the
Cañon de Valle Source Area and Water-Table Model 2

Monitoring Well	Total Detections	Successful Detections	Failed Detections	False Positives	Efficiency
CdV-16-3i	787	38	749	0	3.82%
CdV-R-15-3	951	720	228	3	72.29%
CdV-R-37-2	314	43	271	0	4.32%
DT-05	210	51	157	2	5.12%
DT-09	154	38	113	3	3.82%
DT-10	273	97	173	3	9.74%
R-01	369	3	366	0	0.30%
R-11	676	0	676	0	0.00%
R-12	779	1	778	0	0.10%
R-13	829	1	828	0	0.10%
R-14	518	50	468	0	5.02%
R-15	558	0	558	0	0.00%
R-16	511	1	509	1	0.10%
R-17	785	385	400	0	38.65%
R-18	786	233	553	0	23.39%
R-19	952	457	495	0	45.88%
R-20	962	33	929	0	3.31%
R-21	907	62	842	3	6.22%
R-22	866	109	754	3	10.94%
R-23	921	112	806	3	11.24%
R-25	1000	244	753	3	24.50%
R-27	466	161	302	3	16.16%
R-28	681	0	681	0	0.00%
R-31	139	54	83	2	5.42%
R-32	863	120	740	3	12.05%
R-33	459	0	459	0	0.00%
R-34	919	0	918	1	0.00%
R-35	790	0	790	0	0.00%
R-36	840	0	840	0	0.00%
R-4X	984	940	41	3	94.38%

Table E-5.0-6
Details of Efficiency Calculations for
Plumes Originating at S-Site (Martin Spring) Canyon Source

Monitoring Well	Total Detections	Successful Detections	Failed Detections	False Positives	Efficiency
CdV-16-3i	665	569	62	34	57.13%
CdV-R-15-3	759	685	42	32	68.78%
CdV-R-37-2	936	805	63	68	80.82%
DT-05	643	451	137	55	45.28%
DT-09	434	207	176	51	20.78%
DT-10	649	439	149	61	44.08%
R-01	28	2	26	0	0.20%
R-11	108	0	108	0	0.00%
R-12	297	0	297	0	0.00%
R-13	338	0	338	0	0.00%
R-14	35	5	30	0	0.50%
R-15	45	1	44	0	0.10%
R-16	173	2	170	1	0.20%
R-17	141	55	85	1	5.52%
R-18	27	23	4	0	2.31%
R-19	873	763	89	21	76.61%
R-20	891	68	812	11	6.83%
R-21	883	72	789	22	7.23%
R-22	908	193	671	44	19.38%
R-23	934	147	733	54	14.76%
R-25	130	114	14	2	11.45%
R-27	788	573	148	67	57.53%
R-28	116	0	116	0	0.00%
R-31	381	145	186	50	14.56%
R-32	917	193	690	34	19.38%
R-33	16	0	16	0	0.00%
R-34	397	0	396	1	0.00%
R-35	213	0	213	0	0.00%

Table E-5.0-7
Average Travel Times from the Cañon de Valle
Source Area to the Wells in the Case of Water-Table Model 1

Well	Number of Detected Plumes	Mean Travel Time [yr]
O-1	156	98.4
O-4	693	254.4
PM-1	850	78.1
PM-2	994	57.5
PM-3	887	51.0
PM-4	965	28.6
PM-5	868	23.9
CdV-16-3i	787	1.4
CdV-R-15-3	951	11.0
CdV-R-37-2	314	6.9
DT-05	210	15.2
DT-09	154	18.4
DT-10	273	14.6
R-01	369	132.1
R-02	57	197.1
R-03	69	107.3
R-04	48	173.4
R-05	82	128.8
R-06	149	308.3
R-07	131	275.8
R-08	189	88.4
R-09	201	80.2
R-10a	275	108.7
R-11	676	47.6
R-12	779	74.5
R-13	829	36.4
R-14	518	85.0
R-15	558	57.8
R-16	511	248.9
R-17	785	32.2
R-18	786	4.8
R-19	952	65.6
R-20	962	107.9
R-21	907	134.9
R-22	866	121.5
R-23	921	158.5

Table E-5.0-7 (continued)

Well	Number of Detected Plumes	Mean Travel Time [yr]
R-24	27	152.3
R-25	1000	0.2
R-26	38	0.4
R-27	466	18.7
R-28	681	33.2
R-31	139	26.8
R-32	863	124.6
R-33	459	106.2
R-34	919	145.5
R-35	790	55.4
R-36	840	74.3
R-4X	984	1.5
TW-1	65	100.0
TW-2	55	221.2
TW-3	398	224.9
TW-4	37	37.8

Table E-5.0-8
Average Travel Times from the Canon de Valle Source Area to the Wells in the Case of Water-Table Model 2

Well	Number of Detected Plumes	Mean Travel Time [yr]
O-1	156	98.3896
O-4	693	254.407
PM-1	850	78.055
PM-2	994	57.5147
PM-3	887	50.9902
PM-4	965	28.6123
PM-5	868	23.9086
CdV-16-3i	787	1.37346
CdV-R-15-3	951	11.0013
CdV-R-37-2	314	6.94263
DT-05	210	15.2292
DT-09	154	18.4427
DT-10	273	14.6267
R-01	369	132.111
R-02	57	197.067
R-03	69	107.342
R-04	48	173.384
R-05	82	128.79
R-06	149	308.289
R-07	131	275.849
R-08	189	88.3653
R-09	201	80.2183
R-10a	275	108.652
R-11	676	47.553
R-12	779	74.5495
R-13	829	36.3754
R-14	518	85.0411
R-15	558	57.8123
R-16	511	248.912
R-17	785	32.19
R-18	786	4.78025
R-19	952	65.6323
R-20	962	107.914
R-21	907	134.931
R-22	866	121.527
R-23	921	158.517

Table E-5.0-8 (continued)

Well	Number of Detected Plumes	Mean Travel Time [yr]
R-24	27	152.323
R-25	1000	0.181206
R-26	38	0.391789
R-27	466	18.7036
R-28	681	33.2052
R-31	139	26.8008
R-32	863	124.562
R-33	459	106.151
R-34	919	145.528
R-35	790	55.3886
R-36	840	74.2963
R-4X	984	1.53872
TW-1	65	99.9964
TW-2	55	221.177
TW-3	398	224.902
TW-4	37	37.7966
TW-8	370	126.386

Table E-5.0-9
Average Travel Times from the
S-Site (Martin Spring) Canyon Source Area
to the Wells in the Case of Water-Table Model 1

Well	Number of Detected Plumes	Mean Travel Time [yr]
O-1	17	51.8
O-4	142	220.1
PM-1	475	52.4
PM-2	923	52.1
PM-3	394	36.0
PM-4	611	27.3
PM-5	222	34.4
CdV-16-3i	665	3.0
CdV-R-15-3	759	6.6
CdV-R-37-2	936	4.9
DT-05	643	19.1
DT-09	434	25.4
DT-10	649	13.0
R-01	28	158.9
R-02	4	277.6
R-03	5	137.3
R-04	3	55.0
R-05	9	52.4
R-06	11	329.9
R-07	15	252.6
R-08	12	119.2
R-09	25	78.2
R-10a	88	72.9
R-11	108	37.5
R-12	297	54.5
R-13	338	24.5
R-14	35	173.9
R-15	45	80.5
R-16	173	268.0
R-17	141	69.4
R-18	27	12.8
R-19	873	52.5
R-20	891	72.6
R-21	883	112.4
R-22	908	107.0

Table E-5.0-9 (continued)

Well	Number of Detected Plumes	Mean Travel Time [yr]
R-23	934	147.0
R-24	0	0.0
R-25	130	13.5
R-26	15	0.3
R-27	788	15.5
R-28	116	23.9
R-31	381	50.2
R-32	917	96.9
R-33	16	274.9
R-34	397	137.0
R-35	213	38.9
TW-1	3	70.5
TW-2	8	212.7
TW-3	36	212.2
TW-4	1	7.2
TW-8	26	147.6