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Interim Facility-Wide Groundwater Monitoring Plan for the 2015 Monitoring Year, October 2014–September 2015

Los Alamos
NATIONAL LABORATORY
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Prepared by the Environmental Programs Directorate

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EXECUTIVE SUMMARY

This Interim Facility-Wide Groundwater Monitoring Plan (hereafter, the Interim Plan) fulfills a requirement of the Compliance Order on Consent (hereafter, the Consent Order). Los Alamos National Laboratory (the Laboratory) will collect and analyze groundwater and surface water samples at specific locations and for specific constituents to fulfill the requirements of the Consent Order. Groundwater-level data will also be collected because they are critical to understanding groundwater occurrence and movement. Four types of water are monitored: base flow (persistent surface water), alluvial groundwater, intermediate-perched groundwater, and regional aquifer groundwater. This Interim Plan is updated annually and submitted to the New Mexico Environment Department (NMED) for its approval. The 2015 Interim Plan applies to the 2015 monitoring year from October 1, 2014, to September 30, 2015. The monitoring conducted under this plan is designed to enhance the understanding of groundwater within and beneath the Laboratory. These data are used for characterization purposes to support corrective measures work conducted at numerous sites around the Laboratory and to support ongoing operations. The monitoring is conducted both inside and outside current Laboratory boundaries. Monitoring within current Laboratory boundaries takes place in seven major watershed groupings: Los Alamos Canyon/Pueblo Canyons, Sandia Canyon, Mortandad Canyon, Pajarito Canyon, Water Canyon/Cañon de Valle, Ancho/Chaquehui/Frijoles Canyons, and White Rock Canyon/Rio Grande.

Most of the monitoring wells discussed in the Interim Plan are assigned to area-specific monitoring groups related to project areas that may be located in more than one watershed. Area-specific monitoring groups are defined for Technical Area 54 (TA-54), TA-21, Material Disposal Area (MDA) AB, MDA C, Chromium Investigation, and the TA-16 260 Outfall. Locations not included within one of these six area-specific monitoring groups are assigned to the General Surveillance monitoring group.

Monitoring outside the Laboratory boundaries is conducted in areas (1) where Laboratory operations have occurred in the past (e.g., Guaje and Rendija Canyons) or (2) that historically have not been affected by Laboratory operations. To ensure water leaving the Laboratory does not pose an unacceptable risk to human and ecological receptors, this plan also includes monitoring in areas downgradient of and outside Laboratory boundaries (e.g., the Rio Grande and springs in White Rock Canyon).

Monitoring locations were initially derived from Table XII-5 of the Consent Order, but the current list of monitoring locations represents the most recent annual updates to the 2005 Interim Plan. The locations, analytical suites, and frequency of monitoring reflect the technical and regulatory status of each area-specific monitoring group.

The monitoring data collected under this plan are published in periodic monitoring reports submitted to NMED, and analytical results are made available to the public in the Intellus New Mexico database (available at www.intellusnm.com). In addition, groundwater data collected by the Laboratory are reviewed monthly, and constituents exceeding any of the seven screening criteria laid out in Section IV.A.3.g of the Consent Order are reported monthly to the NMED Hazardous Waste Bureau.

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1.0 INTRODUCTION

The monitoring year (MY) 2015 Interim Facility-Wide Groundwater Monitoring Plan (hereafter, the Interim Plan) for Los Alamos National Laboratory (LANL or the Laboratory) fulfills the groundwater monitoring requirement in Section IV.A.3.b of the Compliance Order on Consent (the Consent Order). Section IV.A.3.b requires the Interim Plan to be updated annually and anticipates that monitoring plans for specific areas will change as the groundwater investigation objectives in Section IV.A.3.a are met. This Interim Plan applies to MY2015, from October 1, 2014, to September 30, 2015.

Groundwater monitoring has been conducted at the Laboratory for over 60 yr, starting with U.S. Geological Survey (USGS) water-supply studies in 1945 and Laboratory groundwater-quality monitoring in 1949. The first groundwater-monitoring network consisted of water-supply wells, several observation wells, and springs. The monitoring network continued to evolve through the years as additional wells were installed during various environmental investigations, primarily in the shallow alluvial systems, as potential monitoring points.

Between 1997 and 2005, the Laboratory implemented a sitewide hydrogeologic characterization program, described in the Laboratory's "Hydrogeologic Workplan" (LANL 1998, 059599). The primary objective of this characterization program was to refine the Laboratory's understanding of the area's hydrogeologic systems and to improve its ability to design and implement an integrated sitewide groundwater monitoring plan. Building upon information obtained from this and other programs, the Laboratory has subsequently refined the monitoring-network design and implementation through a series of monitoring-well network evaluation reports and the delineation of area-specific monitoring groups. The Consent Order was modified in April 2012 to provide the option for a site-specific groundwater monitoring plan in place of a watershed-specific monitoring plan, where appropriate.

This plan consists of nine sections, including this introduction, with supporting appendixes. Sections 2 through 7 describe the monitoring and site activities conducted in six area-specific monitoring groups: Technical Area 21 (TA-21); Chromium Investigation; Material Disposal Area (MDA) C; MDAs G, H, and L at TA-54; TA-16 260 Outfall; and MDA AB. Section 8 describes general surveillance monitoring in seven major watersheds or watershed groupings: Los Alamos/Pueblo Canyons, Sandia Canyon, Mortandad Canyon, Pajarito Canyon, Water Canyon/Cañon de Valle, the combined watersheds of Ancho/Chaquehui/Frijoles Canyons, and White Rock Canyon/Rio Grande. Section 9 includes a list of references cited in this report and the map data sources.

Appendix A is the list of acronyms and abbreviations used in the report, a metric conversion table, and the definitions of data qualifiers. Appendix B summarizes the methods and procedures used to conduct monitoring and the management of investigation-derived waste (IDW). Appendix C summarizes the objectives of the monitoring performed and the sampling frequencies and analytical suites for each monitoring group. Appendix D summarizes how field quality assurance (QA)/quality control (QC) results are used and the types of corrective actions that may be taken to address exceedances of target measures for each QA/QC sample type. Appendix E assesses the reliability of water-quality data collected from specific monitoring-network wells. Appendix F presents geologic cross-sections of the watersheds.

Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the New Mexico Environment Department (NMED) in accordance with U.S. Department of Energy (DOE) policy.

1.1 Purpose

The Interim Plan will address monitoring to

- determine the fate and transport of known legacy-waste contaminants,
- detect the arrival of potential contaminants in groundwater from previous releases,
- evaluate efficacies of corrective action remedies,
- support proposed corrective measures,
- meet groundwater discharge permit requirements, and
- meet the monitoring requirements of DOE Orders 436.1 and 458.1.

These objectives collectively assist the Laboratory in determining any potential adverse impacts to surface water and groundwater resulting from Laboratory operations.

In addition, monitoring produces data required to evaluate risk and to assess regulatory compliance. Although the Interim Plan does not specifically address how the data collected will be used in those evaluations, the design of the monitoring network is based on conceptual models of potential sources, hydrogeologic pathways, and receptors. The data collected are intended to be useful in meeting reporting requirements under the Consent Order.

This Interim Plan focuses on monitoring activities at the area-specific monitoring groups for TA-54, TA-21, MDA AB, MDA C, TA-16 260 Outfall, and Chromium Investigation. Monitoring of alluvial wells and springs that show a history of nondetects, that are located near other springs being monitored, or that are located in outlying areas away from Laboratory operations has been significantly reduced in recent years under the focused monitoring approach introduced in the 2011 Interim Plan, Revision 1 (LANL 2011, 208811).

The current monitoring approach includes the following key elements to ensure groundwater protection.

- *The spatial coverage of the current monitoring program will be maintained*. The monitoring footprint in perched-intermediate and regional wells at all monitoring groups is retained.
- *The selection of monitoring frequency and appropriate analytes is tailored to each specific area.* The monitoring frequency for each monitoring group was selected based on the contamination status at each site, the rate of change in contaminant concentrations, the historical monitoring data, and the hydrogeological conditions governing contaminant fate and transport for the area.
- *The groundwater monitoring program continues to be protective of the regional aquifer beneath the Pajarito Plateau and of water-supply wells.* Monitoring of key sentinel wells is maintained.
- *Monitoring of key alluvial monitoring wells and springs will continue.* The alluvial wells were selected at locations downgradient of ongoing Laboratory operations. Continued monitoring of these alluvial wells will allow detection of contaminant releases, should any occur.

Section 1.6 summarizes basic sets of analytical suites and frequencies for locations assigned to area-specific monitoring groups or to general surveillance monitoring in each watershed.

Updates to monitoring within each watershed or monitoring group, including changes in monitoring frequency, analytical suites, and monitoring locations, are based on the following:

- Conceptual models in watershed investigation reports (IRs)
- Completed canyons investigations whose results show contributions to risk from surface water are low

- Changes to the monitoring-well networks over time, including the addition of newly installed monitoring wells, the rehabilitation and conversion of multiscreen wells, and the removal of wells recently plugged and abandoned or planned for plugging and abandonment in the near-term
- Changes in well performance
- Monitoring objectives for the area-specific monitoring groups
- Programmatic data requirements to support decisions regarding corrective actions
- Regulatory direction specified in NMED approval letters related to earlier interim plans

1.2 Scope

The Interim Plan describes the objectives for monitoring, the locations of sampling stations, the frequency of sampling, the field measurements taken at each location, and the analytical suites included in the monitoring plan for each watershed or monitoring group.

Four occurrences of water are monitored in this plan:

- *Base flow*—persistent surface water that is maintained by precipitation, snowmelt, effluent, and other sources
- *Alluvial groundwater*—water within the alluvium in the bottom of the canyons
- *Perched-intermediate groundwater*—localized saturated zones within the unsaturated zone
- *Regional groundwater*—deep, laterally continuous groundwater beneath the Pajarito Plateau

Groundwater will be monitored routinely by collecting samples at wells and springs and by analyzing them for specific constituents. Groundwater monitoring refers to collecting data not only for water-quality analysis but also for water-level measurements. Water-level data are critical to understanding groundwater occurrence and movement and the responses of groundwater levels to recharge and to pumping of water-supply wells.

Surface water at the Laboratory is divided into the following three flow types:

- *Base flow*—persistent, but not necessarily perennial, stream flow. This stream flow is present for periods of weeks or longer. The water source may be effluent, springs, or shallow groundwater in canyons.
- *Snowmelt*—flowing water that is present because of melting snow. This type of water often may be present for several weeks or more (persistent) but may not be present at all in some years.
- *Storm runoff*—flowing water that is present in response to rainfall. These flow events are generally short-lived, with flows lasting from less than an hour to several days.

In some cases, depending on weather conditions, each flow type may be collected at a single location within a time span of a few days. At other times, the flow may represent a combination of these types.

Storm runoff and snowmelt monitoring is not addressed in this plan but rather through the National Pollutant Discharge Elimination System (NPDES) Individual Permit and Multi-Sector General Permit and under DOE Orders 436.1 and 458.1 for surveillance. Base flow (persistent water) and, in some cases, persistent flow derived from snowmelt are monitored under the Interim Plan.

Monitoring under the Interim Plan will take place in area-specific monitoring groups within seven major watershed groupings: Los Alamos/Pueblo Canyons, Sandia Canyon, Mortandad Canyon, Pajarito Canyon, Water Canyon/Cañon de Valle, the combined watersheds of Ancho/Chaquehui/ Frijoles Canyons, and White Rock Canyon. Monitoring outside the Laboratory boundary is conducted to collect baseline data in areas that have been affected by past Laboratory operations (e.g., Guaje and Rendija Canyons) or that have not been affected by Laboratory operations. To ensure water leaving the Laboratory boundaries does not pose an unacceptable risk, this plan also includes monitoring in areas off-site that could potentially to be impacted by the Laboratory (e.g., the Rio Grande and springs in White Rock Canyon). Figure 1.2-1 shows the areas included in this Interim Plan.

The Interim Plan is updated annually to incorporate new information collected during the previous year. Locations, analytes, and sampling frequencies are evaluated and updated, as appropriate, to ensure adequate monitoring and monitoring objectives for the individual monitoring groups continue to be met. Information gained through characterization efforts, aquifer test results, water-level monitoring, network assessments, and water-quality data may be used to refine the monitoring plan for each monitoring group. In addition, the need for sampling of analytes previously eliminated from sampling in various monitoring groups may be reevaluated during the development of the annual updates to the Interim Plan. Regulatory input from NMED is also considered.

1.3 Reporting

Analytical results obtained from groundwater, base-flow, and spring samples collected under this Interim Plan are provided in periodic monitoring reports (PMRs) in accordance with Section IV.A.6 of the Consent Order. Each PMR includes all available watershed monitoring data, along with the analytical results from the previous three monitoring events for each location, including groundwater, base-flow, and spring analytical results. PMRs will be submitted quarterly on November 30, February 28, May 31, and August 31. PMR submittals will include period monitoring events concluded 120 d before the above submittal dates.

The Laboratory reviews analytical data from all groundwater monitoring conducted under the Consent Order that were received during the previous month and notifies NMED monthly of any exceedances of seven criteria in accordance with Section IV.A.3.g, Notifications, of the Consent Order.

Analytical results provided in PMRs and monthly notifications are also made available to the public at the Intellus New Mexico database (available at www.intellusnm.com). The results are subject to the protocol stipulated in the memorandum of understanding (MOU) regarding the release of monitoring data collected from locations on Pueblo of San Ildefonso lands.

Reporting summary:

- Fifteen PMRs will be prepared and submitted annually in support of the groundwater sampling.
- Results for wells included in Ancho General Surveillance monitoring group (R-31 screens 4 and 5, sampled biennially) will be reported in MDA AB PMR, as approved by NMED.
- Results for locations included in the Water General Surveillance monitoring group (Between E252 and Water at Beta and WCO-1r, sampled annually) will be reported in the TA-16 260 PMR, as approved by NMED.
- Samples for well 03-B-13 in the Pajarito General Surveillance monitoring group are collected semiannually. The results from the sampling event not coinciding with the annual sampling for the rest of the monitoring group will be reported in the TA-54 PMR, as approved by NMED.

- Electronic reports will be submitted to the Pueblo of San Ildefonso and Los Alamos County.
- Electronic reports and quarterly letter reports will be submitted to the City of Santa Fe.

1.4 Regulatory Context

This Interim Plan fulfills groundwater monitoring requirements of the Consent Order as described in section 1.0. In addition to the Consent Order, the Laboratory is required to perform groundwater monitoring to satisfy other regulatory requirements, as summarized below. The Laboratory has an integrated approach to monitoring groundwater, and many of the other regulatory requirements discussed below are fulfilled through the implementation of the monitoring performed under the Interim Plan.

1.4.1 DOE Environmental Protection Programs

Groundwater monitoring has been conducted in compliance with DOE orders related to environmental protection. DOE Orders 436.1 and 458.1 require an environmental management system at DOE facilities that includes surveillance and reporting. Surveillance monitoring has been conducted at the Laboratory since 1949; the Laboratory took over the surveillance monitoring program in 1970. Currently, the Laboratory conducts groundwater-surveillance monitoring at wells located within the Laboratory boundary and at off-site locations. These wells include alluvial, perched-intermediate, and regional aquifer wells. Some off-site monitoring is performed under cooperative agreements with Los Alamos County, which owns and operates water-supply wells within and near the Laboratory, and with the City of Santa Fe. Additional monitoring is performed under the annually updated Appendix A of the “Memorandum of Understanding for Environmental Monitoring” among DOE, the Bureau of Indian Affairs, and the Pueblo of San Ildefonso. The results of surveillance monitoring are reported in annual environmental reports and in the Intellus New Mexico database. The environmental reports contain descriptions of the surveillance monitoring network, key results and trends, and the QA/QC program.

1.4.2 Hazardous Waste Facility Permit

Section III.W of the Consent Order describes the integration of the current and any future Hazardous Waste Facility Permits with the Consent Order. Parallel supporting language is contained in Part 11.1 of the current permit. Groundwater monitoring for solid waste management units (SWMUs) and areas of concern (AOCs) and the regulated units at TA-54 are addressed through the monitoring requirements of this Interim Plan.

1.5 Integration of Groundwater Monitoring at the Laboratory

All groundwater monitoring under the Interim Plan is conducted as an integrated activity that uses the same operating procedures, field sampling and analytical contracts, and data-management systems. For chemical analysis of water samples, the Laboratory uses commonly accepted analytical methods called for under federal statutes (such as the Clean Water Act) and approved by the U.S. Environmental Protection Agency (EPA). The Laboratory is responsible for obtaining analytical services that support monitoring activities. Samples for laboratory analysis are submitted to accredited contract laboratories. The analytical laboratory statement of work provides contract laboratories the general QA guidelines and includes specific requirements and guidelines for analyzing water samples. The contract laboratories are required to establish method detection limits (MDLs) and practical quantitation limits (PQLs) for target analytes.

Appendix B includes summaries of the procedures followed to measure water levels and collect water samples (sections B-1.0 and B-2.0) and to measure field parameters (section B-3.0). Field procedures follow guidelines from USGS water sample collection methods and industrial standards common to environmental sample collection and field measurements. The analytical methods, PQLs, and applicable background or screening levels used for each analyte are listed in section B-4.0. The management of IDW is discussed in section B-5.0.

1.6 Approach to Monitoring Network Design

The interim nature of this monitoring plan reflects an evolving monitoring network at the Laboratory. The groundwater data collected under this plan are used for subsurface characterization, groundwater monitoring network evaluation, and supporting corrective measures. A Consent Order modification, which was approved by NMED on April 20, 2012, allows periodic groundwater monitoring to be conducted on an area-specific basis instead of a watershed basis, where appropriate.

For the 2010 Interim Plan, monitoring groups were established to address monitoring requirements for locations within specific project areas (LANL 2010, 109830). These monitoring groups are shown in Plate 1 and include the following:

- TA-21
- TA-54
- MDA C
- Chromium Investigation
- TA-16 260
- MDA AB

Monitoring locations outside of the six area-specific monitoring groups delineated above are included in the General Surveillance monitoring group.

The analytical suites and frequency of monitoring for each monitoring group reflect the state of knowledge for a given project area, including what contaminants have been released and the nature and extent of the contaminants released. Recommendations for the analytical suites were determined by evaluating past Laboratory operations, past monitoring results, and direction from NMED.

Table 1.6-1 presents applicable standards for surface water and groundwater quality, which are used as screening levels for evaluating monitoring results. Table 1.6-2 lists analytes, field preparation (filtered or unfiltered samples), and analytical methods used by contract laboratories for samples collected under the Interim Plan. Table 1.6-3 summarizes analytical suites and sampling frequencies for each type of sampling location (e.g., base flow, alluvial, intermediate, regional, or springs) within each area-specific monitoring group. Table 1.6-4 summarizes the analytical suites and sampling frequencies for General Surveillance monitoring locations (that is, locations not assigned to area-specific monitoring groups). In this sampling table, the northern locations (including Los Alamos/Pueblo, Sandia, and Mortandad Canyons) and the southern locations (including Pajarito, Water/Cañon de Valle, Frijoles, Ancho, and Chaquehui Canyons) are distinguished because the analytical suites differ, based primarily on the presence of high explosives (HE) in the southern canyons and their absence in the northern canyons. The analytical suites and frequencies are tailored to each watershed and sampling location based on the adequacy of the data record, the status of investigations and maturity of the conceptual model, the nature of watershed contaminant sources, and the history of detections, as documented in more detail in sections 2 to 8.

Tables 1.6-3 and 1.6-4 also list characterization suites and sampling frequencies for newly installed, reconfigured, or rehabilitated wells (wells installed, reconfigured or rehabilitated on or after October 1, 2013). As a rule, new wells are sampled for at least four rounds for the monitoring group–specific characterization suites for new wells presented in Tables 1.6-3 and 1.6-4. No new wells have been installed since October 1, 2013.

Exceptions to the analytical suites and sampling frequencies presented in Tables 1.6-3 and 1.6-4 occur in some cases. These exceptions may be the result of a number of factors such as additional regulatory or permit requirements or sampling commitments outlined in the MOU with the Pueblo of San Ildefonso.

Exceptions to the default analytical suites and sampling frequencies may also be made for wells affected by residual drilling or construction products, recently rehabilitated wells, and other wells known to produce nonrepresentative water-quality data or for which the reliability of the data has not yet been established or may be questioned (Appendix E). Additionally, some wells may be monitored for a limited set of constituents tailored to address monitoring objectives or performance issues with the well.

Appendix C summarizes the sampling frequencies and analytical suites for each monitoring group and explains how the monitoring objectives are protective of groundwater.

Low-MDL volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) refer to analyses of 24 VOCs and SVOCs using lower MDLs as discussed in the Laboratory's letter to NMED, dated April 4, 2013, in its "Response to Approval with Modifications for the 2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1" (LANL 2013, 239555). For 9 of 24 constituents discussed in the letter, lower MDLs have been achieved using other analytical methods. In MY2014, which began on October 1, 2013, the Laboratory began to characterize select VOC and SVOC constituents at low MDLs. During MY2015, the remaining locations will be sampled for the 9 Low-MDL VOCs and SVOCs.

For the remaining 15 of 24 constituents discussed in Comment 10 of NMED's approval with modifications (NMED 2012, 520410), the Laboratory is working with its contract laboratory to identify suitable analytical methods for analysis of VOCs and SVOCs. Once suitable analytical methods are identified, the Laboratory will begin collection of samples for analysis of these constituents.

1.7 Sampling Frequency and Schedule

The Interim Plan proposes monitoring frequencies for each monitoring group as described in the sampling tables in sections 2 through 8 (Tables 2.4-1 through 8.3-2). The sampling frequency for the current MY is designated by Q for quarterly, S for semiannually, and A for annually. Some suites may be sampled less frequently than annually based on their limited mobility (for example, polychlorinated biphenyls [PCBs], and dioxins/furans) or based on historical data indicating the contaminants are not present in a given monitoring group. In these cases, the sampling frequency may be designated B for biennially (every 2 yr), T for triennially (every 3 yr), or V (for quinquennially every 5 yr). The monitoring year during which the samples will be collected is listed in the superscript following the B, T, or V sampling frequency designator.

Sampling under this Interim Plan will be conducted during MY2015, from October 2014 to September 2015. Table 1.7-1 presents a proposed sampling schedule. Following submittal of this Interim Plan to NMED, a finalized sampling schedule for each monitoring group or watershed will be developed to ensure the monitoring frequency is met during the implementation year of the plan. The Consent Order requires all monitoring wells within a watershed be sampled within 21 d of the start of the groundwater sampling event.

For this Interim Plan, monitoring groups for project areas are the primary organizational structure for sampling, and sampling campaigns for project area monitoring groups will be completed within 21 d. Monitoring of White Rock Canyon locations within the General Surveillance group will be completed within 21 d, while other General Surveillance locations will be sampled throughout the year during sampling campaigns for nearby monitoring groups.

1.8 Water-Level Monitoring

Most monitoring wells are equipped with pressure transducers to measure and record water levels to aid in understanding the hydrologic system. As a general rule, where possible, water levels will be monitored with pressure transducers in all wells that are sampled for the Interim Plan, provided the well has room for both the dedicated sampling system and the pressure transducer. Pressure transducers are typically set to record on an hourly basis. Manual water-level measurements are also collected on a regular basis to verify pressure transducer data.

The water-level data collected using the automated pressure transducers address the requirement of Section IX.B.2.h.i of the Consent Order to measure groundwater levels in all wells in a given watershed within 24 h. These data are available for any 24-h period and, therefore, meet the requirement for these measurements to be completed across all watersheds within 14 d of the commencement of the specified water-level measuring event, as required by the Consent Order. Water levels are monitored in some wells and/or well screens not sampled under the Interim Plan to collect data to develop and validate the conceptual models (Table 1.8-1). Groundwater levels are also monitored in Los Alamos County water-supply wells in cooperation with Los Alamos County utilities personnel and in the Buckman well field in cooperation with the City of Santa Fe.

Water level or discharge is either measured continuously or at each sampling event. Continuous monitoring for groundwater refers to the measurement of groundwater levels by a transducer placed in a well and programmed to collect groundwater-level measurements at highly frequent intervals (e.g., every 60 min daily throughout the year). Spring or base-flow discharge is measured during sampling.

1.9 Wells That Are Historically Dry

Generally, historically dry wells are no longer monitored for water levels, except for a few wells in key locations (Table 1.8-1). Wells that intermittently show water (in response to large snowmelt years or precipitation events) may continue to be monitored for water levels using transducers and may be sampled if sufficient water is present during their respective watershed's sampling campaign and if the wells are included within the sampling tables in the Interim Plan. New wells that do not yield sufficient water for sampling may still be retained in the monitoring plan to evaluate potential wetting responses and temporal changes in water levels.

1.10 Deviations to the Sampling Requirements

Occasionally, monitoring locations scheduled for a sampling campaign cannot be sampled for various reasons. In these cases, NMED is notified of deviations from the Interim Plan in the PMRs, in accordance with the requirements of Sections XI.D.7 and XI.D.10 of the Consent Order.

The following approach will be implemented when samples cannot be collected per the requirements of the Interim Plan.

- Locations that are dry or that do not have adequate water for sampling during the scheduled sampling campaign will be sampled during the next scheduled sampling event for those locations. Locations that are consistently dry from year to year will be removed from the Interim Plan.
- Locations that have limited water will be sampled according to a prioritized sampling suite prepared for the monitoring group or sampling location.
- If a location cannot be sampled because of pump or equipment failure, every effort will be made to repair the equipment, and the location will be sampled during the next scheduled sampling event for the location.
- If a location cannot be safely sampled because of changes in field conditions, the situation will be discussed with NMED personnel, and alternative sampling arrangements will be considered to ensure sampling can be conducted safely.
- If a location cannot be sampled within the 21-d sampling window because of access issues (for example, as a result of road damage from flooding or inaccessibility because of snow), the Laboratory will work to reestablish access and to conduct sampling during the sampling campaign. If access cannot be reestablished during the campaign, the location will be sampled during the next scheduled sampling event for the location.

2.0 TA-21 MONITORING GROUP

2.1 Introduction

The TA-21 monitoring group is located in and around TA-21 and is primarily located in upper Los Alamos Canyon (Figure 2.1-1). The group includes monitoring wells completed in the perched-intermediate groundwater and in the regional aquifer.

TA-21 is located on the mesa north of Los Alamos Canyon, which is joined by DP Canyon, east of TA-21. TA-21 consists of two historical operating areas, DP West and DP East, both of which produced liquid and solid radioactive wastes. The operations at DP West included plutonium processing, while the operations at DP East included the production of weapons initiators and tritium research. A total of 155 SWMUs and AOCs are located in TA-21. Immediately adjacent to the west end of TA-21, to the south in Los Alamos Canyon, is TA-02, the location of the former Omega West nuclear reactor. A total of 38 SWMUS and AOCs are located in TA-02.

2.2 Background

The occurrence of surface water and alluvial, perched-intermediate, and regional groundwater in Los Alamos Canyon is discussed in detail in section 7.2 of the Los Alamos and Pueblo Canyons IR (LANL 2004, 087390).

In upper Los Alamos Canyon, perennial flow originates from springs and interflow through hillslope soils. The downgradient extent of perennial flow varies but generally terminates in the upper portions of Los Alamos Canyon west of TA-41. The remainder of upper Los Alamos Canyon down to the confluence with Pueblo Canyon is characterized by intermittent surface-water flow that is seasonally dependent. Within the vicinity of TA-21, surface water occurs predominantly as intermittent flow in Los Alamos and DP Canyons. Intermittent surface-water flows generally occur during runoff associated with thunderstorms and snowmelt.

In the vicinity of TA-21, alluvial groundwater occurs in Los Alamos Canyon and in stretches of DP Canyon. DP Canyon is typical of other dry canyons (Birdsell et al. 2005, 092048) based on its small drainage area and low-elevation headwaters. However, it previously received effluent discharges from operations at TA-21 [SWMU 21-011(k)]. It currently receives surface runoff from paved parking lots and roadways from within the Los Alamos townsite. These townsite runoff sources contribute to locally persistent alluvial groundwater beneath parts of the canyon floor, specifically the portion next to TA-21. There, alluvial deposits are thin (approximately 2 m [6 ft]) and are periodically recharged by surface-water flows that reach this part of the canyon. Surface water infiltrates into the canyon bottom alluvial sediments until its downward movement is impeded by strata of lower permeability, typically welded tuff at the top of unit Qbt 2 of the Tshirege Member. Despite the episodic nature of surface-water flow and thin nature of the alluvial deposits, transducer readings at alluvial well LAUZ-1 indicate the alluvium in this part of the canyon was continuously saturated from January 2008 to January 2010 (Koch and Schmeer 2010, 108926), suggesting the underlying welded tuffs are an effective perching horizon that inhibits deeper percolation.

Appendix D of the “Technical Area 21 Groundwater and Vadose-Zone Monitoring Well Network Evaluation and Recommendations” report (LANL 2010, 109947) describes known occurrences of perched-intermediate water beneath Los Alamos and Pueblo Canyons. Perched-intermediate zones nearest TA-21 are shown on the geologic cross-sections presented in Appendix F.

Perched-intermediate groundwater beneath Los Alamos and Pueblo Canyons results from percolation of surface water and alluvial groundwater derived from snowmelt and seasonal rainfall. Surface water in Pueblo Canyon was previously augmented by effluent released from the Pueblo Canyon wastewater treatment plant (WWTP) from 1951 to 1991 and the Central WWTP from 1947 to 1961. Perched-intermediate groundwater beneath lower Pueblo Canyon includes contributions of canyon-floor effluent percolation from the Bayo WWTP that operated from 1963 to 2007 and the Los Alamos WWTP that began to operate in 2007.

The most significant perched-intermediate groundwater in the vicinity of TA-21 occurs within the Guaje Pumice Bed and the underlying Puye Formation beneath Los Alamos Canyon. Near TA-21, saturated thicknesses for these occurrences range from about 9 ft at LADP-3 to more than 31 ft at LAOI-3.2a. The depth to perched-intermediate groundwater ranges from 124 ft to 746 ft below ground surface (bgs). These perched groundwater occurrences are probably part of a larger integrated system that extends over 3.5 mi along the axis of Los Alamos Canyon from H-19 to LAOI-3.2 and LAOI-3.2a and may extend locally to the south (Appendix F).

Based on these observations, it appears an important control of intermediate-zone groundwater flow in the vicinity of TA-21 is the contact between the Guaje Pumice Bed and the underlying Puye Formation. Structure contours indicate the downdip direction for the base of the Guaje Pumice Bed is towards the south, southeast, and southwest in the vicinity of TA-21. The control exerted on groundwater flow by the Guaje Pumice Bed suggests perched water beneath Los Alamos Canyon should move generally southward away from TA-21.

The occurrence of thicker perched-intermediate zones in the eastern part of Los Alamos Canyon may be the result of enhanced percolation where the canyon floor is underlain by Cerros del Rio basalts rather than by the Bandelier Tuff. Because the Cerros del Rio basalt does not extend as far west as the developed portion of TA-21, it is unlikely the eastern perched zones of Los Alamos Canyon extend beneath the TA-21 area. To date, no perched-intermediate groundwater has been encountered during drilling on DP Mesa.

The regional aquifer includes confined and unconfined zones. The shallow portion of the regional aquifer is predominantly unconfined, and the deeper portion of the aquifer is predominantly confined. Groundwater flow in the shallow portion of the regional aquifer generally follows the gradient of the water table. The deep portion of the regional aquifer is predominantly under confined conditions that are affected by water-supply pumping on the Pajarito Plateau.

Near TA-21, the upper surface of the regional aquifer is located in the Puye Formation and in the Santa Fe Group. The depths to water range from 707 ft to 1159 ft bgs (Koch and Schmeer 2011, 201566). The regional aquifer beneath the east end of DP Mesa occurs at a depth of 1159 ft bgs, based on water levels measured in well R-6. Shallow regional groundwater in the vicinity of TA-21 generally flows to the east-northeast.

Contaminant Sources and Distributions

The primary sources of contaminants near the TA-21 monitoring group include the SWMU 21-011(k) outfall, the adsorption beds and disposal shafts at MDA T, the adsorption beds at MDA U, the former Omega West reactor cooling tower (SWMU 02-005) and outfall, DP West, and waste lines and sumps. Other potential sources include DP East and leakage from an underground diesel fuel line as well as past releases from the former Omega West Reactor.

Mobile contaminants, such as tritium, nitrate, and perchlorate, released at the SWMU 21-011(k) outfall have dispersed by surface water and alluvial groundwater down DP and Los Alamos Canyons. They are present in perched-intermediate groundwater near the north boundary of TA-21 and DP Canyon (at well R-6i), near the confluence of DP and Los Alamos Canyons (at wells LAOI-3.2, and LAOI-3.2a), farther down Los Alamos Canyon (at LAOI-7 and R-9i), and beneath Mesita de Los Alamos (at R-53i).

The lower reach of DP Canyon is the likely location of percolation for mobile contaminants such as tritium, nitrate, and perchlorate detected in perched groundwater at R-6i, LAOI-3.2, and LAOI-3.2a. Percolation at the confluence with DP Canyon (near wells LAOI-3.2/LAOI-3.2a) may be further enhanced by surface water runoff and alluvial groundwater in Los Alamos Canyon, contributing to the deeper perched-intermediate zones observed beneath the confluence of the two canyons. The zones of perched-intermediate groundwater occur within the Guaje Pumice Bed and the underlying Puye Formation near the confluence of the two canyons.

Contaminant concentrations are at background levels in regional groundwater monitoring wells near TA-21 (e.g., R-6, R-8, and R-64), suggesting deep percolation through the vadose zone, including migration from perched groundwater, does not reach the regional aquifer near TA-21. This observation is also supported by the absence of tritium activity in the regional screen in R-7, although the absence of nitrate and perchlorate detections at this location is not conclusive because of reducing conditions in the screened interval that may be attributed to residual organic drilling products. The regional aquifer near former Test Well (TW) 3 shows levels of contamination above background, but this may be related to leakage around the well casing from the absence of annular seal in this older well. TW-3 was plugged and abandoned in early 2012. Tritium and perchlorate are slightly elevated in the regional aquifer at R-9, located farther down Los Alamos Canyon. These far-field contaminants may have originated at SWMU 21-011(k).

2.3 Monitoring Objectives

The monitoring objectives for the TA-21 monitoring group presented in this Interim Plan are based in part on the results and conclusions presented in the Los Alamos and Pueblo Canyons IR (LANL 2004, 087390) as well as on the NMED-approved “Los Alamos and Pueblo Canyons Groundwater Monitoring Well Network Evaluation and Recommendations, Revision 1” (LANL 2008, 101330).

Sampling over the last few years has generated a substantial data set from perched-intermediate and regional groundwater wells located in and next to Los Alamos Canyon. Data from these wells indicate the importance of lateral migration of perched-intermediate groundwater and regional groundwater flow directions. This information can lead to a groundwater monitoring domain that may extend beyond the footprint of a watershed where the initial release occurred.

Monitoring for TA-21 is focused on perched-intermediate and regional wells surrounding the TA-21 area that monitor for potential releases from mesa-top sites and the fate of mobile constituents historically released into DP Canyon from SWMU 21-011(k). The key constituents detected in nearby perched-intermediate and regional groundwater wells include nitrate, perchlorate, and tritium. Base-flow and alluvial groundwater wells near and downgradient of TA-21 are not part of the TA-21 monitoring group because the source(s) of constituents detected in these wells is terminated or controlled and residual concentrations are stable, declining, or no longer present.

2.4 Scope of Activities

Active monitoring locations in the TA-21 monitoring group include intermediate-perched groundwater wells and regional groundwater wells, which are shown in Figure 2.1-1. All the monitoring locations are in the Los Alamos Canyon/Pueblo Canyon watershed.

Table 2.4-1 presents sampling locations, the rationale for these locations, analytical suites, and frequencies for the TA-21 monitoring group. Analytical suites and frequencies assigned to individual locations listed in Table 2.4-1 generally follow the high-level monitoring design presented in Table 1.6-3 for the TA-21 monitoring group. These analytical suites and frequencies are based on the results of applicable IRs, previous reviews of monitoring data, and direction from NMED as stated in its approval with modifications for the 2011 Interim Plan, Revision 1 (NMED 2012, 520410).

The majority of the wells in the TA-21 monitoring group are sampled annually. The objectives for the sampling frequency and analytical suites are presented in Table C-1.

3.0 CHROMIUM INVESTIGATION MONITORING GROUP

3.1 Introduction

The Chromium Investigation monitoring group is located in Sandia and Mortandad Canyons (Figure 3.1-1). Monitoring focuses on the characterization and fate and transport of chromium contamination in perched-intermediate groundwater and within the regional aquifer. The distribution of wells in the monitoring group also addresses historical releases from Outfall 051, which discharged from the Radioactive Liquid Waste Treatment Facility (RLWTF) in the Mortandad Canyon watershed. No effluent has been released at Outfall 051 since November 2010.

Sandia Canyon heads on Laboratory property within TA-03 at an elevation of approximately 7300 ft and trends east-southeast across the Laboratory, Bandelier National Monument, and San Ildefonso Pueblo. Sandia Canyon empties into the Rio Grande in White Rock Canyon at an elevation of 5450 ft. The area of Sandia Canyon watershed is approximately 5.5 mi^2. The head of the canyon is located on the Pajarito Plateau at TA-03. Perennial stream flow and saturated alluvial groundwater conditions occur in the upper and middle portions of the canyon system because sanitary wastewater and cooling tower effluent discharge to the canyon from operating facilities. A wetland of approximately 7 acres has developed as a result of the wastewater and cooling tower effluent discharge. Sandia Spring is located in lower Sandia Canyon near the Rio Grande. TAs located in the Sandia Canyon watershed include TA-03, TA-53, TA-60, TA-61, TA-72, and former TA-20. A total of 264 SWMUs and AOCs are located within the portions of these TAs in the Sandia Canyon watershed.

Mortandad Canyon is an east-to-southeast trending canyon that heads on the Pajarito Plateau near the main Laboratory complex at TA-03 at an elevation of 7380 ft (Figure 1.2-1). The drainage extends about 9.6 mi from its headwaters to its confluence with the Rio Grande at an elevation of 5440 ft. The canyon crosses Pueblo of San Ildefonso land for several miles before joining the Rio Grande (LANL 1997, 056835). The Mortandad Canyon watershed is located in the central portion of the Laboratory and covers approximately 10 mi^2. Pueblo of San Ildefonso lies immediately next to a portion of the Laboratory's eastern boundary and includes the eastern end of Mortandad Canyon. The Mortandad Canyon watershed contains several tributary canyons that have received contaminants released during Laboratory operations. The most prominent tributary canyons include Ten Site Canyon, Pratt Canyon, Effluent Canyon, and Cañada del Buey. TAs located in the Mortandad Canyon watershed include TA-03, TA-05, TA-35, TA-48, TA-50, TA-52, TA-55, TA-60, TA-63, former TA-04, and former TA-42. A total of 257 SWMUs and AOCs are located within the portions of these TAs in the Mortandad Canyon watershed.

3.2 Background

Sources of surface water in the Sandia watershed are currently dominated by effluent releases. Effluent water releases to Sandia Canyon have occurred since the early 1950s and continue today, with the primary source being treated sanitary wastewater and steam plant discharges at Outfall 001 and lesser sources being cooling tower blowdown. Data from 2007 and 2008 indicate the NPDES outfalls contribute approximately 75% of the total surface-water flow in Sandia Canyon, with storm water runoff and snowmelt contributing the remainder (LANL 2008, 102996, Appendix C).

The Sanitary Effluent Reclamation Facility (SERF) began further treating of the sanitary wastewater stream in July 2012 to meet two goals (1) to reduce PCB levels to meet stricter effluent limits and (2) to supply recycled water (rather than potable water) for cooling use at the Strategic Computing Complex. These changes were implemented during 2012 and 2013, and have resulted in decreased effluent volumes and lower PCB concentrations (meeting the stricter NPDES discharge limits) in effluent released to the Sandia watershed. The long-term discharges and runoff support a wetland near the head of Sandia Canyon. Persistent surface flow occurs through the wetland and into the narrow bedrock portion of the upper canyon. Typically, surface water flows past gage E124 only during times of high levels of alluvial groundwater, increased effluent volume, or storm water-runoff events.

Surface water in Mortandad Canyon is intermittent and occurs infrequently in lower Mortandad Canyon. Effluent releases from the RLWTF have historically supported surface water in middle Mortandad Canyon, but those contributions have ceased. The lower canyon is characterized by a broad flat canyon floor with an indistinct drainage channel. It contains thick alluvial deposits (up to 30 m [100 ft]) that rapidly accommodate the rare surface-water flows reaching this part of the canyon. Surface water is rarely observed below the confluence with Ten Site Canyon.

Alluvial groundwater in Sandia Canyon is recharged daily by surface-water flow, largely supplied by effluent from Outfall 001 and periodically by storm water. This groundwater generally accumulates in the lower part of the alluvial deposits that fill the canyon bottom, most often perching on or within shallow bedrock units. The alluvial groundwater body extends farther downcanyon (roughly more than 1 km [0.6 mi] farther east) than do the daily stream-flow events. Alluvial saturation occurs approximately between alluvial wells SCA-2 and well SCA-5, with the most persistent perched alluvial groundwater occurring between alluvial wells SCA-2 and SCA-4. SCA-2 has been dry during recent sampling events.

In Mortandad Canyon, alluvial groundwater storage is limited in the upper reaches but increases downcanyon in wider, thicker alluvial deposits (LANL 2006, 094161). Small outfall and runoff sources in upper Effluent Canyon create localized areas of surface water and possibly minor alluvial groundwater. The extent of alluvial saturation in Mortandad Canyon is historically variable and depends primarily on variations in runoff and effluent volume; the extent has decreased recently with the decrease of effluent from RLWTF.

A zone of perched-intermediate groundwater occurs within the Puye Formation on top of the Cerros del Rio basalt between well SCI-1 and borehole SCC-4 where it ranged from approximately 1 ft to 25 ft thick, and generally thinned to the west. This perched zone in Sandia Canyon is probably recharged by percolation of alluvial groundwater through the underlying bedrock units before perching on top of the basalt. The perching layer for this perched-intermediate groundwater is the top of the Cerros del Rio basalt. A local depression occurs in the upper basalt surface in the vicinity of nearby well SCI-2, also located in Sandia Canyon, which may control the accumulation of perched water in this area. The top of the Cerros del Rio basalt also acts as a perching horizon at perched-intermediate wells MCOI-4 and MCOBT-4.4 in Mortandad Canyon, indicating this contact has favorable characteristics for perching groundwater over a wide area.

A second perched-intermediate zone is penetrated by well SCI-2 within fractured lavas and interflow breccias in the lower part of the Cerros del Rio basalt. The thickness of the perched zone is uncertain but ranges between 45 ft and 100 ft. The lava flows hosting the perched groundwater at well SCI-2 were deposited over a south- to south-southeast-dipping surface that developed on top of the Puye Formation. The nature of the perching horizon at the base of these basalts is poorly understood but may include relatively impermeable sedimentary rock of the Puye Formation and clay-altered flow-base volcanic sediment at the base of the Cerros del Rio basalt that occurs at a depth of 629 ft (LANL 2009, 105296).

The lack of perched water in the Cerros del Rio basalt at wells R-28 and R-42 in Mortandad Canyon may indicate the perched groundwater drained from the basalts and percolated into the underlying Puye Formation, eventually reaching the regional aquifer in the area between wells SCI-2 and R-28/R-42.

During drilling of well R-10a, perched-intermediate groundwater was encountered between 330-ft and 370-ft depth in silts and arkosic sands sandwiched between thick massive lavas of the Cerros del Rio basalt. The water level in this zone was 304 ft, indicating the groundwater was confined. Well R-10a and its companion well R-10 were completed in the regional aquifer. However, perched-intermediate groundwater was not encountered at regional wells R-11, R-35a, R-35b, R-36, R-28, R-44, R-45, R-61, or R-62, suggesting the perched zones at wells SCI-1 and SCI-2 are not connected with those observed in R-12 and R-10/R-10a. The inferred connection between the perched-intermediate systems at wells R-10/R-10a and R-12 is based on their similar settings within the Cerros del Rio basalt, their similar groundwater elevations, and their relatively close proximity.

The regional aquifer beneath Sandia Canyon (and canyons to the north and south) includes confined and unconfined zones. The shallow portion of the regional aquifer is predominantly unconfined, and the deeper portion of the aquifer is predominantly confined. Groundwater flow in the shallow portion of the regional aquifer generally follows the gradient of the water table. Groundwater flow and water levels within the deeper portion of the regional aquifer are impacted by water-supply pumping, with the largest fluctuations in water levels observed at well R-35a, located close to water supply well PM-3.

In the vicinity of the Chromium Investigation monitoring group, the water table is located in the Puye Formation and in the Santa Fe Group.

Contaminant Sources and Distributions

Chromium concentrations exceed the NMED groundwater standard in the regional aquifer at wells R-28, R-42, and R-50, located in Mortandad Canyon; R-43, located in Sandia Canyon; and R-62, located on the mesa between Sandia and Mortandad Canyons. The primary source of chromium is chromated water discharged from the TA-03 power plant cooling tower that occurred from 1956 to 1972. Perchlorate exceeds the Consent Order screening level of 4 µg/L in wells R-15 and R-61. The primary source of perchlorate is effluent discharged from the TA-50 RLWTF. Other constituents detected above background in wells in the monitoring group include nitrate and tritium. A conceptual model for the sources and distributions of these contaminants is presented in the “2009 Investigation Report for Sandia Canyon” (LANL 2009, 107453) and updated in the “Phase II Investigation Report for Sandia Canyon” (hereafter, the Sandia Canyon Phase II IR) (LANL 2012, 228624). These two investigation reports present the results of the chromium and related studies conducted to date to address the nature and extent and the fate and transport of chromium and other contaminants originating in the Sandia Canyon watershed.

The conceptual model hypothesizes chromium and other contaminants originate from releases into Sandia Canyon with lateral migration pathways that move contamination to locations beneath Mortandad Canyon. For this reason, perched-intermediate and regional wells beneath Mortandad Canyon are included in the Chromium Investigation monitoring group. Other sources of contamination beneath Sandia and Mortandad Canyons are from Mortandad Canyon sources, particularly historical releases from the RLWTF outfall (LANL 2006, 094161). Lateral migration from Los Alamos Canyon sources [including Outfall 21-011(k), which discharged to DP Canyon] appears also to be detected. These sources and the migration pathways are discussed in the Sandia Canyon IR (LANL 2009, 107453).

3.3 Monitoring Objectives

The objective of the Chromium Investigation monitoring group is to further refine the nature and extent of contamination originating from various sources principally within Sandia and Mortandad Canyons and to monitor the fate and transport of detected contaminants. Monitoring in and beneath Sandia Canyon and adjacent canyons has focused on acquiring a fundamental understanding of the nature and extent of contaminants originating in the Sandia Canyon watershed, with an emphasis on chromium contamination because its concentration exceeds groundwater standards in the regional aquifer. This work has been coupled with sediment and biota investigations to refine the conceptual model for the fate and transport of contaminants.

Base-flow locations and alluvial wells in Sandia Canyon are excluded from the Chromium Investigation monitoring group because the primary contaminants of concern are at low and very stable concentrations in these media (LANL 2009, 107453). In Mortandad Canyon, contaminants in the surface water and alluvial groundwater have shown a marked decrease in concentration as a result of improvements in the treatment processes at the TA-50 RLWTF (see Figures 7.2-17, 7.2-18, and 7.2-25 of the Mortandad Canyon IR [LANL 2006, 094161]). The steadily decreasing trend of the contaminant concentrations in the surface water and alluvial groundwater supports the inclusion of the locations within the General Surveillance monitoring group (section 8.0). These data should provide sufficient information to continue verifying the decreasing trends in contaminant concentrations in alluvial groundwater.

Perched-intermediate and regional wells in Mortandad Canyon are included in the Chromium Investigation monitoring group because they are located along the contaminant-transport pathway that includes the southerly diversion of groundwater within the vadose zone beneath Sandia and Mortandad Canyons. The predominant contaminants monitored in this group of wells include chromium, nitrate, perchlorate, 1,4-dioxane, and tritium. The monitoring recommendations for perched-intermediate and regional groundwater beneath Mortandad Canyon reflect the updated conceptual model for these zones as presented in the Phase II IR for Sandia Canyon (LANL 2012, 228624), and data collection requirements in support of the "Interim Measures Work Plan for the Evaluation of Chromium Mass Removal" (LANL 2013, 241096).

3.4 Scope of Activities

Active monitoring locations in the Chromium Investigation monitoring group include perched-intermediate and regional aquifer wells, which are shown in Figure 3.1-1. The monitoring group includes locations in Sandia Canyon as well as in Mortandad Canyon.

Table 3.4-1 presents sampling locations, the rationale for these locations, analytical suites, and monitoring frequencies. Analytical suites and frequencies assigned to individual locations in Table 3.4-1 generally follow the high-level monitoring design presented in Table 1.6-3 for the Chromium Investigation monitoring group. These analytical suites and frequencies are based on the results of applicable IRs, previous reviews of monitoring data, direction from NMED as stated in its approval with modifications for the 2011 Interim Plan, Revision 1 (NMED 2012, 520410).

Following submittal of the Sandia Canyon Phase II IR (LANL 2009, 107453), monitoring remains focused on the perched-intermediate and regional groundwater, with an emphasis on chromium and general inorganic chemicals (particularly nitrate), as presented in Table 1.6-3. The sampling frequency for the wells in the Chromium Investigation monitoring group is based primarily on the chromium concentrations compared with groundwater standards. In general, wells with concentrations exceeding standards are sampled quarterly, wells with concentrations above background levels, but below standards, are sampled semiannually, and wells with concentrations at background levels are sampled annually. Well R-61 was rehabilitated in September and October 2012 and was sampled quarterly through the remainder of MY2014. Well MCOI-4, completed in perched-intermediate groundwater, no longer yields sufficient water for sampling and will be monitored for water levels only. The objectives for the sampling frequency and analytical suites are presented in Table C-1.

In 2013, the Laboratory began tests for remediation of chromium-contaminated groundwater (LANL 2014, 255110). Tests were carried at three monitoring wells, R-28, R-42, and SCI-2. As a result, these wells were not always available to collect monitoring samples. In MY2015, additional wells will be withdrawn from the monitoring schedule to accommodate this project.

4.0 MDA C MONITORING GROUP

4.1 Introduction

The MDA C monitoring group includes nearby regional monitoring wells on the mesa top and in Mortandad Canyon (Figure 4.1-1). MDA C is located on Mesita del Buey in TA-50, at the head of Ten Site Canyon. TA-50 is bounded on the north by Effluent and Mortandad Canyons, on the east by the upper reaches of Ten Site Canyon, on the south by Twomile Canyon, and on the west by TA-55.

MDA C (SWMU 50-009) is an inactive 11.8-acre landfill consisting of 7 disposal pits and 108 shafts. Between 1948 and 1974, solid low-level radioactive wastes and chemical wastes were disposed of in the landfill. The depths of the seven pits at MDA C range from 12 ft to 25 ft below the original ground surface. The depths of the 108 shafts range from 10 ft to 25 ft below the original ground surface. The original ground surface is defined as beneath the cover that was placed over the site in 1984. The pits and shafts are constructed in the Tshirege Member of the Bandelier Tuff. The regional aquifer is estimated to be approximately 1330 ft deep based on the water level in well R-46 (LANL 2009, 105592). The topography of MDA C is relatively flat, although the slope steepens to the north where the northeast corner of MDA C abuts the south wall of Ten Site Canyon.

4.2 Background

MDA C is located on a mesa top, so no shallow alluvial groundwater is present in the immediate vicinity. The nearest surface water is found in Effluent Canyon to the north and in Pajarito Canyon and Twomile Canyon to the south.

No perched groundwater or intermediate-depth saturated horizons were encountered during previous investigations at MDA C (LANL 1998, 059599; LANL 2005, 091493, p. 6) or in any of the boreholes drilled during the Phase III investigation at MDA C (LANL 2011, 204370). No perched groundwater was encountered during the drilling of regional wells R-46 or R-60.

Regional monitoring wells R-46 and R-60 are located downgradient of MDA C (Figure 4.1-1) (LANL 2009, 105592; LANL 2011, 111798). The upper surface of the regional aquifer is located within the lower Puye Formation or the upper pumiceous deposits of the Santa Fe Group, and the depths to water range from approximately 1320 ft to 1330 ft bgs (Koch and Schmeer 2011, 201566). Near MDA C, the direction of shallow groundwater flow in the regional aquifer is to the east-southeast.

Contaminant Sources and Distributions

Vapor-phase VOCs and tritium are present in the upper 500 ft of the unsaturated zone beneath MDA C (LANL 2011, 204370). The primary vapor-phase contaminants beneath MDA C are trichloroethene (TCE) and tritium. No evidence has been found of groundwater contamination in the regional aquifer. MDA C is located on a mesa top above thick unsaturated units of the Bandelier Tuff, and therefore, present-day aqueous-phase transport is generally assumed to be minimal.

4.3 Monitoring Objectives

Monitoring objectives for the MDA C monitoring group are to supplement existing vadose zone pore-gas monitoring to refine the nature and extent of contamination and to assess the fate and transport of the current vadose zone contaminant distribution. The monitoring will also support the remedy selection process for MDA C.

4.4 Scope of Activities

The MDA C monitoring group consists of three regional groundwater monitoring wells, R-14, R-46, and R-60, as shown in Figure 4.1-1. Table 4.4-1 presents sampling locations, the rationale for these locations, analytical suites, and frequencies for the MDA C monitoring group. Analytical suites and frequencies assigned to individual locations listed in Table 4.4-1 generally follow the high-level monitoring design presented in Table 1.6-3 for the MDA C monitoring group. These analytical suites and frequencies are based on the results of applicable IRs, previous reviews of monitoring data, and direction from NMED as stated in its approval with modifications for the 2011 Interim Plan, Revision 1 (LANL 2011, 208811; NMED 2012, 520410).

The wells in the MDA C monitoring group are sampled semiannually. The objectives for the sampling frequency and analytical suites are presented in Table C-1.

5.0 TA-54 MONITORING GROUP

5.1 Introduction

At TA-54, groundwater monitoring is conducted to support both the corrective measures process for SWMUs and AOCs (particularly MDAs G, H, and L) under the Consent Order and in support of the Resource Conservation and Recovery Act (RCRA) permit. The TA-54 monitoring group was established to address the monitoring requirements for all portions and aspects of TA-54 (Figure 5.1-1). The TA-54 monitoring group includes both perched-intermediate and regional wells in the near vicinity. Other downgradient wells have general relevance to TA-54 and other upgradient sources but are not considered part of the TA-54 monitoring network and are not discussed in this section.

TA-54 is situated in the east-central portion of the Laboratory on Mesita del Buey. TA-54 includes four MDAs designated as G, H, J, and L; a waste characterization, container storage, and transfer facility (TA-54 West); active radioactive waste storage and disposal operations at Area G; hazardous and mixed-waste storage operations at Area L; and administrative and support areas. The transfer facility is located at the western end of TA-54. MDAs H and J are located approximately 500 ft and 1000 ft (150 m and 305 m) southeast of the transfer facility, respectively. MDA L is located approximately 1 mi (1.6 km) southeast of the transfer facility. MDA G subsurface units are located within Area G approximately 0.5 mi (0.8 km) southeast of MDA L. A total of 47 SWMUs and AOCs are located within TA-54.

Mesita del Buey is a 100-ft- to 140-ft-high finger-shaped mesa that trends southeast. The elevation of Mesita del Buey ranges from 6750 ft to 6670 ft at Area G. The mesa is approximately 500 ft wide and is bounded by the basin of Cañada del Buey (450 ft to the north) and the basin of Pajarito Canyon (360 ft to the south) (Figure 5.1-1).

5.2 Background

The TA-54 monitoring group is located in the Pajarito and Mortandad Canyon watersheds, and the occurrence of surface water, alluvial groundwater, and perched-intermediate and regional groundwater is discussed in detail in section 7.2 of the Pajarito Canyon IR (LANL 2009, 106939). The Mortandad Canyon setting is discussed in section 3.

Sources of surface water in the Pajarito watershed currently include snowmelt, storm water runoff, and discharges at several springs. Perennial surface-water flow within the TA-54 monitoring group area occurs in Pajarito Canyon.

The primary alluvial groundwater body in Pajarito Canyon extends east from below the confluence with Twomile Canyon to approximately regional well R-23, a distance of 4.4 mi (7 km). Spatially restricted bodies of alluvial groundwater are also present west of the Twomile Canyon confluence and extend upcanyon to springs in the south fork of Pajarito Canyon (Upper Starmer Spring) and Pajarito Canyon above the south fork confluence (Homestead Spring). The alluvial groundwater is recharged by stream flow and some local precipitation. It accumulates in the alluvial deposits that fill the canyon bottom, often perching on shallow bedrock units. The alluvial groundwater extends farther downcanyon than does stream flow because some downcanyon lateral flow occurs within the alluvium. Alluvial groundwater acts as a source of water percolating into the deeper tuff units the Cerros del Rio basalt, which is very near the surface at well R-23. The extent of this groundwater helps to define deeper percolation zones within the canyon. Overall, lateral flow within the alluvium and deeper percolation of alluvial groundwater into underlying bedrock may provide a driving force for subsurface transport of soluble contaminants along the length of the canyon and into the deeper subsurface.

Perched-intermediate groundwater occurs in a variety of settings beneath the Pajarito watershed. Occurrences are known from deep groundwater investigations and from more localized site investigations. Perched-intermediate horizons are present in the Bandelier Tuff in the upper portion of the watershed and in the Cerro Toledo interval, Puye Formation, dacitic lavas, and Cerros del Rio lavas in the middle and lower portions of Pajarito Canyon. The location and nature of most of these occurrences are consistent with, and indicative of, known or suspected canyon reaches with higher percolation, such as nearby wells R-17 and R-23. No indication was found that the perched-intermediate zones are laterally continuous over large areas.

In the vicinity of TA-54, perched-intermediate groundwater occurs in wells R-55/R-55i and R-23/R-23i (LANL 2003, 079601; Kleinfelder 2006, 092495; LANL 2011, 111611) at depths ranging from 406 ft to 498 ft bgs. Perched-intermediate groundwater also occurs in wells R-40/R-40i and R-37 (LANL 2009, 106432; LANL 2009, 107116) at depths ranging from 639 ft to 909 ft. This water is thought to be localized beneath the canyon floor and to result from localized canyon floor percolation.

The regional aquifer in the vicinity of TA-54 includes confined and unconfined zones. The shallow portion of the regional aquifer is predominantly unconfined, and the deeper portion of the aquifer is predominantly confined. Groundwater flow in the shallow portion of the regional aquifer is generally eastward beneath the western section of Pajarito watershed and southeastward beneath the eastern section of Pajarito watershed. In the vicinity of TA-54, the upper surface of the regional aquifer is located within the Cerros del Rio basalts and the underlying sediments of the Puye Formation, and the depths to water range from 785 ft to 1020 ft bgs (Koch and Schmeer 2011, 201566).

Groundwater flow in the upper part of the regional aquifer beneath TA-54 appears to be substantially impacted by the Cerros del Rio lavas (LANL 2010, 111362). These lavas are more than 150 ft thick beneath the regional water table. Groundwater flow in the regional aquifer beneath TA-54 is impacted by (1) water-supply pumping, (2) the local-scale recharge along Pajarito Canyon, (3) the lateral propagation of large-scale mountain-front aquifer recharge occurring to the west of TA-54, and (4) the discharge of the regional aquifer to the southwest towards the White Rock Canyon springs and the Rio Grande.

Contaminant Sources and Distributions

Pore-gas monitoring data show that vapor-phase transport of contaminants occurs in the upper portion of the unsaturated zone and vapor-phase VOCs are present beneath MDAs G and L. The primary contaminants in the vapor phase at TA-54 are 1,1,1-trichloroethane; TCE; and tritium (LANL 2005, 090513; LANL 2006, 091888; LANL 2007, 096409).

Historical data from the groundwater monitoring network around TA-54 showed sporadic detections of several organic compounds. Data show minimal detections for these constituents and only consistently at two wells, specifically trichloroethene at R-40 screen 1 and R-20 screen 2, and are all below applicable Consent Order groundwater cleanup levels. Further evaluations of existing groundwater data near TA-54 and detailed descriptions of organic and inorganic contaminants detected in perched-intermediate and regional groundwater at TA-54 are presented in the CMEs for MDAs G, H, and L (LANL 2011, 205756; LANL 2011, 206319; LANL 2011, 206324).

5.3 Monitoring Objectives

Monitoring at TA-54 focuses on perched-intermediate and regional groundwater zones beneath TA-54 (Figure 5.1-1). The monitoring suite for perched-intermediate and regional groundwater addresses RCRA monitoring requirements and also reflects the data collected to date from wells in the TA-54 network.

Characterization of groundwater under MDAs G, H, and L is underway as data are collected from the completed network of new and existing wells. Groundwater monitoring for TA-54 is conducted with perched-intermediate well screens at R-40i, R-40 screen 1, R-23i, and R-37 screen 1, R-55i, and regional wells R-20, R-21, R-23, R-32, R-37, R-38, R-39, R-40, R-41, R-49, R-51, R-52, R-53, R-54, R-55, R-56, and R-57 (Figure 5.1-1). The actively sampled wells have one or two screens equipped with purgeable sampling systems. The Laboratory plans to reconfigure R-22 as a single-completion well and incorporate it into the TA-54 monitoring group.

The monitoring at TA-54 provides the basis for accurately describing the groundwater conditions beneath TA-54. Base-flow and alluvial groundwater wells near and downgradient of TA-54 are not included in the TA-54 monitoring group because no evidence was found of a hydrologic connection between the subsurface contamination beneath TA-54 and adjacent canyons, as discussed in the Pajarito Canyon and Cañada del Buey IRs (LANL 2009, 106939; LANL 2009, 107497).

The regional monitoring-well network downgradient of the MDAs in TA-54 is a system that includes redundancy and is designed to provide reliable detection of potential contaminants reaching the regional aquifer. The wells are located both near the facility boundary and at more distal locations along the dominant regional flow direction as well as along potential local flow directions to the northeast. The locations of wells also address potential complex pathways for contaminants in the vadose zone. Because of the difficulties associated with monitoring groundwater that occurs in lavas beneath TA-54, the network is made up of two-screen wells with an upper well screen placed as close to the water table as possible to monitor the first arrival of contaminants in the aquifer and a lower screen placed in permeable aquifer sediments to monitor the primary groundwater pathways downgradient of the facility.

5.4 Scope of Activities

The TA-54 monitoring group consists of intermediate-perched and regional groundwater wells, many of which are dual-screened wells with Baski sampling systems. The TA-54 monitoring wells are shown in Figure 5.1-1.

Table 5.4-1 presents sampling locations, the rationale for these locations, analytical suites, and frequencies for the TA-54 monitoring group. Analytical suites and frequencies assigned to individual locations listed in Table 4.4-1 generally follow the high-level monitoring design presented in Table 1.6-3 for the TA-54 monitoring group. These analytical suites and frequencies are based on the results of previous investigations, CMEs, reviews of monitoring data, and direction from NMED, as stated in its approval with modifications for the 2011 Interim Plan, Revision 1 (LANL 2011, 208811; NMED 2012, 520410).

The wells in the TA-54 monitoring group are sampled quarterly or semiannually, with higher sampling frequencies for mobile constituents known to be present beneath MDAs at TA-54 (e.g., tritium and VOCs), and lower sampling frequencies for less mobile constituents or constituents not known to be present in significant quantities within the inventories of the TA-54 MDAs. The objectives for the sampling frequency and analytical suites are presented in Table C-1.

Well screen R-40 Si shows impacts from drilling foam, but the water chemistry appears to be improving. Monitoring in this screen has been expanded from tritium only to include metals and general inorganics as well to evaluate continued improvements in the geochemistry of samples from this well.

Samples from monitoring well R-55i and the R-54 screen 1 show impacts from residual organic material introduced during drilling; collection of samples from these screens is limited to low-level tritium.

6.0 TA-16 260 MONITORING GROUP

6.1 Introduction

The TA-16 260 monitoring group (Figure 6.1-1) was established for the upper Water Canyon/Cañon de Valle watershed to detect and monitor contaminants released from Consolidated Unit 16-021(c)-99, the TA-16 260 Outfall (hereafter, the 260 Outfall), and other sites at TA-16. The 260 Outfall is a former HE-machining outfall that discharged HE-bearing water to Cañon de Valle from 1951 to 1996 and is the predominant source of contaminants detected in groundwater in the Water Canyon/Cañon de Valle area. These discharges contaminated the soils, sediments, surface waters, spring waters, and deep-perched and regional groundwater at TA-16.

The TA-16 260 monitoring group includes springs, alluvial wells, and wells completed in several deep perched-intermediate groundwater zones and in the regional aquifer. Shallow monitoring locations such as the springs and alluvial wells are included in this monitoring group because they contain HE, barium, and VOC contamination related to past activities at the 260 Outfall and other sites in the area.

TA-16 is located in the southwest corner of the Laboratory and was established to develop explosive formulations, cast and machine explosive charges, and assemble and test explosive components for the nuclear weapons program. A total of 410 SWMUs and AOCs are located within TA-16. TA-16 is bordered by Bandelier National Monument along NM 4 to the south and by the Santa Fe National Forest along NM 501 to the west. To the north and east, it is bordered by TA-08, TA-09, TA-11, TA-14, TA-15, TA-37, and TA-49. Water Canyon, a 200-ft-deep ravine with steep walls, separates NM 4 from active sites at TA-16. Cañon de Valle forms the northern border of TA-16.

6.2 Background

Surface water in the area consists of perennial water derived from springs (particularly Burning Ground Spring) and storm water and snowmelt runoff that flows in canyon drainages, including Cañon de Valle, Fishladder Canyon, and Martin Spring (S-Site) Canyon. Fishladder Canyon also receives snowmelt and storm water runoff. Alluvial groundwater occasionally discharges at Fishladder Spring. The surface flow in Fishladder Canyon decreased significantly once the TA-16 340 Outfall was deactivated.

The TA-16 260 monitoring group includes alluvial monitoring wells in Cañon de Valle (e.g., CdV-16-02659), in Fishladder Canyon (FLC-16-25280), and in Martin Spring Canyon (MSC-16-06294). Groundwater in these alluvial systems is shallow, and water levels generally show responses to snowmelt runoff.

The vadose zone at TA-16 is approximately 1000 ft to 1300 ft thick and is recharged by mountain-front precipitation and subsequent percolation along the Pajarito fault zone west of TA-16 and along canyons (e.g., percolation along upper Cañon de Valle). The vadose zone contains a shallow suite of perched water zones (less than 200 ft depth from the mesa top) and two significant deep perched-intermediate groundwater zones between approximately 750 ft and 1200 ft bgs. The shallow perched zones are heterogeneous and controlled by fractures and surge beds near the contact of units 3 and 4 of the Tshirege Member. They manifest as three springs (SWSC, Burning Ground, and Martin); as intermittently saturated zones in several boreholes in the northern portions of TA-16; and in a continuously saturated zone in a borehole near the 90s Line Pond. The deep perched-intermediate groundwater zones are believed to extend from west to east for more than 6500 ft and from north to south for approximately 3280 ft. Perched-intermediate groundwater was encountered at R-26 screen 1; R-25b, R-25 screens 1, 2, and 4; CdV-16-1(i); CdV-16-2(i)r; CdV-16-4ip; and R-47i. No perched groundwater was observed at R-18 and R-48, limiting its north-south extent. The low permeability Tschicoma dacite observed in R-48 (approximately 2000 ft south of Cañon de Valle) may impede the southward flow of water in the deep-perched system. The perched zones are present both within the Otowi Member of the Bandelier Tuff (R-25, R-25b, and CdV-16-1[i]) and within the Puye Formation (CdV-16-4ip and CdV-16-2[i]r). In the vicinity of CdV-16-4ip, the two perched zones are separated by 100 ft to 150 ft of Puye sediments under variable saturation (LANL 2011, 203711). To date, the degree of hydraulic connection between the perched horizons and the regional aquifer has not been fully analyzed but will be assessed in future reports.

Water-level data indicate groundwater within the perched horizons generally flows from west to east. Some evidence indicates a southerly component of flow within the Otowi Member of the Bandelier Tuff in the vicinity of R-25, possibly from recharge along Cañon de Valle. Water-level data from multiple screens in R-25 and from the two screens of CdV-16-4ip indicate water levels within the deep-perched system are lower with depth, suggesting significant vertical anisotropy, with vertical hydraulic conductivities perhaps orders of magnitude lower than horizontal hydraulic conductivities in some strata (LANL 2011, 203711).

The regional aquifer in the vicinity of northern TA-16 is predominantly unconfined, with the water table located within the Puye Formation at a depth of approximately 1108 ft to 1353 ft bgs. Groundwater flow in the shallow portion of the regional aquifer is generally eastward, with some perturbation near R-25, perhaps reflecting local recharge. Downgradient (east) of R-25, the regional groundwater flow direction incorporates a northerly component of flow near R-18 and R-17. Water levels in regional wells near TA-16 show little influence from transient effects of deeper water-supply pumping (LANL 2006, 091450).

Contaminant Sources and Distributions

Discharges from the former 260 Outfall at Consolidated Unit 16-021(c)-99 from 1951 to 1996 served as a primary source of source of HE and inorganic contamination found throughout the site (LANL 1998, 059891; LANL 2003, 085531; LANL 2011, 207069). Results of the 260 Outfall CME (LANL 2007, 098734) show the drainage channel below the outfall and the canyon bottom as well as surface water, alluvial groundwater, and deep-perched groundwater, are contaminated with explosive compounds, including RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine); HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine); TNT (2,4,6-trinitrotoluene); and barium. In addition, the VOCs tetrachloroethene and TCE have been detected in springs, alluvial groundwater, and perched-intermediate groundwater. Low concentrations of tetrachloroethene have also been detected in the regional aquifer in R-25 (screen 5) and in R-18. RDX has also been detected in the regional aquifer in wells R-18 and R-63.

The primary migration pathway for these contaminants is thought to consist of (1) discharge as effluent from the 260 Outfall, (2) surface flow to Cañon de Valle via a small tributary drainage, (3) downcanyon transport by surface-water flow and alluvial groundwater, (4) and percolation through the vadose zone as recharge to the deep-perched groundwater zones and potentially into the regional aquifer.

Groundwater in the perched horizons contains the largest inventory of HE in the environment on a mass basis; estimates range from as low as approximately 700 kg of RDX to as high as approximately 8000 kg of RDX. Investigations of vadose zone and regional groundwater at TA-16 have been conducted during the past several years, and the results of these investigations are discussed in several reports (e.g., Longmire 2005, 088510; LANL 2006, 093798; LANL 2007, 096003; LANL 2007, 095787; LANL 2011, 203711; LANL 2011, 207069). HE-contaminated sediments below the outfall and in the drainage were removed during an interim measure (IM) in 2000 and 2001 and during a corrective measures implementation (CMI) completed in 2010 (LANL 2002, 073706; LANL 2010, 108868; LANL 2010, 110508). During the IM and CMI, approximately 1300 yd^3 of sediment containing 8500 kg of HE was removed.

6.3 Monitoring Objectives

The monitoring objective for the TA-16 260 monitoring group is to further refine the nature and extent for contamination originating from the area and to monitor fate and transport for the detected contaminants. These data will support the pending CME for perched-intermediate and regional groundwater (LANL 2007, 098734; LANL 2008, 103165). This group's monitoring focuses on HE, barium, and VOC contamination in the upper Cañon de Valle watershed (Table 1.6-3).

Characterization sampling for a wide range of potential contaminants in groundwater from TA-16 (e.g., fission-product radionuclides, SVOCs, pesticides, PCBs, dioxins/furans) has been completed for the majority of wells in the group. These constituents have not been detected beyond sporadic, low-level detections that can be attributed to infrequent but normal analytical issues.

6.4 Scope of Activities

Active monitoring locations in the TA-16 260 monitoring group include alluvial groundwater wells, perched-intermediate groundwater wells, regional groundwater wells, and springs. These locations are shown in Figure 6.1-1. Sampling locations, frequencies, analytical suites, and the rationale for these locations are presented in Table 6.4-1.

Additional base-flow and alluvial groundwater monitoring is conducted as general surveillance in the watershed (section 8.6). Monitoring of deep groundwater from the perched-intermediate and regional aquifers represents a long-term data set that indicates what constituents are present and their trends and variability. Additional rounds are maintained for some constituents in the perched-intermediate groundwater as an early-detection location for potential migration of those constituents from secondary sources in the vadose zone.

The sampling frequency for the wells in the TA-16 260 monitoring group is based on the presence of RDX contamination: locations where RDX has been consistently detected are sampled semiannually, while locations that do not show significant contamination are sampled annually. Monitoring wells CdV-16-4ip, CdV-R-37-2 and CdV-R-15-3 were reconfigured to single-screened wells with dedicated, purgeable sampling systems. Following reconfiguration, monitoring will be conducted semiannually until IM are implemented to remove and treat contaminated groundwater from CdV-16-4ip screen 1 (LANL 2012, 232222; NMED 2012, 521747). The objectives for the sampling frequency and analytical suites are presented in Table C-1.

7.0 MDA AB MONITORING GROUP

7.1 Introduction

The MDA AB monitoring group is located in TA-49 and includes one monitoring well completed in perched-intermediate groundwater and three wells completed in the regional aquifer. TA-49, also known as the Frijoles Mesa Site, is located on a mesa in the upper part of the Ancho Canyon drainage and part of the area drains into Water Canyon. The MDA AB monitoring group is shown in Figure 7.1-1.

TA-49 was used for underground hydronuclear testing in the early 1960s. The testing consisted of criticality, equation-of-state, and calibration experiments involving special nuclear materials and produced large inventories of radioactive and hazardous materials: isotopes of uranium and plutonium, lead, and beryllium; explosives such as TNT, RDX, and HMX; and barium nitrate. Much of this material remains in shafts on the mesa top. Further information about activities and SWMUs and AOCs at TA-49 is presented in recent Laboratory reports (LANL 2010, 109318; LANL 2010, 109319). The investigation work plans

(LANL 2008, 102215; LANL 2008, 102691) also describe the planned investigations that focus on identifying and quantifying migration of contaminants from the shafts. A total of 20 SWMUs and AOCs are located within TA-49.

7.2 Background

Both Ancho Canyon and the north fork of Ancho Canyon head on the Pajarito Plateau in the south-central part of the Laboratory. Approximately 2.2 mi^2 (5.6 km^2) is drained by the north fork of Ancho Canyon and approximately 2.3 mi^2 (5.8 km^2) is drained by Ancho Canyon. Surface-water flow is intermittent and occurs as runoff, primarily following infrequent intense thunderstorms or during snowmelt. Its source is direct precipitation and runoff from surrounding mesa tops. No perennial sources of surface water exist at TA-49.

In 1960, the USGS drilled three deep wells (test wells DT-5A, DT-9, and DT-10) to monitor the water quality in the regional aquifer. No contaminants were found in these wells at concentrations near or above standards. As with other wells installed around the Laboratory during that period using mild carbon steel, samples from these three test wells have shown elevated metals concentrations related to corrosion or flaking of well components. In 2010, the total lead concentration in a sample from test well DT-9 of 20.1 µg/L was above the EPA drinking water system action level of 15 µg/L. Another sample during the year had a total lead result of less than 2 µg/L. Some results during the 1990s were above 50 µg/L. The source of lead was believed to be galvanized piping used for pump or transducer installation.

Several deep mesa-top boreholes and wells have been drilled to intermediate depths of 300 ft to 700 ft bgs (49-CH-1 through 49-CH-4, 49-2-700) and to the regional aquifer (DT-5A, DT-9, DT-10, R-29, and R-30). No perched-intermediate groundwater zones were encountered when these wells were drilled (LANL 2006, 093714; LANL 2010, 110478; LANL 2010, 110518). A moisture profile for the 700-ft-deep mesa-top borehole 49-2-700-1 shows low moisture content (<17% by weight) throughout the profile; the profile is similar to that beneath other dry mesas and indicates percolation along neighboring canyons does not impact moisture beneath the mesa at TA-49. In addition, 49-Gamma was drilled to 54 ft bgs in upper Ancho Canyon, and wells 49-9M-2 through 49-9M-4 were drilled in the drainage of the upper north fork of Ancho Canyon; these boreholes were dry when drilled. These observations show a lack of shallow perched groundwater in the upper portions of the Ancho watershed.

Perched-intermediate groundwater was encountered in Water Canyon, approximately 3500 ft northeast of MDA AB during the drilling of R-27 in 2005. The perched zone was detected at 628 ft bgs in the Puye Formation immediately above the Cerros del Rio basalt. Monitoring well R-27i was subsequently installed in September 2009 with a single screen to evaluate water quality and measure water levels in the perched zone.

Springs and seeps are known to occur in the lower reaches of Water and Ancho Canyons, far downgradient of TA-49 (near the Rio Grande), but none have been identified within the boundaries of TA-49 (LANL 2007, 098492; LANL 2007, 098523).

The top of the regional aquifer occurs approximately 1126 ft to 1153 ft bgs, based on water levels in monitoring wells R-29 and R-30. The potentiometric surface of the regional aquifer beneath TA-49 lies completely within the Puye Formation and the Cerros del Rio basalt. Groundwater flow in the upper portion of the regional aquifer at TA-49 is generally eastward.

Contaminant Sources and Distributions

The primary contaminants at MDA AB and other disposal areas in TA-49 include tritium; radionuclides (plutonium-238, plutonium-239/240, americium-241, and cesium-137); arsenic; chromium; copper; lead; and perchlorate. Radionuclides have been detected in canyon sediments, but no elevated levels of contaminants have been detected in groundwater in the wells that comprise the MDA AB monitoring group. Three decades of water-quality records from regional wells in this area (test wells DT-5A, DT-9, and DT-10) show no substantial changes in water chemistry or the presence of Laboratory contaminants in the regional aquifer. Perchlorate has been detected slightly above background in well R-27i.

7.3 Monitoring Objectives

The monitoring objectives for the MDA AB monitoring group are to characterize the groundwater beneath MDA AB and ultimately to support the MDA AB CME process. Regional aquifer wells R-29 and R-30 have been drilled immediately downgradient of MDA AB at TA-49. The older test wells, DT-5A, DT-9, and DT-10, are no longer monitored because of their potential for producing nonrepresentative data associated with well casing and screen material and their long well screen intervals (617 ft, 681 ft, and 329.6 ft bgs, respectively); these wells have been replaced by wells R-29 and R-30.

7.4 Scope of Activities

The frequency, analytical suites, and rationale for monitoring at each location are presented in Table 7.4-1. Groundwater monitoring for MDA AB has historically been conducted primarily at the DT-series regional aquifer wells. Recently installed wells R-29 and R-30 have been incorporated into the monitoring network for MDA AB and will be monitored annually to support the corrective action process for MDA AB. The objectives for the sampling frequency and analytical suites are presented in Table C-1.

8.0 GENERAL SURVEILLANCE MONITORING GROUP

8.1 Overview

Monitoring locations not associated with project-specific monitoring groups are included in the General Surveillance monitoring group. This group includes most base-flow locations, alluvial monitoring wells, and springs, except for those assigned to the TA-16 260 monitoring group. The General Surveillance group also includes some wells completed in perched-intermediate zones or in the regional aquifer that are not associated with area-specific monitoring groups.

General Surveillance monitoring group locations are sited across the Pajarito Plateau in all the major watersheds. Some are upgradient of project-specific areas or are in areas where contamination was historically present but where concentrations have since decreased and are stable and below standards. General Surveillance monitoring locations for Los Alamos/Pueblo Canyons, Sandia Canyon, Mortandad Canyon, Pajarito Canyon, Water Canyon/Cañon de Valle, and Ancho Canyons are shown in Figure 8.1-1. The locations for White Rock Canyon within the General Surveillance monitoring group are shown in Figure 8.1-2.

Most general surveillance locations are well-characterized and have a long history of sampling data. Some locations show little or no contamination, while others show residual contamination from past operations or effluent releases. The residual contamination may be present in surface water, alluvial groundwater, and occasionally in perched-intermediate groundwater. In many cases, contaminant concentrations at these locations are fairly steady over time or decrease as a result of reductions in sources over the years.

8.2 Monitoring Objectives

The primary monitoring objectives for the General Surveillance locations are to

- continue monitoring long-term water-quality trends;
- continue verifying decreasing contaminant trends at General Surveillance locations in some watersheds (Los Alamos, Sandia, and Mortandad);
- monitor for potential impacts from ongoing operations under DOE requirements for environmental surveillance; and
- continue surveillance for potential Laboratory impacts to the groundwater, as expressed at the springs in White Rock Canyon.

8.3 Scope of Activities

The objectives can be met at all General Surveillance monitoring group locations through annual or biennial monitoring at the majority of locations, with a few exceptions. Semiannual monitoring is proposed at two locations, monitoring well 03-B-13 (because of elevated and highly variable VOC and SVOC concentrations), and Vine Tree Spring (to meet monitoring requirements under the MOU). Quarterly monitoring is proposed at R-34 to meet monitoring requirements under the MOU. Well R-12 screen 1 shows reducing conditions, as indicated by low dissolved oxygen and oxidation-reduction potential, and will be monitored for low-level tritium only on an annual basis. R-12 screen 2 data also show possible reducing conditions, with elevated manganese concentrations and low dissolved oxygen concentrations. Screen 2 will be sampled annually rather than biennially to reduce the potential for stagnation around the well screen between sampling events. Alluvial well SCA-2, located in Sandia Canyon, was significantly damaged during the September 2013 flooding event, and has been removed from the General Surveillance monitoring plan. No nearby alluvial wells can serve as a replacement for SCA-2 in the Interim Plan.

Biennial monitoring is proposed for some White Rock Canyon locations because decades of annual monitoring at these springs shows little evidence of Laboratory contaminants. Focused monitoring around MDAs and areas of known groundwater contamination along with generally low groundwater velocities (on the order of a few hundred feet per year or less) support proposing a biennial sampling frequency. The 4-series springs (Springs 4, 4AA, and 4B) will continue to be sampled annually because anomalous concentrations of perchlorate and tritium have been detected in these springs.

Spring 9B has been removed from the White Rock Canyon sampling campaign because of safety concerns regarding the poison ivy in the immediate vicinity of the spring. This spring does not show contamination, and three other springs within one-half mile of Spring 9B (Springs 9, 9A, and 8A) are successfully sampled during most years with less risk to the sampling team.

Tables 8.3-1 and 8.3-2 list the sampling locations, the rationale for these locations, the analytical suites, and frequencies for the General Surveillance monitoring group. The objectives for the sampling frequency and analytical suites are presented in Table C-1.

9.0 REFERENCES AND MAP DATA SOURCES

9.1 References

The following list includes all documents cited in this plan. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Record Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

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

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NMED (New Mexico Environment Department), December 21, 2012. "Approval with Modifications, Work Plan to Reconfigure Well CdV-16-4ip," New Mexico Environment Department letter to P. Maggiore (DOE-LASO) and J.D. Mousseau (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2012, 521747)

9.2 Map Data Sources

Water sampling locations: ER Project Locations; Los Alamos National Laboratory, ESH&Q Waste and Environmental Services Division, 2010-2E; 1:2,500 Scale Data; 04 October 2010.

Primary drainage: Watercourse; Los Alamos National Laboratory, ENV Water Quality & Hydrology Group; 05 April 2005.

Paved road: Road Centerlines for the County of Los Alamos; County of Los Alamos, Information Services; as published 04 March 2009.

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

LANL boundary: LANL Areas Used and Occupied; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; 19 September 2007; as published 13 August 2010.

Land ownership: LANL Areas Used and Occupied; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; 19 September 2007; as published 13 August 2010.

TA boundary: Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 13 August 2010.

LANL structure: Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010.

Watershed: Watersheds; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; EP2006-0942; 1:2,500 Scale Data; 27 October 2006.

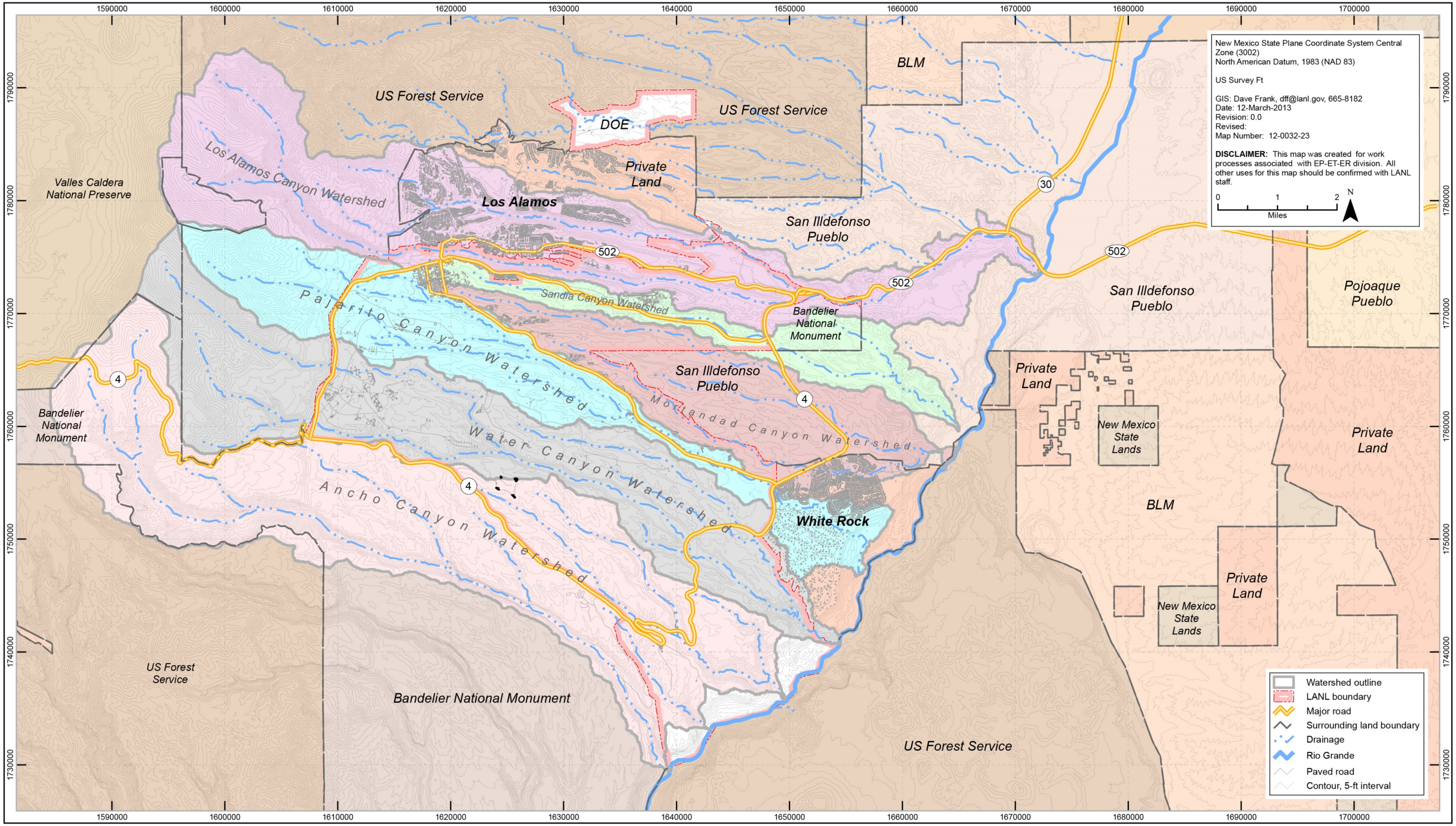


Figure 1.2-1 Watersheds at Los Alamos National Laboratory

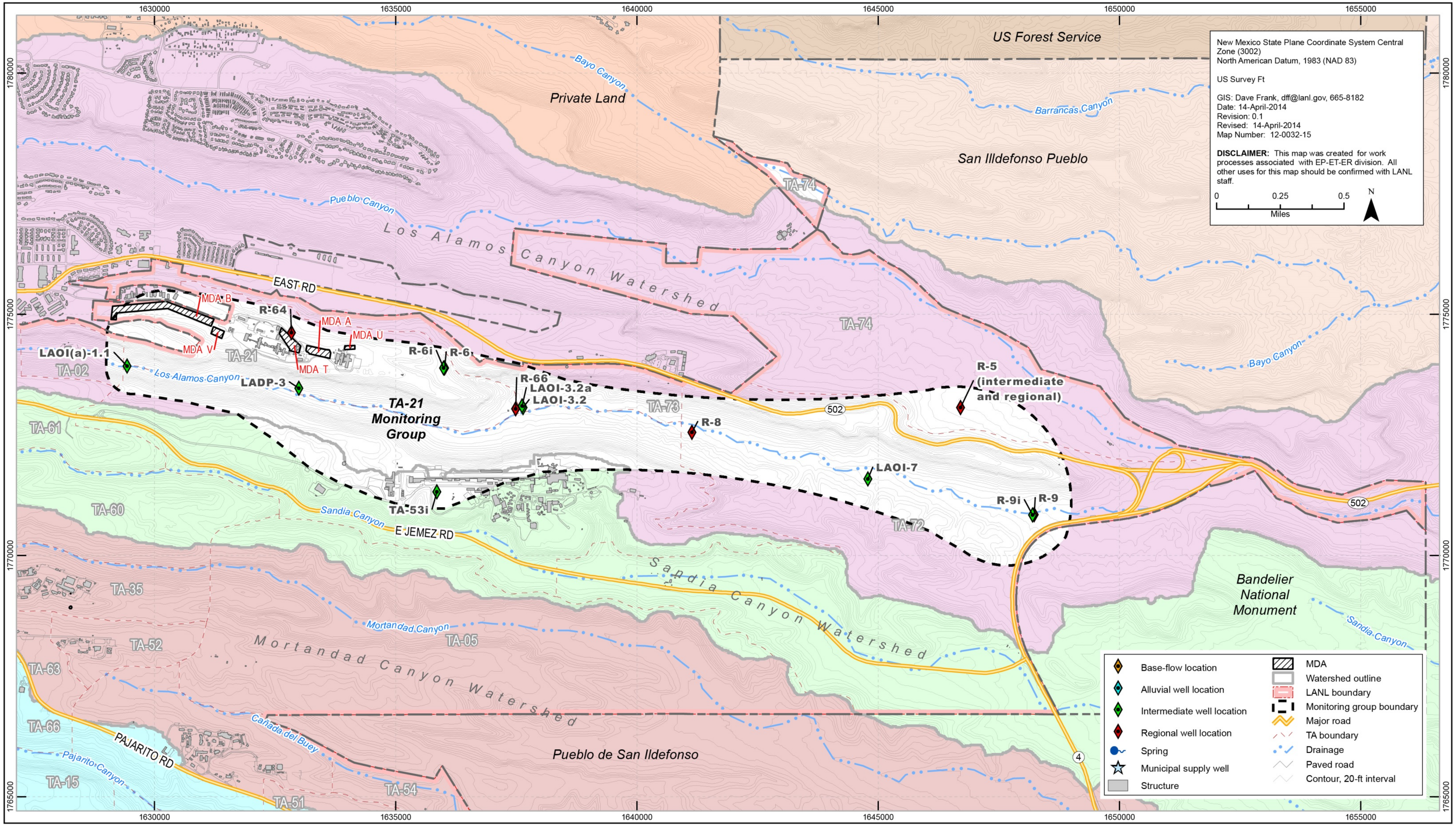


Figure 2.1-1 TA-21 monitoring group

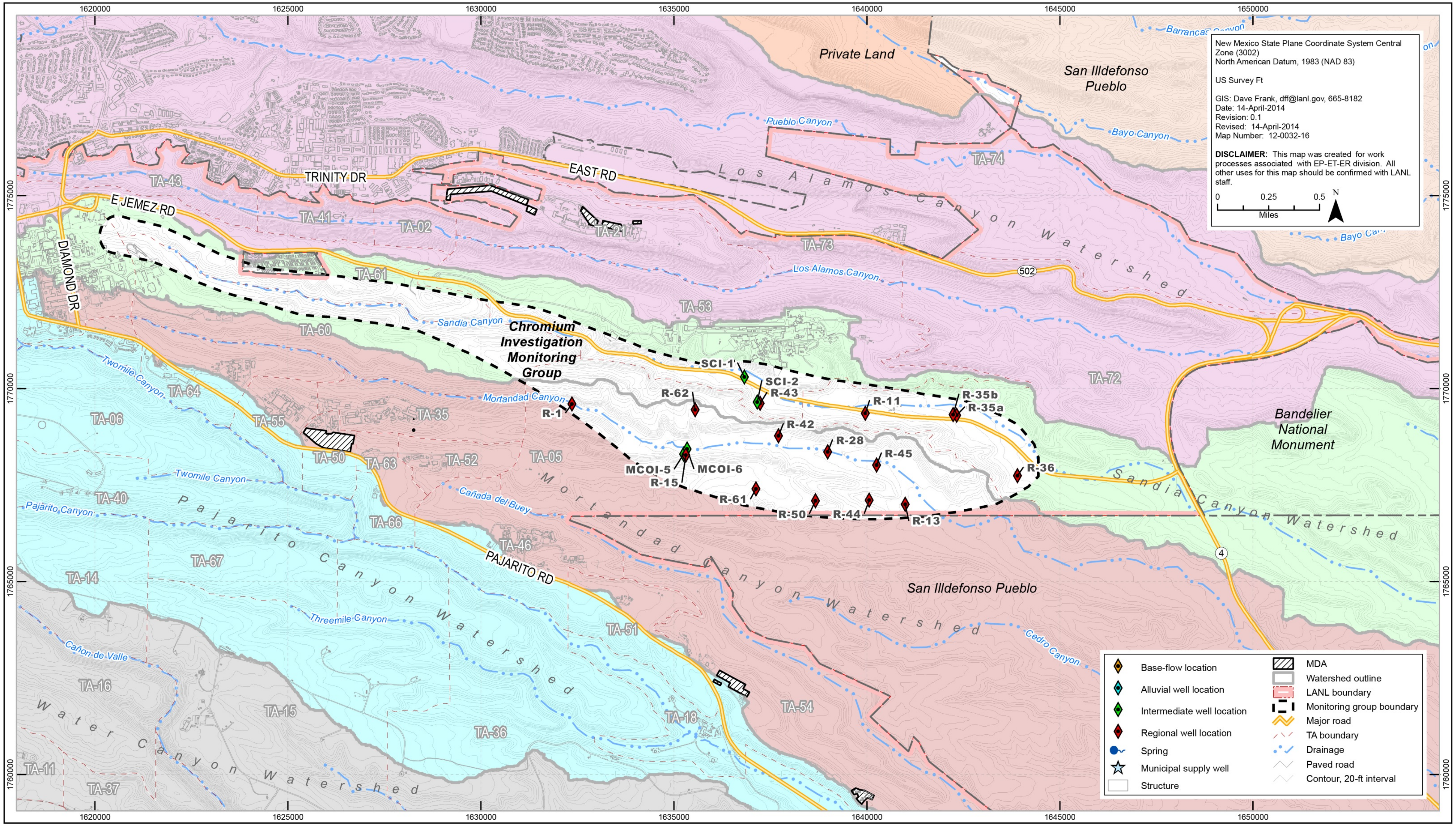


Figure 3.1-1 Chromium Investigation monitoring group

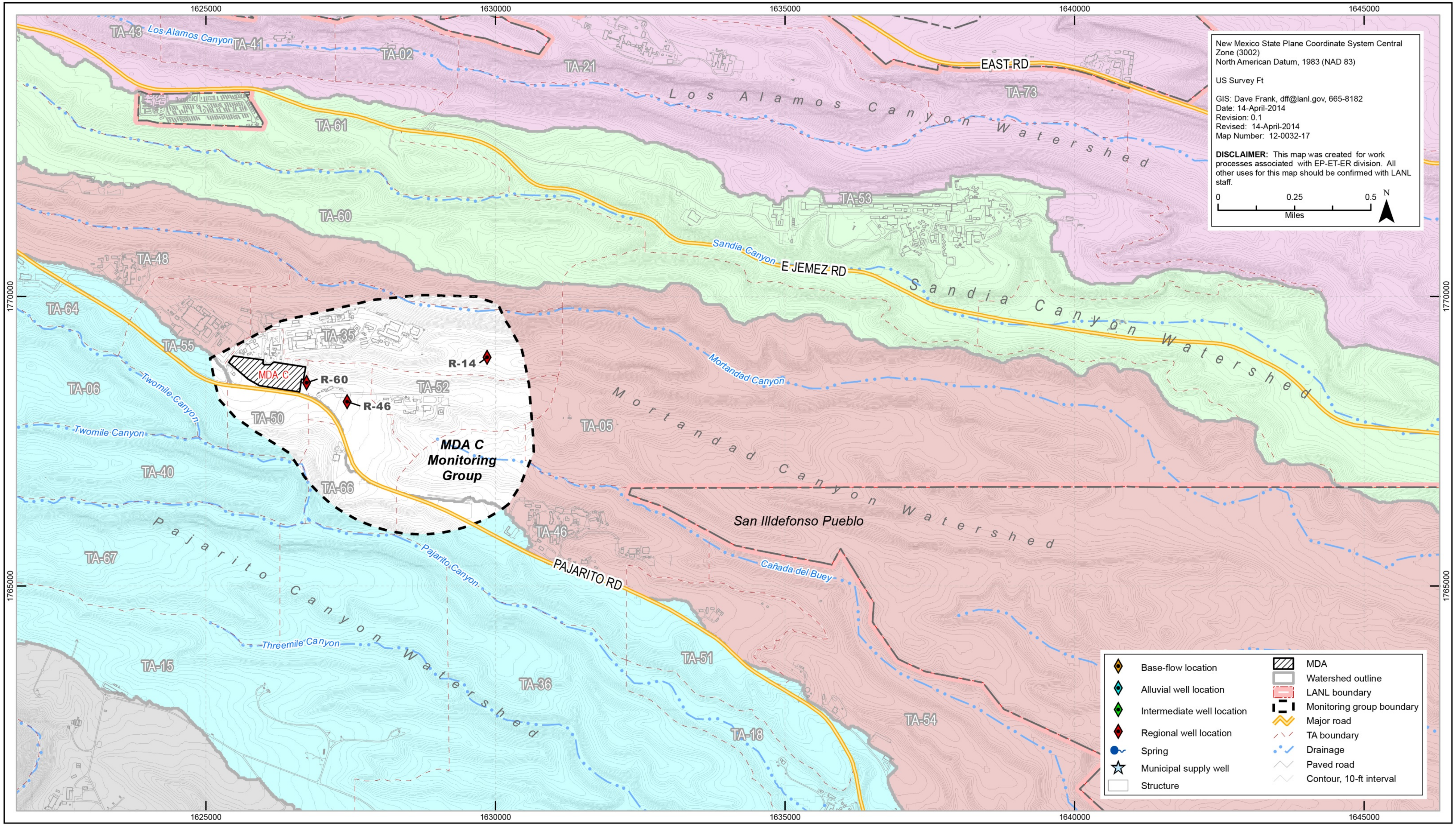


Figure 4.1-1 MDA C monitoring group

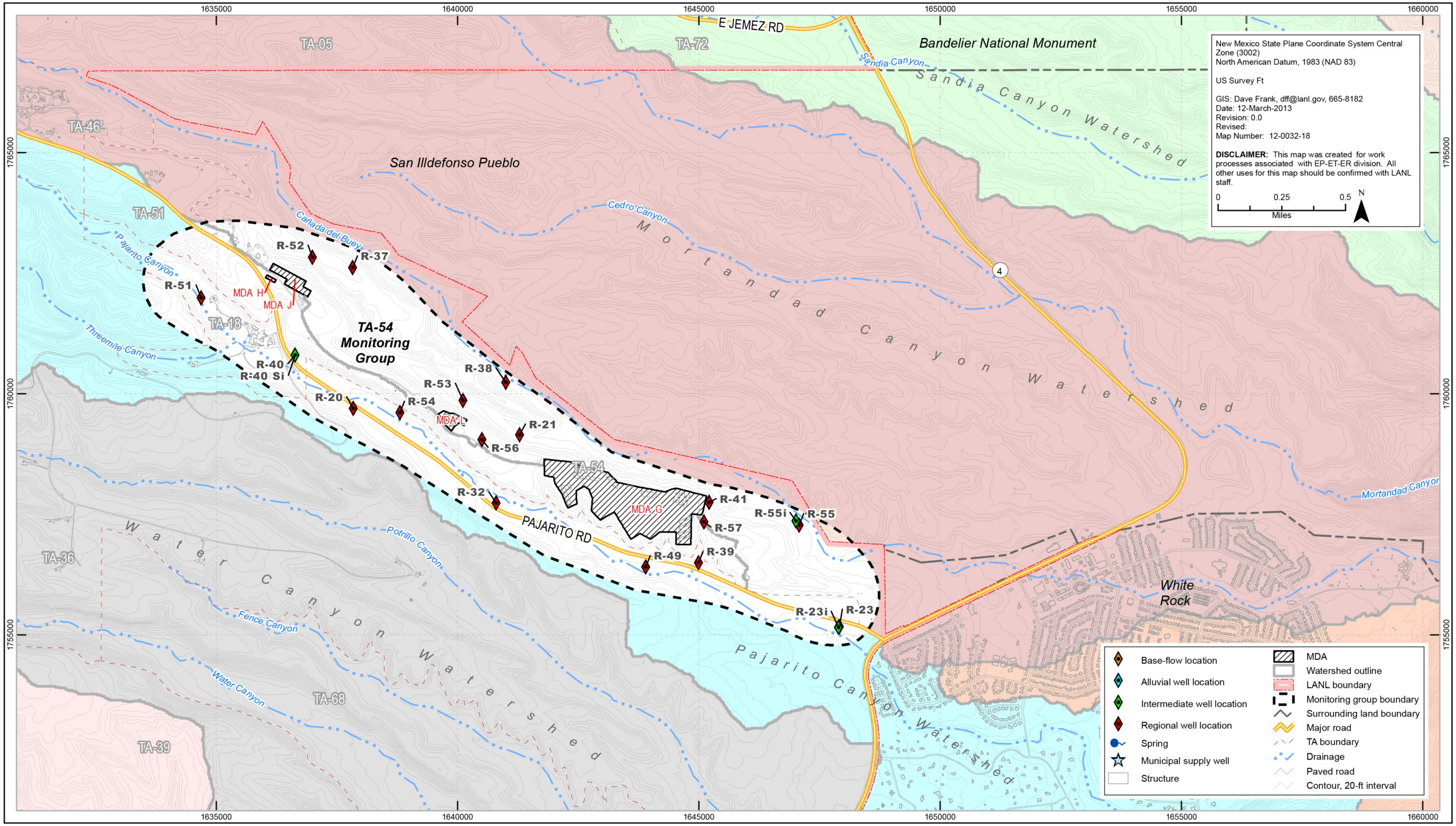


Figure 5.1-1 Monitoring well network for TA-54 MDAs H, L, and G

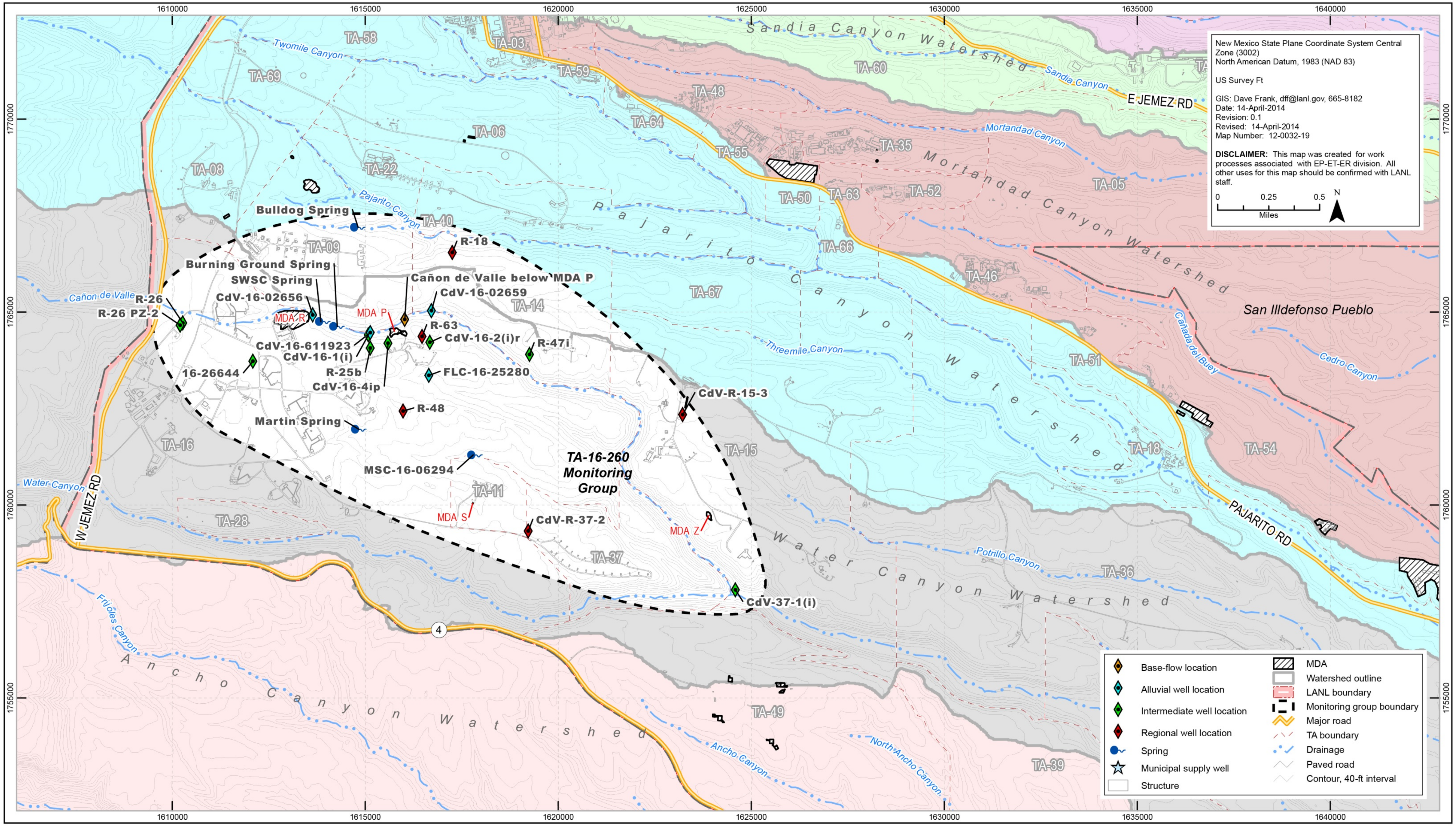


Figure 6.1-1 TA-16 260 Outfall monitoring group

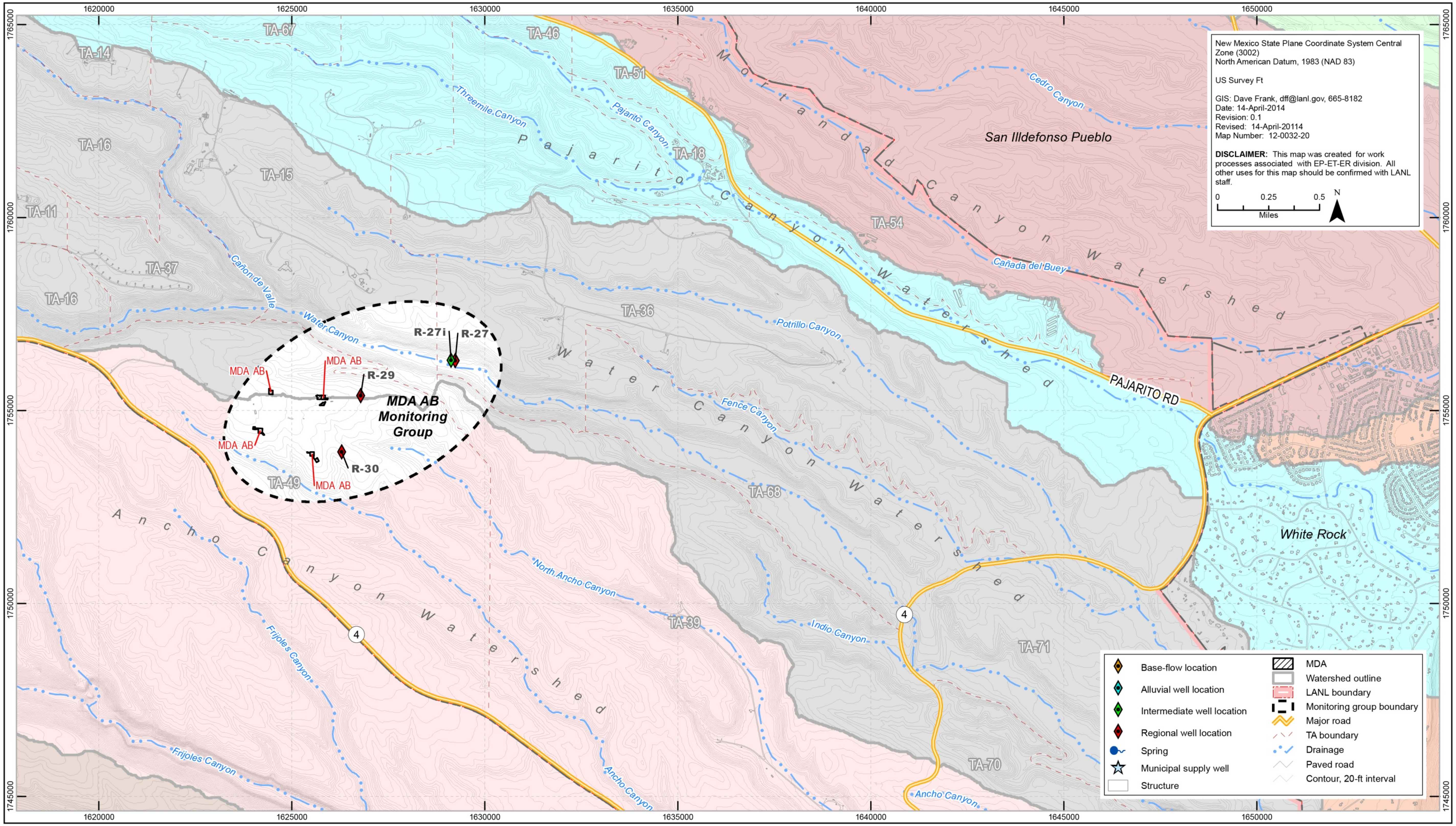


Figure 7.1-1 MDA AB monitoring group

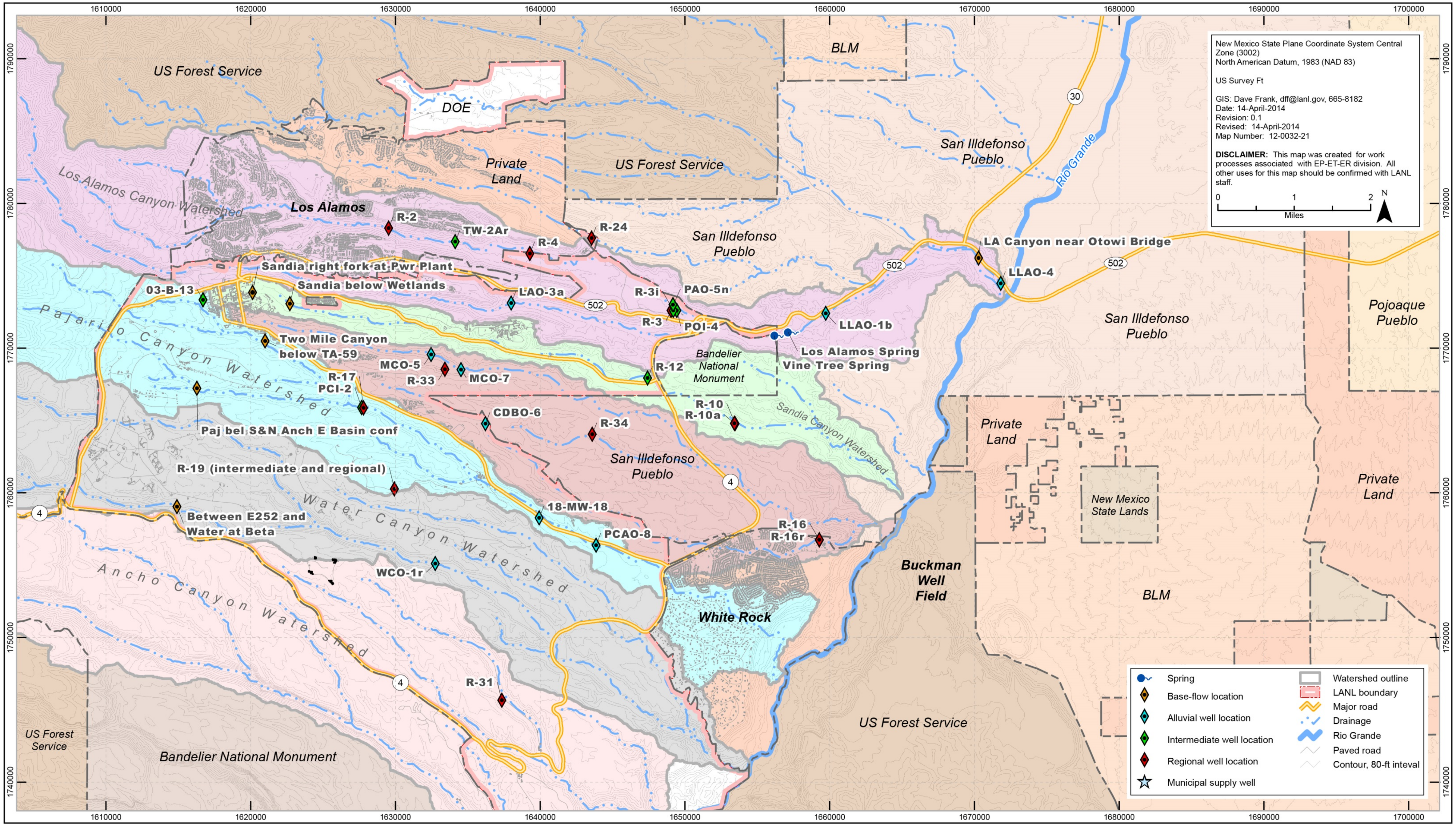


Figure 8.1-1 General surveillance

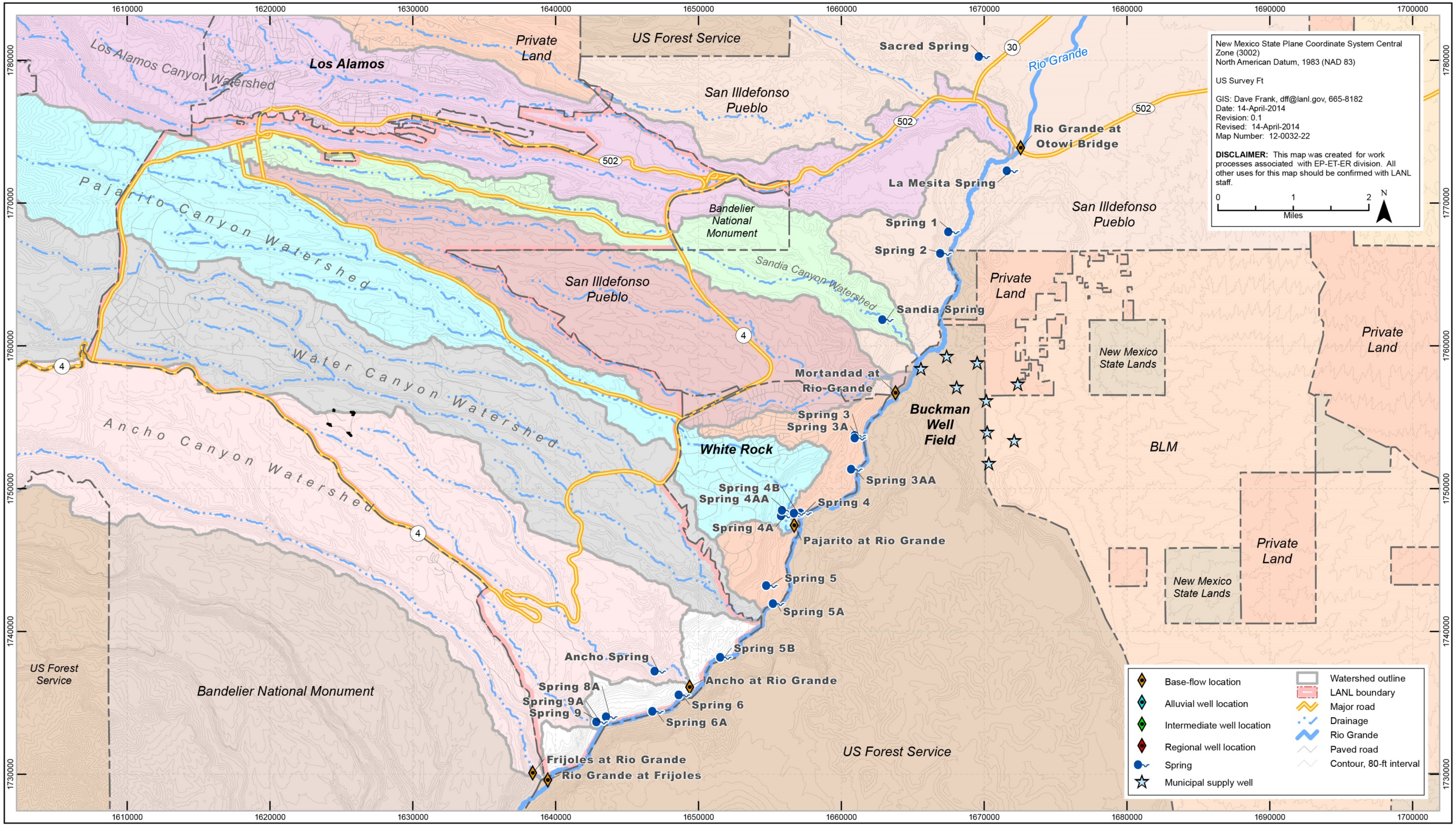


Figure 8.1-2 General surveillance, White Rock Canyon

Table 1.6-1
Potentially Applicable Standards Used to Select Base-Flow and Groundwater Screening Levels

Type	Source	Description	Potential Applicability[a]	
			Surface Water	Groundwater (Includes Springs)
Standard	20 NMAC 6.4	Livestock Watering	X	
Standard	20 NMAC 6.4	Irrigation	X	
Standard	20 NMAC 6.4	Wildlife Habitat	X	
Standard	20 NMAC 6.4	Aquatic Life Acute	X	
Standard	20 NMAC 6.4	Aquatic Life Chronic	X	
Standard	20 NMAC 6.4	Human Health Standard	X	
Standard	20 NMAC 6.2	Groundwater Human Health Standards, Other Standards for Domestic Water Supply and Standards for Irrigation Use		X
Screening level	Consent Order	Screening Level for Perchlorate in Groundwater		X
EPA				
Standard	40 Code of Federal Regulations 141	EPA maximum contaminant levels		X
Risk—Human	EPA Regional Screening Levels[b]	EPA Regional Screening Levels for Tap Water		X
DOE				
Risk—Ecological	DOE Order 458.1	DOE Biota Concentration Guides	X	
Standard	DOE Order 458.1	DOE 4-mrem Drinking Water Derived Concentration Technical Standards		X

[a] Blank cells indicate the screening level is not applicable to the water type.

[b] EPA Regional Screening Levels (www.epa.gov/region6/6pd-n/screen.htm).

Table 1.6-2
Analytes, Field Preparation, and Analytical Methods Used by Contract Laboratories for Samples Collected under the Interim Plan

Analytical Suite	Analytical Group	Field Prep	Analytical Method	Analytes
Metals	WSP-All Metals	Filtered	EPA:245.2	Mercury
Metals	WSP-All Metals	Filtered	SM:A2340B	Hardness
Metals	WSP-All Metals	Filtered	SW-846:6010C	Aluminum, barium, beryllium, calcium, cobalt, copper, iron, magnesium, manganese, potassium, silicon dioxide, sodium, strontium, tin, vanadium, zinc
Metals	WSP-All Metals	Filtered	SW-846:6020	Antimony, arsenic, boron, cadmium, chromium, lead, molybdenum, nickel, selenium, silver, thallium, uranium
Metals	MSGP-Hg	Unfiltered	EPA:245.2	Mercury
VOCs	WSP-8260B-VOA	Unfiltered	SW-846:8260B	See Table B-4.1-1
SVOCs	WSP-8270C-SVOA	Unfiltered	SW-846:8270D	See Table B-4.1-1
Low-MDL VOCs and SVOCs	WSP-LL-8260B	Unfiltered	SW-846:8260B	See Table B-4.1-1
Low-MDL VOCs and SVOCs	WSP-8011-EDB_DBCP	Unfiltered	SW-846:8011	Dibromo-3-Chloropropane[1,2-], dibromoethane[1,2-]
Low-MDL VOCs and SVOCs	WSP-LL-8270C	Unfiltered	SW-846:8270D	See Table B-4.1-1
Low-MDL VOCs and SVOCs	WSP-8310-PAH	Unfiltered	SW-846:8310	See Table B-4.1-1
Low-MDL VOCs and SVOCs	WSP-LL-8081A-HCB	Unfiltered	SW-846:8081B	Hexachlorobenzene
Low-MDL VOCs and SVOCs	WSP-LL-8151A-PCP	Unfiltered	SW-846:8151A	Pentachlorophenol
PCBs	WSP-8082-PCB	Unfiltered	SW-846:8082	See Table B-4.1-1
HEXP	WSP-8321A-NMED HEXP	Unfiltered	SW-846:8321A_MOD	See Table B-4.1-1
Dioxins/Furans	WSP-8290-D/F	Unfiltered	SW-846:8290A	See Table B-4.1-1
Radionuclides	WSP-GrossA/B	Unfiltered	EPA:900	Gross alpha, gross beta
Radionuclides	WSP-RAD	Unfiltered	EPA:901.1	Cesium-137, cobalt-60, gross gamma, neptunium-237, potassium-40, sodium-22

Table 1.6-2 (continued)

Analytical Suite	Analytical Group	Field Prep	Analytical Method	Analytes
Radionuclides	WSP-RAD	Unfiltered	EPA:905.0	Strontium-90
Radionuclides	WSP-RAD	Unfiltered	HASL-300:AM-241	Americium-241
Radionuclides	WSP-RAD	Unfiltered	HASL-300:ISOPU	Plutonium-238, plutonium-239/240
Radionuclides	WSP-RAD	Unfiltered	HASL-300:ISOU	Uranium-234, uranium-235/236, uranium-238
Tritium	WSP-H-3	Unfiltered	EPA:906.0	Tritium
Low-Level Tritium	WSP-LL-H-3	Unfiltered	Generic:Low_Level_Tritium	Tritium
General Inorganics	WSP-GENINORG+PerChlorate	Filtered	EPA:120.1	Specific conductance
General Inorganics	WSP-GENINORG+PerChlorate	Filtered	EPA:150.1	Acidity or alkalinity of a solution
General Inorganics	WSP-GENINORG+PerChlorate	Filtered	EPA:160.1	Total dissolved solids
General Inorganics	WSP-GENINORG+PerChlorate	Filtered	EPA:300.0	Bromide, chloride, fluoride, sulfate
General Inorganics	WSP-GENINORG+PerChlorate	Filtered	EPA:310.1	Alkalinity-CO3, alkalinity-CO3+HCO3
General Inorganics	WSP-GENINORG+PerChlorate	Filtered	SW-846:6010C	Silicon dioxide
General Inorganics	WSP-GENINORG+PerChlorate	Filtered	SW-846:6850	Perchlorate
General Inorganics	WSP-NH3+NO3/NO2+PO4	Filtered	EPA:350.1	Ammonia as nitrogen
General Inorganics	WSP-NH3+NO3/NO2+PO4	Filtered	EPA:353.2	Nitrate-nitrite as nitrogen
General Inorganics	WSP-NH3+NO3/NO2+PO4	Filtered	EPA:365.4	Total phosphate as phosphorus
General Inorganics	WSP-TKN+TOC	Unfiltered	EPA:351.2	Total Kjeldahl nitrogen
General Inorganics	WSP-TKN+TOC	Unfiltered	SW-846:9060	Total organic carbon
General Inorganics	WSP-CN(T)	Unfiltered	EPA:335.4	Cyanide (Total)
General Inorganics	WSP-All Metals	Filtered	SW-846:6010C	Includes major cations (calcium, magnesium, sodium, potassium) obtained from metals analysis
Chromium Isotopes	WSP-CR52/53	Filtered	SW-846:6020	Chromium-53/52
15N/18O Isotopes in Nitrate	WSP-N15/O18-NO3	Filtered	Generic:Nitrogen Isotope Ratio	Nitrogen-15/nitrogen-14 ratio
15N/18O Isotopes in Nitrate	WSP-N15/O18-NO3	Filtered	Generic:Oxygen Isotope Ratio	Oxygen-18/oxygen-16 ratio from nitrate

Table 1.6-3
Analytical Suites and Frequencies for Locations Assigned to Area-Specific Monitoring Groups

Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Tritium	Low-Level Tritium	General Inorganics	Chromium Isotopes	15N/18O Isotopes in Nitrate
TA-21 Monitoring Group (Upper Los Alamos and Sandia Canyons)												
Intermediate	A, B,	A, B, —[a]	A, B, —	—	—	—	A, B	A, —	A, B, —	A, B	—	—
Regional	S, A, B, —	S, B, —	S, B, —	—	—	—	S, A, B	S, A, —	S, B, —	S, A, B	—	—
Characterization of new deep groundwater wells[b]	Q	Q	Q	A	A	A	Q	—	Q	Q	—	—
Chromium Investigation Monitoring Group (Sandia and Mortandad Canyons)												
Intermediate (Sandia)	Q, S	B, —	B, —	B	—	—	A	A	—	Q, S	A	A
Intermediate (Mortandad)	Q,S	S	S	—	—	—	A	A	—	Q, S	Q, A	A, —
Regional	Q, S, A	S, A, B, —	S, A, B, —	—	—	—	B	A, —	S, A, —	Q, S, A	Q,S,A, —	S, A, —
Characterization of new deep groundwater wells	Q	S	S	A	A	A	S	—	S	Q	S	S
MDA C Monitoring Group (Mortandad and Pajarito Canyons)												
Regional	S, A	S	S	—	V	—	A	—	S	S, A	—	—
Characterization of new deep groundwater wells	Q	Q	Q	A	A	A	S	—	S	Q	—	—
TA-54 Monitoring Group (Mortandad Canyon/Cañada del Buey and Pajarito Canyon)												
Intermediate	A, —	Q, S, —	S, A, —	V, —	V, —	—	A, —	A,—	Q, S, —	A, —	—	—
Regional	A, —	Q, S, —	A, —	V, —	V, —	—	A, —	—	Q, S	A, —	—	—
Characterization of new deep groundwater wells	Q	Q	Q	Q	Q	S	S	—	S	Q	—	—

Table 1.6-3 (continued)

Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Tritium	Low-Level Tritium	General Inorganics[f]	Chromium Isotopes	15N/18O Isotopes in Nitrate
TA-16 260 Monitoring Group (Water Canyon/Cañon de Valle and Pajarito Canyon)												
Base flow	A	S	B	V	S	V	B	—	—	A	—	—
Springs	S	S	B	V	S	V	B	—	—	S	—	—
Alluvial	A	S, A	B	V	S	V	B	—	—	A	—	—
Intermediate	S, A	S, A	B	V, —	S, A	V,—	B	—	B, —	S, A	—	—
Regional	Q, S, A	Q, S, A	B	—	Q, S, A	—	B	—	B, —	Q, S, A	—	—
Characterization of new deep groundwater wells	Q	Q	Q	A	Q	A	A	—	S	Q	—	—
MDA AB Monitoring Group (Ancho and Water Canyons)												
Intermediate	A	A	A	—	A	—	A	—	A	A	—	—
Regional	S	S	S	—	S	—	S	—	S	S	—	—

Notes: Sampling suites and frequencies: Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time/2 yr); T= triennial (1 time/3 yr); V = quinquennial (1 time/5 yr).

[a] — = This analytical suite is not scheduled to be collected for this type of water at select locations assigned to this monitoring group.

[b] Characterization suites and frequencies apply to new intermediate perched or regional groundwater wells assigned to this monitoring group. “New” wells are defined as those completed or converted on or after October 1 of the previous monitoring year.

Table 1.6-4
Analytical Suites and Frequencies for Locations Assigned to General Surveillance Monitoring

Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	Low-MDL VOCs and SVOCs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Tritium	Low-Level Tritium	General Inorganics
Northern Locations (Los Alamos/Pueblo, Sandia, and Mortandad Canyons)											
Base Flow	A	A	A	—	V	T	V	A	—*	—	A
Springs	S, A	S, A	T	—	T	T	V	A	—	A	S, A
Alluvial	A, B	A, B	B, T	—	T, V	T, V, —	V	A	—	—	A, B
Intermediate	A, B, —	B, —	B, —	—	—	—	—	A, —	A —	—	A, B, —
Regional	Q, S, A	S, A, B	Q, S, A	—	T, —	T, —	—	S, A	—	S, A, B, —	Q, S, A
Southern Locations (Pajarito, Water Canyon/Cañon de Valle, Frijoles, Ancho, and Chaquehui Canyons)											
Base flow	A	A	A	—	V	A	V	A	—	—	A
Alluvial	A	B	B	—	V	V	V	A	—	—	A
Intermediate	S, A, B	S, B, —	S, B, —	—	—	A, B, V	—	A	B, —	B, —	S, A, B
Regional	A, B	B, —	B, —	—	—	A, V	—	A, B	—	B, —	A, B
White Rock Canyon and Rio Grande Watershed											
Base flow	A, B	A, B	A, B	X	A, B	B, —	A, B	A, B	—	—	A, B
Springs	A, B	A, B	A, B, T	X	A, B, T, —	A, B, T	A, B, —	A, B	—	A, B, —	A, B

Notes: Sampling suites and frequencies: Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time/2 yr); T= triennial (1 time/3 yr); V = quinquennial (1 time/5 yr); X = sampled once in MY2015.

* — = This analytical suite is not scheduled to be collected for this type of water at select locations assigned to this monitoring group.

Table 1.7-1
Sampling Schedule for MY2015: October 1, 2014–September 30, 2015

Monitoring Group or Watershed	Location Type	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
		Oct–Dec 2014	Jan–Mar 2015	Apr–Jun 2015	Jul–Sep 2015
Monitoring Groups					
TA-54	Routine	V, A, **S,** Q	Q	**S**, Q	Q
Chromium Investigation	Routine	B, A, S, **Q**	**Q**	S, **Q**	**Q**
MDA C	Routine	A, **S**	—	**S**	—
TA-21	Routine	—	S	—	B, **A**, S
MDA AB	Routine	—	**A**, S	—	S
TA-16 260	Routine	Q	V, B, A, **S**, Q	Q	**S**, Q
General Surveillance					
Los Alamos and Pueblo Canyons	Routine	S[a]	—	V, T, B, **A**, S[a]	—
Mortandad and Sandia Canyons	Routine	Q[b]	Q[b]	Q[b]	V, B, **A**, Q[b], X
Pajarito Canyon	Routine	S[c]	—	V, B, **A**, S[c]	—
Frijoles, Ancho, and Chaquehui Canyons	Routine	—	V, B[d]	—	—
Water Canyon	Routine	—	—	—	**A**
White Rock Canyon	Routine	B, **A**, X	—	—	—
Characterization					
All Watersheds	Characterization	Q	Q	Q	Q, X

Notes: Bold indicates the frequency of sampling for the majority of wells in the monitoring group and for which PMRs will be prepared. Sampling frequencies: Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time/2 yr); T= triennial (1 time/3 yr); V = quinquennial (1 time/5 yr); X = 1 time in MY2015; — = no samples are scheduled to be collected from this monitoring group during this period.

[a] Vine Tree Spring.

[b] R-34.

[c] 03-B-13.

[d] R-31, screens 4 and 5.

Table 1.8-1
Frequencies for Locations Assigned to Water-Level Monitoring Only

Assigned Monitoring Group	Location	Rationale for Selection of Location	Source Aquifer	Water Level*
Los Alamos/Pueblo Canyons Watershed				
TA-21 Monitoring Group	R-5 screen 1	Well located downgradient of upper Pueblo and Acid Canyons. Screen has been dry since well installation (2001) although water was observed in the sump below the screen (Koch and Schmeer 2011, 201566). Automated monitoring of water levels maintained to determine if the zone wets up.	Intermediate	C^{HD}
	R-7 screen 1	Well located in middle Los Alamos Canyon. Screen 1 went dry during sampling in December 2003 (Koch and Schmeer 2011, 201566). The zone produced water during drilling, and the screen produced small amounts of water for a short period following installation. Water was detected in the sump below the screen since 2005. Automated monitoring of water levels maintained to determine if either zone recovers.	Intermediate	C^{HD}
	R-7 screen 2	Well located in middle Los Alamos Canyon. Screen 2 has been dry since well installation in 2001 although water has been observed in the sump since mid-2008 (Koch and Schmeer 2011, 201566). Automated monitoring of water levels maintained to determine if either zone recovers.	Intermediate	C^{HD}
	R-7 screen 3	Well located in middle Los Alamos Canyon. The collection of water-quality samples from this screen is suspended because it remains impacted by drilling products. Automated monitoring of water levels should be maintained to monitor the top of the regional aquifer	Regional	C
General Surveillance	LAO-4.5c	Monitors location downcanyon below Los Alamos/DP Canyon confluence.	Alluvial	C
	LAUZ-1	Well is located downgradient of Reach DP 2. Continue monitoring water levels and specific conductance using an Aqua Troll transducer to collect data on salinity impacts from snowmelt runoff.	Alluvial	C
	PAO-2	Well is located approximately mid-way between SCA-3 and the easternmost drainage from the TA-53 complex. Continue monitoring water levels and specific conductance using an Aqua Troll transducer to collect data on salinity impacts from snowmelt runoff.	Alluvial	C

Table 1.8-1 (continued)

Assigned Monitoring Group	Location	Rationale for Selection of Location	Source Aquifer	Water Level*
Mortandad Canyon Watershed				
General Surveillance	MCO-2	Well monitors Effluent Canyon above the TA-50 outfall. Continue monitoring water levels and specific conductance using an Aqua Troll transducer to collect data on salinity impacts from snowmelt runoff.	Alluvial	C
	MCO-4B	Well monitors upper part of Mortandad Canyon. Data will be used to assess the influence from reductions in discharge from the TA-50 RLWTF outfall.	Alluvial	C
	MCO-6	Well monitors upper part of Mortandad Canyon. Data will be used to assess the influence from reductions in discharge from the TA-50 RLWTF outfall.	Alluvial	C
Chromium Investigation Monitoring Group	MCOI-4	Well monitors upper Mortandad and Ten Site Canyons, but no longer yields sufficient water for sampling.	Intermediate	C
	R-61 S2	Water levels should be monitored to assess hydraulic responses from pumping at production wells PM-4 and PM-5, and at other Chromium Monitoring Group wells during aquifer testing.	Regional	C
TA-54 Monitoring Group	R-41 screen 1	Well located east of MDA G at TA-54. Screen 1 has been dry since well installation (March 2009) (Koch and Schmeer 2011, 201566). Water level should be checked during sampling of R-41.	Intermediate	Q^{HD}
Pajarito Canyon Watershed				
General Surveillance	PCAO-7b2	Well characterizes potential impacts from TA-18. Continue monitoring water levels and specific conductance using an Aqua Troll transducer to collect data on salinity impacts from snowmelt runoff.	Alluvial	C
	R-19 screen 1	Well located on a mesa south of Threemile Canyon and downgradient of TA-16. Screen 1 has been dry since installation of the Westbay sampling system in September 2000 (Koch and Schmeer 2011, 201566). Water-level data will continue to be monitored in this screen.	Intermediate	C^{HD}
	R-19 screen 5 R-19 screen 6 R-19 screen 7	Well located on a mesa south of Threemile Canyon and downgradient of TA-16. The collection of water-quality samples from these screens is suspended because they remain impacted by drilling products. Water-level data will continue to be collected from these screens until well R-19 is reconfigured or replaced.	Regional	C

Table 1.8-1 (continued)

Assigned Monitoring Group	Location	Rationale for Selection of Location	Source Aquifer	Water Level*
Water Canyon/Cañon de Valle Watershed				
TA-16 260 Monitoring Group	R-25 screen 1 R-25 screen 2 R-25 screen 3 R-25 screen 4 R-25 screen 5 R-25 screen 6 R-25 screen 7 R-25 screen 8	Located at TA-16 within the Cañon de Valle watershed. Well is planned for plugging and abandonment. Monitor water levels in all screens until well has been plugged and abandoned.	Intermediate (S1, S2, S3, S4) Regional (S5, S6, S7, S8)	C
TA-16 260 Monitoring Group	CdV-R-37-2 S2	Located on mesa between Cañon de Valle watershed and Water Canyon at TA-37. Provides in support of CME activities.	Regional (S2)	C
Ancho Canyon Watershed				
General Surveillance	R-31 screen 1	Located in the north Ancho Canyon tributary. Zone initially showed water during drilling but has been dry since installation of the Westbay system in April 2000 (Koch and Schmeer 2011, 201566). Water-level data will continue to be monitored in this screen.	Intermediate	C^{HD}
	R-31 screen 2 R-31 screen 3	The collection of water-quality samples from these screens is suspended because they remain impacted by drilling products. Water-level data will continue to be monitored in these screens.	Regional	C
Water-Level Data from Water-Supply Wells (Koch and Schmeer 2011, 201566)				
Cooperative Agreement	G-1A, G-2A, G-3A, G-5A	Water-supply wells located in Guaje Canyon	Regional	C
	G-4A	Water-supply well located in lower Rendija Canyon near its confluence with Guaje Canyon	Regional	C
	O-1	Water-supply well located in lower Pueblo Canyon	Regional	C
	O-4	Water-supply well located in Los Alamos Canyon above confluence with DP Canyon	Regional	C
	PM-1 and PM-3	Water-supply wells located in Sandia Canyon	Regional	C
	PM-2	Water-supply well located in Pajarito Canyon	Regional	C
	PM-4	Water-supply well located on Mesita del Buey south of Mortandad Canyon	Regional	C
	PM-5	Water-supply well located on a mesa south of Ten Site and Mortandad Canyons	Regional	C

* Sampling frequency: C = continuous; Q = quarterly (4 times/yr at set time periods); S = semiannual (2 times/yr); A = annual (1 time/yr). The superscript HD indicates this sampling location is historically dry. Continuous monitoring for groundwater refers to the measurement of groundwater-level measurements by a transducer placed in a well and programmed to collect groundwater-level measurements at highly frequent intervals (e.g., every 60 min daily throughout the year).

Table 2.4-1
Interim Monitoring Plan for TA-21 Monitoring Group

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Tritium	Low-Level Tritium	General Inorganics
LADP-3	Los Alamos	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	A	B (2016)[a]	B (2016)	—[b]	—	—	A	—	A	A
LAOI(a)-1.1	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21. Background location in Groundwater Background Investigation Report, Revision 3 (GBIR R3) (LANL 2007, 095817) and Groundwater Background Investigation Report, Revision 4 (GBIR R4) (LANL 2010, 110535).	Intermediate	A	B (2016)	B (2016)	—	—	—	A	—	A	A
LAOI-3.2	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	A	B (2016)	B (2016)	—	—	—	A	A	—	A
LAOI-3.2a	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	A	B (2016)	B (2016)	—	—	—	A	A	—	A
LAOI-7	Los Alamos	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	A	B (2016)	B (2016)	—	—	—	A	A	—	A
R-5 S2	Los Alamos	Monitors for potential contaminants from upper Pueblo and Acid Canyons.	Intermediate	A	—	—	—	—	—	B (2015)	—	B (2015)	B (2015)
R-6i	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	A	A	A	—	—	—	A	A	—	A
R-9i S1	Los Alamos	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21 and possible southward perched-zone migration from Pueblo Canyon.	Intermediate	B (2015)	—	—	—	—	—	B (2015)	—	—	B (2015)
TA-53i	Los Alamos	Monitors for potential southward migration of contaminants from sources in Los Alamos Canyon. Located within TA-53 on the mesa separating Los Alamos and Sandia Canyons.	Intermediate	A	A	A	—	—	—	A	A	—	A
R-5 S3	Los Alamos	Monitors for potential contaminants from upper Pueblo and Acid Canyons.	Regional	B (2015)	—	—	—	—	—	B (2015)	—	B (2015)	B (2015)
R-6	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21. Background location in GBIR R4.	Regional	S	B (2016)	B (2016)	—	—	—	S	S	—	S
R-64	Los Alamos	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21 MDA T.	Regional	S	S	S	—	—	—	S	—	S	S
R-66	Los Alamos	Regional well installed to replace TW-3, located near Otowi-4. Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Regional	S	S	S	—	—	—	S	—	S	S
R-8 S1	Los Alamos	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Regional	B (2015)	—	—	—	—	—	B (2015)	—	B (2015)	B (2015)
R-8 S2	Los Alamos	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Regional	B (2015)	—	—	—	—	—	B (2015)	—	B (2015)	B (2015)
R-9	Los Alamos	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21 and or possible southward perched-zone migration from Pueblo Canyon.	Regional	A	B (2016)	B (2016)	—	—	—	A	A	—	A

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time/2 yr); T = triennial (1 time/3 yr); V = quinquennial (1 time/5 yr); X = sampled once in MY2016.

[a] 2016 = Samples scheduled to be collected during implementation of MY2016 Interim Plan.

[b] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

Table 3.4-1
Interim Monitoring Plan for Chromium Investigation Monitoring Group

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Tritium	Low-Level Tritium	General Inorganics	Chromium Isotopes	15N/18O Isotopes in Nitrate
MCOI-5	Mortandad	Monitors for potential contaminants from upper Mortandad and Ten Site Canyons or possibly Sandia Canyon.	Intermediate	S	S	S	—	—	—	A	A	—	S	A	—
MCOI-6	Mortandad	Monitors for potential contaminants from upper Mortandad and Ten Site Canyons or possibly Sandia Canyon.	Intermediate	Q	S	S	—	—	—	A	A	—	Q	Q	A
SCI-1	Sandia	Monitors the first perched-intermediate groundwater encountered along the key infiltration pathway in Sandia Canyon.	Intermediate	S	—	—	B (2015)[a]	—	—	A	A	—	S	A	A
SCI-2	Sandia	Monitors key infiltration pathway in Sandia Canyon.	Intermediate	Q	B (2016)[b]	B (2016)	B (2015)	—	—	A	A	—	Q	A	A
R-1	Mortandad	Monitors for potential contaminants from upper Mortandad Canyon or possibly Sandia Canyon. Background location in GBIR R3.	Regional	A	B (2016)	B (2016)	—	—	—	B (2015)	—	A	A	—	—
R-11	Sandia	Monitors for potential contaminants from Sandia Canyon and possibly Los Alamos Canyon.	Regional	Q	—	—	—	—	—	B (2015)	—	A	Q	S	—
R-13	Mortandad	Monitors for nature and extent of contaminants originating in Mortandad and Sandia Canyons. Key lower boundary well. Background location in GBIR R3.	Regional	S	—	—	—	—	—	B (2015)	—	A	S	—	—
R-15	Mortandad	Monitors for potential contaminants from upper Ten Site or Mortandad Canyons.	Regional	S	B (2016)	B (2016)	—	—	—	B (2016)	—	A	S	A	—
R-28	Mortandad	Monitors for potential contaminants from upper Sandia, Mortandad, or Ten Site Canyons or possibly sources in canyons to the north.	Regional	Q	—	—	—	—	—	B (2015)	A	—	Q	A	A
R-35a	Sandia	Sentinel monitoring location for chromium contamination in regional groundwater. Located within the same stratigraphic zone as the upper louvered section of water-supply well PM-3.	Regional	Q	B (2016)	B (2016)	—	—	—	B (2015)	—	A	Q	—	—
R-35b	Sandia	Sentinel monitoring location for chromium contamination in the regional groundwater. Located near the water table above the louvered section of water-supply well PM-3.	Regional	Q	B (2016)	B (2016)	—	—	—	B (2015)	—	A	Q	—	—
R-36	Sandia	Monitors for potential contaminants from the Sandia Canyon source and other potential sources from canyons to the north. Also serves as a sentinel well for water-supply well PM-1.	Regional	S	A	A	—	—	—	B (2015)	—	A	S	—	—
R-42	Mortandad	Key characterization and monitoring point located upgradient of R-28.	Regional	Q	B (2016)	B (2016)	—	—	—	B (2015)	A	—	Q	A	A
R-43 S1	Sandia	Monitors downgradient extent of contamination originating in Sandia Canyon and possibly canyons to the north.	Regional	Q	B (2016)	B (2016)	—	—	—	B (2015)	—	A	Q	Q	A
R-43 S2	Sandia	Monitors downgradient extent of contamination originating in Sandia Canyon and possibly canyons to the north.	Regional	Q	B (2016)	B (2016)	—	—	—	B (2015)	—	A	Q	Q	A
R-44 S1	Mortandad	Monitors near the water table for nature and extent of contaminants from sources in Sandia Canyon and possibly sources in canyons to the north.	Regional	Q	B (2016)	B (2016)	—	—	—	B (2015)	—	A	Q	—	—
R-44 S2	Mortandad	Monitors for nature and extent of contaminants from sources in Sandia Canyon and possibly sources in canyons to the north.	Regional	Q	B (2016)	B (2016)	—	—	—	B (2015)	—	A	Q	—	—
R-45 S1	Mortandad	Monitors near the water table for nature and extent of contaminants from sources in Sandia Canyon and possibly sources in canyons to the north.	Regional	S	B (2016)	B (2016)	—	—	—	B (2015)	—	A	S	Q	A
R-45 S2	Mortandad	Monitors for nature and extent of contaminants from sources in Sandia Canyon and possibly sources in canyons to the north.	Regional	S	B (2016)	B (2016)	—	—	—	B (2015)	—	A	S	Q	A
R-50 S1	Mortandad	Monitoring well located on the mesa south of Mortandad Canyon to define the southern extent of chromium contamination in the regional aquifer.	Regional	Q	B (2016)	B (2016)	—	—	—	B (2015)	—	S	Q	Q	—
R-50 S2	Mortandad	Monitoring well located on the mesa south of Mortandad Canyon to define the southern extent of chromium contamination in the regional aquifer.	Regional	Q	B (2015)	B (2015)	—	—	—	B (2015)	—	S	Q	Q	—
R-61 S1	Mortandad	Located on the mesa south of Mortandad Canyon to define the western extent of the flow path for chromium migration.	Regional	Q (filtered and non-filtered)	S	S	A	A	A	S	—	S	Q	Q	A
R-62	Mortandad	Located on a ridge between Sandia and Mortandad Canyon at the east end of Sigma Mesa.	Regional	S	S	S	A	A	A	S	—	S	S	S	S

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time/2 yr); T = triennial (1 time/3 yr); V = quinquennial (1 time/5 yr); X = sampled once in MY2016.

[a] 2015 = Samples scheduled to be collected during implementation of MY2015 Interim Plan.

[b] 2016 = Samples scheduled to be collected during implementation of MY2016 Interim Plan.

Table 4.4-1
Interim Monitoring Plan for MDA C Monitoring Group

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Low-Level Tritium	General Inorganics
R-14 S1	Mortandad	Monitors for potential contaminants from Ten Site Canyon or upper Mortandad Canyon, including MDA C. Background location in GBIR R4.	Regional	A	S	S	—[a]	V (2015)[b]	—	A	S	A
R-46	Mortandad	Monitors groundwater quality downgradient of MDA C.	Regional	S	S	S	—	V (2015)	—	A	S	S
R-60	Mortandad	Located east of MDA C. Monitors for potential contaminant releases from MDA C.	Regional	S	S	S	—	V (2015)	—	A	S	S

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time/2 yr); T = triennial (1 time/3 yr); V = quinquennial (1 time/5 yr); X = sampled once in MY2016.

[a] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

[b] 2015 = Samples scheduled to be collected during implementation of MY2015 Interim Plan.

Table 5.4-1
Interim Monitoring Plan for TA-54 Monitoring Group

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Tritium	Low-Level Tritium	General Inorganics
R-23i S1	Pajarito	Downgradient monitoring location for TA-54. Monitors potential sources in Pajarito watershed and potential sources in canyons to the north.	Intermediate	A	S	A	V (2015)[a]	V (2015)	—[b]	A	A	—	A
R-23i S2	Pajarito	Downgradient monitoring location for TA-54. Also monitors potential sources in Pajarito watershed and potential sources in canyons to the north.	Intermediate	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-23i S3	Pajarito	Downgradient monitoring location for TA-54. Monitors potential sources in Pajarito watershed and potential sources in canyons to the north.	Intermediate	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-37 S1	Mortandad	Monitors perched-intermediate groundwater downgradient of MDA H.	Intermediate	A	Q	S	V (2015)	V (2015)	—	A	—	Q	A
R-40 Si	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed. Screen impacted by drilling fluids.	Intermediate	A	—	—	—	—	—	—	—	S	A
R-40 S1	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Intermediate	—	S	—	—	—	—	—	—	S	—
R-55i	Mortandad	Intermediate well located downgradient of MDA G. Monitors for potential contaminant releases from MDA G and other sources in Pajarito Canyon.	Intermediate	—	—	—	—	—	—	—	—	S	—
R-20 S1	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-20 S2	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-21	Mortandad	Monitors regional groundwater in Mortandad Canyon. Background location in GBIR R3 and GBIR R4.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-23	Pajarito	Downgradient monitoring location for TA-54. Also monitors potential sources in Pajarito watershed and possible sources from canyons to the north.	Regional	A	Q	A	V (2015)	V (2015)	—	A	—	Q	A
R-32 S1	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-37 S2	Mortandad	Monitors regional groundwater downgradient of MDA H.	Regional	A	Q	A	V (2015)	V (2015)	—	A	—	Q	A
R-38	Mortandad	Monitors groundwater downgradient of MDA L in the north fork of Cañada del Buey in the Mortandad watershed.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-39	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	A	Q	A	V (2015)	V (2015)	—	A	—	Q	A

Table 5.4-1 (continued)

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Tritium[f]	Low-Level Tritium[f]	General Inorganics
R-40 S2	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-41 S2	Pajarito	Monitors groundwater near northeast corner of MDA G.	Regional	A	Q	A	V (2015)	V (2015)	—	A	—	Q	A
R-49 S1	Pajarito	Monitors groundwater south of Area G in Pajarito Canyon.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-49 S2	Pajarito	Monitors groundwater south of Area G in Pajarito Canyon. Background location in GBIR R4.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-51 S1	Pajarito	Monitoring well installed west of MDAs H and J and northwest of TA-18. Monitors TA-54 and other potential contaminant sources in Pajarito Canyon.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-51 S2	Pajarito	Monitoring well installed west of MDAs H and J and northwest of TA-18. Monitors TA-54 and other potential contaminant sources in Pajarito Canyon.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-52 S1	Pajarito	Located north-northeast of MDAs H and J on mesa south of Cañada del Buey. Monitors for potential releases of contaminants from MDA H.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-52 S2	Pajarito	Located north-northeast of MDAs H and J on mesa south of Cañada del Buey. Monitors for potential releases of contaminants from MDA H.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-53 S1	Pajarito	Located north of MDA L in Cañada del Buey; monitors for potential releases from MDA L.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-53 S2	Pajarito	Located north of MDA L in Cañada del Buey; monitors for potential releases from MDA L.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-54 S1	Pajarito	Monitoring well installed immediately west of MDA L in Pajarito Canyon; monitors for potential releases from MDA L.	Regional	—	—	—	—	—	—	—	—	S	—
R-54 S2	Pajarito	Monitoring well installed immediately west of MDA L in Pajarito Canyon; monitors for potential releases from MDA L.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-55 S1	Mortandad	Located downgradient of MDA G. Monitors for potential contaminant releases from MDA G and other sources in Pajarito Canyon.	Regional	A	Q	A	V (2015)	V (2015)	—	A	—	Q	A
R-55 S2	Mortandad	Located downgradient of MDA G. Monitors for potential contaminant releases from MDA G and other sources in Pajarito Canyon.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-56 S1	Pajarito	Located on Mesita del Buey between MDAs G and L. Monitors for potential contaminant releases from MDAs G and L and other sources in Pajarito Canyon. Co	Regional	A	Q	A	V (2015)	V (2015)	—	A	—	Q	A
R-56 S2	Pajarito	Located on Mesita del Buey between MDAs G and L. Monitors for potential contaminant releases from MDAs G and L and other sources in Pajarito Canyon.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A
R-57 S1	Pajarito	Located downgradient of MDA G at the eastern end of TA-54; monitors for potential releases from MDA G.	Regional	A	Q	A	V (2015)	V (2015)	—	A	—	Q	A
R-57 S2	Pajarito	Located downgradient of MDA G at the eastern end of TA-54; monitors for potential releases from MDA G.	Regional	A	S	A	V (2015)	V (2015)	—	A	—	S	A

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time/2 yr); T = triennial (1 time/3 yr); V = quinquennial (1 time/5 yr); X = sampled once in MY2016.

[a] 2015 = Samples scheduled to be collected during implementation of MY2015 Interim Plan.

[b] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

Table 6.4-1
Interim Monitoring Plan for TA-16 260 Monitoring Group

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Low-Level Tritium	General Inorganics
Canon de Valle below MDA P	Water	Downgradient surface water location for 260 Outfall (E256). Monitors HE and other contaminants in support of surface CME.	Base flow	A	S	B (2015)[a]	V (2015)	S	V (2015)	B (2016)[b]	—[c]	A
Bulldog Spring	Pajarito	Monitors HE contamination downgradient of TA-09.	Spring	S	S	B (2015)	V (2015)	S	V (2015)	B (2016)	—	S
SWSC Spring	Water	Spring downgradient of TA-16 260 Outfall. Monitors HE and other contaminants in support of surface CME.	Spring	S	S	B (2015)	V (2015)	S	V (2015)	B (2016)	—	S
Burning Ground Spring	Water	Spring downgradient of TA-16 260 Outfall. Monitors HE and other contaminants in support of surface CME.	Spring	S	S	B (2015)	V (2015)	S	V (2015)	B (2016)	—	S
Martin Spring	Water	Spring located in upper Martin/S-Site Canyon.	Spring	S	S	B (2015)	V (2015)	S	V (2015)	B (2016)	—	S
FLC-16-25280	Water	Alluvial well downgradient of Fishladder Spring and Burning Ground Spring.	Alluvial	A	S	B (2015)	V (2015)	S	V (2015)	B (2016)	—	A
CdV-16-02656	Water	Alluvial well location nearest to 260 Outfall drainage/Cañon de Valle confluence. Downgradient of MDA R. Monitors HE and other contaminants in support of surface CME.	Alluvial	A	S	B (2015)	V (2015)	S	V (2015)	B (2016)	—	A
CdV-16-02659	Water	Downgradient alluvial well from 260 Outfall drainage confluence. Monitors HE and other contaminants in support of surface CME.	Alluvial	A	S	B (2015)	V (2015)	S	V (2015)	B (2016)	—	A
CdV-16-611923	Water	Key alluvial well downgradient from TA-16 260 Outfall.	Alluvial	A	S	B (2015)	V (2015)	S	V (2015)	B (2016)	—	A
MSC-16-06294	Water	Alluvial well in S-Site/Martin Canyon downgradient of Martin Spring and several TA-16 SWMU sites. Replaces MSC-16-06295, destroyed in September 2013 floods.	Alluvial	A	A	B (2015)	V (2015)	A	V (2015)	B (2016)	—	A
16-26644	Water	Intermediate well located at TA-16 southeast and downgradient of the 90 Line Pond.	Intermediate	A	S	B (2015)	—	S	—	B (2016)	—	A
CdV-16-1(i)	Water	Located downgradient of the 260 Outfall [Consolidated Unit 16-021(c)-99].	Intermediate	A	S	B (2015)	—	S	—	B (2016)	—	A
CdV-16-2(i)r	Water	Located downgradient of the 260 Outfall.	Intermediate	A	S	B (2015)	—	S	—	B (2016)	—	A
CdV-16-4ip S1	Water	Hydrologic test well installed downgradient of the 260 Outfall to evaluate the hydrologic properties of the deep perched-intermediate aquifer in TA-16.	Intermediate	A	S	B (2015)	V (2015)	S	V (2015)	B (2016)	—	A
CdV-37-1(i)	Water	Located near the confluence of Water Canyon and Cañon de Valle. Monitors groundwater contamination in the perched-intermediate zone downgradient of TA-16.	Intermediate	A	A	B (2015)	—	A	—	B (2016)	B (2015)	A
R-25b	Water	Located immediately west of R-25 on the mesa top in TA-16. Monitors perched-intermediate groundwater for potential contamination associated with effluent from the 260 Outfall. Installed as a replacement for screen 1 in R-25.	Intermediate	S	S	B (2015)	—	S	—	B (2016)	—	S
R-26 PZ-2	Water	Piezometer installed near R-26. Provides data for perched-intermediate groundwater upgradient of TA-16.	Intermediate	A	S	B (2015)	—	S	—	B (2016)	—	A
R-26 S1	Water	Provides site-specific background data for perched-intermediate groundwater upgradient of TA-16. Background location in GBIR R3. Converted to single-screen well.	Intermediate	A	A	B (2016)	—	A	—	B (2016)	—	A
R-47i	Water	Located northeast of the 260 Outfall. Provides data in support of the 260 Outfall CME.	Intermediate	A	A	B (2015)	—	A	—	B (2016)	B (2015)	A
CdV-R-15-3 S4	Water	Monitors for potential contaminants from sources in TA-16.	Regional	S	S	B (2016)	—	S	—	B (2016)	B (2015)	S
CdV-R-37-2 S2	Water	Monitors for potential contaminants from sources in TA-16. Planned for rehabilitation or restoration (work plan due to NMED June 12, 2014).	Regional	—	—	—	—	—	—	—	—	—
R-18	Pajarito	Monitors for potential contaminants from sources in TA-16.	Regional	Q	Q	B (2015)	—	Q	—	B (2016)	B (2015)	Q
R-48	Water	Completed by deepening open borehole CdV-16-3(i). Monitors historical TA-16 sources.	Regional	A	A	B (2015)	—	A	—	B (2016)	B (2015)	A
R-63	Water	Single-screen regional well installed as a replacement for R-25 screen 5.	Regional	S	S	B (2016)	—	S	—	B (2016)	B (2015)	S

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time/2 yr); T = triennial (1 time/3 yr); V = quinquennial (1 time/5 yr); X = sampled once in MY2016.

[a] 2015 = Samples scheduled to be collected during implementation of MY2015 Interim Plan.

[b] 2016 = Samples scheduled to be collected during implementation of MY2016 Interim Plan.

[c] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

Table 7.4-1
Interim Monitoring Plan for MDA AB Monitoring Group

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Low-Level Tritium	General Inorganics
R-27i	Water	Monitors potential contamination associated with the perched-intermediate zone downgradient of historical TA-16 sources.	Intermediate	A	A	A	—*	A	—	A	A	A
R-27	Water	Monitors TA-16 in support of the TA-16 260 Outfall CME. Background location in GBIR R4.	Regional	A	A	A	—	A	—	A	A	A
R-29	Ancho	Located in TA-49 downgradient of MDA AB. Installed to determine whether zones of perched-intermediate groundwater occur under MDA AB.	Regional	S	S	S	—	S	—	S	S	S
R-30	Ancho	Located in TA-49 downgradient of MDA AB. Installed to determine whether zones of perched-intermediate groundwater occur under MDA AB.	Regional	S	S	S	—	S	—	S	S	S

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time/2 yr); T = triennial (1 time/3 yr); V = quinquennial (1 time/5 yr); X = sampled once in MY2016.

* — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

Table 8.3-1
Interim Monitoring Plan for General Surveillance Monitoring

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	Low-MDL VOCs and SVOVs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Tritium	Low-Level Tritium	General Inorganics
LA Canyon near Otowi Bridge	Los Alamos	Measures quality of persistent surface water in Los Alamos Canyon above the confluence of Los Alamos Canyon and Rio Grande (E110). Located on San Ildefonso land and sampled under the MOU.	Base flow	A	A	A	—[a]	V (2015)[b]	T (2017)[c]	V (2015)	A	—	—	A
Los Alamos Spring	Los Alamos	Los Alamos Spring water quality indicates a relation to perched-intermediate groundwater, possibly originating beneath Los Alamos Canyon. Located on San Ildefonso land and sampled under the MOU.	Spring	A	A	T (2017)[c]	—	T (2017)	T (2017)	V (2015)	A	—	A	A
Vine Tree Spring	Los Alamos	Located near Basalt Spring, which no longer flows. Water quality indicates a relation to perched-intermediate groundwater in lower Pueblo Canyon. Located on San Ildefonso land immediately downgradient of the Laboratory boundary and sampled under the MOU.	Spring	S	S	T (2017)	—	T (2017)	T (2017)	V (2015)	A	—	A	S
LLAO-1b	Los Alamos	Monitors upper portion of San Ildefonso Pueblo reach in lower Los Alamos Canyon. Water quality is consistent with recharge of water that emerges at Vine Tree Spring. Located on San Ildefonso land and sampled under the MOU.	Alluvial	A	A	T (2017)	—	T (2017)	T (2017)	V (2015)	A	—	—	A
LLAO-4	Los Alamos	Monitors lower San Ildefonso Pueblo reach in lower Los Alamos Canyon near the confluence with Rio Grande. Water quality appears to reflect mixing with regional groundwater near the Rio Grande. Located on San Ildefonso land and sampled under the MOU.	Alluvial	A	A	T (2017)	—	T (2017)	T (2017)	V (2015)	A	—	—	A
LAO-3a	Los Alamos	Monitors net effect of mixing of alluvial groundwater from Los Alamos and DP Canyons. Located just downcanyon of the confluence of Los Alamos and DP Canyons.	Alluvial	A	B (2015)	B (2015)	—	V (2015)	—	V (2015)	A	—	—	A
PAO-5n	Pueblo	Monitors within the wetland below the Pueblo WWTP. Most downcanyon monitoring point in Pueblo Canyon. Replaces APCO-1, destroyed in September 2013 floods.	Alluvial	A	B (2015)	B (2015)	—	V (2015)	—	V (2015)	A	—	—	A
POI-4	Pueblo	Monitors for potential contaminants from sources in upper Pueblo and Acid Canyons.	Intermediate	A	B (2015)	B (2015)	—	—	—	—	A	—	—	A

Table 8.3-1 (continued)

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	Low-MDL VOCs and SVOVs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Tritium	Low-Level Tritium	General Inorganics
R-3i	Pueblo	Monitors along the potential infiltration pathway originating in lower Pueblo Canyon.	Intermediate	A	B (2016)[d]	B (2016)	—	—	—	—	A	—	—	A
TW-2Ar	Pueblo	Replacement monitoring well for TW-2A. Monitors perched-intermediate groundwater in lower Pueblo Canyon.	Intermediate	A	B (2015)	B (2015)	—	—	—	—	A	A	—	A
R-2	Pueblo	Monitors for potential contaminants from upper Pueblo and Acid Canyons. Background location in GBIR R4.	Regional	A	B (2015)	B (2015)	—	—	—	—	A	—	—	A
R-24	Pueblo	Monitors for potential contaminants from upper Pueblo and Acid Canyons and Guaje Canyon. Background location in GBIR R4.	Regional	A	B (2015)	B (2015)	—	—	—	—	A	—	B (2015)	A
R-3	Pueblo	Located in Pueblo Canyon near the eastern boundary of TA-74. Monitors potential contaminant flow paths near municipal production well Otowi 1.	Regional	A	B (2015)	B (2015)	—	—	—	—	A	—	B (2015)	A
R-4	Pueblo	Monitors for potential contaminants from upper Pueblo and Acid Canyons.	Regional	A	A	A	—	—	—	—	A	—	B (2015)	A
Sandia right fork at Pwr Plant	Sandia	Monitors water quality of base flow above wetland (E121).	Base flow	A	A	A	—	A	T (2017)	V (2015)	A	—	—	A
Sandia below Wetlands	Sandia	Monitors water quality of base flow from wetland (E123).	Base flow	A	A	A	—	A	T (2017)	V (2015)	A	—	—	A
R-12 S1	Sandia	Monitors for potential contaminants from Sandia Canyon or possibly Los Alamos or Pueblo Canyons.	Intermediate	—	—	—	—	—	—	—	—	—	A	—
R-12 S2	Sandia	Monitors for potential contaminants from Sandia Canyon or possibly Los Alamos or Pueblo Canyons.	Intermediate	A	B (2015)	B (2015)	X	—	—	—	A	—	—	A
R-10 S1	Sandia	Monitors for potential contaminants from Sandia Canyon and possibly Los Alamos or Pueblo Canyons. Located on San Ildefonso land and sampled under the MOU. Background location in GBIR R4.	Regional	A	A	A	—	T (2017)	T (2017)	—	A	—	A	A
R-10 S2	Sandia	Monitors for potential contaminants from Sandia Canyon and possibly Los Alamos or Pueblo Canyons. Located on San Ildefonso land and sampled under the MOU. Background location in GBIR R4.	Regional	A	A	A	—	T (2017)	T (2017)	—	A	—	A	A
R-10a	Sandia	Monitors for potential contaminants from Sandia Canyon and possibly Los Alamos or Pueblo Canyons. Located on San Ildefonso land and sampled under the MOU.	Regional	S	S	S	—	T (2017)	T (2017)	—	S	—	S	S
CDBO-6	Mortandad	Located in a small spatially limited saturated zone below Cañada del Buey in shallow bedrock. Monitors infiltration of runoff through the canyon floor.	Alluvial	B (2015)	B (2015)	B (2015)	X	V (2015)	—	V (2015)	A	—	—	B (2015)
MCO-5	Mortandad	Monitors trends in alluvial groundwater quality following upgrades to the RLWTF.	Alluvial	A	B (2016)	B (2015)	—	V (2015)	—	V (2015)	A	A	—	A
MCO-7	Mortandad	Near recent downcanyon extent of alluvial saturation. Monitors trends in alluvial groundwater quality following upgrades to the RLWTF. Monitoring required for RLWTF Discharge Permit DP-1132.	Alluvial	A	B (2016)	B (2016)	—	V (2015)	—	V (2015)	A	A	—	A
R-16 S2	Mortandad	Downgradient monitoring location for TA-54 or other possible sources in Pajarito Canyon or canyons to the north.	Regional	A	B (2015)	B (2015)	—	—	—	—	A	—	—	A
R-16 S4	Mortandad	Downgradient monitoring location for TA-54 or other possible sources in Pajarito Canyon or canyons to the north.	Regional	A	B (2015)	B (2015)	—	—	—	—	A	—	—	A
R-16r	Mortandad	Downgradient monitoring location for TA-54 or other possible sources in Pajarito Canyon or canyons to the north. Replaces screen 1 in R-16. Background location in GBIR R4.	Regional	A	B (2015)	B (2015)	—	—	—	—	A	—	—	A
R-33 S1	Mortandad	Monitors for potential contaminants from upper Ten Site or Mortandad Canyons. Background location in GBIR R4.	Regional	A	B (2015)	B (2015)	—	—	—	—	A	—	B (2015)	A
R-33 S2	Mortandad	Monitors for potential contaminants from upper Ten Site or Mortandad Canyons. Background location in GBIR R4.	Regional	A	B (2015)	B (2015)	—	—	—	—	A	—	—	A

Table 8.3-1 (continued)

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	Low-MDL VOCs and SVOVs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Tritium	Low-Level Tritium	General Inorganics
R-34	Mortandad	Monitors regional groundwater for potential contaminants originating beneath Los Alamos, Sandia, or Mortandad Canyons. Key monitoring location for San Ildefonso and Buckman well field. Located on San Ildefonso land and sampled under the MOU. Background location in GBIR R4.	Regional	Q	A	A	—	T (2017)	T (2017)	—	A	—	A	Q
Two Mile Canyon Below TA-59	Pajarito	Located in Twomile Canyon below TA-59. Monitors water quality below SWMUs and AOCs in upper Twomile basin.	Base flow	A	A	A	—	V (2015)	A	V (2015)	A	—	—	A
Paj bel S&N Anch E Basin conf	Pajarito	Located below the confluences of South and North Anchor East Basin (below E242.5). Monitors water quality below SWMUs and AOCs in Anchor East basin.	Base flow	A	A	A	—	V (2015)	A	V (2015)	A	—	—	A
18-MW-18	Pajarito	Part of a group of alluvial wells within the former TA-18 complex. Monitoring point for potential releases associated with historical sewage lagoons on lower Pajarito Canyon.	Alluvial	A	B (2015)	B (2015)	—	V (2015)	V (2015)	V (2015)	A	—	—	A
PCAO-8	Pajarito	Characterizes potential impacts from runoff associated with TA-54 near PCTH-5 (between PCO 2 and PCO-3).	Alluvial	A	B (2015)	B (2015)	—	V (2015)	V (2015)	V (2015)	A	—	—	A
03-B-13	Pajarito	Near TA-03 building SM-30. Monitored in support of project at SWMU 03-010(a).	Intermediate	S	S	S	—	—	V (2015)	—	A	B (2015)	—	S
PCI-2	Pajarito	Monitors perched-intermediate groundwater at the confluence of Twomile and Pajarito Canyons. Provides baseline characterization data for areas upgradient of TA-54. Background location in GBIR R4.	Intermediate	A	B (2015)	B (2015)	—	—	V (2015)	—	A	—	B (2015)	A
R-19 S2	Pajarito	Monitors for potential contaminants from TA-16. Also provides baseline characterization data for downgradient areas including TA-54.	Intermediate	B (2015)	—	—	—	—	B (2015)	—	A	—	—	B (2015)
R-17 S1	Pajarito	Monitors MDA C, TA-16, and potential sources in upper Pajarito watershed. Background location in GBIR R4.	Regional	A	B (2015)	B (2015)	—	—	A	—	A	—	B (2015)	A
R-17 S2	Pajarito	Monitors MDA C, TA-16, and potential sources in upper Pajarito watershed. Background location in GBIR R4.	Regional	A	B (2015)	B (2015)	—	—	A	—	A	—	—	A
R-19 S3	Pajarito	Monitors for potential contaminants from TA-16. Also provides baseline characterization data for downgradient areas including TA-54.	Regional	B (2015)	—	—	—	—	V (2015)	—	A	—	—	B (2015)
R-19 S4	Pajarito	Monitors for potential contaminants from TA-16. Also provides baseline characterization data for downgradient areas including TA-54.	Regional	B (2015)	—	—	—	—	V (2015)	—	A	—	—	B (2015)
Between E252 and Water at Beta	Water	Located in Water Canyon east of TA-28. Monitors water quality below SWMUs and AOCs in Water Canyon.	Base flow	A	A	A	—	V (2015)	A	V (2015)	A	—	—	A
WCO-1r	Water	Replacement well for WCO-1.	Alluvial	B (2015)	B (2015)	B (2015)	—	V (2015)	V (2015)	V (2015)	A	—	—	B (2015)
R-31 S4	Frijoles, Ancho, and Chaquehui	Part of interim monitoring network pending well network assessment for MDA AB.	Regional	B (2015)	—	—	—	—	V (2015)	—	B (2015)	—	—	B (2015)
R-31 S5	Frijoles, Ancho, and Chaquehui	Part of interim monitoring network pending well network assessment for MDA AB.	Regional	B (2015)	—	—	—	—	V (2015)	—	B (2015)	—	—	B (2015)

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time/2 yr); T = triennial (1 time/3 yr); V = quinquennial (1 time/5 yr); X = sampled once in MY2016.

[a] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

[b] 2015 = Samples scheduled to be collected during implementation of MY2015 Interim Plan.

[c] 2017 = Samples scheduled to be collected during implementation of MY2017 Interim Plan.

[d] 2016 = Samples scheduled to be collected during implementation of MY2016 Interim Plan.

Table 8.3-2
Interim Monitoring Plan for White Rock Canyon

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	Low-MDL VOCs and SVOCs	PCBs	HEXP	Dioxins/Furans	Radionuclides	Low-Level Tritium	General Inorganics
Ancho at Rio Grande	White Rock	Historical annual sampling site. Monitors base flow from Ancho at Rio Grande. If base flow is not reaching the Rio Grande, a surface water sample will be collected at the first upstream location with sufficient flow that is no farther than 1000 ft from the confluence with the Rio Grande.	Base flow	B (2015)[a]	B (2015)	B (2015)	X	B (2015)	B (2015)	B (2015)	B (2015)	—[b]	B (2015)
Frijoles at Rio Grande	White Rock	Perimeter station for the Laboratory. Sampled in fall during White Rock and Rio Grande watershed sampling event. If base flow is not reaching the Rio Grande, a surface water sample will be collected at the first upstream location with sufficient flow that is no farther than 1000 ft from the confluence with the Rio Grande.	Base flow	B (2015)	B (2015)	B (2015)	X	B (2015)	B (2015)	B (2015)	B (2015)	—	B (2015)
Mortandad at Rio Grande	White Rock	Located on San Ildefonso land and sampled under the MOU. If base flow is not reaching the Rio Grande, a surface water sample will be collected at the first upstream location with sufficient flow that is no farther than 1000 ft from the confluence with the Rio Grande.	Base flow	B (2016)[c]	B (2016)	B (2016)	X	B (2016)	B (2016)	B (2016)	B (2016)	—	B (2015)
Pajarito at Rio Grande	White Rock	Monitors base flow from Pajarito at the Rio Grande. If base flow is not reaching the Rio Grande, a surface water sample will be collected at the first upstream location with sufficient flow that is no farther than 1000 ft from the confluence with the Rio Grande.	Base flow	B (2015)	B (2015)	B (2015)	X	B (2015)	B (2015)	B (2015)	B (2015)	—	B (2015)
Rio Grande at Frijoles	White Rock	Monitors base flow in the Rio Grande at Frijoles Canyon.	Base flow	B (2015)	B (2015)	B (2015)	X	B (2015)	B (2015)	B (2015)	B (2015)	—	B (2015)
Rio Grande at Otowi Bridge	White Rock	Monitors base flow in the Rio Grande at Otowi Bridge. Located on San Ildefonso land and sampled under the MOU.	Base flow	A	A	A	X	A	—	A	A	—	A
Ancho Spring	White Rock	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	X	—	A	—	A	A	A
La Mesita Spring	White Rock	Monitors regional aquifer downgradient of the Laboratory. Located on San Ildefonso land and sampled under the MOU.	Spring	A	A	T (2017)[d]	X	T (2017)	T (2017)	—	A	A	A
Sacred Spring	White Rock	Off-site spring that monitors regional aquifer downgradient of the Laboratory. Background location. Located on San Ildefonso land and sampled under the MOU. Background location in GBIR R3 and GBIR R4.	Spring	A	A	T (2017)	X	T (2017)	T (2017)	—	A	A	A
Sandia Spring	White Rock	Monitors regional aquifer downgradient of the Laboratory. Located on San Ildefonso land and sampled under the MOU. Background location in GBIR R4.	Spring	B (2016)[c]	B (2016)	B (2016)	X	B (2016)	B (2016)	—	B (2016)	B (2016)	B (2016)
Spring 1	White Rock	Monitors regional aquifer downgradient of the Laboratory. Background location. Located on San Ildefonso land and sampled under the MOU. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	X	A	A	—	A	A	A
Spring 2	White Rock	Monitors regional aquifer downgradient of the Laboratory. Located on San Ildefonso land and sampled under the MOU.	Spring	B (2016)	B (2016)	B (2016)	X	B (2016)	B (2016)	—	B (2016)	B (2016)	B (2016)
Spring 3	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	B (2015)	B (2015)	B (2015)	X	B (2015)	B (2015)	B (2015)	B (2015)	—	B (2015)
Spring 3A	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	X	—	A	—	A	—	A
Spring 3AA	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	B (2015)	B (2015)	B (2015)	X	—	B (2015)	—	B (2015)	—	B (2015)
Spring 4	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	X	A	T (2017)[k]	A	A	—	A
Spring 4A	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	X	—	A	—	A	—	A
Spring 4AA	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	B (2016)	X	—	B (2016)	—	A	—	A

Table 8.3-2 (continued)

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Metals	VOCs	SVOCs	Low-MDL VOCs and SVOCs	PCBs	HEXP[d]	Dioxins/Furans	Radionuclides	Low-Level Tritium	General Inorganics
Spring 4B	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	B (2016)	X	—	B (2016)	—	A	—	A
Spring 5	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	X	—	A	—	A	—	A
Spring 5A	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	B (2015)	B (2015)	B (2015)	X	—	B (2015)	—	B (2015)	—	B (2015)
Spring 5B	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	X	—	A	—	A	—	A
Spring 6	White Rock	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	X	—	A	—	A	—	A
Spring 6A	White Rock	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3 and GBIR R4.	Spring	B (2015)	B (2015)	B (2015)	X	—	B (2015)	—	B (2015)	—	B (2015)
Spring 8A	White Rock	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3.	Spring	B (2015)	B (2015)	B (2015)	X	—	B (2015)	—	B (2015)	—	B (2015)
Spring 9	White Rock	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	X	—	A	—	A	—	A
Spring 9A	White Rock	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3.	Spring	A	A	A	X	—	A	—	A	—	A

Notes: Sampling suites and frequencies: C = continuous; Q = quarterly (4 times/yr); S = semiannual (2 times/yr); A = annual (1 time/yr); B = biennial (1 time/2 yr); T = triennial (1 time/3 yr); V = quinquennial (1 time/5 yr); X = sampled once in MY2015.

[a] 2015 = Samples scheduled to be collected during implementation of MY2015 Interim Plan.

[b] — = This analytical suite is not scheduled to be collected for this type of water at locations assigned to this monitoring group.

[c] 2016 = Samples scheduled to be collected during implementation of MY2016 Interim Plan.

[d] 2017 = Samples scheduled to be collected during implementation of MY2017 Interim Plan.

Appendix A

Acronyms and Abbreviations, Metric Conversion Table, and Data Qualifier Definitions

A-1.0 ACRONYMS AND ABBREVIATIONS

AK	acceptable knowledge
AOC	area of concern
AWM	approval with modifications
BART	Biological Activity Reaction Tests
BCG	Biota Concentration Guides (DOE)
bgs	below ground surface
CAS	Chemical Abstract Service
CME	corrective measures evaluation
CMI	corrective measures implementation
Consent Order	Compliance Order on Consent
COPC	chemical of potential concern
CV	casing volume
CY	calendar year
DCG	Derived Concentration Guidelines (DOE)
DO	dissolved oxygen
DOE	Department of Energy (U.S.)
DP	drop pipe
EES-14	Earth Systems Observations (Laboratory group)
EP	Environmental Programs (Directorate)
EPA	Environmental Protection Agency (U.S.)
FY	fiscal year
GBIR	Groundwater Background Investigation Report
GFM	geologic framework model
GGRL	Geochemistry and Geomaterials Research Laboratories
HE	high explosives (also HEXP)
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
ICP-AES	inductively coupled plasma atomic emission spectroscopy
ICP-MS	inductively coupled plasma mass spectrometry
IDW	investigation-derived waste
IM	interim measure
Interim Plan	Interim Facility-Wide Groundwater Monitoring Plan
IR	investigation report
LANL	Los Alamos National Laboratory

MCL	maximum contaminant level
MDA	material disposal area
MDL	method detection limit
meq	milliequivalent
MOU	memorandum of understanding
MP	multiport (Westbay system)
MY	monitoring year
NIST	National Institute of Standards and Technology
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NM GW STD	New Mexico Groundwater Standard
NMWQCC	New Mexico Water Quality Control Commission
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
ORP	oxygen-reduction potential
PCB	polychlorinated biphenyl
PEB	performance evaluation blank
PMR	periodic monitoring report
PQL	practical quantitation limit
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5,trinitro-1,3,5-triazine
RLWTF	Radioactive Liquid Waste Treatment Facility
RPF	Records Processing Facility
SC	specific conductance
SERF	Sanitary Effluent Reclamation Facility
SL	screening level
SMO	Sample Management Office
SOP	standard operating procedure
SU	Standard Unit
SVOC	semivolatile organic compound
SWMU	solid waste management unit
SWWS	Sanitary Wastewater Systems

T	temperature
TA	technical area
TATB	triaminotrinitrobenzene
TCE	trichloroethene
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TNT	trinitrotoluene(2,4,6)
TOC	total organic carbon
TW	Test Well
USGS	U.S. Geological Survey
VOC	volatile organic compound
WCSF	waste characterization strategy form
WWTP	waste water treatment plant
XRD	x-ray diffraction

A-2.0 METRIC CONVERSION TABLE

Multiply SI (Metric) Unit	by	To Obtain U.S. 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.)
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)

A-3.0 DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
U	The analyte was analyzed for but not detected.
J	The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.
J+	The analyte was positively identified, and the result is likely to be biased high.
J-	The analyte was positively identified, and the result is likely to be biased low.
UJ	The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit.
R	The data are rejected as a result of major problems with quality assurance/quality control (QA/QC) parameters.

Appendix B

Procedures, Methods, and Investigation-Derived Waste Management

B-1.0 PROCEDURES FOR MEASURING GROUNDWATER LEVELS AND COLLECTING WATER SAMPLES

This section summarizes Los Alamos National Laboratory (LANL or the Laboratory) standard operating procedures (SOPs) used to measure groundwater levels and to collect groundwater, base-flow, and spring samples. These procedures are listed in the table below and are summarized in subsequent sections. These procedures (or their equivalent) will be used during sampling activities conducted in accordance with this Interim Facility-Wide Groundwater Monitoring Plan (the Interim Plan). The SOPs are listed at http://www.lanl.gov/community-environment/environmental-stewardship/plans-procedures.php, and are available at the Los Alamos National Laboratory Public Reading Room at http://eprr.lanl.gov.

Procedure Identifier	Procedure Title	Applicability
Measurement of Groundwater Levels		
SOP-5223	Manual Groundwater Level Measurements	Procedure for measuring depth to groundwater and determining groundwater elevation in a monitoring well or an open borehole
EP-DIV-SOP-10010	Pressure Transducer Installation, Removal, and Maintenance	Procedure to install, remove, and maintain pressure transducers to monitor and record water-level data in monitoring wells and piezometers
SOP-5226	Westbay Pressure Transducer Installation, Removal, and Maintenance	Procedure to install, remove, and maintain pressure transducers to monitor and record water-level data in Westbay monitoring wells
SOP-5230	Groundwater-Level Data Processing, Review, and Validation	Procedure to review and validate groundwater-level data obtained from pressure transducers
EP-DIV-SOP-20006	Pressure Monitoring of Packer Systems in Monitoring Wells	Procedure for monitoring and maintenance of Baski sampling system packers and temporary packers installed in water wells
Collection of Groundwater Samples		
EP-DIR-SOP-20032	Groundwater Sampling	Procedure for sampling groundwater using various types of pumps. Procedure also addresses sampling of water supply wells and domestic wells.
SOP-5225	Groundwater Sampling Using Westbay MP System	Procedure for sampling groundwater using the Westbay multiport (MP) system
EP-ERSS-SOP-5061	Field Decontamination of Equipment	Procedure for field decontamination of equipment
Collection of Surface Water and Spring Samples		
SOP-5224	Spring and Surface Water Sampling	Procedure for sampling springs and surface water
Sample Preparation, Preservation, and Transportation		
EP-ERSS-SOP-5059	Field Quality Control Samples	Procedure for collection of field quality control (QC) samples, including field duplicates, equipment rinsate blanks, and trip blanks
EP-ERSS-SOP-5056	Sample Containers and Preservation	Procedure specifying sample containers, collection and preservation techniques, and holding times
EP-ERSS-SOP-5057	Handling, Packaging, and Transporting Field Samples	Procedure for sample packaging and shipping
SOP-5255	Shipping of Environmental Samples by the WES SMO	Procedure for receiving, packaging, and shipping samples to analytical laboratories

Procedure Identifier	Procedure Title	Applicability
Field Activities Documentation		
SOP-5181	Notebook and Logbook Documentation for Environmental Directorate Technical and Field Activities	Procedure for documenting technical work and field activities in a notebook or logbook
Waste Management		
EP-DIR-SOP-10021	Characterization and Management of Environmental Program Waste	Procedure for characterizing and managing generated waste

B-2.0 SUMMARY OF FIELD INVESTIGATION METHODS

Method	Summary
General	The objective of this sampling program is to collect samples from wells, springs, or base-flow stations that are representative of physical and geochemical conditions in the targeted hydrogeologic unit. To meet this objective, sampling equipment, sampling methods, monitoring-well operation and maintenance, and sample-handling procedures are implemented such that the chemistry of the sample is not altered. The procedures summarized below have been developed to meet the above objective and to be consistent with the requirements of the Compliance Order on Consent (the Consent Order).
Groundwater-Level Measurements Referenced Procedures: • EP-DIV-SOP-10010, Pressure Transducer Installation, Removal, and Maintenance • SOP-5226, Westbay Pressure Transducer Installation, Removal and Maintenance • SOP-5223, Manual Groundwater Level Measurements • SOP-5230, Groundwater Level Data Processing, Review and Validation	This summary applies to the collection of groundwater-level data. Groundwater levels are manually measured at predetermined intervals. Additionally, data are downloaded at wells with pressure transducers installed after each sampling event. Water levels cannot be manually measured in wells equipped with the Westbay sampling system; however, data from these wells are downloaded before and after each sampling event. Westbay transducers must be removed before sampling and are reinstalled after each sampling event. Two methods are used to collect water-level data: • Pressure transducers are used to measure water levels in individual wells or well screens at specified intervals. Most wells sampled under the Interim Plan are monitored with pressure transducers. • Manual water-level measurements are routinely measured in wells not instrumented with pressure transducers. These measurements are also taken before purging and sampling alluvial wells. Manual water-level measurements are also taken periodically to verify transducer readings. Data from pressure transducers are automatically recorded in a data logger for later retrieval and processing to calculate water levels. Information collected during manual water-level measurements is documented on the Groundwater Level Measurement Form or Groundwater Level Project Field Form. Pressure transducers are periodically bench-tested to verify calibration.

<table>
<tr><th>Method</th><th>Summary</th></tr>
<tr>
<td>**Collection of Groundwater Samples Using Dedicated Submersible or Portable Pumping Systems**
Referenced Procedures:
• EP-DIV-SOP-20032 Groundwater Sampling
• EP-ERSS-SOP-5056, Sample Containers and Preservation
• EP-DIR-SOP-10021, Characterization and Management of Environmental Program Waste
• SOP-5181, Notebook and Logbook Documentation for Environmental Directorate Technical Field Activities</td>
<td>This summary applies to the use of an electric gear-driven submersible pump system, a bladder-pump system, a Bennett pump system, a Baski pump system, a hand-bailer system, and portable versions of the bladder pump and Bennett pump to sample wells.
• Wells are purged sufficiently before sample collection to ensure samples will be representative of formation water.
• The pumping rate should be adjusted, if possible, during purging so excessive drawdown does not occur. Field crews may have limited ability to restrict flow, depending on the pumping system. Turning off the pump while purging regional and intermediate wells should be avoided unless absolutely necessary. Instead, the pumping rate should be slowed to prevent drawdown into the screen, whenever possible.
• The discharge rate is calculated either by using an in-line flow meter or by filling a bucket or bottle of known volume and dividing by the fill time. Flow rate is monitored at regular intervals during the purge, preferably once per casing volume (CV) and while the drop pipe is being cleared.
• In general, a well may be sampled once the following criteria have been met (see EP-DIV-SOP-20032 for details):
❖ A minimum of 1 CV has been removed for alluvial wells and a minimum of 3 CVs (plus the drop pipe) has been removed for intermediate or regional wells (unless otherwise requested).
❖ The field indicator parameters have stabilized within their allowable ranges (as listed below) for at least three consecutive measurements taken a minimum of 3 or 5 min apart.
<table>
<tr><th>Field Parameter</th><th>Stabilization Criteria
(Yeskis and Zavala 2002, 204429)</th></tr>
<tr><td>Turbidity</td><td><10 nephelometric turbidity units (NTU), or turbidity should vary no more than 10% when turbidity is greater than 10 NTU.</td></tr>
<tr><td>Dissolved Oxygen (DO)</td><td>DO varies no more than 0.3 mg/L.</td></tr>
<tr><td>pH</td><td>pH varies no more than 0.2 Standard Units (SU).</td></tr>
<tr><td>Specific Conductance (SC)</td><td>For SC>100 μS/cm, SC varies no more than 3%, or
for SC≤100 μS/cm, SC varies no more than 5%.</td></tr>
</table>
• At the start of each sampling campaign, well-specific work plans are developed which provide additional direction where purge volume and/or field parameter stability requirements cannot be met. In these cases, the work plan requirements will supersede the requirements of this SOP.
• Purge water is discharged under the notice of intent (NOI) with the New Mexico Environment Department (NMED) or containerized pending waste determination.
• Sample labels and documentation are completed for each sample following procedures referenced in this Interim Plan. All activities are documented in the field logbook and appropriate field forms.
• Chain-of-custody seals are applied to each sample container before samples are transported from the site.
• All samples are submitted to the Sample Management Office (SMO) and then shipped to the designated off-site analytical laboratory in a timely manner to allow the laboratory to conduct analyses within proper holding times.</td>
</tr>
</table>

Method	Summary
Collection of Groundwater Samples Using Westbay System Referenced Procedures: • SOP-5225, Groundwater Sampling Using Westbay Sampling System • SOP-5226, Westbay Pressure Transducer Installation, Removal and Maintenance • EP-ERSS-SOP-5056, Sample Containers and Preservation	This summary applies to the sampling of wells equipped with the Westbay MP system, a multilevel groundwater monitoring system. Samples are collected using a dedicated closed-access tube with valved ports that provide access to multiple levels of a borehole through a single well casing. The Westbay system is designed to allow for sampling without purging under normal aquifer conditions and takes samples at an in situ pressure. • The Westbay MP system consists of casing components that are permanently installed in the final casing, portable pressure measurement and sampling probes, and specialized tools. • The sampling probes are lowered to a precise port depth from which the sample is collected. This sampling system is a nonpurge system so no purge water is generated. • Samples are collected directly into the sampling probe’s sample containers and are transferred into the appropriate sample containers as soon as possible. • Data collected during sampling, including port pressures and field parameters, are documented on the appropriate forms in SOP-5225. • The sample probe and sample containers are the only equipment or materials that are reused and are decontaminated between sampling each port, as described in SOP-5225. • Sample labels and documentation are completed for each sample following procedures referenced in this Interim Plan. Samples are delivered to SMO and shipped to the designated off-site analytical laboratory in a timely manner to allow the samples to be analyzed within proper holding times.
Collection of Spring and Surface Water Samples Referenced Procedures: • SOP-5224, Spring and Surface Water Sampling • EP-ERSS-SOP-5056, Sample Containers and Preservation	This summary applies to collecting water-quality samples from base-flow sites and springs. • Permanent spring and base-flow sampling sites are usually identified by posts or gaging stations. However, this may not be possible at some sites. • Ideally, samples are collected from flowing water. In some cases, the samples may need to be collected from pooled or ponded water. Samples are collected far enough upstream of a confluence so they are not influenced by water from another stream. If there is any question about whether a representative sample can be collected, field personnel are instructed to contact the requestor before proceeding. • Samples may be collected using either the direct containment method or a peristaltic pump. Filtered samples must be collected using a peristaltic pump. • Where both field conditions and flow conditions allow, a discharge measurement should be taken using one of the methods outlined in SOP-5224. Discharge may be estimated where quantitative measurements are not possible. • Sample labels and documentation are completed for each sample following procedures referenced in this Interim Plan. All activities are documented in the field logbook and appropriate field forms. • Samples are delivered to SMO and shipped to the designated off-site analytical laboratory in a timely manner to allow the samples to be analyzed within proper holding times.

Method	Summary
Sample Bottles and Preservation of Samples Referenced Procedure: • EP-ERSS-SOP-5056, Sample Containers and Preservation	This summary applies to requirements for sampling containers, sample pretreatment, and sample preservation requirements that are applicable to all water-quality samples. • All samples are collected in containers specifically prepared for that given parameter. • Sample containers are precleaned to a 300 Series (I-Chem, ESS) and are commercially available through a number of vendors. • For filtered samples for the analysis of dissolved constituents, the following systems will be used: ❖ in-line 0.45-µm disposable filter capsules, ❖ in-line filter holders with 0.45-µm filter membranes, or ❖ in-line 0.02-µm disposable filter capsules (for samples requiring microfiltration only). • Samples are preserved in accordance with Attachment 1 to SOP-5056. Samples are preserved and pH tested immediately after collection.
Handling, Packaging, and Shipping of Samples Referenced Procedures: • EP-ERSS-SOP-5057, Handling, Packaging, and Transporting Field Samples • SOP-5255, Shipping of Environmental Samples by the WES SMO	This summary applies to requirements for handling, packaging, and shipping of samples. • After all samples are collected and preserved, the sample containers are wiped off and custody tape is applied before packaging. • Samples for off-site analysis are transported to the SMO for shipment to off-site analytical laboratories. • The sampling personnel will coordinate with the SMO regarding shipment of all samples.
Sample Documentation Referenced Procedures: • EP-ERSS-SOP-5057, Handling, Packaging, and Transporting Field Samples • SOP-5181, Notebook and Logbook Documentation for Environmental Directorate Technical Field Activities	This summary applies to requirements for documentation of sample collection. • The requested parameters, preservation and bottle type, chain of custody, required field parameters, and any other additional information are included on the analytical request generated from the database. • All sampling activities are documented in the field logbooks and appropriate field forms. • Chain of custody is documented on the analytical request form and signed to verify that the samples were not left unattended. • All field information, date and time of sample, purging and final field parameters, field conditions, and sampling personnel are included in the specific sampling method field sheets.

Method	Summary
Field Quality Assurance/Quality Control Samples Referenced Document: • Current Interim Facility-Wide Groundwater Monitoring Plan	Field quality assurance (QA)/QC samples are required by the Consent Order and are discussed in detail in Appendix D. Field QA/QC samples to be collected are summarized below. • Field blanks are collected at a minimum frequency of 10% of all samples collected in a sampling campaign. • Equipment rinsate blanks are collected before a well with a nondedicated pump is sampled and before each well equipped with a Westbay sampling system is sampled. • Field duplicates are collected at a rate of 10% of all samples collected during a sampling campaign and are distributed proportionately by media type (surface water, alluvial groundwater, and intermediate/regional groundwater). • Field trip blanks are included with any coolers containing samples submitted for volatile organic compound (VOC) analysis. • Performance evaluation blanks are collected once per sampling campaign, and analyzed for all constituents sampled for during the campaign. They are prepared from reagent-grade deionized water.

B-3.0 METHODS AND INSTRUMENTS USED FOR FIELD MEASUREMENTS

Field Parameter	Method Description	U.S. Environmental Agency–Approved Methods	Primary Field Instrument(s)	Primary Flow-Through Cell Used/Type	Description
pH	Hydrogen ion, pH (pH units): electrometric measurement	EPA Method 150.1 Standard Methods,* 4500-H^+ B Editions 18th, 19th, 20th	YSI 650 Handheld Meter with YSI 6820 Sonde Water-Quality Probe YSI-EXO Handheld Meter with EXO Sonde Water-Quality Probe or Equivalent	YSI 6-Series cell YSI-EXO cell	Samples will be analyzed for pH and temperature in the field using a flow-through cell during well purging and at the time of sample collection. The listed instrument is commercially available with a temperature sensor for automatic compensation. A calibration check is performed following the manufacturer's instructions with standard buffers traceable to National Institute of Standards and Technology (NIST). Standards are purchased from commercial vendors.
Temperature	Temperature, thermometric (°C)	EPA Method 170.1 Standard Methods, 2550 B Editions 18th, 19th, 20th	YSI 650 Handheld Meter with YSI 6820 Sonde Water-Quality Probe YSI-EXO Handheld Meter with EXO Sonde Water-Quality Probe or Equivalent	YSI 6-Series cell YSI-EXO cell	Samples will be analyzed for temperature concurrently with pH measurement in the field using a flow-through cell during well purging and at the time of sample collection. The listed instruments are commercially available with a temperature sensor for automatic compensation.
Specific Conductance	Electrical conductance (micromhos/cm at 25°C): Wheatstone bridge	EPA Method 120.1 Standard Methods, 2510 B Editions 18th, 19th, 20th	YSI 650 Handheld Meter with YSI 6820 Sonde Water-Quality Probe YSI-EXO Handheld Meter with EXO Sonde Water-Quality Probe or Equivalent	YSI 6-Series cell YSI-EXO cell	Samples will be analyzed for specific conductance in the field during well purging and at the time of sample collection. The listed instruments are commercially available with a temperature sensor for automatic compensation. A calibration check is performed following the manufacturer's instructions with standard buffers traceable to NIST. Standards are purchased from commercial vendors.

Field Parameter	Method Description	U.S. Environmental Agency–Approved Methods	Primary Field Instrument(s)	Primary Flow-Through Cell Used/Type	Description
Dissolved Oxygen	Oxygen, dissolved (mg/L): electrode	EPA Method 360.1 Standard Methods, 4500-O G Editions 18th, 19th, 20th ASTM D888-09(C)	YSI 650 Handheld Meter with YSI 6820 Sonde Water-Quality Probe YSI-EXO Handheld Meter with EXO Sonde Water-Quality Probe or Equivalent	YSI 6-Series cell YSI-EXO cell	Samples will be analyzed for dissolved oxygen in the field using a flow-through cell during well purging and at the time of sample collection. The listed instruments are commercially available with a temperature sensor for automatic compensation. The instrument is calibrated following the manufacturer's instructions.
Turbidity	Static determination using white-light turbidimeter	EPA Method 180.1 Standard Methods, 2130 B Editions 18th, 19th, 20th ASTM D7315, ISO 7027	Hach 2100P YSI 650 Handheld Meter with YSI 6820 Sonde Water-Quality Probe YSI-EXO Handheld Meter with EXO Sonde Water-Quality Probe or Equivalent	Single sample aliquot application YSI 6-Series cell YSI-EXO cell	Samples will be analyzed for turbidity in the field using a flow-through cell and/or a single aliquot method during well purging and at the time of sample collection. The listed instruments are commercially available, and a calibration check is performed following the manufacturer's instructions.
Oxidation-Reduction Potential	Oxidation-reduction potential (mV): electrode method	Standard Methods, 2580 A Editions 18th, 19th, 20th	YSI 650 Handheld Meter with YSI 6820 Sonde Water-Quality Probe YSI-EXO Handheld Meter with EXO Sonde Water-Quality Probe or Equivalent	YSI 6-Series cell YSI-EXO cell	Samples will be analyzed for oxidation-reduction potential in the field using a flow-through cell during well purging and at the time of sample collection. The listed instruments are commercially available with a temperature sensor for automatic compensation. A calibration check is performed following the manufacturer's instructions and is recorded.

* "Standard Methods" refers to editions of the Standard Methods for the Examination of Water and Wastewater, published by the American Public Health Association (Washington, D.C.).

B-4.0 ANALYTICAL METHODS—GROUNDWATER ANALYTICAL SUITES

B-4.1 Analyses by Accredited Contract Laboratories

Samples for laboratory analysis are submitted to accredited contract laboratories and analyzed using the methods listed in Tables 1.6-2 and B-4.1-1. The contract laboratories are required to establish method detection limits (MDLs) and practical quantitation limits (PQLs) for target analytes.

The MDL is the minimum concentration of an analyte that can be measured and reported with a 99% confidence that the concentration is greater than 0, as determined by the procedure set forth at Appendix B of 40 Code of Federal Regulations Part 136. The MDL is based on prepared spiked samples that go through the entire sample preparation scheme before they are analyzed. Most often, the MDL samples are analyzed by the contract laboratories under ideal conditions when the analytical instrumentation has been recently serviced, cleaned, and calibrated.

The PQL is the lowest concentration that can be reliably measured within specified limits of precision, accuracy, representativeness, completeness, and comparability during *routine* laboratory operating conditions using approved U.S. Environmental Protection Agency (EPA) methods. In most cases the contract laboratories define the low spike on their initial calibration curve as the PQL. Generally, the PQL is 3 to 5 times higher than the MDL and should not be more than 10 times the MDL.

Tables B-4.1-2 and B-4.1-3 list analytical suites, analytes, and average MDLs and PQLs for groundwater and base-flow samples collected during the 5-yr period from 2008 to 2012. For comparison, these tables also include the lowest applicable groundwater cleanup levels or base-flow screening levels, as appropriate.

B-4.2 Low-MDL Analyses of Organic Compounds

Low-MDL VOCs and SVOCs refer to analyses of 24 VOCs and semivolatile organic compounds (SVOCs) using lower MDLs as discussed in the Laboratory's letter to NMED, dated April 4, 2013, in its "Response to Approval with Modifications for the 2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1" (the Interim Plan) (LANL 2013, 239555). These analytes were initially collected during monitoring year (MY) 2014. During MY2015, samples from locations that were not sampled for low-MDL VOCs and SVOCs in MY2014 will be analyzed for low-MDL VOCs and SVOCs.

On May 21, 2012, NMED provided an approval with modifications (AWM) for the 2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1 (LANL 2011, 208811; NMED 2012, 520410). In Comment 10 of the AWM, NMED required the analysis of 26 VOCs and SVOCs at least once by analytical methods with detection limits that are lower than the Compliance Order on Consent (the Consent Order) groundwater cleanup levels. To address the NMED's requirement, the Laboratory proposed the following analytical approach for all locations in the Interim Plan where VOCs and SVOCs are included in the analytical suite:

- Two of the 26 constituents [2,2'-atrazine and oxybis(1-chloropropane)] are currently sampled at sufficiently low levels such that their MDLs are at or below regulatory screening levels. No additional action is proposed for these constituents.
- For analysis of nine organic constituents, the following EPA methods will be used:
  - EPA Method 8310 for benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; dibenz(a,h)anthracene; and indeno(1,2,3-cd)pyrene)
  - EPA Method 8011 for dibromo-3-chloropropane[1,2-] and dibromoethane[1,2-])

- ❖ EPA Method 8151 for pentachlorophenol
- ❖ EPA Method 8081 for hexachlorobenzene

Samples from most locations were analyzed using the proposed methods during MY2014, and significant reduction in MDL for the analytes was achieved.

For the remaining 15 constituents discussed in Comment 10, the Laboratory proposed to work closely with its contract laboratory to identify analytical methods for analysis of VOCs and SVOCs. To date, the Laboratory has not determined a suitable method for these 15 constituents but plans to find a suitable method and sample every location during MY2015. Once methods are identified, the Laboratory will begin collecting samples for these analyses.

In consultation with NMED, the Laboratory will review the results and use them to develop an out-year sampling schedule that will include the wells/monitoring groups to be monitored and the frequency at which they will be monitored.

B-4.3 Analyses by On-Site Laboratories

Regulatory analyses that support Laboratory's characterization, cleanup, and monitoring programs are provided by external contract analytical laboratories. However, in some specific situations, samples are most appropriately submitted for on-site analysis by the Geochemistry and Geomaterials Research Laboratories (GGRL) in the Laboratory's Earth Systems Observations Group (EES-14). In-house analyses are often used in the following cases:

- When rapid turnaround data (e.g., less than 24 h) are required to support activities such as drilling, well development, or well rehabilitation. Such rapid turnaround analyses are unavailable (at reasonable cost) from external laboratories.
- When special studies are undertaken to develop and refine conceptual models for contaminant transport in the environment. Examples of such studies include studies of stable isotopes and of contaminant concentration trends during long-term aquifer testing and rebound.
- When a well screen is impacted by the residual effects of drilling and construction and is not producing reliable or representative water-quality data that fully meet monitoring objectives.

Table B-4.2-1 lists the analytical methods, PQLs, and MDLs for analytes reported by GGRL in recent data packages submitted to the Laboratory. The analytical methods used by GGRL are the most recent EPA and industry-accepted extraction and analytical methods for chemical analyses of these analytes.

B-5.0 INVESTIGATION-DERIVED WASTE MANAGEMENT

This section describes how investigation-derived waste (IDW) generated during the groundwater monitoring activities conducted under this Interim Plan will be managed. IDW is waste generated as a result of field-investigation activities and may include, but is not limited to, purge water, contact waste, decontamination fluids, and all other wastes that has potentially come into contact with contaminants. IDW generated during implementation of the Interim Plan will be managed to protect human health and the environment, comply with applicable regulatory requirements, and adhere to Laboratory waste minimization goals.

All IDW generated during groundwater-monitoring activities will be managed in accordance with applicable Environmental Programs Directorate SOPs, which incorporate the requirements of all applicable EPA and NMED regulations, DOE orders, and Laboratory requirements. The SOP applicable to the characterization and management of IDW is

- EP-DIR-SOP-10021, Characterization and Management of Environmental Program Waste.

The most current version of the Los Alamos National Security, LLC, Hazardous Waste Minimization Plan (LANL 2009, 109324) will be implemented during groundwater monitoring to minimize waste generation. This document is updated annually as a requirement of Permit Section 2.9 of the Laboratory's Hazardous Waste Facility Permit.

The IDW waste streams associated with groundwater monitoring are identified in the Table B-5.0-1 and are briefly described below. The estimated volumes of these waste streams that may be generated during the implementation of this Interim Plan are summarized in Table B-5.0-1.

A waste characterization strategy form (WCSF) will be prepared and approved per requirements of EP-DIR-SOP-10021. The WCSF will provide detailed information on IDW characterization methods, management, containerization, and potential volumes. IDW characterization is completed through review of sampling data and/or documentation or by direct sampling of the IDW or the media being investigated (e.g., groundwater, surface soil, subsurface soil). Waste characterization may include a review of historical information and process knowledge to identify whether listed hazardous waste may be present (i.e., due diligence reviews). If low levels of hazardous waste from a listed source are identified, a "contained in" determination may be submitted for approval to NMED.

Wastes will be containerized and placed in clearly marked, appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements will be based on the type of IDW and its classification. Container and storage requirements will be detailed in the WCSF and approved before the waste is generated. Transportation and disposal requirements will also be detailed in the WCSF and approved before waste is generated.

Waste Determinations

The number of sampling events needed to make Resource Conservation and Recovery Act (RCRA) waste determinations will be based on acceptable knowledge (AK) of groundwater conditions within a watershed at the well or surface sample location. AK includes a review of historical information and process knowledge to identify whether hazardous waste, from a listed source, may be present (i.e., due diligence reviews).

The number of sampling events needed to make the waste determination for a given location is summarized as follows:

- For locations where existing AK demonstrates no RCRA hazardous waste or hazardous constituents above RCRA regulatory limits, a minimum of one sampling event will be used annually to confirm the nonhazardous waste determination. This waste determination will be reevaluated with data from subsequent sampling campaigns.
- For new wells with no existing AK, two consecutive sampling events will be conducted to ensure reproducibility and to establish reliable AK. Wastes generated during the first sampling event will be characterized by the data collected during the event. These wastes will be managed in accordance with the regulatory classification.

- For locations where RCRA hazardous constituents are suspected to exhibit a characteristic or sporadic, but not confirmed, detection, the waste will initially be managed as hazardous. Once data from the first sampling event are received, waste will be managed and disposed of according to the analytical results. Waste generated from subsequent sampling events will be managed using AK from previous events until analytical data are available.

For new locations at or near a known listed hazardous waste source that does not have a “contained in” determination, waste will be managed as hazardous until a due diligence can be performed. If a listed hazardous waste source is identified and low levels of listed hazardous waste constituents are detected, a “contained in” determination may be submitted to NMED for approval.

- For locations where IDW has been identified as RCRA hazardous waste, subsequent IDW generated at the location will be managed as hazardous waste until the data from four consecutive sampling events contain no RCRA hazardous waste or hazardous constituents above RCRA regulatory limits. At this point, the waste will be managed as nonhazardous.

Where RCRA constituents are detected, the following steps may be taken to complete the waste determination:

- Where duplicate groundwater samples are collected during the same sampling event and one is a nondetect and the other is detected, the Laboratory assumes the detection is the result of laboratory or field contamination. The detection will not be used for waste determination.
- When an F-, U-, P-, or K-listed contaminant is detected, the sources contributing to the watershed will be evaluated (i.e., due diligence reviews). If there is no documentation that these contaminants are from listed processes, the waste will be managed as nonhazardous.
- Sampling purge water will be managed in accordance with the most current version of ENV-RCRA-SOP-010, Land Application of Groundwater, as amended by the NMED-approved LANL Drilling, Development, Rehabilitation and Sampling Purge Water Decision Tree—Revised 03/12/2010 (NMED 2010, 109025).

Waste Management

Purge water: This waste stream consists of water purged from wells before and during sampling. The management of nonhazardous purge water will comply with ENV-RCRA-SOP-010, Land Application of Groundwater. If the purge water is hazardous, it will be managed in accordance with hazardous waste management requirements.

Purge water will be characterized based on the results of the analysis of water samples from the well from which the purge water originated or by direct sampling and analysis of the purge water. Purge water will be land applied if it meets the criteria in the NMED-approved NOI for land application of groundwater.

Contact waste: The contact waste stream consists of potentially contaminated wastes that “contacted” purge water during sampling. This waste stream consists primarily of, but is not limited to, personal protective equipment such as gloves; decontamination wastes such as paper wipes; and disposable sampling supplies. Characterization of this waste stream will be performed through AK from analytical results for the environmental media (i.e., purge water) with which it came into contact or direct sampling of the containerized waste and a review of any potentially RCRA Hazardous Listed Waste sources. The Laboratory expects most of these contact wastes will be nonhazardous waste that will be disposed of at a New Mexico solid waste landfill or low-level waste that will be disposed of at Area G at Technical Area 54 (TA-54).

Decontamination fluids: The decontamination fluids waste stream will consist of liquid wastes from decontamination activities (i.e., decontamination solutions and rinse waters). Consistent with waste minimization practices, the Laboratory employs dry decontamination methods to the extent possible. If dry decontamination cannot be performed, liquid decontamination wastes will be collected in containers at the point of generation. The decontamination fluids will be characterized through AK of the waste materials, the levels of contamination observed in the environmental media (e.g., purge water) and, if necessary, direct sampling of the containerized waste. The Laboratory expects most of these wastes to be nonhazardous liquid waste or radioactive liquid waste that will be sent to one of its wastewater treatment facilities or a Laboratory-approved off-site treatment facility.

B-6.0 REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

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

LANL (Los Alamos National Laboratory), November 2009. "Los Alamos National Security, LLC, Hazardous Waste Minimization Plan," Los Alamos National Laboratory document LA-UR-09-07682, Los Alamos, New Mexico. (LANL 2009, 109324)

LANL (Los Alamos National Laboratory), December 2011. "2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1," Los Alamos National Laboratory document LA-UR-11-6958, Los Alamos, New Mexico. (LANL 2011, 208811)

LANL (Los Alamos National Laboratory), April 4, 2013. "Response to Approval with Modifications for the 2011 Interiam Facility-Wide Groundwater Monitoring Plan, Revision 1," Los Alamos National Laboratory letter (EP2013-0062) to J.E. Keiling (NMED-HWB) from J. Mousseau (LANL) and P. Maggiore (DOE-NA-00-LA), Los Alamos, New Mexico. (LANL 2013, 239555)

NMED (New Mexico Environment Department), March 12, 2010. "LANL Drilling, Development, Rehabilitation and Sampling Purge Water Decision Tree Revision," New Mexico Environment Department letter to G. Turner (DOE-LASO) and T. George (LANL) from J.P. Bearzi (NMED-HWB) and W.C. Olsen (NMED-GWQB), Santa Fe, New Mexico. (NMED 2010, 109025)

NMED (New Mexico Environment Department), May 21, 2012. "Approval with Modifications, 2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1," New Mexico Environment Department letter to P. Maggiore (DOE-LASO) and M.J. Graham (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2012, 520410)

Yeskis, D., and B. Zavala, May 2002. "Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers," a *Ground Water Forum Issue Paper*, EPA 542-S-02-001, Office of Solid Waste and Emergency Response, Washington, D.C. (Yeskis and Zavala 2002, 204429)

Table B-4.1-1
Analytical Methods Used by Contract Laboratories for Samples Collected under the Interim Plan

Symbol or CAS No.	Analyte	Analytical Method
VOCs		
67-64-1	Acetone	SW-846:8260B
75-05-8	Acetonitrile	SW-846:8260B
107-02-8	Acrolein	SW-846:8260B
107-13-1	Acrylonitrile	SW-846:8260B
71-43-2	Benzene	SW-846:8260B
108-86-1	Bromobenzene	SW-846:8260B
74-97-5	Bromochloromethane	SW-846:8260B
75-27-4	Bromodichloromethane	SW-846:8260B
75-25-2	Bromoform	SW-846:8260B
74-83-9	Bromomethane	SW-846:8260B
71-36-3	Butanol[1-]	SW-846:8260B
78-93-3	Butanone[2-]	SW-846:8260B
104-51-8	Butylbenzene[n-]	SW-846:8260B
135-98-8	Butylbenzene[sec-]	SW-846:8260B
98-06-6	Butylbenzene[tert-]	SW-846:8260B
75-15-0	Carbon Disulfide	SW-846:8260B
56-23-5	Carbon Tetrachloride	SW-846:8260B
126-99-8	Chloro-1,3-butadiene[2-]	SW-846:8260B
107-05-1	Chloro-1-propene[3-]	SW-846:8260B
108-90-7	Chlorobenzene	SW-846:8260B
124-48-1	Chlorodibromomethane	SW-846:8260B
75-00-3	Chloroethane	SW-846:8260B
67-66-3	Chloroform	SW-846:8260B
74-87-3	Chloromethane	SW-846:8260B
95-49-8	Chlorotoluene[2-]	SW-846:8260B
106-43-4	Chlorotoluene[4-]	SW-846:8260B
96-12-8	Dibromo-3-Chloropropane[1,2-]	SW-846:8260B
106-93-4	Dibromoethane[1,2-]	SW-846:8260B
74-95-3	Dibromomethane	SW-846:8260B
95-50-1	Dichlorobenzene[1,2-]	SW-846:8260B
541-73-1	Dichlorobenzene[1,3-]	SW-846:8260B
106-46-7	Dichlorobenzene[1,4-]	SW-846:8260B
75-71-8	Dichlorodifluoromethane	SW-846:8260B
75-34-3	Dichloroethane[1,1-]	SW-846:8260B
107-06-2	Dichloroethane[1,2-]	SW-846:8260B
75-35-4	Dichloroethene[1,1-]	SW-846:8260B

Table B-4.1-1 (continued)

Symbol or CAS No.	Analyte	Analytical Method
540-59-0	Dichloroethene[cis/trans-1,2-]	SW-846:8260B
156-59-2	Dichloroethene[cis-1,2-]	SW-846:8260B
156-60-5	Dichloroethene[trans-1,2-]	SW-846:8260B
78-87-5	Dichloropropane[1,2-]	SW-846:8260B
142-28-9	Dichloropropane[1,3-]	SW-846:8260B
594-20-7	Dichloropropane[2,2-]	SW-846:8260B
563-58-6	Dichloropropene[1,1-]	SW-846:8260B
10061-01-5	Dichloropropene[cis-1,3-]	SW-846:8260B
10061-02-6	Dichloropropene[trans-1,3-]	SW-846:8260B
60-29-7	Diethyl Ether	SW-846:8260B
123-91-1	Dioxane[1,4-]	SW-846:8260B
97-63-2	Ethyl Methacrylate	SW-846:8260B
100-41-4	Ethylbenzene	SW-846:8260B
87-68-3	Hexachlorobutadiene	SW-846:8260B
591-78-6	Hexanone[2-]	SW-846:8260B
74-88-4	Iodomethane	SW-846:8260B
78-83-1	Isobutyl alcohol	SW-846:8260B
98-82-8	Isopropylbenzene	SW-846:8260B
99-87-6	Isopropyltoluene[4-]	SW-846:8260B
126-98-7	Methacrylonitrile	SW-846:8260B
80-62-6	Methyl Methacrylate	SW-846:8260B
1634-04-4	Methyl tert-Butyl Ether	SW-846:8260B
108-10-1	Methyl-2-pentanone[4-]	SW-846:8260B
75-09-2	Methylene Chloride	SW-846:8260B
91-20-3	Naphthalene	SW-846:8260B
107-12-0	Propionitrile	SW-846:8260B
103-65-1	Propylbenzene[1-]	SW-846:8260B
100-42-5	Styrene	SW-846:8260B
630-20-6	Tetrachloroethane[1,1,1,2-]	SW-846:8260B
79-34-5	Tetrachloroethane[1,1,2,2-]	SW-846:8260B
127-18-4	Tetrachloroethene	SW-846:8260B
108-88-3	Toluene	SW-846:8260B
76-13-1	Trichloro-1,2,2-trifluoroethane[1,1,2-]	SW-846:8260B
87-61-6	Trichlorobenzene[1,2,3-]	SW-846:8260B
120-82-1	Trichlorobenzene[1,2,4-]	SW-846:8260B
71-55-6	Trichloroethane[1,1,1-]	SW-846:8260B
79-00-5	Trichloroethane[1,1,2-]	SW-846:8260B

Table B-4.1-1 (continued)

Symbol or CAS No.	Analyte	Analytical Method
79-01-6	Trichloroethene	SW-846:8260B
75-69-4	Trichlorofluoromethane	SW-846:8260B
96-18-4	Trichloropropane[1,2,3-]	SW-846:8260B
95-63-6	Trimethylbenzene[1,2,4-]	SW-846:8260B
108-67-8	Trimethylbenzene[1,3,5-]	SW-846:8260B
108-05-4	Vinyl acetate	SW-846:8260B
75-01-4	Vinyl Chloride	SW-846:8260B
95-47-6	Xylene[1,2-]	SW-846:8260B
Xylene[m+p]	Xylene[1,3-]+Xylene[1,4-]	SW-846:8260B
SVOCs		
83-32-9	Acenaphthene	SW-846:8270D
208-96-8	Acenaphthylene	SW-846:8270D
62-53-3	Aniline	SW-846:8270D
120-12-7	Anthracene	SW-846:8270D
1912-24-9	Atrazine	SW-846:8270D
103-33-3	Azobenzene	SW-846:8270D
92-87-5	Benzidine	SW-846:8270D
56-55-3	Benzo(a)anthracene	SW-846:8270D
50-32-8	Benzo(a)pyrene	SW-846:8270D
205-99-2	Benzo(b)fluoranthene	SW-846:8270D
191-24-2	Benzo(g,h,i)perylene	SW-846:8270D
207-08-9	Benzo(k)fluoranthene	SW-846:8270D
65-85-0	Benzoic Acid	SW-846:8270D
100-51-6	Benzyl Alcohol	SW-846:8270D
111-91-1	Bis(2-chloroethoxy)methane	SW-846:8270D
111-44-4	Bis(2-chloroethyl)ether	SW-846:8270D
117-81-7	Bis(2-ethylhexyl)phthalate	SW-846:8270D
101-55-3	Bromophenyl-phenylether[4-]	SW-846:8270D
85-68-7	Butylbenzylphthalate	SW-846:8270D
59-50-7	Chloro-3-methylphenol[4-]	SW-846:8270D
106-47-8	Chloroaniline[4-]	SW-846:8270D
91-58-7	Chloronaphthalene[2-]	SW-846:8270D
95-57-8	Chlorophenol[2-]	SW-846:8270D
7005-72-3	Chlorophenyl-phenyl[4-] Ether	SW-846:8270D
218-01-9	Chrysene	SW-846:8270D
53-70-3	Dibenz(a,h)anthracene	SW-846:8270D
132-64-9	Dibenzofuran	SW-846:8270D
95-50-1	Dichlorobenzene[1,2-]	SW-846:8270D
541-73-1	Dichlorobenzene[1,3-]	SW-846:8270D

Table B-4.1-1 (continued)

Symbol or CAS No.	Analyte	Analytical Method
106-46-7	Dichlorobenzene[1,4-]	SW-846:8270D
91-94-1	Dichlorobenzidine[3,3'-]	SW-846:8270D
120-83-2	Dichlorophenol[2,4-]	SW-846:8270D
84-66-2	Diethylphthalate	SW-846:8270D
131-11-3	Dimethyl Phthalate	SW-846:8270D
105-67-9	Dimethylphenol[2,4-]	SW-846:8270D
84-74-2	Di-n-butylphthalate	SW-846:8270D
534-52-1	Dinitro-2-methylphenol[4,6-]	SW-846:8270D
51-28-5	Dinitrophenol[2,4-]	SW-846:8270D
121-14-2	Dinitrotoluene[2,4-]	SW-846:8270D
606-20-2	Dinitrotoluene[2,6-]	SW-846:8270D
117-84-0	Di-n-octylphthalate	SW-846:8270D
88-85-7	Dinoseb	SW-846:8270D
123-91-1	Dioxane[1,4-]	SW-846:8270D
122-39-4	Diphenylamine	SW-846:8270D
206-44-0	Fluoranthene	SW-846:8270D
86-73-7	Fluorene	SW-846:8270D
118-74-1	Hexachlorobenzene	SW-846:8270D
87-68-3	Hexachlorobutadiene	SW-846:8270D
77-47-4	Hexachlorocyclopentadiene	SW-846:8270D
67-72-1	Hexachloroethane	SW-846:8270D
193-39-5	Indeno(1,2,3-cd)pyrene	SW-846:8270D
78-59-1	Isophorone	SW-846:8270D
90-12-0	Methylnaphthalene[1-]	SW-846:8270D
91-57-6	Methylnaphthalene[2-]	SW-846:8270D
95-48-7	Methylphenol[2-]	SW-846:8270D
106-44-5	Methylphenol[4-]	SW-846:8270D
91-20-3	Naphthalene	SW-846:8270D
88-74-4	Nitroaniline[2-]	SW-846:8270D
99-09-2	Nitroaniline[3-]	SW-846:8270D
100-01-6	Nitroaniline[4-]	SW-846:8270D
98-95-3	Nitrobenzene	SW-846:8270D
88-75-5	Nitrophenol[2-]	SW-846:8270D
100-02-7	Nitrophenol[4-]	SW-846:8270D
55-18-5	Nitrosodiethylamine[N-]	SW-846:8270D
62-75-9	Nitrosodimethylamine[N-]	SW-846:8270D
924-16-3	Nitroso-di-n-butylamine[N-]	SW-846:8270D
621-64-7	Nitroso-di-n-propylamine[N-]	SW-846:8270D
930-55-2	Nitrosopyrrolidine[N-]	SW-846:8270D

Table B-4.1-1 (continued)

Symbol or CAS No.	Analyte	Analytical Method
108-60-1	Oxybis(1-chloropropane)[2,2'-]	SW-846:8270D
608-93-5	Pentachlorobenzene	SW-846:8270D
87-86-5	Pentachlorophenol	SW-846:8270D
85-01-8	Phenanthrene	SW-846:8270D
108-95-2	Phenol	SW-846:8270D
129-00-0	Pyrene	SW-846:8270D
110-86-1	Pyridine	SW-846:8270D
95-94-3	Tetrachlorobenzene[1,2,4,5]	SW-846:8270D
58-90-2	Tetrachlorophenol[2,3,4,6-]	SW-846:8270D
120-82-1	Trichlorobenzene[1,2,4-]	SW-846:8270D
95-95-4	Trichlorophenol[2,4,5-]	SW-846:8270D
88-06-2	Trichlorophenol[2,4,6-]	SW-846:8270D
Low-MDL VOCs		
107-02-8	Acrolein	SW-846:8260B
107-13-1	Acrylonitrile	SW-846:8260B
126-99-8	Chloro-1,3-butadiene[2-]	SW-846:8260B
126-98-7	Methacrylonitrile	SW-846:8260B
96-18-4	Trichloropropane[1,2,3-]	SW-846:8260B
Low-MDL SVOCs		
103-33-3	Azobenzene	SW-846:8270D
92-87-5	Benzidine	SW-846:8270D
111-44-4	Bis(2-chloroethyl)ether	SW-846:8270D
91-94-1	Dichlorobenzidine[3,3'-]	SW-846:8270D
534-52-1	Dinitro-2-methylphenol[4,6-]	SW-846:8270D
55-18-5	Nitrosodiethylamine[N-]	SW-846:8270D
62-75-9	Nitrosodimethylamine[N-]	SW-846:8270D
924-16-3	Nitroso-di-n-butylamine[N-]	SW-846:8270D
621-64-7	Nitroso-di-n-propylamine[N-]	SW-846:8270D
930-55-2	Nitrosopyrrolidine[N-]	SW-846:8270D
Low-MDL VOCs and SVOCs Polycyclic Aromatic Hydrocarbons		
83-32-9	Acenaphthene	SW-846:8310
208-96-8	Acenaphthylene	SW-846:8310
120-12-7	Anthracene	SW-846:8310
56-55-3	Benzo(a)anthracene	SW-846:8310
50-32-8	Benzo(a)pyrene	SW-846:8310
205-99-2	Benzo(b)fluoranthene	SW-846:8310
191-24-2	Benzo(g,h,i)perylene	SW-846:8310
207-08-9	Benzo(k)fluoranthene	SW-846:8310
218-01-9	Chrysene	SW-846:8310

Table B-4.1-1 (continued)

Symbol or CAS No.	Analyte	Analytical Method
53-70-3	Dibenz(a,h)anthracene	SW-846:8310
206-44-0	Fluoranthene	SW-846:8310
86-73-7	Fluorene	SW-846:8310
193-39-5	Indeno(1,2,3-cd)pyrene	SW-846:8310
90-12-0	Methylnaphthalene[1-]	SW-846:8310
91-57-6	Methylnaphthalene[2-]	SW-846:8310
91-20-3	Naphthalene	SW-846:8310
85-01-8	Phenanthrene	SW-846:8310
129-00-0	Pyrene	SW-846:8310
Polychlorinated Biphenyls		
12674-11-2	Aroclor-1016	SW-846:8082
11104-28-2	Aroclor-1221	SW-846:8082
11141-16-5	Aroclor-1232	SW-846:8082
53469-21-9	Aroclor-1242	SW-846:8082
12672-29-6	Aroclor-1248	SW-846:8082
11097-69-1	Aroclor-1254	SW-846:8082
11096-82-5	Aroclor-1260	SW-846:8082
37324-23-5	Aroclor-1262	SW-846:8082
High Explosives		
6629-29-4	2,4-Diamino-6-nitrotoluene	SW-846:8321A_MOD
59229-75-3	2,6-Diamino-4-nitrotoluene	SW-846:8321A_MOD
618-87-1	3,5-Dinitroaniline	SW-846:8321A_MOD
19406-51-0	Amino-2,6-dinitrotoluene[4-]	SW-846:8321A_MOD
35572-78-2	Amino-4,6-dinitrotoluene[2-]	SW-846:8321A_MOD
99-65-0	Dinitrobenzene[1,3-]	SW-846:8321A_MOD
121-14-2	Dinitrotoluene[2,4-]	SW-846:8321A_MOD
606-20-2	Dinitrotoluene[2,6-]	SW-846:8321A_MOD
2691-41-0	HMX	SW-846:8321A_MOD
98-95-3	Nitrobenzene	SW-846:8321A_MOD
88-72-2	Nitrotoluene[2-]	SW-846:8321A_MOD
99-08-1	Nitrotoluene[3-]	SW-846:8321A_MOD
99-99-0	Nitrotoluene[4-]	SW-846:8321A_MOD
78-11-5	PETN	SW-846:8321A_MOD
121-82-4	RDX	SW-846:8321A_MOD
3058-38-6	TATB	SW-846:8321A_MOD
479-45-8	Tetryl	SW-846:8321A_MOD
99-35-4	Trinitrobenzene[1,3,5-]	SW-846:8321A_MOD
118-96-7	Trinitrotoluene[2,4,6-]	SW-846:8321A_MOD
78-30-8	Tris (o-cresyl) phosphate	SW-846:8321A_MOD

Table B-4.1-1 (continued)

Symbol or CAS No.	Analyte	Analytical Method
Dioxins/Furans		
35822-46-9	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	SW-846:8290A
37871-00-4	Heptachlorodibenzodioxins (Total)	SW-846:8290A
67562-39-4	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	SW-846:8290A
55673-89-7	Heptachlorodibenzofuran[1,2,3,4,7,8,9-]	SW-846:8290A
38998-75-3	Heptachlorodibenzofurans (Total)	SW-846:8290A
39227-28-6	Hexachlorodibenzodioxin[1,2,3,4,7,8-]	SW-846:8290A
57653-85-7	Hexachlorodibenzodioxin[1,2,3,6,7,8-]	SW-846:8290A
19408-74-3	Hexachlorodibenzodioxin[1,2,3,7,8,9-]	SW-846:8290A
34465-46-8	Hexachlorodibenzodioxins (Total)	SW-846:8290A
70648-26-9	Hexachlorodibenzofuran[1,2,3,4,7,8-]	SW-846:8290A
57117-44-9	Hexachlorodibenzofuran[1,2,3,6,7,8-]	SW-846:8290A
72918-21-9	Hexachlorodibenzofuran[1,2,3,7,8,9-]	SW-846:8290A
60851-34-5	Hexachlorodibenzofuran[2,3,4,6,7,8-]	SW-846:8290A
55684-94-1	Hexachlorodibenzofurans (Total)	SW-846:8290A
3268-87-9	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	SW-846:8290A
39001-02-0	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	SW-846:8290A
40321-76-4	Pentachlorodibenzodioxin[1,2,3,7,8-]	SW-846:8290A
36088-22-9	Pentachlorodibenzodioxins (Total)	SW-846:8290A
57117-41-6	Pentachlorodibenzofuran[1,2,3,7,8-]	SW-846:8290A
57117-31-4	Pentachlorodibenzofuran[2,3,4,7,8-]	SW-846:8290A
30402-15-4	Pentachlorodibenzofurans (Totals)	SW-846:8290A
1746-01-6	Tetrachlorodibenzodioxin[2,3,7,8-]	SW-846:8290A
41903-57-5	Tetrachlorodibenzodioxins (Total)	SW-846:8290A
51207-31-9	Tetrachlorodibenzofuran[2,3,7,8-]	SW-846:8290A
55722-27-5	Tetrachlorodibenzofurans (Totals)	SW-846:8290A

Table B-4.1-2
Analytes and MDLs and PQLs Obtained for Groundwater Samples by Contract Laboratories and Analyte Detection Statistics from 2008 to 2012

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
Alpha Spec	Am-241	Americium-241	pCi/L	1960	13	0.7	—*	—	0.0302	0.34344	3.81	1.2	DOE DW DCG
Alpha Spec	Np-237	Neptunium-237	pCi/L	62	0	0	—	—	—	—	—	1.2	DOE DW DCG
Alpha Spec	Pu-238	Plutonium-238	pCi/L	1960	6	0.3	—	—	0.026	0.70805	4.02	1.6	DOE DW DCG
Alpha Spec	Pu-239/240	Plutonium-239/240	pCi/L	1960	23	1	—	—	0.0281	0.42688	4.38	1.2	DOE DW DCG
Alpha Spec	Th-228	Thorium-228	pCi/L	178	16	9	—	—	0.0808	0.32136	1.1	—	—
Alpha Spec	Th-230	Thorium-230	pCi/L	178	13	7	—	—	0.0664	0.23225	0.746	—	—
Alpha Spec	Th-232	Thorium-232	pCi/L	177	21	12	—	—	0.0377	0.24046	1.23	—	—
Alpha Spec	U-234	Uranium-234	pCi/L	1966	1713	87	—	—	0.0403	0.75042	29.7	20	DOE DW DCG
Alpha Spec	U-235/236	Uranium-235/236	pCi/L	1966	223	11	—	—	0.0244	0.11502	1.2	24	DOE DW DCG
Alpha Spec	U-238	Uranium-238	pCi/L	1966	1712	87	—	—	0.0284	0.42167	17.3	24	DOE DW DCG
Diox/Fur	1746-01-6	Tetrachlorodibenzodioxin[2,3,7,8-]	µg/L	498	0	0	0.0000012	0.0000063	—	—	—	0.00003	EPA MCL
Diox/Fur	19408-74-3	Hexachlorodibenzodioxin[1,2,3,7,8,9-]	µg/L	498	0	0	0.000004	0.00003	—	—	—	—	—
Diox/Fur	30402-15-4	Pentachlorodibenzofurans (Totals)	µg/L	498	3	0.6	0.000004	0.000025	6.7E-07	3.3E-06	7.4E-06	—	—
Diox/Fur	3268-87-9	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	µg/L	496	53	11	0.00000954	0.000068	1.4E-06	1.7E-05	0.00012	—	—
Diox/Fur	34465-46-8	Hexachlorodibenzodioxins (Total)	µg/L	498	2	0.4	0.000004	0.000025	9.7E-06	1.2E-05	1.4E-05	—	—
Diox/Fur	35822-46-9	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	µg/L	498	26	5	0.0000046	0.000032	4.9E-07	6.3E-06	4.4E-05	—	—
Diox/Fur	36088-22-9	Pentachlorodibenzodioxins (Total)	µg/L	498	0	0	0.000004	0.000025	—	—	—	—	—
Diox/Fur	37871-00-4	Heptachlorodibenzodioxins (Total)	µg/L	498	42	8	0.0000047	0.000028	4.9E-07	7.9E-06	7.7E-05	—	—
Diox/Fur	38998-75-3	Heptachlorodibenzofurans (Total)	µg/L	498	17	3	0.000004	0.000025	4E-07	5.7E-06	2.7E-05	—	—
Diox/Fur	39001-02-0	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	µg/L	498	18	4	0.0000079	0.000063	6.2E-07	5.3E-06	2.4E-05	—	—
Diox/Fur	39227-28-6	Hexachlorodibenzodioxin[1,2,3,4,7,8-]	µg/L	498	0	0	0.000004	0.00003	—	—	—	—	—
Diox/Fur	40321-76-4	Pentachlorodibenzodioxin[1,2,3,7,8-]	µg/L	498	0	0	0.000004	0.00003	—	—	—	—	—
Diox/Fur	41903-57-5	Tetrachlorodibenzodioxins (Total)	µg/L	498	0	0	0.0000012	0.0000052	—	—	—	—	—
Diox/Fur	51207-31-9	Tetrachlorodibenzofuran[2,3,7,8-]	µg/L	498	0	0	0.000001	0.0000063	—	—	—	—	—
Diox/Fur	55673-89-7	Heptachlorodibenzofuran[1,2,3,4,7,8,9-]	µg/L	498	0	0	0.000046	0.00003	—	—	—	—	—
Diox/Fur	55684-94-1	Hexachlorodibenzofurans (Total)	µg/L	498	8	2	0.0000038	0.000025	5.6E-07	4.5E-06	9.6E-06	—	—
Diox/Fur	55722-27-5	Tetrachlorodibenzofurans (Totals)	µg/L	498	3	0.6	0.000001	0.0000052	9.7E-07	1.9E-06	3.4E-06	—	—
Diox/Fur	57117-31-4	Pentachlorodibenzofuran[2,3,4,7,8-]	µg/L	498	0	0	0.0000038	0.00003	—	—	—	—	—
Diox/Fur	57117-41-6	Pentachlorodibenzofuran[1,2,3,7,8-]	µg/L	498	2	0.4	0.0000038	0.00003	6.7E-07	8.9E-07	1.1E-06	—	—
Diox/Fur	57117-44-9	Hexachlorodibenzofuran[1,2,3,6,7,8-]	µg/L	498	0	0	0.0000037	0.00003	—	—	—	—	—
Diox/Fur	57653-85-7	Hexachlorodibenzodioxin[1,2,3,6,7,8-]	µg/L	498	0	0	0.000004	0.00003	—	—	—	—	—
Diox/Fur	60851-34-5	Hexachlorodibenzofuran[2,3,4,6,7,8-]	µg/L	498	0	0	0.0000037	0.00003	—	—	—	—	—
Diox/Fur	67562-39-4	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	µg/L	498	15	3	0.000004	0.00003	4E-07	4E-06	1.5E-05	—	—
Diox/Fur	70648-26-9	Hexachlorodibenzofuran[1,2,3,4,7,8-]	µg/L	498	5	1	0.0000037	0.00003	1.3E-06	2.2E-06	2.9E-06	—	—
Diox/Fur	72918-21-9	Hexachlorodibenzofuran[1,2,3,7,8,9-]	µg/L	498	0	0	0.0000038	0.00003	—	—	—	—	—

Table B-4.1-2 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
Gamma	Ac-228	Actinium-228	pCi/L	66	0	0	—	—	—	—	—	—	—
Gamma	Am-241	Americium-241	pCi/L	69	0	0	—	—	—	—	—	1.2	DOE DW DCG
Gamma	Bi-212	Bismuth-212	pCi/L	66	0	0	—	—	—	—	—	—	—
Gamma	Bi-214	Bismuth-214	pCi/L	59	8	14	—	—	19.3	46.7625	90.2	—	—
Gamma	Co-60	Cobalt-60	pCi/L	1958	0	0	—	—	—	—	—	200	DOE DW DCG
Gamma	Cs-134	Cesium-134	pCi/L	66	0	0	—	—	—	—	—	—	—
Gamma	Cs-137	Cesium-137	pCi/L	1952	1	0.1	—	—	43.1	43.1	43.1	120	DOE DW DCG
Gamma	GROSSG	Gross gamma	pCi/L	1560	148	9	—	—	3	109.222	469	—	—
Gamma	K-40	Potassium-40	pCi/L	1912	6	0.3	—	—	49.7	75.9667	98.5	280	DOE DW DCG
Gamma	Na-22	Sodium-22	pCi/L	1959	0	0	—	—	—	—	—	400	DOE DW DCG
Gamma	Np-237	Neptunium-237	pCi/L	1878	0	0	—	—	—	—	—	1.2	DOE DW DCG
Gamma	Pa-234m	Protactinium-234m	pCi/L	66	0	0	—	—	—	—	—	—	—
Gamma	Pb-212	Lead-212	pCi/L	64	1	2	—	—	14.5	14.5	14.5	—	—
Gamma	Pb-214	Lead-214	pCi/L	62	5	8	—	—	25.3	66.02	105	—	—
Gamma	Th-234	Thorium-234	pCi/L	65	0	0	—	—	—	—	—	—	—
Gamma	Tl-208	Thallium-208	pCi/L	66	0	0	—	—	—	—	—	—	—
Gamma	U-235	Uranium-235	pCi/L	66	0	0	—	—	—	—	—	—	—
Geninorg	SPEC_CONDC	Specific Conductance	µS/cm	2456	2456	100	—	—	1.73	273.146	25700	—	—
Geninorg	HARDNESS	Hardness	mg/L	4403	4401	100	0.4	1.24	6.36	73.0381	956	—	—
Geninorg	pH	pH	SU	2413	2413	100	—	—	4.14	7.70114	11.8	—	—
Geninorg	SSC	Suspended Sediment Concentration	mg/L	288	151	52	2	8	1.2	30.0524	664	—	—
Geninorg	TDS	Total Dissolved Solids	mg/L	86	86	100	2.4	10	102	198.047	745	—	—
Geninorg	TDS	Total Dissolved Solids	mg/L	2329	2328	100	2.4	10	47.1	203.324	6180	1000	NM GW STD
Geninorg	TSS	Total Suspended Solids	mg/L	10	5	50	2	8	2	12.36	27.2	—	—
Geninorg	OIL_GREASE	Oil and Grease	mg/L	2	2	100	—	—	1.63	1.855	2.08	—	—
Geninorg	Br(-1)	Bromide	mg/L	2449	741	30	0.067	0.2	0.048	0.22869	1.8	—	—
Geninorg	C2O4	Oxalate	mg/L	40	0	0	0.33	1	—	—	—	—	—
Geninorg	Cl(-1)	Chloride	mg/L	142	142	100	0.1254	0.38	1.51	11.5181	128	—	—
Geninorg	Cl(-1)	Chloride	mg/L	2327	2317	100	0.1254	0.38	0.341	25.7969	3300	250	NM GW STD
Geninorg	F(-1)	Fluoride	mg/L	122	120	98	0.033	0.1	0.078	0.3081	1	—	—
Geninorg	F(-1)	Fluoride	mg/L	2329	2318	100	0.033	0.1	0.046	0.33685	8.75	1.6	NM GW STD
Geninorg	SO4(-2)	Sulfate	mg/L	142	141	99	0.097	0.4	1.29	6.63894	40.6	-	-
Geninorg	SO4(-2)	Sulfate	mg/L	2327	2309	99	0.097	0.4	0.473	10.714	148	600	NM GW STD
Geninorg	ALK-CO3	Alkalinity-CO3	mg/L	2462	147	6	0.73	1	0.953	5.92929	38.1	—	—
Geninorg	ALK-CO3+HCO3	Alkalinity-CO3+HCO3	mg/L	2462	2460	100	0.7	1	9.83	75.454	500	—	—
Geninorg	CN(TOTAL)	Cyanide (Total)	mg/L	1	0	0	0.0016	0.005	—	—	—	—	—
Geninorg	CN(TOTAL)	Cyanide (Total)	mg/L	1575	132	8	0.0016	0.005	-0.0021	0.00685	0.304	0.2	EPA MCL
Geninorg	NH3-N	Ammonia as Nitrogen	mg/L	2443	605	25	0.023	5.4	0.016	0.12738	10.3	—	—

Table B-4.1-2 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
Geninorg	TKN	Total Kjeldahl Nitrogen	mg/L	2442	660	27	0.042	0.13	0.029	0.27796	6.67	—	—
Geninorg	NO3	Nitrate	mg/L	2	2	100	—	—	1.32	1.37	1.42	—	—
Geninorg	NO3+NO2-N	Nitrate-Nitrite as Nitrogen	mg/L	2408	2130	88	0.04	0.2	0.0207	1.28833	20.2	10	EPA MCL
Geninorg	P	Total Phosphorus	mg/L	2	2	100	—	—	0.0689	0.07135	0.0738	—	—
Geninorg	PO4-P	Total Phosphate as Phosphorus	mg/L	2379	893	38	0.017	0.05	0.015	0.36989	19.1	—	—
Geninorg	SURFACTANTS	Surfactants	mg/L	2	0	0	0.016	0.05	—	—	—	—	—
Geninorg	ClO3	Chlorate	mg/L	21	6	29	0.0007	0.003	0.0047	0.04128	0.15	—	—
Geninorg	TOC	Total Organic Carbon	mg/L	2331	1924	83	—	—	0.33	2.24097	138	—	—
Gross AB	GROSSA	Gross alpha	pCi/L	1280	147	11	—	—	1.05	6.69476	62.8	15	EPA MCL
Gross AB	GROSSAB	Gross alpha/beta	pCi/L	4	0	0	—	—	—	—	—	—	—
Gross AB	GROSSB	Gross beta	pCi/L	1280	598	47	—	—	1.07	8.29271	241	50	EPA SEC DW LVL
Herb	120-36-5	Dichlorprop	µg/L	154	0	0	0.09	0.28	—	—	—	—	—
Herb	1918-00-9	Dicamba	µg/L	151	0	0	0.09	0.28	—	—	—	1100	EPA TAP SCRN LVL
Herb	75-99-0	Dalapon	µg/L	153	0	0	1.3	5.6	—	—	—	200	EPA MCL
Herb	88-85-7	Dinoseb	µg/L	151	0	0	0.09	0.2	—	—	—	7	EPA MCL
Herb	93-65-2	MCPP	µg/L	153	0	0	11	56	—	—	—	37	EPA TAP SCRN LVL
Herb	93-72-1	TP[2,4,5-]	µg/L	154	0	0	0.09	0.28	—	—	—	50	EPA MCL
Herb	93-76-5	T[2,4,5-]	µg/L	154	0	0	0.09	0.28	—	—	—	370	EPA TAP SCRN LVL
Herb	94-74-6	MCPA	µg/L	154	0	0	12	56	—	—	—	18	EPA TAP SCRN LVL
Herb	94-75-7	D[2,4-]	µg/L	154	0	0	0.09	0.28	—	—	—	70	EPA MCL
Herb	94-82-6	DB[2,4-]	µg/L	154	0	0	0.09	0.28	—	—	—	290	EPA TAP SCRN LVL
HEXP	118-96-7	Trinitrotoluene[2,4,6-]	µg/L	1484	38	3	0.092	0.33	0.0853	1.53185	8.58	22	EPA TAP SCRN LVL
HEXP	121-14-2	Dinitrotoluene[2,4-]	µg/L	1485	21	1	0.1	0.33	0.041	0.29643	0.804	2	EPA TAP SCRN LVL
HEXP	121-82-4	RDX	µg/L	1485	268	18	0.1	0.33	0.114	22.5425	265	6.1	EPA TAP SCRN LVL
HEXP	19406-51-0	Amino-2,6-dinitrotoluene[4-]	µg/L	1481	129	9	0.1	0.33	0.107	1.18962	5.3	30	EPA TAP SCRN LVL
HEXP	2691-41-0	HMX	µg/L	1485	237	16	0.1	0.33	0.0895	8.95455	352	780	EPA TAP SCRN LVL
HEXP	3058-38-6	TATB	µg/L	1483	2	0.1	0.4	1.3	0.436	0.6545	0.873	—	—
HEXP	35572-78-2	Amino-4,6-dinitrotoluene[2-]	µg/L	1485	105	7	0.1	0.33	0.1	1.0889	4	30	EPA TAP SCRN LVL
HEXP	479-45-8	Tetryl	µg/L	1414	3	0.2	0.13	0.64	0.055	0.245	0.57	63	EPA TAP SCRN LVL
HEXP	55-63-0	Nitroglycerin	µg/L	31	2	6	0.21	1	0.22	0.47	0.72	3.7	EPA TAP SCRN LVL
HEXP	59229-75-3	2,6-Diamino-4-nitrotoluene	µg/L	1471	14	1	0.34	1.6	0.033	0.33071	1.1	—	—
HEXP	606-20-2	Dinitrotoluene[2,6-]	µg/L	1484	6	0.4	0.1	0.33	0.053	0.14033	0.4	15	EPA TAP SCRN LVL
HEXP	618-87-1	3,5-Dinitroaniline	µg/L	1484	39	3	0.47	1.3	0.032	0.50159	0.988	—	—
HEXP	6629-29-4	2,4-Diamino-6-nitrotoluene	µg/L	1471	20	1	0.4	1.6	0.026	1.01095	3.6	—	—
HEXP	78-11-5	PETN	µg/L	1483	3	0.2	0.1	1.2	0.076	0.27533	0.59	160	EPA TAP SCRN LVL
HEXP	78-30-8	Tris (o-cresyl) phosphate	µg/L	1475	0	0	0.3	1.3	—	—	—	—	—
HEXP	88-72-2	Nitrotoluene[2-]	µg/L	1484	6	0.4	0.1	0.33	0.194	0.53217	1.24	2.7	EPA TAP SCRN LVL
HEXP	98-95-3	Nitrobenzene	µg/L	1484	4	0.3	0.1	0.33	0.11	0.1745	0.31	1.2	EPA TAP SCRN LVL

Table B-4.1-2 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
HEXP	99-08-1	Nitrotoluene[3-]	µg/L	1470	1	0.1	0.1	0.34	0.28	0.28	0.28	1.3	EPA TAP SCRN LVL
HEXP	99-35-4	Trinitrobenzene[1,3,5-]	µg/L	1484	74	5	0.1	0.33	0.095	1.31977	23	460	EPA TAP SCRN LVL
HEXP	99-65-0	Dinitrobenzene[1,3-]	µg/L	1484	3	0.2	0.1	0.33	0.088	0.19167	0.32	1.5	EPA TAP SCRN LVL
HEXP	99-99-0	Nitrotoluene[4-]	µg/L	1449	1	0.1	0.1	0.65	0.327	0.327	0.327	37	EPA TAP SCRN LVL
HEXP	DNX	DNX	µg/L	59	11	19	0.089	0.28	0.103	0.16282	0.311	—	—
HEXP	MNX	MNX	µg/L	59	12	20	0.089	0.277	0.159	0.35983	0.72	—	—
HEXP	TNX	TNX	µg/L	59	12	20	0.089	0.28	0.115	0.22567	0.502	—	—
HEXP	DNX	DNX	µg/L	958	42	4	0.073	0.5	0.11	0.53548	2.3	—	—
HEXP	MNX	MNX	µg/L	926	90	10	0.091	0.5	0.096	0.70884	2.3	—	—
HEXP	TNX	TNX	µg/L	961	63	7	0.082	0.5	0.11	0.79254	8.2	—	—
Metals	Al	Aluminum	µg/L	2094	747	36	70	200	68.1	2443.29	65800	—	—
Metals	Al	Aluminum	µg/L	2305	428	19	70	200	69	1382.76	24400	5000	NM GW STD
Metals	B	Boron	µg/L	2111	1322	63	15	50	10	49.5654	1500	—	—
Metals	B	Boron	µg/L	2303	1412	61	15	50	10	50.5719	1550	750	NM GW STD
Metals	Ba	Barium	µg/L	2093	2091	100	1	5	1.7	218.599	49200	—	—
Metals	Ba	Barium	µg/L	2303	2293	100	1	5	1.51	228.773	49400	1000	NM GW STD
Metals	Be	Beryllium	µg/L	4396	46	1	1	5	1	1.69217	4.5	4	EPA MCL
Metals	Ca	Calcium	µg/L	4397	4396	100	0.05	0.2	2.08	20.994	277	—	—
Metals	Co	Cobalt	µg/L	2093	126	6	1	5	1	6.5596	98.2	—	—
Metals	Co	Cobalt	µg/L	2303	239	10	1	5	1	4.16669	51.2	50	NM GW STD
Metals	Cr	Chromium	µg/L	1	1	100	—	—	1.16	1.16	1.16	—	—
Metals	Cu	Copper	µg/L	2093	344	16	3	10	3	12.3129	272	—	—
Metals	Cu	Copper	µg/L	2303	192	8	3	10	3	8.63854	120	1000	NM GW STD
Metals	Fe	Iron	µg/L	2095	1254	60	30	100	25.1	1437.8	58700	-	-
Metals	Fe	Iron	µg/L	2305	742	32	30	100	25	1205.39	49500	1000	NM GW STD
Metals	K	Potassium	mg/L	4397	4377	100	0.05	0.15	0.222	3.40606	215	—	—
Metals	Mg	Magnesium	mg/L	4391	4379	100	0.1	0.3	0.115	5.00937	71.5	—	—
Metals	Mn	Manganese	µg/L	2091	1194	57	2	10	2	223.285	17100	—	—
Metals	Mn	Manganese	µg/L	2301	1015	44	2	10	2	260.705	17500	200	NM GW STD
Metals	Mo	Molybdenum	µg/L	47	21	45	2	10	2.1	23.1333	84.2	1000	NM GW STD
Metals	Mo	Molybdenum	µg/L	47	24	51	2	10	2.1	23.3625	82	—	—
Metals	Na	Sodium	µg/L	4397	4397	100	—	—	0.267	25.1281	1750	—	—
Metals	SiO2	Silicon Dioxide	µg/L	2415	2397	99	0.048	0.21	0.0609	59.5461	170	—	—
Metals	Sn	Tin	µg/L	4396	54	1	10	33	2.53	12.0163	122	9300	EPA TAP SCRN LVL
Metals	Sr	Strontium	µg/L	4396	4395	100	1	5	8.58	125.026	2240	9300	EPA TAP SCRN LVL
Metals	V	Vanadium	µg/L	4396	3692	84	1	5	1	6.80806	78.5	78	EPA TAP SCRN LVL
Metals	Zn	Zinc	µg/L	2094	1340	64	3	10	2	36.8229	9080	—	—
Metals	Zn	Zinc	µg/L	2303	1259	55	3	10	2	26.8437	3530	10000	NM GW STD

Table B-4.1-2 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
Metals	Ag	Silver	µg/L	2124	79	4	0.2	1	0.2	0.77138	5.8	—	—
Metals	Ag	Silver	µg/L	2332	27	1	0.2	1	0.21	0.37204	1.2	50	NM GW STD
Metals	Al	Aluminum	µg/L	29	24	83	10	30	10.7	267.838	1690	5000	NM GW STD
Metals	Al	Aluminum	µg/L	30	30	100	10	30	25	4643.2	52900	—	—
Metals	As	Arsenic	µg/L	1	0	0	1.6	5	—	—	—	—	—
Metals	As	Arsenic	µg/L	4455	971	22	1.6	5	1.5	3.22593	21.4	10	EPA MCL
Metals	B	Boron	µg/L	2	0	0	18	50	—	—	—	750	NM GW STD
Metals	B	Boron	µg/L	4	4	100	18	50	18.4	33.9	51.4	—	—
Metals	Ba	Barium	µg/L	29	29	100	—	—	38.7	9097.95	34000	1000	NM GW STD
Metals	Ba	Barium	µg/L	30	30	100	—	—	40.3	9089.91	34900	—	—
Metals	Be	Beryllium	µg/L	1	0	0	0.13	0.5	—	—	—	—	—
Metals	Be	Beryllium	µg/L	58	5	9	0.13	0.5	0.17	1.894	5.1	4	EPA MCL
Metals	Ca	Calcium	mg/L	58	58	100	—	—	17.9	25.1948	52	—	—
Metals	Cd	Cadmium	µg/L	1	0	0	0.1	1	—	—	—	—	—
Metals	Cd	Cadmium	µg/L	4455	102	2	0.1	1	0.111	0.31611	8.18	5	EPA MCL
Metals	Co	Cobalt	µg/L	29	28	97	0.24	2	0.26	3.36357	6.7	50	NM GW STD
Metals	Co	Cobalt	µg/L	30	29	97	0.24	2	0.2	3.39207	14.5	—	—
Metals	Cr	Chromium	µg/L	2125	1403	66	2.3	9	1.5	31.4693	1270	—	—
Metals	Cr	Chromium	µg/L	2541	1521	60	2.3	9	1.5	40.8081	1240	50	NM GW STD
Metals	Cu	Copper	µg/L	29	18	62	0.47	1	0.47	1.23222	2.9	1000	NM GW STD
Metals	Cu	Copper	µg/L	30	24	80	0.47	1	0.48	5.65025	41.9	—	—
Metals	Fe	Iron	µg/L	29	28	97	20	50	29.7	2706.14	8750	1000	NM GW STD
Metals	Fe	Iron	µg/L	29	29	100	20	50	52.8	5509.75	38600	—	—
Metals	K	Potassium	mg/L	58	58	100	—	—	2.48	4.12552	10.6	—	—
Metals	Mg	Magnesium	mg/L	59	59	100	—	—	4.06	6.91203	15.4	—	—
Metals	Mn	Manganese	µg/L	29	28	97	0.6	2	1.1	1298.89	3880	200	NM GW STD
Metals	Mn	Manganese	µg/L	30	30	100	0.6	2	0.82	1263.59	3700	—	—
Metals	Mo	Molybdenum	µg/L	2061	1701	83	0.1	0.5	0.1	6.51511	350	—	—
Metals	Mo	Molybdenum	µg/L	2255	1901	84	0.1	0.5	0.117	6.24262	333	1000	NM GW STD
Metals	Na	Sodium	µg/L	58	58	100	—	—	8.07	20.5702	32.4	—	—
Metals	Ni	Nickel	µg/L	2124	1750	82	0.6	2.4	0.5	5.30072	596	—	—
Metals	Ni	Nickel	µg/L	2332	1847	79	0.6	2.4	0.5	9.61497	4770	200	NM GW STD
Metals	Pb	Lead	µg/L	1	0	0	0.5	2	—	—	—	—	—
Metals	Pb	Lead	µg/L	4456	638	14	0.5	2	0.5	5.61188	526	15	EPA MCL
Metals	Sb	Antimony	µg/L	1	0	0	0.65	2.7	—	—	—	—	—
Metals	Sb	Antimony	µg/L	4454	147	3	0.65	2.7	0.5	1.8452	24.8	6	EPA MCL
Metals	Se	Selenium	µg/L	1	0	0	1	5	—	—	—	—	—
Metals	Se	Selenium	µg/L	4455	294	7	1	5	0.55	1.64861	4.6	50	EPA MCL

Table B-4.1-2 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
Metals	Sn	Tin	µg/L	4	0	0	0.68	2	—	—	—	9300	EPA TAP SCRN LVL
Metals	Sn	Tin	µg/L	1	1	100	0.68	2	2.72	2.72	2.72	—	—
Metals	Sr	Strontium	µg/L	4	4	100	—	—	126	138.75	165	9300	EPA TAP SCRN LVL
Metals	Ti	Titanium	µg/L	1	1	100	—	—	10.5	10.5	10.5	—	—
Metals	Tl	Thallium	µg/L	1	0	0	0.35	1	—	—	—	—	—
Metals	Tl	Thallium	µg/L	4455	254	6	0.35	1	0.3	0.52761	15.7	2	EPA MCL
Metals	U	Uranium	µg/L	4401	3851	88	0.052	0.2	0.05	1.06775	52.5	30	EPA MCL
Metals	V	Vanadium	µg/L	58	18	31	3	10	3.1	12.5111	56.2	78	EPA TAP SCRN LVL
Metals	Zn	Zinc	µg/L	29	21	72	3.7	10	6.1	25.6095	144	—	—
Metals	Zn	Zinc	µg/L	29	22	76	3.7	10	5	12.8136	32.1	10000	NM GW STD
Metals	Hg	Mercury	µg/L	1	0	0	0.06	0.2	—	—	—	—	—
Metals	Hg	Mercury	µg/L	4450	58	1	0.06	0.2	0.032	0.16727	1.81	2	EPA MCL
Metals	Cr(VI)	Chromium hexavalent ion	µg/L	5	1	20	3	10	4.25	4.25	4.25	50	NM GW STD
Metals	Cr(VI)	Chromium hexavalent ion	µg/L	5	1	20	3	10	4.25	4.25	4.25	—	—
PCB	11096-82-5	Aroclor-1260	µg/L	786	4	0.5	0.036	0.1	0.054	0.0665	0.075	0.5	EPA MCL
PCB	11097-69-1	Aroclor-1254	µg/L	785	7	0.9	0.036	0.1	0.051	0.35643	2.1	0.5	EPA MCL
PCB	11104-28-2	Aroclor-1221	µg/L	787	0	0	0.036	0.1	—	—	—	0.5	EPA MCL
PCB	11141-16-5	Aroclor-1232	µg/L	787	0	0	0.036	0.1	—	—	—	0.5	EPA MCL
PCB	12672-29-6	Aroclor-1248	µg/L	787	0	0	0.036	0.1	—	—	—	0.5	EPA MCL
PCB	12674-11-2	Aroclor-1016	µg/L	786	1	0.1	0.036	0.1	0.0739	0.0739	0.0739	0.5	EPA MCL
PCB	37324-23-5	Aroclor-1262	µg/L	786	0	0	0.036	0.1	—	—	—	0.5	EPA MCL
PCB	53469-21-9	Aroclor-1242	µg/L	786	4	0.5	0.036	0.1	0.061	0.36525	1.1	0.5	EPA MCL
Perchlorate	ClO4	Perchlorate	µg/L	2503	2347	94	0.05	0.2	0.0517	2.93021	187	4	Consent Order
Pesticides	1024-57-3	Heptachlor Epoxide	µg/L	651	1	0.2	0.006	0.02	0.00668	0.00668	0.00668	0.2	EPA MCL
Pesticides	1031-07-8	Endosulfan Sulfate	µg/L	651	3	0.5	0.009	0.04	0.00671	0.01756	0.0365	—	—
Pesticides	309-00-2	Aldrin	µg/L	651	2	0.3	0.006	0.022	0.0175	0.02575	0.034	0.0021	EPA TAP SCRN LVL
Pesticides	319-84-6	BHC[alpha-]	µg/L	651	0	0	0.006	0.02	—	—	—	0.062	EPA TAP SCRN LVL
Pesticides	319-85-7	BHC[beta-]	µg/L	651	3	0.5	0.008	0.02	0.0108	0.01877	0.0338	0.22	EPA TAP SCRN LVL
Pesticides	319-86-8	BHC[delta-]	µg/L	651	2	0.3	0.006	0.02	0.0104	0.0113	0.0122	—	—
Pesticides	33213-65-9	Endosulfan II	µg/L	651	2	0.3	0.009	0.04	0.00737	0.00979	0.0122	—	—
Pesticides	50-29-3	DDT[4,4'-]	µg/L	651	3	0.5	0.01	0.04	0.0173	0.03827	0.0523	2	EPA TAP SCRN LVL
Pesticides	5103-71-9	Chlordane[alpha-]	µg/L	651	0	0	0.006	0.02	—	—	—	—	—
Pesticides	5103-74-2	Chlordane[gamma-]	µg/L	651	3	0.5	0.006	0.02	0.00564	0.0079	0.011	—	—
Pesticides	53494-70-5	Endrin Ketone	µg/L	651	0	0	0.01	0.04	—	—	—	—	—
Pesticides	58-89-9	BHC[gamma-]	µg/L	651	3	0.5	0.006	0.02	0.0101	0.01117	0.0132	0.2	EPA MCL
Pesticides	60-57-1	Dieldrin	µg/L	651	4	0.6	0.009	0.04	0.00767	0.01004	0.0119	0.015	EPA TAP SCRN LVL
Pesticides	72-20-8	Endrin	µg/L	651	2	0.3	0.009	0.04	0.00688	0.01069	0.0145	2	EPA MCL
Pesticides	72-43-5	Methoxychlor[4,4'-]	µg/L	651	0	0	0.05	0.2	—	—	—	40	EPA MCL

Table B-4.1-2 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
Pesticides	72-54-8	DDD[4,4'-]	µg/L	651	5	0.8	0.009	0.04	0.00631	0.01965	0.0452	2.8	EPA TAP SCRN LVL
Pesticides	72-55-9	DDE[4,4'-]	µg/L	651	6	0.9	0.006	0.04	0.0139	0.03323	0.0904	2	EPA TAP SCRN LVL
Pesticides	7421-93-4	Endrin Aldehyde	µg/L	649	2	0.3	0.006	0.04	0.00624	0.00673	0.00722	—	—
Pesticides	76-44-8	Heptachlor	µg/L	651	7	1	0.006	0.02	0.0122	0.02907	0.0828	0.4	EPA MCL
Pesticides	8001-35-2	Toxaphene (Technical Grade)	µg/L	651	1	0.2	0.16	0.5	0.682	0.682	0.682	3	EPA MCL
Pesticides	959-98-8	Endosulfan I	µg/L	651	3	0.5	0.006	0.02	0.00741	0.00972	0.0134	—	—
Rad	Ra-226	Radium-226	pCi/L	642	189	29	—	—	0.298	0.92348	4.86	5	EPA MCL
Rad	Ra-228	Radium-228	pCi/L	643	202	31	—	—	0.46	1.34842	11.8	5	EPA MCL
Rad	Sr-90	Strontium-90	pCi/L	1960	103	5	—	—	0.244	13.3669	66	8	EPA MCL
Rad	H-3	Tritium	pCi/L	180	139	77	—	—	162	2703.38	12600	20000	EPA MCL
Rad	Rn-222	Radon-222	pCi/L	1	1	100	—	—	490.761	490.761	490.761	—	—
Rad	H-3	Tritium	pCi/L	1889	650	34	—	—	0.2898	55.2902	766.36	20000	EPA MCL
SVOA	100-01-6	Nitroaniline[4-]	µg/L	1799	0	0	3.3	10	—	—	—	33	EPA TAP SCRN LVL
SVOA	100-02-7	Nitrophenol[4-]	µg/L	1738	0	0	2.3	10	—	—	—	—	—
SVOA	100-51-6	Benzyl Alcohol	µg/L	1799	0	0	2.3	10	—	—	—	1500	EPA TAP SCRN LVL
SVOA	101-55-3	Bromophenyl-phenylether[4-]	µg/L	1800	0	0	2.4	10	—	—	—	—	—
SVOA	103-33-3	Azobenzene	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	103-33-3	Azobenzene	µg/L	1799	0	0	2.4	10	—	—	—	1	EPA TAP SCRN LVL
SVOA	105-67-9	Dimethylphenol[2,4-]	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	105-67-9	Dimethylphenol[2,4-]	µg/L	1778	0	0	2.4	10	—	—	—	270	EPA TAP SCRN LVL
SVOA	106-44-5	Methylphenol[4-]	µg/L	1777	4	0.2	3.3	10	3.32	3.965	4.58	1400	EPA TAP SCRN LVL
SVOA	106-46-7	Dichlorobenzene[1,4-]	µg/L	1799	0	0	2.3	10	—	—	—	75	EPA MCL
SVOA	106-47-8	Chloroaniline[4-]	µg/L	1799	0	0	2.4	10	—	—	—	3.2	EPA TAP SCRN LVL
SVOA	108-39-4	Methylphenol[3-]	µg/L	1	0	0	2.2	10	—	—	—	1800	EPA TAP SCRN LVL
SVOA	108-60-1	Oxybis(1-chloropropane)[2,2'-]	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	108-60-1	Oxybis(1-chloropropane)[2,2'-]	µg/L	1796	0	0	2.4	10	—	—	—	3.1	EPA TAP SCRN LVL
SVOA	108-95-2	Phenol	µg/L	3	0	0	1.4	10	—	—	—	—	—
SVOA	108-95-2	Phenol	µg/L	1776	3	0.2	1.4	10	1.99	15.0533	38.3	5	NM GW STD
SVOA	110-86-1	Pyridine	µg/L	1799	0	0	2.7	10	—	—	—	15	EPA TAP SCRN LVL
SVOA	111-44-4	Bis(2-chloroethyl)ether	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	111-44-4	Bis(2-chloroethyl)ether	µg/L	1799	0	0	2.4	10	—	—	—	0.12	EPA TAP SCRN LVL
SVOA	111-91-1	Bis(2-chloroethoxy)methane	µg/L	1	0	0	3.3	10	—	—	—	—	—
SVOA	111-91-1	Bis(2-chloroethoxy)methane	µg/L	1799	0	0	3.3	10	—	—	—	47	EPA TAP SCRN LVL
SVOA	117-81-7	Bis(2-ethylhexyl)phthalate	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	117-81-7	Bis(2-ethylhexyl)phthalate	µg/L	1799	99	6	2.4	10	0.984	9.39782	96.4	6	EPA MCL
SVOA	117-84-0	Di-n-octylphthalate	µg/L	1800	1	0.1	3.3	10	3.07	3.07	3.07	—	—
SVOA	118-74-1	Hexachlorobenzene	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	118-74-1	Hexachlorobenzene	µg/L	1799	0	0	2.4	10	—	—	—	1	EPA MCL

Table B-4.1-2 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
SVOA	120-12-7	Anthracene	µg/L	1	0	0	0.24	1	—	—	—	—	—
SVOA	120-12-7	Anthracene	µg/L	1799	1	0.1	0.24	1	0.323	0.323	0.323	1300	EPA TAP SCRN LVL
SVOA	120-82-1	Trichlorobenzene[1,2,4-]	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	120-82-1	Trichlorobenzene[1,2,4-]	µg/L	1799	0	0	2.4	10	—	—	—	70	EPA MCL
SVOA	120-83-2	Dichlorophenol[2,4-]	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	120-83-2	Dichlorophenol[2,4-]	µg/L	1778	0	0	2.4	10	—	—	—	35	EPA TAP SCRN LVL
SVOA	121-14-2	Dinitrotoluene[2,4-]	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	121-14-2	Dinitrotoluene[2,4-]	µg/L	1799	0	0	2.4	10	—	—	—	2	EPA TAP SCRN LVL
SVOA	122-39-4	Diphenylamine	µg/L	1	0	0	3.3	10	—	—	—	—	—
SVOA	122-39-4	Diphenylamine	µg/L	1794	0	0	3.3	10	—	—	—	240	EPA TAP SCRN LVL
SVOA	123-91-1	Dioxane[1,4-]	µg/L	1799	100	6	2	10	1.15	82.7248	1190	6.7	EPA TAP SCRN LVL
SVOA	129-00-0	Pyrene	µg/L	1	0	0	0.33	1	—	—	—	—	—
SVOA	129-00-0	Pyrene	µg/L	1799	0	0	0.33	1	—	—	—	87	EPA TAP SCRN LVL
SVOA	131-11-3	Dimethyl Phthalate	µg/L	1800	0	0	2.4	10	—	—	—	—	—
SVOA	132-64-9	Dibenzofuran	µg/L	1799	0	0	2.3	10	—	—	—	5.8	EPA TAP SCRN LVL
SVOA	1912-24-9	Atrazine	µg/L	1025	0	0	3	10	—	—	—	3	EPA MCL
SVOA	191-24-2	Benzo(g,h,i)perylene	µg/L	1797	5	0.3	0.24	1	0.21	0.3888	0.489	—	—
SVOA	193-39-5	Indeno(1,2,3-cd)pyrene	µg/L	1	0	0	0.24	1	—	—	—	—	—
SVOA	193-39-5	Indeno(1,2,3-cd)pyrene	µg/L	1799	5	0.3	0.24	1	0.4	0.5436	0.837	0.29	EPA TAP SCRN LVL
SVOA	205-99-2	Benzo(b)fluoranthene	µg/L	1	0	0	0.25	1	—	—	—	—	—
SVOA	205-99-2	Benzo(b)fluoranthene	µg/L	1799	7	0.4	0.25	1	0.239	0.96357	3.68	0.29	EPA TAP SCRN LVL
SVOA	206-44-0	Fluoranthene	µg/L	1	0	0	0.24	1	—	—	—	—	—
SVOA	206-44-0	Fluoranthene	µg/L	1799	1	0.1	0.24	1	0.343	0.343	0.343	630	EPA TAP SCRN LVL
SVOA	207-08-9	Benzo(k)fluoranthene	µg/L	1	0	0	0.24	1	—	—	—	—	—
SVOA	207-08-9	Benzo(k)fluoranthene	µg/L	1799	6	0.3	0.24	1	0.25	0.371	0.568	2.9	EPA TAP SCRN LVL
SVOA	208-96-8	Acenaphthylene	µg/L	1800	1	0.1	0.22	1	0.283	0.283	0.283	—	—
SVOA	218-01-9	Chrysene	µg/L	1	0	0	0.24	1	—	—	—	—	—
SVOA	218-01-9	Chrysene	µg/L	1799	2	0.1	0.24	1	0.295	0.309	0.323	29	EPA TAP SCRN LVL
SVOA	50-32-8	Benzo(a)pyrene	µg/L	1	0	0	0.25	1	—	—	—	—	—
SVOA	50-32-8	Benzo(a)pyrene	µg/L	1799	7	0.4	0.25	1	0.245	0.74343	2.12	0.2	EPA MCL
SVOA	51-28-5	Dinitrophenol[2,4-]	µg/L	1	0	0	7	20	—	—	—	—	—
SVOA	51-28-5	Dinitrophenol[2,4-]	µg/L	1774	0	0	7	20	—	—	—	30	EPA TAP SCRN LVL
SVOA	534-52-1	Dinitro-2-methylphenol[4,6-]	µg/L	1	0	0	3.3	10	—	—	—	—	—
SVOA	534-52-1	Dinitro-2-methylphenol[4,6-]	µg/L	1776	0	0	3.3	10	—	—	—	1.2	EPA TAP SCRN LVL
SVOA	53-70-3	Dibenz(a,h)anthracene	µg/L	1	0	0	0.24	1	—	—	—	—	—
SVOA	53-70-3	Dibenz(a,h)anthracene	µg/L	1799	5	0.3	0.24	1	0.36	0.8548	1.63	0.029	EPA TAP SCRN LVL
SVOA	541-73-1	Dichlorobenzene[1,3-]	µg/L	1799	0	0	2.3	10	—	—	—	—	—
SVOA	55-18-5	Nitrosodiethylamine[N-]	µg/L	1798	0	0	2.3	10	—	—	—	0.0014	EPA TAP SCRN LVL

Table B-4.1-2 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
SVOA	56-55-3	Benzo(a)anthracene	µg/L	1	0	0	0.24	1	—	—	—	—	—
SVOA	56-55-3	Benzo(a)anthracene	µg/L	1799	4	0.2	0.24	1	0.252	0.26475	0.286	0.29	EPA TAP SCRN LVL
SVOA	58-90-2	Tetrachlorophenol[2,3,4,6-]	µg/L	1778	1	0.1	2.4	10	5.1	5.1	5.1	170	EPA TAP SCRN LVL
SVOA	59-50-7	Chloro-3-methylphenol[4-]	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	59-50-7	Chloro-3-methylphenol[4-]	µg/L	1778	0	0	2.4	10	—	—	—	1100	EPA TAP SCRN LVL
SVOA	606-20-2	Dinitrotoluene[2,6-]	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	606-20-2	Dinitrotoluene[2,6-]	µg/L	1798	0	0	2.4	10	—	—	—	15	EPA TAP SCRN LVL
SVOA	608-93-5	Pentachlorobenzene	µg/L	1798	0	0	3	10	—	—	—	2.3	EPA TAP SCRN LVL
SVOA	621-64-7	Nitroso-di-n-propylamine[N-]	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	621-64-7	Nitroso-di-n-propylamine[N-]	µg/L	1799	0	0	2.4	10	—	—	—	0.093	EPA TAP SCRN LVL
SVOA	62-53-3	Aniline	µg/L	1799	0	0	2.8	10	—	—	—	120	EPA TAP SCRN LVL
SVOA	62-75-9	Nitrosodimethylamine[N-]	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	62-75-9	Nitrosodimethylamine[N-]	µg/L	1799	0	0	2.4	10	—	—	—	0.0042	EPA TAP SCRN LVL
SVOA	65-85-0	Benzoic Acid	µg/L	1661	30	2	6.6	20	8.33	21.5293	146	58000	EPA TAP SCRN LVL
SVOA	67-72-1	Hexachloroethane	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	67-72-1	Hexachloroethane	µg/L	1799	0	0	2.4	10	—	—	—	7.9	EPA TAP SCRN LVL
SVOA	7005-72-3	Chlorophenyl-phenyl[4-] Ether	µg/L	1800	0	0	2.4	10	—	—	—	—	—
SVOA	77-47-4	Hexachlorocyclopentadiene	µg/L	1	0	0	3	10	—	—	—	—	—
SVOA	77-47-4	Hexachlorocyclopentadiene	µg/L	1799	0	0	3	10	—	—	—	50	EPA MCL
SVOA	78-59-1	Isophorone	µg/L	1	0	0	3	10	—	—	—	—	—
SVOA	78-59-1	Isophorone	µg/L	1799	0	0	3	10	—	—	—	670	EPA TAP SCRN LVL
SVOA	83-32-9	Acenaphthene	µg/L	1	0	0	0.34	1	—	—	—	—	—
SVOA	83-32-9	Acenaphthene	µg/L	1799	0	0	0.34	1	—	—	—	400	EPA TAP SCRN LVL
SVOA	84-66-2	Diethylphthalate	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	84-66-2	Diethylphthalate	µg/L	1799	74	4	2.4	10	2.18	23.4128	432	11000	EPA TAP SCRN LVL
SVOA	84-74-2	Di-n-butylphthalate	µg/L	1	0	0	2.3	10	—	—	—	—	—
SVOA	84-74-2	Di-n-butylphthalate	µg/L	1799	1	0.1	2.3	10	4.01	4.01	4.01	670	EPA TAP SCRN LVL
SVOA	85-01-8	Phenanthrene	µg/L	1800	1	0.1	0.24	1	0.333	0.333	0.333	—	—
SVOA	85-68-7	Butylbenzylphthalate	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	85-68-7	Butylbenzylphthalate	µg/L	1799	0	0	2.4	10	—	—	—	140	EPA TAP SCRN LVL
SVOA	86-30-6	Nitrosodiphenylamine[N-]	µg/L	5	0	0	1.2	10	—	—	—	140	EPA TAP SCRN LVL
SVOA	86-73-7	Fluorene	µg/L	1	0	0	0.24	1	—	—	—	—	—
SVOA	86-73-7	Fluorene	µg/L	1799	1	0.1	0.24	1	0.303	0.303	0.303	220	EPA TAP SCRN LVL
SVOA	87-68-3	Hexachlorobutadiene	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	87-68-3	Hexachlorobutadiene	µg/L	1799	0	0	2.4	10	—	—	—	2.6	EPA TAP SCRN LVL
SVOA	87-86-5	Pentachlorophenol	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	87-86-5	Pentachlorophenol	µg/L	1778	1	0.1	2.4	10	7.01	7.01	7.01	1	EPA MCL
SVOA	88-06-2	Trichlorophenol[2,4,6-]	µg/L	1	0	0	2.4	10	—	—	—	—	—

Table B-4.1-2 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
SVOA	88-06-2	Trichlorophenol[2,4,6-]	µg/L	1778	0	0	2.4	10	—	—	—	35	EPA TAP SCRN LVL
SVOA	88-74-4	Nitroaniline[2-]	µg/L	1799	0	0	2.3	10	—	—	—	150	EPA TAP SCRN LVL
SVOA	88-75-5	Nitrophenol[2-]	µg/L	1779	0	0	2.4	10	—	—	—	—	—
SVOA	88-85-7	Dinoseb	µg/L	1777	0	0	2.4	10	—	—	—	7	EPA MCL
SVOA	90-12-0	Methylnaphthalene[1-]	µg/L	1797	0	0	0.33	1	—	—	—	9.7	EPA TAP SCRN LVL
SVOA	91-20-3	Naphthalene	µg/L	3	0	0	0.33	1	—	—	—	—	—
SVOA	91-20-3	Naphthalene	µg/L	1797	1	0.1	0.33	1	0.33	0.33	0.33	30	NM GW STD
SVOA	91-57-6	Methylnaphthalene[2-]	µg/L	1799	0	0	0.33	1	—	—	—	27	EPA TAP SCRN LVL
SVOA	91-58-7	Chloronaphthalene[2-]	µg/L	1	0	0	0.35	1	—	—	—	—	—
SVOA	91-58-7	Chloronaphthalene[2-]	µg/L	1799	0	0	0.35	1	—	—	—	550	EPA TAP SCRN LVL
SVOA	91-94-1	Dichlorobenzidine[3,3'-]	µg/L	1	0	0	2	10	—	—	—	—	—
SVOA	91-94-1	Dichlorobenzidine[3,3'-]	µg/L	1798	0	0	2	10	—	—	—	1.1	EPA TAP SCRN LVL
SVOA	924-16-3	Nitroso-di-n-butylamine[N-]	µg/L	1798	0	0	3	10	—	—	—	0.024	EPA TAP SCRN LVL
SVOA	92-87-5	Benzidine	µg/L	1	0	0	3	10	—	—	—	—	—
SVOA	92-87-5	Benzidine	µg/L	1625	0	0	3	10	—	—	—	0.00092	EPA TAP SCRN LVL
SVOA	930-55-2	Nitrosopyrrolidine[N-]	µg/L	1793	0	0	2.3	10	—	—	—	0.32	EPA TAP SCRN LVL
SVOA	95-48-7	Methylphenol[2-]	µg/L	1778	0	0	2.3	10	—	—	—	720	EPA TAP SCRN LVL
SVOA	95-50-1	Dichlorobenzene[1,2-]	µg/L	1799	0	0	2.3	10	—	—	—	600	EPA MCL
SVOA	95-57-8	Chlorophenol[2-]	µg/L	1	0	0	2.4	10	—	—	—	—	—
SVOA	95-57-8	Chlorophenol[2-]	µg/L	1778	0	0	2.4	10	—	—	—	71	EPA TAP SCRN LVL
SVOA	95-94-3	Tetrachlorobenzene[1,2,4,5]	µg/L	1799	0	0	3	10	—	—	—	1.2	EPA TAP SCRN LVL
SVOA	95-95-4	Trichlorophenol[2,4,5-]	µg/L	1778	0	0	2	10	—	—	—	890	EPA TAP SCRN LVL
SVOA	98-95-3	Nitrobenzene	µg/L	1	0	0	3.3	10	—	—	—	—	—
SVOA	98-95-3	Nitrobenzene	µg/L	1799	0	0	3.3	10	—	—	—	1.2	EPA TAP SCRN LVL
SVOA	99-09-2	Nitroaniline[3-]	µg/L	1799	0	0	2.3	10	—	—	—	—	—
TPH-DRO	TPH-DRO	TPH-DRO	µg/L	19	5	26	60	188	81.3	115.1	186	—	—
TPH-GRO	TPH-GRO	TPH-GRO	µg/L	6	0	0	12	50	—	—	—	—	—
VOA	100-41-4	Ethylbenzene	µg/L	1	0	0	0.25	1	—	—	—	—	—
VOA	100-41-4	Ethylbenzene	µg/L	2419	4	0.2	0.25	1	0.265	0.27175	0.28	700	EPA MCL
VOA	100-42-5	Styrene	µg/L	2419	3	0.1	0.25	1	0.31	1.99667	3.86	100	EPA MCL
VOA	10061-01-5	Dichloropropene[cis-1,3-]	µg/L	2420	0	0	0.25	1	—	—	—	—	—
VOA	10061-02-6	Dichloropropene[trans-1,3-]	µg/L	2420	0	0	0.25	1	—	—	—	—	—
VOA	103-65-1	Propylbenzene[1-]	µg/L	2419	1	0.04	0.25	1	0.37	0.37	0.37	530	EPA TAP SCRN LVL
VOA	104-51-8	Butylbenzene[n-]	µg/L	2419	1	0.04	0.25	1	1.1	1.1	1.1	780	EPA TAP SCRN LVL
VOA	106-43-4	Chlorotoluene[4-]	µg/L	2419	1	0.04	0.25	1	0.3	0.3	0.3	190	EPA TAP SCRN LVL
VOA	106-46-7	Dichlorobenzene[1,4-]	µg/L	1	0	0	0.25	1	—	—	—	—	—
VOA	106-46-7	Dichlorobenzene[1,4-]	µg/L	2419	0	0	0.25	1	—	—	—	75	EPA MCL
VOA	106-93-4	Dibromoethane[1,2-]	µg/L	2419	0	0	0.25	1	—	—	—	0.05	EPA MCL

Table B-4.1-2 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
VOA	107-02-8	Acrolein	µg/L	1	0	0	1.5	5	—	—	—	—	—
VOA	107-02-8	Acrolein	µg/L	1548	1	0.1	1.5	5	1.95	1.95	1.95	0.041	EPA TAP SCRN LVL
VOA	107-05-1	Chloro-1-propene[3-]	µg/L	2419	0	0	1.8	5	—	—	—	6.3	EPA TAP SCRN LVL
VOA	107-06-2	Dichloroethane[1,2-]	µg/L	1	0	0	0.25	1	—	—	—	—	—
VOA	107-06-2	Dichloroethane[1,2-]	µg/L	2419	6	0.2	0.25	1	0.262	0.84733	1.69	5	EPA MCL
VOA	107-12-0	Propionitrile	µg/L	1281	0	0	1.5	5	—	—	—	—	—
VOA	107-13-1	Acrylonitrile	µg/L	1	0	0	1	5	—	—	—	—	—
VOA	107-13-1	Acrylonitrile	µg/L	2410	0	0	1	5	—	—	—	0.45	EPA TAP SCRN LVL
VOA	108-05-4	Vinyl acetate	µg/L	2419	0	0	1.5	5	—	—	—	410	EPA TAP SCRN LVL
VOA	108-10-1	Methyl-2-pentanone[4-]	µg/L	2419	5	0.2	1.3	5	1.52	17.71	75.8	1000	EPA TAP SCRN LVL
VOA	108-67-8	Trimethylbenzene[1,3,5-]	µg/L	2419	1	0.04	0.25	1	0.4	0.4	0.4	87	EPA TAP SCRN LVL
VOA	108-86-1	Bromobenzene	µg/L	2419	0	0	0.25	1	—	—	—	54	EPA TAP SCRN LVL
VOA	108-88-3	Toluene	µg/L	3	2	67	0.25	1	0.819	7.1595	13.5	—	—
VOA	108-88-3	Toluene	µg/L	2417	244	10	0.25	1	0.251	4.1057	119	750	NM GW STD
VOA	108-90-7	Chlorobenzene	µg/L	1	0	0	0.25	1	—	—	—	—	—
VOA	108-90-7	Chlorobenzene	µg/L	2419	1	0.04	0.25	1	0.43	0.43	0.43	100	EPA MCL
VOA	110-75-8	Chloroethyl vinyl ether[2-]	µg/L	94	0	0	1.5	5	—	—	—	—	—
VOA	120-82-1	Trichlorobenzene[1,2,4-]	µg/L	2419	2	0.1	0.3	1	0.48	0.4915	0.503	70	EPA MCL
VOA	123-91-1	Dioxane[1,4-]	µg/L	28	19	68	20	60	24.2	982.311	4790	6.7	EPA TAP SCRN LVL
VOA	124-48-1	Chlorodibromomethane	µg/L	1	0	0	0.29	1	—	—	—	—	—
VOA	124-48-1	Chlorodibromomethane	µg/L	2419	1	0.04	0.29	1	1.27	1.27	1.27	80	EPA MCL
VOA	126-98-7	Methacrylonitrile	µg/L	2417	0	0	1	5	—	—	—	0.75	EPA TAP SCRN LVL
VOA	126-99-8	Chloro-1,3-butadiene[2-]	µg/L	2419	0	0	0.3	1	—	—	—	0.16	EPA TAP SCRN LVL
VOA	127-18-4	Tetrachloroethene	µg/L	1	1	100	0.32	1	1.96	1.96	1.96	—	—
VOA	127-18-4	Tetrachloroethene	µg/L	2419	108	4	0.32	1	0.31	5.94294	200	5	EPA MCL
VOA	1330-20-7	Xylene (Total)	µg/L	2	0	0	0.071	2	-	—	—	620	NM GW STD
VOA	135-98-8	Butylbenzene[sec-]	µg/L	2419	1	0.04	0.25	1	0.66	0.66	0.66	—	—
VOA	142-28-9	Dichloropropane[1,3-]	µg/L	2419	0	0	0.28	1	—	—	—	290	EPA TAP SCRN LVL
VOA	156-59-2	Dichloroethene[cis-1,2-]	µg/L	2419	4	0.2	0.3	1	0.31	4.845	9.55	70	EPA MCL
VOA	156-60-5	Dichloroethene[trans-1,2-]	µg/L	1	0	0	0.3	1	—	—	—	—	—
VOA	156-60-5	Dichloroethene[trans-1,2-]	µg/L	2419	0	0	0.3	1	—	—	—	100	EPA MCL
VOA	1634-04-4	Methyl tert-Butyl Ether	µg/L	2419	59	2	0.25	1	0.253	0.77324	1.64	120	EPA TAP SCRN LVL
VOA	26523-64-8	Trichlorotrifluoroethane	µg/L	2	0	0	0.17	1	—	—	—	—	—
VOA	541-73-1	Dichlorobenzene[1,3-]	µg/L	2420	8	0.3	0.25	1	0.26	0.33438	0.513	—	—
VOA	56-23-5	Carbon Tetrachloride	µg/L	1	0	0	0.3	1	—	—	—	—	—
VOA	56-23-5	Carbon Tetrachloride	µg/L	2419	0	0	0.3	1	—	—	—	5	EPA MCL
VOA	563-58-6	Dichloropropene[1,1-]	µg/L	2419	0	0	0.25	1	—	—	—	—	—
VOA	591-78-6	Hexanone[2-]	µg/L	2419	1	0.04	1.4	5	4.63	4.63	4.63	34	EPA TAP SCRN LVL

Table B-4.1-2 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
VOA	594-20-7	Dichloropropane[2,2-]	µg/L	2419	0	0	0.3	1	—	—	—	—	—
VOA	60-29-7	Diethyl Ether	µg/L	2419	6	0.2	0.3	1	0.301	0.81317	1.99	3100	EPA TAP SCRN LVL
VOA	630-20-6	Tetrachloroethane[1,1,1,2-]	µg/L	2419	0	0	0.3	1	—	—	-	5	EPA TAP SCRN LVL
VOA	67-64-1	Acetone	µg/L	2417	141	6	3	10	1.25	122.208	13700	12000	EPA TAP SCRN LVL
VOA	67-66-3	Chloroform	µg/L	1	0	0	0.25	1	—	—	—	—	—
VOA	67-66-3	Chloroform	µg/L	2419	92	4	0.25	1	0.26	0.63009	10.7	80	EPA MCL
VOA	71-36-3	Butanol[1-]	µg/L	1505	6	0.4	15	50	16	59.0833	157	1500	EPA TAP SCRN LVL
VOA	71-43-2	Benzene	µg/L	1	0	0	0.3	1	—	—	—	—	—
VOA	71-43-2	Benzene	µg/L	2419	10	0.4	0.3	1	0.318	4.1006	23.8	5	EPA MCL
VOA	71-55-6	Trichloroethane[1,1,1-]	µg/L	3	0	0	0.32	1	—	—	—	—	—
VOA	71-55-6	Trichloroethane[1,1,1-]	µg/L	2417	34	1	0.32	1	39.9	110.147	254	60	NM GW STD
VOA	74-83-9	Bromomethane	µg/L	1	0	0	0.36	1	—	—	—	—	—
VOA	74-83-9	Bromomethane	µg/L	2419	3	0.1	0.36	1	14.7	31.2	55.3	7	EPA TAP SCRN LVL
VOA	74-87-3	Chloromethane	µg/L	1	0	0	0.37	1	—	—	—	—	—
VOA	74-87-3	Chloromethane	µg/L	2419	89	4	0.37	1	0.25	0.44357	2.61	190	EPA TAP SCRN LVL
VOA	74-88-4	Iodomethane	µg/L	2419	1	0.04	1.3	5	1.66	1.66	1.66	—	—
VOA	74-95-3	Dibromomethane	µg/L	2419	0	0	0.3	1	—	—	—	7.9	EPA TAP SCRN LVL
VOA	74-97-5	Bromochloromethane	µg/L	2419	0	0	0.3	1	—	—	—	83	EPA TAP SCRN LVL
VOA	75-00-3	Chloroethane	µg/L	1	0	0	0.33	1	—	—	—	—	—
VOA	75-00-3	Chloroethane	µg/L	2419	0	0	0.33	1	—	—	—	21000	EPA TAP SCRN LVL
VOA	75-01-4	Vinyl Chloride	µg/L	3	0	0	0.48	1	—	—	—	—	—
VOA	75-01-4	Vinyl Chloride	µg/L	2417	0	0	0.48	1	—	—	—	1	NM GW STD
VOA	75-05-8	Acetonitrile	µg/L	1271	2	0.2	6.6	25	6.78	7.12	7.46	130	EPA TAP SCRN LVL
VOA	75-09-2	Methylene Chloride	µg/L	1	0	0	2.8	10	—	—	—	—	—
VOA	75-09-2	Methylene Chloride	µg/L	2419	9	0.4	2.8	10	2.11	3.59222	6.97	5	EPA MCL
VOA	75-15-0	Carbon Disulfide	µg/L	2419	7	0.3	1.3	5	1.32	16.9	107	720	EPA TAP SCRN LVL
VOA	75-25-2	Bromoform	µg/L	1	0	0	0.25	1	—	—	—	—	—
VOA	75-25-2	Bromoform	µg/L	2419	1	0.04	0.25	1	4.91	4.91	4.91	80	EPA MCL
VOA	75-27-4	Bromodichloromethane	µg/L	1	0	0	0.25	1	—	—	—	—	—
VOA	75-27-4	Bromodichloromethane	µg/L	2419	2	0.1	0.25	1	0.35	0.4685	0.587	80	EPA MCL
VOA	75-34-3	Dichloroethane[1,1-]	µg/L	3	0	0	0.3	1	—	—	—	—	—
VOA	75-34-3	Dichloroethane[1,1-]	µg/L	2417	34	1	0.3	1	0.71	2.6375	8.5	25	NM GW STD
VOA	75-35-4	Dichloroethene[1,1-]	µg/L	3	0	0	0.3	1	—	—	—	—	—
VOA	75-35-4	Dichloroethene[1,1-]	µg/L	2417	34	1	0.3	1	0.94	6.11882	19.4	5	NM GW STD
VOA	75-69-4	Trichlorofluoromethane	µg/L	2415	0	0	0.3	1	—	—	—	1100	EPA TAP SCRN LVL
VOA	75-71-8	Dichlorodifluoromethane	µg/L	2419	0	0	0.36	1	—	—	—	190	EPA TAP SCRN LVL
VOA	76-13-1	Trichloro-1,2,2-trifluoroethane[1,1,2-]	µg/L	2352	0	0	1	5	—	—	—	53000	EPA TAP SCRN LVL
VOA	78-83-1	Isobutyl alcohol	µg/L	942	1	0.1	15	50	24.9	24.9	24.9	4600	EPA TAP SCRN LVL

Table B-4.1-2 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	GW Std	GW Std Type
VOA	78-87-5	Dichloropropane[1,2-]	µg/L	1	0	0	0.25	1	—	—	—	—	—
VOA	78-87-5	Dichloropropane[1,2-]	µg/L	2419	0	0	0.25	1	—	—	—	5	EPA MCL
VOA	78-93-3	Butanone[2-]	µg/L	2413	46	2	1.4	5	1.27	3.47087	14.5	4900	EPA TAP SCRN LVL
VOA	79-00-5	Trichloroethane[1,1,2-]	µg/L	1	0	0	0.25	1	—	—	—	—	—
VOA	79-00-5	Trichloroethane[1,1,2-]	µg/L	2419	9	0.4	0.25	1	0.251	0.57156	1.16	5	EPA MCL
VOA	79-01-6	Trichloroethene	µg/L	1	1	100	0.25	1	1.59	1.59	1.59	—	—
VOA	79-01-6	Trichloroethene	µg/L	2419	147	6	0.25	1	0.25	1.22312	11.8	5	EPA MCL
VOA	79-34-5	Tetrachloroethane[1,1,2,2-]	µg/L	3	0	0	0.25	1	—	—	—	—	—
VOA	79-34-5	Tetrachloroethane[1,1,2,2-]	µg/L	2417	0	0	0.25	1	—	—	—	10	NM GW STD
VOA	80-62-6	Methyl Methacrylate	µg/L	2419	0	0	1	5	—	—	—	1400	EPA TAP SCRN LVL
VOA	87-61-6	Trichlorobenzene[1,2,3-]	µg/L	2419	2	0.1	0.32	1	0.46	0.54	0.62	5.2	EPA TAP SCRN LVL
VOA	87-68-3	Hexachlorobutadiene	µg/L	2419	0	0	0.32	1	—	—	—	2.6	EPA TAP SCRN LVL
VOA	91-20-3	Naphthalene	µg/L	2	0	0	0.26	1	—	—	—	—	—
VOA	91-20-3	Naphthalene	µg/L	2417	7	0.3	0.26	1	0.353	1.52557	3.9	30	NM GW STD
VOA	95-47-6	Xylene[1,2-]	µg/L	2419	4	0.2	0.28	1	0.34	0.3755	0.419	190	EPA TAP SCRN LVL
VOA	95-49-8	Chlorotoluene[2-]	µg/L	2419	0	0	0.25	1	—	—	—	180	EPA TAP SCRN LVL
VOA	95-50-1	Dichlorobenzene[1,2-]	µg/L	1	0	0	0.25	1	—	—	—	—	—
VOA	95-50-1	Dichlorobenzene[1,2-]	µg/L	2419	1	0.04	0.25	1	0.26	0.26	0.26	600	EPA MCL
VOA	95-63-6	Trimethylbenzene[1,2,4-]	µg/L	2419	4	0.2	0.25	1	0.27	0.40875	0.6	15	EPA TAP SCRN LVL
VOA	96-12-8	Dibromo-3-Chloropropane[1,2-]	µg/L	2419	0	0	0.36	1	—	—	—	0.2	EPA MCL
VOA	96-18-4	Trichloropropane[1,2,3-]	µg/L	2419	0	0	0.3	1	—	—	—	0.0065	EPA TAP SCRN LVL
VOA	97-63-2	Ethyl Methacrylate	µg/L	2419	1	0.04	1	5	3.28	3.28	3.28	420	EPA TAP SCRN LVL
VOA	98-06-6	Butylbenzene[tert-]	µg/L	2419	0	0	0.25	1	—	—	—	—	—
VOA	98-82-8	Isopropylbenzene	µg/L	2419	7	0.3	0.25	1	0.252	0.33314	0.47	390	EPA TAP SCRN LVL
VOA	99-87-6	Isopropyltoluene[4-]	µg/L	2419	4	0.2	0.25	1	0.35	0.9925	1.74	—	—
VOA	Xylene[m+p]	Xylene[1,3-]+Xylene[1,4-]	µg/L	2417	22	0.9	0.44	2	0.438	1.29109	3.51	—	—

Notes: CAS = Chemical Abstracts Service; GW = groundwater; DOE DW DCG = DOE Drinking Water–Derived Concentration Guide; EPA MCL = EPA maximum contaminant level; NM GW STD = New Mexico groundwater standard; EPA SEC DW LVL = EPA secondary drinking water level; EPA TAP SCRN LVL = EPA tap water screening level.

*— = Not available.

Table B-4.1-3
Analytes, Analytical Methods, MDLs and PQLs Obtained for Base-flow Samples by Contract Laboratories, and Analyte Detection Statistics from 2008–2012

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
Alpha Spec	Am-241	Americium-241	pCi/L	Y	228	13	6	—*	—	0.042	0.991953846	5.57	400	DOE BCG WATER
Alpha Spec	Np-237	Neptunium-237	pCi/L	—	4	0	0	—	—	—	—	—	—	—
Alpha Spec	Pu-238	Plutonium-238	pCi/L	Y	228	16	7	—	—	0.03	0.4886625	2.44	—	—
Alpha Spec	Pu-239/240	Plutonium-239/240	pCi/L	Y	228	23	10	—	—	0.0371	1.286126087	8.74	200	DOE BCG WATER
Alpha Spec	Th-228	Thorium-228	pCi/L	Y	41	14	34	—	—	0.0571	0.262507143	0.738	—	—
Alpha Spec	Th-230	Thorium-230	pCi/L	Y	41	11	27	—	—	0.0571	0.180736364	0.355	—	—
Alpha Spec	Th-232	Thorium-232	pCi/L	Y	41	15	37	—	—	0.0322	0.19374	0.582	300	DOE BCG WATER
Alpha Spec	U-234	Uranium-234	pCi/L	Y	228	151	66	—	—	0.0562	0.550962252	1.94	200	DOE BCG WATER
Alpha Spec	U-235/236	Uranium-235/236	pCi/L	Y	228	23	10	—	—	0.0337	0.057930435	0.117	—	—
Alpha Spec	U-238	Uranium-238	pCi/L	Y	228	164	72	—	—	0.0273	0.319878049	1.44	200	DOE BCG WATER
Diox/Fur	1746-01-6	Tetrachlorodibenzodioxin[2,3,7,8-]	µg/L	—	30	0	0	0.0000012	0.0000063	—	—	—	0.000000051	NM HH 00
Diox/Fur	19408-74-3	Hexachlorodibenzodioxin[1,2,3,7,8,9-]	µg/L	—	30	0	0	0.000004	0.00003	—	—	—	—	—
Diox/Fur	30402-15-4	Pentachlorodibenzofurans (Totals)	µg/L	Y	30	4	13	0.000004	0.000025	0.00000251	0.000005805	0.00000872	—	—
Diox/Fur	3268-87-9	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	µg/L	Y	30	15	50	0.00000954	0.000068	0.00000594	0.000500749	0.00293	—	—
Diox/Fur	34465-46-8	Hexachlorodibenzodioxins (Total)	µg/L	Y	30	3	10	0.000004	0.000025	0.0000251	0.000042	0.0000748	—	—
Diox/Fur	35822-46-9	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	µg/L	Y	30	8	27	0.0000046	0.000032	0.00000691	8.56063E-05	0.000319	—	—
Diox/Fur	36088-22-9	Pentachlorodibenzodioxins (Total)	µg/L	Y	30	2	7	0.000004	0.000025	0.00000269	0.0000053	0.00000791	—	—
Diox/Fur	37871-00-4	Heptachlorodibenzodioxins (Total)	µg/L	Y	30	14	47	0.0000047	0.000028	0.00000209	0.000105968	0.000617	—	—
Diox/Fur	38998-75-3	Heptachlorodibenzofurans (Total)	µg/L	Y	30	8	27	0.000004	0.000025	0.00000448	8.45038E-05	0.000387	—	—
Diox/Fur	39001-02-0	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	µg/L	Y	30	9	30	0.0000079	0.000063	0.00000252	0.00007609--111	0.000319	—	—
Diox/Fur	39227-28-6	Hexachlorodibenzodioxin[1,2,3,4,7,8-]	µg/L	—	30	0	0	0.000004	0.00003	—	—	—	—	—
Diox/Fur	40321-76-4	Pentachlorodibenzodioxin[1,2,3,7,8-]	µg/L	—	30	0	0	0.000004	0.00003	—	—	—	—	—
Diox/Fur	41903-57-5	Tetrachlorodibenzodioxins (Total)	µg/L	Y	30	1	3	0.0000012	0.0000052	0.00000342	0.00000342	0.00000342	—	—
Diox/Fur	51207-31-9	Tetrachlorodibenzofuran[2,3,7,8-]	µg/L	Y	30	1	3	0.000001	0.0000063	0.000000796	0.000000796	0.000000796	—	—
Diox/Fur	55673-89-7	Heptachlorodibenzofuran[1,2,3,4,7,8,9-]	µg/L	Y	30	3	10	0.000046	0.00003	0.00000365	7.37333E-06	0.0000101	—	—
Diox/Fur	55684-94-1	Hexachlorodibenzofurans (Total)	µg/L	Y	30	7	23	0.0000038	0.000025	0.0000013	1.93557E-05	0.0000742	—	—
Diox/Fur	55722-27-5	Tetrachlorodibenzofurans (Totals)	µg/L	Y	30	1	3	0.000001	0.0000052	0.00000321	0.00000321	0.00000321	—	—
Diox/Fur	57117-31-4	Pentachlorodibenzofuran[2,3,4,7,8-]	µg/L	—	30	0	0	0.0000038	0.00003	—	—	—	—	—
Diox/Fur	57117-41-6	Pentachlorodibenzofuran[1,2,3,7,8-]	µg/L	—	30	0	0	0.0000038	0.00003	—	—	—	—	—
Diox/Fur	57117-44-9	Hexachlorodibenzofuran[1,2,3,6,7,8-]	µg/L	Y	30	1	3	0.0000037	0.00003	0.00000285	0.00000285	0.00000285	—	—
Diox/Fur	57653-85-7	Hexachlorodibenzodioxin[1,2,3,6,7,8-]	µg/L	Y	30	1	3	0.000004	0.00003	0.00000444	0.00000444	0.00000444	—	—
Diox/Fur	60851-34-5	Hexachlorodibenzofuran[2,3,4,6,7,8-]	µg/L	—	30	0	0	0.0000037	0.00003	—	—	—	—	—
Diox/Fur	67562-39-4	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	µg/L	Y	30	8	27	0.000004	0.00003	0.00000176	2.35863E-05	0.000103	—	—
Diox/Fur	70648-26-9	Hexachlorodibenzofuran[1,2,3,4,7,8-]	µg/L	—	30	0	0	0.0000037	0.00003	—	—	—	—	—
Diox/Fur	72918-21-9	Hexachlorodibenzofuran[1,2,3,7,8,9-]	µg/L	—	30	0	0	0.0000038	0.00003	—	—	—	—	—
Gamma	Am-241	Americium-241	pCi/L	—	1	0	0	—	—	—	—	—	400	DOE BCG WATER

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
Gamma	Co-60	Cobalt-60	pCi/L	—	228	0	0	—	—	—	—	—	4000	DOE BCG WATER
Gamma	Cs-137	Cesium-137	pCi/L	Y	227	4	2	—	—	8.47	44.7425	89	40	DOE BCG WATER
Gamma	GROSSG	Gross gamma	pCi/L	Y	212	1	0.5	—	—	40.7	40.7	40.7	—	—
Gamma	K-40	Potassium-40	pCi/L	Y	216	2	0.9	—	—	71.3	94.15	117	—	—
Gamma	Na-22	Sodium-22	pCi/L	—	228	0	0	—	—	—	—	—	—	—
Gamma	Np-237	Neptunium-237	pCi/L	—	228	0	0	—	—	—	—	—	—	—
Geninorg	SPEC_CONDC	Specific Conductance	µS/cm	Y	220	220	100	—	—	1.25	553.5415909	19600	—	—
Geninorg	HARDNESS	Hardness	mg/L	Y	447	447	100	0.4	1.24	12.9	86.24608501	391	—	—
Geninorg	pH	pH	SU	Y	220	220	100	—	—	1.46	7.817045455	9	—	—
Geninorg	SSC	Suspended Sediment Concentration	mg/L	Y	215	162	75	2	8	1.2	22.09950617	196	—	—
Geninorg	TDS	Total Dissolved Solids	mg/L	Y	220	220	100	2.4	10	63	323.6863636	4400	—	—
Geninorg	TSS	Total Suspended Solids	mg/L	Y	8	7	88	2	8	5.6	45.74285714	97.2	—	—
Geninorg	TURB	Turbidity	NTU	Y	1	1	100	-	-	93.9	93.9	93.9	—	—
Geninorg	Br(-1)	Bromide	mg/L	Y	220	86	39	0.067	0.2	0.07	0.562073256	9.11	—	—
Geninorg	Cl(-1)	Chloride	mg/L	Y	219	219	100	0.1254	0.38	0.838	67.06352055	1820	—	—
Geninorg	F(-1)	Fluoride	mg/L	Y	220	219	100	0.033	0.1	0.0483	0.329599087	1.17	—	—
Geninorg	SO4(-2)	Sulfate	mg/L	Y	220	220	100	0.097	0.4	0.953	19.87092273	424	—	—
Geninorg	ALK-CO3	Alkalinity-CO3	mg/L	Y	220	36	16	0.73	1	1.03	10.18333333	37.4	—	—
Geninorg	ALK-CO3+HCO3	Alkalinity-CO3+HCO3	mg/L	Y	220	219	100	0.7	1	16.5	93.97808219	264	—	—
Geninorg	CN(TOTAL)	Cyanide (Total)	mg/L	Y	138	26	19	0.0016	0.005	0.00171	0.003932692	0.0245	—	—
Geninorg	NH3-N	Ammonia as Nitrogen	mg/L	Y	219	107	49	0.023	5.4	0.016	0.272753271	14	—	—
Geninorg	TKN	Total Kjeldahl Nitrogen	mg/L	Y	218	149	68	0.042	0.13	0.031	0.719061745	20	—	—
Geninorg	NO3+NO2-N	Nitrate-Nitrite as Nitrogen	mg/L	Y	13	8	62	0.04	0.2	0.0566	0.1563875	0.243	132	NM LVSTK WTR STD
Geninorg	NO3+NO2-N	Nitrate-Nitrite as Nitrogen	mg/L	Y	206	120	58	0.04	0.2	0.0115	1.017914167	7.33	—	—
Geninorg	PO4-P	Total Phosphate as Phosphorus	mg/L	Y	219	126	58	0.017	0.05	0.024	1.288821429	4.74	—	—
Geninorg	TOC	Total Organic Carbon	mg/L	Y	220	219	100	—	—	0.624	6.788726027	96.6	—	—
Gross AB	GROSSA	Gross alpha	pCi/L	Y	106	23	22	—	—	2.06	7.512608696	23.2	15	NM LVSTK WTR STD
Gross AB	GROSSB	Gross beta	pCi/L	Y	106	81	76	—	—	2.38	15.1708642	202	—	—
Herb	120-36-5	Dichlorprop	µg/L	—	2	0	0	0.09	0.28	—	—	—	—	—
Herb	1918-00-9	Dicamba	µg/L	—	2	0	0	0.09	0.28	—	—	—	—	—
Herb	75-99-0	Dalapon	µg/L	—	2	0	0	1.3	5.6	—	—	—	—	—
Herb	88-85-7	Dinoseb	µg/L	—	2	0	0	0.09	0.2	—	—	—	—	—
Herb	93-65-2	MCPP	µg/L	—	2	0	0	11	56	—	—	—	—	—
Herb	93-72-1	TP[2,4,5-]	µg/L	—	2	0	0	0.09	0.28	—	—	—	—	—
Herb	93-76-5	T[2,4,5-]	µg/L	—	2	0	0	0.09	0.28	—	—	—	—	—
Herb	94-74-6	MCPA	µg/L	—	2	0	0	12	56	—	—	—	—	—
Herb	94-75-7	D[2,4-]	µg/L	—	2	0	0	0.09	0.28	—	—	—	—	—
Herb	94-82-6	DB[2,4-]	µg/L	—	2	0	0	0.09	0.28	—	—	—	—	—

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
HEXP	118-96-7	Trinitrotoluene[2,4,6-]	µg/L	—	94	0	0	0.092	0.33	—	—	—	—	—
HEXP	121-14-2	Dinitrotoluene[2,4-]	µg/L	—	94	0	0	0.1	0.33	—	—	—	34	NM HH 00
HEXP	121-82-4	RDX	µg/L	Y	94	23	24	0.1	0.33	0.13	7.094086957	42	—	—
HEXP	19406-51-0	Amino-2,6-dinitrotoluene[4-]	µg/L	Y	94	11	12	0.1	0.33	0.106	0.350363636	1.02	—	—
HEXP	2691-41-0	HMX	µg/L	Y	94	34	36	0.1	0.33	0.106	4.030647059	35.7	—	—
HEXP	3058-38-6	TATB	µg/L	—	94	0	0	0.4	1.3	—	—	—	—	—
HEXP	35572-78-2	Amino-4,6-dinitrotoluene[2-]	µg/L	Y	94	11	12	0.1	0.33	0.102	0.303818182	1.07	—	—
HEXP	479-45-8	Tetryl	µg/L	—	94	0	0	0.13	0.64	—	—	—	—	—
HEXP	55-63-0	Nitroglycerin	µg/L	—	1	0	0	0.21	1	—	—	—	—	—
HEXP	59229-75-3	2,6-Diamino-4-nitrotoluene	µg/L	—	93	0	0	0.34	1.6	—	—	—	—	—
HEXP	606-20-2	Dinitrotoluene[2,6-]	µg/L	—	94	0	0	0.1	0.33	—	—	—	—	—
HEXP	618-87-1	3,5-Dinitroaniline	µg/L	Y	94	1	1	0.47	1.3	0.403	0.403	0.403	—	—
HEXP	6629-29-4	2,4-Diamino-6-nitrotoluene	µg/L	—	93	0	0	0.4	1.6	—	—	—	—	—
HEXP	78-11-5	PETN	µg/L	—	94	0	0	0.1	1.2	—	—	—	—	—
HEXP	78-30-8	Tris (o-cresyl) phosphate	µg/L	—	94	0	0	0.3	1.3	—	—	—	—	—
HEXP	88-72-2	Nitrotoluene[2-]	µg/L	—	94	0	0	0.1	0.33	—	—	—	—	—
HEXP	98-95-3	Nitrobenzene	µg/L	—	94	0	0	0.1	0.33	—	—	—	690	NM HH 00
HEXP	99-08-1	Nitrotoluene[3-]	µg/L	—	94	0	0	0.1	0.34	—	—	—	—	—
HEXP	99-35-4	Trinitrobenzene[1,3,5-]	µg/L	—	94	0	0	0.1	0.33	—	—	—	—	—
HEXP	99-65-0	Dinitrobenzene[1,3-]	µg/L	—	94	0	0	0.1	0.33	—	—	—	—	—
HEXP	99-99-0	Nitrotoluene[4-]	µg/L	—	94	0	0	0.1	0.65	—	—	—	—	—
HEXP	DNX	DNX	µg/L	—	5	0	0	0.089	0.28	—	—	—	—	—
HEXP	MNX	MNX	µg/L	Y	5	1	20	0.089	0.277	0.217	0.217	0.217	—	—
HEXP	TNX	TNX	µg/L	—	5	0	0	0.089	0.28	—	—	—	—	—
HEXP	DNX	DNX	µg/L	Y	60	5	8	0.073	0.5	0.14	0.23	0.29	—	—
HEXP	MNX	MNX	µg/L	Y	54	7	13	0.091	0.5	0.28	0.785714286	1.7	—	—
HEXP	TNX	TNX	µg/L	Y	60	4	7	0.082	0.5	0.14	0.385	0.68	—	—
Metals	Al	Aluminum	µg/L	Y	227	108	48	70	200	68.4	1407.567593	14000	—	—
Metals	Al	Aluminum	µg/L	Y	220	190	86	70	200	69	2258.71	68700	2099	NM Aqu Acute 70 mg/L hardness
Metals	B	Boron	µg/L	Y	220	157	71	15	50	10.3	61.1	414	—	—
Metals	B	Boron	µg/L	Y	227	157	69	15	50	11.2	59.57898089	412	5000	NM LVSTK WTR STD
Metals	Ba	Barium	µg/L	Y	447	447	100	1	5	9.9	191.65434	5740	—	—
Metals	Be	Beryllium	µg/L	Y	447	9	2	1	5	1.03	1.634444444	3.35	—	—
Metals	Ca	Calcium	µg/L	Y	447	447	100	0.05	0.2	4.22	24.9052349	129	—	—
Metals	Co	Cobalt	µg/L	Y	220	23	10	1	5	1.02	2.384782609	6.07	—	—
Metals	Co	Cobalt	µg/L	Y	227	44	19	1	5	1	2.257954545	7.8	1000	NM LVSTK WTR STD
Metals	Cu	Copper	µg/L	Y	227	76	33	3	10	3	7.132631579	49.6	10	NM Aqu Acute 70 mg/L hardness
Metals	Cu	Copper	µg/L	Y	220	92	42	3	10	3.01	10.20380435	84.6	—	—

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
Metals	Fe	Iron	µg/L	Y	447	381	85	30	100	25.6	909.5220472	36600	—	—
Metals	K	Potassium	mg/L	Y	447	447	100	0.05	0.15	1.59	12.71794183	599	—	—
Metals	Mg	Magnesium	mg/L	Y	447	447	100	0.1	0.3	0.564	5.84685906	46.6	—	—
Metals	Mn	Manganese	µg/L	Y	227	198	87	2	10	2.1	91.185	2590	2651	NM Aqu Acute 70 mg/L hardness
Metals	Mn	Manganese	µg/L	Y	220	210	95	2	10	2	103.0787619	2640	—	—
Metals	Mo	Molybdenum	µg/L	Y	22	15	68	2	10	2.2	11.67333333	51.7	—	—
Metals	Na	Sodium	mg/L	Y	447	447	100	-	-	3.96	60.94561521	1160	—	—
Metals	SiO2	Silicon Dioxide	mg/L	Y	220	220	100	0.048	0.21	14.5	61.37136364	196	—	—
Metals	Sn	Tin	µg/L	-	447	0	0	10	33	—	—	—	—	—
Metals	Sr	Strontium	µg/L	Y	447	447	100	1	5	20.5	143.8935123	688	—	—
Metals	V	Vanadium	µg/L	Y	227	182	80	1	5	1.1	8.241648352	38	100	NM LVSTK WTR STD
Metals	V	Vanadium	µg/L	Y	220	189	86	1	5	1.07	9.662645503	67.2	—	—
Metals	Zn	Zinc	µg/L	Y	227	144	63	3	10	2	20.16208333	245	116	NM Aqu Acute 70 mg/L hardness
Metals	Zn	Zinc	µg/L	Y	220	163	74	3	10	2.3	26.41411043	275	—	—
Metals	Ag	Silver	µg/L	Y	227	10	4	0.2	1	0.21	0.335	0.88	1.7	NM Aqu Acute 70 mg/L hardness
Metals	Ag	Silver	µg/L	Y	220	24	11	0.2	1	0.21	0.524	1.4	—	—
Metals	As	Arsenic	µg/L	Y	227	69	30	1.6	5	1.5	3.09173913	9.39	9	NM HH 00
Metals	As	Arsenic	µg/L	Y	220	70	32	1.6	5	1.5	3.242	15	—	—
Metals	Cd	Cadmium	µg/L	Y	227	13	6	0.1	1	0.118	0.290769231	1.4	1.22	NM Aqu Acute 70 mg/L hardness
Metals	Cd	Cadmium	µg/L	Y	220	26	12	0.1	1	0.11	0.259269231	1.7	—	—
Metals	Cr	Chromium	µg/L	Y	231	109	47	2.3	9	1.5	7.988073394	146	430	NM Aqu Acute 70 mg/L hardness
Metals	Cr	Chromium	µg/L	Y	220	124	56	2.3	9	1.7	12.37395161	452	—	—
Metals	Mo	Molybdenum	µg/L	Y	425	360	85	0.1	0.5	0.15	6.213091667	113	—	—
Metals	Ni	Nickel	µg/L	Y	227	190	84	0.6	2.4	0.514	2.151026316	13	350	NM Aqu Acute 70 mg/L hardness
Metals	Ni	Nickel	µg/L	Y	220	193	88	0.6	2.4	0.5	2.693284974	19.5	—	—
Metals	Pb	Lead	µg/L	Y	227	38	17	0.5	2	0.5	1.715736842	10.9	44	NM Aqu Acute 70 mg/L hardness
Metals	Pb	Lead	µg/L	Y	220	119	54	0.5	2	0.509	2.478	35.1	—	—
Metals	Sb	Antimony	µg/L	Y	227	15	7	0.65	2.7	0.51	1.507466667	7.24	640	NM HH 00
Metals	Sb	Antimony	µg/L	Y	220	16	7	0.65	2.7	0.5	1.419625	7.27	—	—
Metals	Se	Selenium	µg/L	Y	220	14	6	1	5	1	2.994285714	15.3	5	NMWQCC WLDLF HAB
Metals	Se	Selenium	µg/L	Y	227	15	7	1	5	1.1	3.172666667	18.6	50	NM LVSTK WTR STD
Metals	Tl	Thallium	µg/L	Y	227	19	8	0.35	1	0.32	0.472578947	0.77	0.47	NM HH 00
Metals	Tl	Thallium	µg/L	Y	220	28	13	0.35	1	0.301	0.5025	0.85	—	—
Metals	U	Uranium	µg/L	Y	447	358	80	0.052	0.2	0.05	0.758636872	3.63	—	—
Metals	Hg	Mercury	µg/L	Y	227	2	0.9	0.06	0.2	0.03	0.0305	0.031	1.4	NM Aqu Acute
Metals	Hg	Mercury	µg/L	Y	220	4	2	0.06	0.2	0.074	0.0965	0.15	0.77	NMWQCC WLDLF HAB
PCB	11096-82-5	Aroclor-1260	µg/L	—	9	0	0	0.036	0.1	—	—	—	—	—
PCB	11096-82-5	Aroclor-1260	µg/L	Y	110	1	0.9	0.036	0.1	0.087	0.087	0.087	0.00064	NM HH 00

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
PCB	11097-69-1	Aroclor-1254	µg/L	—	9	0	0	0.036	0.1	—	—	—	—	—
PCB	11097-69-1	Aroclor-1254	µg/L	Y	110	1	0.9	0.036	0.1	0.086	0.086	0.086	0.00064	NM HH 00
PCB	11104-28-2	Aroclor-1221	µg/L	—	9	0	0	0.036	0.1	—	—	—	—	—
PCB	11104-28-2	Aroclor-1221	µg/L	—	110	0	0	0.036	0.1	—	—	—	0.00064	NM HH 00
PCB	11141-16-5	Aroclor-1232	µg/L	—	9	0	0	0.036	0.1	—	—	—	—	—
PCB	11141-16-5	Aroclor-1232	µg/L	—	110	0	0	0.036	0.1	—	—	—	0.00064	NM HH 00
PCB	12672-29-6	Aroclor-1248	µg/L	—	9	0	0	0.036	0.1	—	—	—	—	—
PCB	12672-29-6	Aroclor-1248	µg/L	—	110	0	0	0.036	0.1	—	—	—	0.00064	NM HH 00
PCB	12674-11-2	Aroclor-1016	µg/L	—	9	0	0	0.036	0.1	—	—	—	—	—
PCB	12674-11-2	Aroclor-1016	µg/L	—	110	0	0	0.036	0.1	—	—	—	0.00064	NM HH 00
PCB	37324-23-5	Aroclor-1262	µg/L	—	9	0	0	0.036	0.1	—	—	—	—	—
PCB	37324-23-5	Aroclor-1262	µg/L	—	110	0	0	0.036	0.1	—	—	—	0.00064	NM HH 00
PCB	53469-21-9	Aroclor-1242	µg/L	—	9	0	0	0.036	0.1	—	—	—	—	—
PCB	53469-21-9	Aroclor-1242	µg/L	—	110	0	0	0.036	0.1	—	—	—	0.00064	NM HH 00
PCB Congeners	13029-08-8	PCB-4	µg/L	—	29	0	0	—	—	—	—	—	—	—
PCB Congeners	1336-36-3	Total PCB	µg/L	Y	9	7	78	—	—	0.00000435	0.000104521	0.00027	—	—
PCB Congeners	1336-36-3	Total PCB	µg/L	Y	30	22	73	—	—	0.0000385	0.006457423	0.0512	0.00064	NM HH 00
PCB Congeners	15862-07-4	PCB-29	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	15968-05-5	PCB-54	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	16605-91-7	PCB-5	µg/L	Y	39	1	3	—	—	0.0000556	0.0000556	0.0000556	—	—
PCB Congeners	16606-02-3	PCB-31	µg/L	Y	39	9	23	—	—	0.000007	2.59444E-05	0.0000569	—	—
PCB Congeners	2050-67-1	PCB-11	µg/L	Y	39	3	8	—	—	0.0000416	0.000134267	0.000316	—	—
PCB Congeners	2050-68-2	PCB-15	µg/L	Y	39	4	10	—	—	0.00000872	0.000013205	0.0000167	—	—
PCB Congeners	2051-24-3	PCB-209	µg/L	Y	39	2	5	—	—	0.00000832	0.00002316	0.000038	—	—
PCB Congeners	2051-60-7	PCB-1	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	2051-61-8	PCB-2	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	2051-62-9	PCB-3	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	2136-99-4	PCB-202	µg/L	Y	39	6	15	—	—	0.0000117	0.0000468	0.000124	—	—
PCB Congeners	2437-79-8	PCB-47	µg/L	Y	26	3	12	—	—	0.0000418	0.0000599	0.0000899	—	—
PCB Congeners	25323-68-6	Total triCB	µg/L	Y	39	11	28	—	—	0.0000105	0.000101264	0.000289	—	—
PCB Congeners	25429-29-2	Total pentaCB	µg/L	Y	39	19	49	—	—	0.00000435	0.001716433	0.0106	—	—
PCB Congeners	25512-42-9	Total diCB	µg/L	Y	39	8	21	—	—	0.0000163	9.13625E-05	0.000372	—	—
PCB Congeners	25569-80-6	PCB-6	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	26601-64-9	Total hexaCB	µg/L	Y	39	19	49	—	—	0.0000193	0.003214511	0.0216	—	—
PCB Congeners	26914-33-0	Total tetraCB	µg/L	Y	39	21	54	—	—	0.0000325	0.00035881	0.00245	—	—
PCB Congeners	27323-18-8	Total monoCB	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	28655-71-2	Total heptaCB	µg/L	Y	39	16	41	—	—	0.0000308	0.002029213	0.0134	—	—
PCB Congeners	31508-00-6	PCB-118	µg/L	Y	13	9	69	—	—	0.0000475	0.000493067	0.00192	—	—

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
PCB Congeners	32598-10-0	PCB-66	µg/L	Y	13	7	54	—	—	0.0000134	0.000113314	0.000351	—	—
PCB Congeners	32598-13-3	PCB-77	µg/L	Y	39	7	18	—	—	0.00000428	1.76771E-05	0.0000524	—	—
PCB Congeners	32598-14-4	PCB-105	µg/L	Y	39	11	28	—	—	0.00000258	0.000126098	0.000539	—	—
PCB Congeners	32690-93-0	PCB-74	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	32774-16-6	PCB-169	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	33025-41-1	PCB-60	µg/L	Y	13	4	31	—	—	0.00000723	1.69075E-05	0.0000283	—	—
PCB Congeners	33091-17-7	PCB-197	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	33146-45-1	PCB-10	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	33284-50-3	PCB-7	µg/L	—	29	0	0	—	—	—	—	—	—	—
PCB Congeners	33284-52-5	PCB-80	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	33284-53-6	PCB-61	µg/L	Y	16	1	6	—	—	0.0000542	0.0000542	0.0000542	—	—
PCB Congeners	33284-54-7	PCB-65	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	33979-03-2	PCB-155	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	34883-39-1	PCB-9	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	34883-41-5	PCB-14	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	34883-43-7	PCB-8	µg/L	Y	13	2	15	—	—	0.00000894	0.00001232	0.0000157	—	—
PCB Congeners	35065-27-1	PCB-153	µg/L	Y	26	7	27	—	—	0.0000294	0.000314429	0.00177	—	—
PCB Congeners	35065-28-2	PCB-138	µg/L	Y	16	4	25	—	—	0.0000324	0.00059715	0.00214	—	—
PCB Congeners	35065-29-3	PCB-180	µg/L	Y	26	6	23	—	—	0.0000308	0.000190983	0.000791	—	—
PCB Congeners	35065-30-6	PCB-170	µg/L	Y	39	11	28	—	—	0.0000483	0.000360127	0.0014	—	—
PCB Congeners	35693-92-6	PCB-30	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	35693-99-3	PCB-52	µg/L	Y	29	11	38	—	—	0.000031	0.000188627	0.000691	—	—
PCB Congeners	35694-04-3	PCB-133	µg/L	Y	29	3	10	—	—	0.0000436	0.0000623	0.0000806	—	—
PCB Congeners	35694-06-5	PCB-137	µg/L	Y	39	5	13	—	—	0.00000721	0.000073142	0.000139	—	—
PCB Congeners	35694-08-7	PCB-194	µg/L	Y	39	10	26	—	—	0.0000127	0.0001664	0.000619	—	—
PCB Congeners	36559-22-5	PCB-42	µg/L	Y	29	2	7	—	—	0.0000421	0.0000526	0.0000631	—	—
PCB Congeners	37680-65-2	PCB-18	µg/L	Y	26	1	4	—	—	0.000046	0.000046	0.000046	—	—
PCB Congeners	37680-66-3	PCB-17	µg/L	Y	39	3	8	—	—	0.00000994	0.00001428	0.0000187	—	—
PCB Congeners	37680-68-5	PCB-34	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	37680-69-6	PCB-35	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	38379-99-6	PCB-95	µg/L	Y	29	12	41	—	—	0.0000452	0.0004	0.00154	—	—
PCB Congeners	38380-01-7	PCB-99	µg/L	Y	39	10	26	—	—	0.0000274	0.00022029	0.000839	—	—
PCB Congeners	38380-02-8	PCB-87	µg/L	Y	16	1	6	—	—	0.00017	0.00017	0.00017	—	—
PCB Congeners	38380-03-9	PCB-110	µg/L	Y	26	5	19	—	—	0.0000383	0.00028006	0.00118	—	—
PCB Congeners	38380-05-1	PCB-132	µg/L	Y	29	12	41	—	—	0.0000175	0.000339958	0.00145	—	—
PCB Congeners	38380-07-3	PCB-128	µg/L	Y	16	1	6	—	—	0.000441	0.000441	0.000441	—	—
PCB Congeners	38380-08-4	PCB-156	µg/L	Y	26	4	15	—	—	0.00000579	2.89725E-05	0.0000856	—	—
PCB Congeners	38411-22-2	PCB-136	µg/L	Y	39	10	26	—	—	0.0000205	0.00014473	0.000489	—	—

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
PCB Congeners	38411-25-5	PCB-174	µg/L	Y	39	13	33	—	—	0.0000135	0.000408477	0.00204	—	—
PCB Congeners	38444-73-4	PCB-19	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	38444-76-7	PCB-27	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	38444-77-8	PCB-32	µg/L	Y	13	2	15	—	—	0.0000132	0.0000143	0.0000154	—	—
PCB Congeners	38444-78-9	PCB-16	µg/L	Y	13	2	15	—	—	0.00000904	0.00001302	0.000017	—	—
PCB Congeners	38444-81-4	PCB-26	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	38444-84-7	PCB-20	µg/L	Y	16	1	6	—	—	0.0000391	0.0000391	0.0000391	—	—
PCB Congeners	38444-85-8	PCB-22	µg/L	Y	39	6	15	—	—	0.00000694	1.23333E-05	0.0000241	—	—
PCB Congeners	38444-87-0	PCB-36	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	38444-88-1	PCB-39	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	38444-90-5	PCB-37	µg/L	Y	39	5	13	—	—	0.00000705	0.00001554	0.0000293	—	—
PCB Congeners	38444-93-8	PCB-40	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	39485-83-1	PCB-100	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	39635-31-9	PCB-189	µg/L	Y	39	5	13	—	—	0.0000074	0.00002192	0.0000539	—	—
PCB Congeners	39635-32-0	PCB-111	µg/L	—	29	0	0	—	—	—	—	—	—	—
PCB Congeners	39635-33-1	PCB-127	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	39635-34-2	PCB-162	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	39635-35-3	PCB-159	µg/L	Y	39	1	3	—	—	0.0000244	0.0000244	0.0000244	—	—
PCB Congeners	40186-70-7	PCB-175	µg/L	Y	39	4	10	—	—	0.00000901	2.36775E-05	0.0000431	—	—
PCB Congeners	40186-71-8	PCB-201	µg/L	Y	39	5	13	—	—	0.0000105	0.00003824	0.0000979	—	—
PCB Congeners	40186-72-9	PCB-206	µg/L	Y	39	9	23	—	—	0.0000114	4.72889E-05	0.000142	—	—
PCB Congeners	41411-61-4	PCB-142	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	41411-62-5	PCB-160	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	41411-63-6	PCB-166	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	41411-64-7	PCB-190	µg/L	Y	39	9	23	—	—	0.0000119	8.84556E-05	0.000304	—	—
PCB Congeners	41464-39-5	PCB-44	µg/L	Y	26	2	8	—	—	0.0000308	0.000032	0.0000332	—	—
PCB Congeners	41464-41-9	PCB-53	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	41464-42-0	PCB-72	µg/L	Y	13	2	15	—	—	0.00000956	0.00000998	0.0000104	—	—
PCB Congeners	41464-43-1	PCB-56	µg/L	Y	29	8	28	—	—	0.0000139	0.0000391	0.000115	—	—
PCB Congeners	41464-47-5	PCB-46	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	41464-48-6	PCB-79	µg/L	Y	39	2	5	—	—	0.0000119	0.00001545	0.000019	—	—
PCB Congeners	41464-49-7	PCB-58	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	41464-51-1	PCB-97	µg/L	Y	26	1	4	—	—	0.000179	0.000179	0.000179	—	—
PCB Congeners	42740-50-1	PCB-196	µg/L	Y	29	11	38	—	—	0.00000881	0.000101274	0.000372	—	—
PCB Congeners	51908-16-8	PCB-146	µg/L	Y	29	10	34	—	—	0.000025	0.000214	0.000924	—	—
PCB Congeners	52663-58-8	PCB-64	µg/L	Y	13	7	54	—	—	0.0000102	3.55143E-05	0.0000979	—	—
PCB Congeners	52663-59-9	PCB-41	µg/L	Y	29	2	7	—	—	0.0000144	0.0000237	0.000033	—	—
PCB Congeners	52663-60-2	PCB-84	µg/L	Y	29	10	34	—	—	0.0000183	0.00013983	0.000522	—	—

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
PCB Congeners	52663-61-3	PCB-92	µg/L	Y	13	9	69	—	—	0.0000181	0.000121767	0.000483	—	—
PCB Congeners	52663-62-4	PCB-82	µg/L	Y	39	9	23	—	—	0.0000101	5.42556E-05	0.000183	—	—
PCB Congeners	52663-63-5	PCB-151	µg/L	Y	26	2	8	—	—	0.0000501	0.00019655	0.000343	—	—
PCB Congeners	52663-64-6	PCB-179	µg/L	Y	39	11	28	—	—	0.0000202	0.000164927	0.000684	—	—
PCB Congeners	52663-65-7	PCB-176	µg/L	Y	39	9	23	—	—	0.00000765	0.00005657--111	0.0002	—	—
PCB Congeners	52663-66-8	PCB-130	µg/L	Y	39	8	21	—	—	0.0000136	8.89625E-05	0.000267	—	—
PCB Congeners	52663-67-9	PCB-178	µg/L	Y	39	7	18	—	—	0.0000122	9.06286E-05	0.000337	—	—
PCB Congeners	52663-68-0	PCB-187	µg/L	Y	13	10	77	—	—	0.0000151	0.00045245	0.00184	—	—
PCB Congeners	52663-69-1	PCB-183	µg/L	Y	26	2	8	—	—	0.0000429	0.00010895	0.000175	—	—
PCB Congeners	52663-70-4	PCB-177	µg/L	Y	39	10	26	—	—	0.0000453	0.0002755	0.00103	—	—
PCB Congeners	52663-71-5	PCB-171	µg/L	Y	26	1	4	—	—	0.000103	0.000103	0.000103	—	—
PCB Congeners	52663-72-6	PCB-167	µg/L	Y	39	10	26	—	—	0.00000282	0.000045289	0.000165	—	—
PCB Congeners	52663-73-7	PCB-200	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	52663-74-8	PCB-172	µg/L	Y	39	9	23	—	—	0.000012	0.0000792	0.00027	—	—
PCB Congeners	52663-75-9	PCB-199	µg/L	Y	26	2	8	—	—	0.0000664	0.0001232	0.00018	—	—
PCB Congeners	52663-76-0	PCB-203	µg/L	Y	13	9	69	—	—	0.00000943	0.000109414	0.000429	—	—
PCB Congeners	52663-77-1	PCB-208	µg/L	Y	39	2	5	—	—	0.0000108	0.00001835	0.0000259	—	—
PCB Congeners	52663-78-2	PCB-195	µg/L	Y	39	9	23	—	—	0.0000156	7.69889E-05	0.000295	—	—
PCB Congeners	52663-79-3	PCB-207	µg/L	Y	39	1	3	—	—	0.0000195	0.0000195	0.0000195	—	—
PCB Congeners	52704-70-8	PCB-134	µg/L	Y	29	4	14	—	—	0.0000381	0.000123775	0.000223	—	—
PCB Congeners	52712-04-6	PCB-141	µg/L	Y	39	12	31	—	—	0.0000111	0.000248883	0.00114	—	—
PCB Congeners	52712-05-7	PCB-185	µg/L	Y	26	1	4	—	—	0.0000399	0.0000399	0.0000399	—	—
PCB Congeners	52744-13-5	PCB-135	µg/L	Y	26	1	4	—	—	0.000267	0.000267	0.000267	—	—
PCB Congeners	53555-66-1	PCB-38	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	53742-07-7	Total nonaCB	µg/L	Y	39	9	23	—	—	0.0000114	0.0000536	0.000188	—	—
PCB Congeners	54230-22-7	PCB-62	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	55215-17-3	PCB-88	µg/L	Y	39	4	10	—	—	0.0000152	0.0001243	0.000173	—	—
PCB Congeners	55215-18-4	PCB-129	µg/L	Y	26	1	4	—	—	0.000109	0.000109	0.000109	—	—
PCB Congeners	55312-69-1	PCB-86	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	55702-45-9	PCB-24	µg/L	—	29	0	0	—	—	—	—	—	—	—
PCB Congeners	55712-37-3	PCB-25	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	55720-44-0	PCB-23	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	55722-26-4	Total octaCB	µg/L	Y	39	11	28	—	—	0.0000512	0.000635109	0.00272	—	—
PCB Congeners	56030-56-9	PCB-139	µg/L	Y	16	4	25	—	—	0.000057	0.00042455	0.00141	—	—
PCB Congeners	56558-16-8	PCB-104	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	56558-17-9	PCB-119	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	56558-18-0	PCB-121	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	57465-28-8	PCB-126	µg/L	Y	39	1	3	—	—	0.0000113	0.0000113	0.0000113	—	—

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
PCB Congeners	59291-64-4	PCB-140	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	59291-65-5	PCB-168	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	60145-20-2	PCB-83	µg/L	Y	39	3	8	—	—	0.0000078	8.12667E-05	0.000128	—	—
PCB Congeners	60145-21-3	PCB-103	µg/L	Y	39	2	5	—	—	0.0000146	0.00001935	0.0000241	—	—
PCB Congeners	60145-22-4	PCB-154	µg/L	Y	39	2	5	—	—	0.0000348	0.0000545	0.0000742	—	—
PCB Congeners	60145-23-5	PCB-182	µg/L	Y	29	3	10	—	—	0.0000357	0.000191567	0.000417	—	—
PCB Congeners	61798-70-7	PCB-131	µg/L	Y	39	2	5	—	—	0.0000238	0.000031	0.0000382	—	—
PCB Congeners	62796-65-0	PCB-50	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	65510-44-3	PCB-123	µg/L	Y	39	1	3	—	—	0.00000301	0.00000301	0.00000301	—	—
PCB Congeners	65510-45-4	PCB-85	µg/L	Y	16	1	6	—	—	0.000174	0.000174	0.000174	—	—
PCB Congeners	68194-04-7	PCB-51	µg/L	Y	26	7	27	—	—	0.0000325	0.000110514	0.00027	—	—
PCB Congeners	68194-07-0	PCB-90	µg/L	Y	16	5	31	—	—	0.0000286	0.00017606	0.000708	—	—
PCB Congeners	68194-08-1	PCB-150	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	68194-09-2	PCB-152	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	68194-10-5	PCB-113	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	68194-12-7	PCB-120	µg/L	Y	39	1	3	—	—	0.0000074	0.0000074	0.0000074	—	—
PCB Congeners	68194-13-8	PCB-147	µg/L	Y	26	1	4	—	—	0.0000558	0.0000558	0.0000558	—	—
PCB Congeners	68194-14-9	PCB-144	µg/L	Y	39	9	23	—	—	0.0000089	0.0000597---	0.000202	—	—
PCB Congeners	68194-15-0	PCB-143	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	68194-16-1	PCB-173	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	68194-17-2	PCB-198	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	69782-90-7	PCB-157	µg/L	Y	26	1	4	—	—	0.0000496	0.0000496	0.0000496	—	—
PCB Congeners	69782-91-8	PCB-193	µg/L	Y	26	1	4	—	—	0.0000416	0.0000416	0.0000416	—	—
PCB Congeners	7012-37-5	PCB-28	µg/L	Y	26	1	4	—	—	0.0000583	0.0000583	0.0000583	—	—
PCB Congeners	70362-41-3	PCB-108	µg/L	Y	16	1	6	—	—	0.0000281	0.0000281	0.0000281	—	—
PCB Congeners	70362-45-7	PCB-45	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	70362-46-8	PCB-43	µg/L	Y	29	1	3	—	—	0.000029	0.000029	0.000029	—	—
PCB Congeners	70362-47-9	PCB-48	µg/L	Y	29	1	3	—	—	0.0000116	0.0000116	0.0000116	—	—
PCB Congeners	70362-48-0	PCB-76	µg/L	Y	16	1	6	—	—	0.0000387	0.0000387	0.0000387	—	—
PCB Congeners	70362-49-1	PCB-78	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	70362-50-4	PCB-81	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	70424-67-8	PCB-57	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	70424-68-9	PCB-107	µg/L	Y	29	5	17	—	—	0.00000854	0.000059748	0.000146	—	—
PCB Congeners	70424-69-0	PCB-106	µg/L	Y	29	3	10	—	—	0.00000832	0.00011204	0.000301	—	—
PCB Congeners	70424-70-3	PCB-124	µg/L	Y	26	1	4	—	—	0.000029	0.000029	0.000029	—	—
PCB Congeners	73575-52-7	PCB-68	µg/L	Y	39	1	3	—	—	0.0000342	0.0000342	0.0000342	—	—
PCB Congeners	73575-53-8	PCB-67	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	73575-54-9	PCB-96	µg/L	—	39	0	0	—	—	—	—	—	—	—

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
PCB Congeners	73575-55-0	PCB-94	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	73575-56-1	PCB-93	µg/L	—	26	0	0	—	—	—	—	—	—	—
PCB Congeners	73575-57-2	PCB-89	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	74338-23-1	PCB-73	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	74338-24-2	PCB-55	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	74472-34-7	PCB-63	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	74472-36-9	PCB-112	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	74472-37-0	PCB-114	µg/L	Y	39	2	5	—	—	0.0000124	0.0000157	0.000019	—	—
PCB Congeners	74472-40-5	PCB-145	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	74472-41-6	PCB-148	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	74472-42-7	PCB-158	µg/L	Y	29	10	34	—	—	0.0000118	0.00012294	0.000467	—	—
PCB Congeners	74472-43-8	PCB-161	µg/L	—	13	0	0	—	—	-	-	-	—	—
PCB Congeners	74472-45-0	PCB-164	µg/L	Y	13	9	69	—	—	0.0000102	9.93222E-05	0.000412	—	—
PCB Congeners	74472-46-1	PCB-165	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	74472-47-2	PCB-181	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	74472-48-3	PCB-184	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	74472-49-4	PCB-186	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	74472-50-7	PCB-191	µg/L	Y	39	5	13	—	—	0.00000703	0.000023726	0.000057	—	—
PCB Congeners	74472-51-8	PCB-192	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	74472-52-9	PCB-204	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	74472-53-0	PCB-205	µg/L	Y	39	3	8	—	—	0.00000869	2.02633E-05	0.0000399	—	—
PCB Congeners	74487-85-7	PCB-188	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	76842-07-4	PCB-122	µg/L	Y	39	1	3	—	—	0.0000105	0.0000105	0.0000105	—	—
PCB Congeners	DECACB(Tot)	Total decaCB	µg/L	Y	39	2	5	—	—	0.00000832	0.00002316	0.000038	—	—
PCB Congeners	PCB-106/118	PCB-106/PCB-118	µg/L	Y	10	3	30	—	—	0.00000435	1.44833E-05	0.0000271	—	—
PCB Congeners	PCB-107/109	PCB-107/PCB-109	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-108/112	PCB-108/PCB-112	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-108/124	PCB-108/PCB-124	µg/L	Y	13	2	15	—	—	0.0000308	0.00004585	0.0000609	—	—
PCB Congeners	PCB-110/115	PCB-110/PCB-115	µg/L	Y	13	5	38	—	—	0.000106	0.000563	0.0019	—	—
PCB Congeners	PCB-111/115	PCB-111/PCB-115	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-12/13	PCB-12/PCB-13	µg/L	—	39	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-128/162	PCB-128/PCB-162	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-128/166	PCB-128/PCB-166	µg/L	Y	13	9	69	—	—	0.0000188	0.000137144	0.000523	—	—
PCB Congeners	PCB-129-163	PCB-129/PCB-138/PCB-163	µg/L	Y	13	10	77	—	—	0.0000748	0.00115038	0.00478	—	—
PCB Congeners	PCB-132/161	PCB-132/PCB-161	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-133/142	PCB-133/PCB-142	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-134/143	PCB-134/PCB-143	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-135/151	PCB-135/PCB-151	µg/L	Y	13	10	77	—	—	0.0000276	0.00038357	0.00159	—	—

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
PCB Congeners	PCB-138-164	PCB-138/PCB-163/PCB-164	µg/L	Y	10	3	30	—	—	0.0000395	4.24333E-05	0.0000465	—	—
PCB Congeners	PCB-139/140	PCB-139/PCB-140	µg/L	Y	13	2	15	—	—	0.0000348	0.0000477	0.0000606	—	—
PCB Congeners	PCB-139/149	PCB-139/PCB-149	µg/L	Y	10	1	10	—	—	0.0000351	0.0000351	0.0000351	—	—
PCB Congeners	PCB-146/165	PCB-146/PCB-165	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-147/149	PCB-147/PCB-149	µg/L	Y	13	9	69	—	—	0.000127	0.000995556	0.00397	—	—
PCB Congeners	PCB-153/168	PCB-153/PCB-168	µg/L	Y	13	9	69	—	—	0.000158	0.001105778	0.00418	—	—
PCB Congeners	PCB-156/157	PCB-156/PCB-157	µg/L	Y	13	8	62	—	—	0.0000194	0.0001237	0.000424	—	—
PCB Congeners	PCB-158/160	PCB-158/PCB-160	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-16/32	PCB-16/PCB-32	µg/L	Y	26	1	4	—	—	0.0000323	0.0000323	0.0000323	—	—
PCB Congeners	PCB-171/173	PCB-171/PCB-173	µg/L	Y	13	8	62	—	—	0.0000228	0.000145063	0.0005	—	—
PCB Congeners	PCB-18/30	PCB-18/PCB-30	µg/L	Y	13	5	38	—	—	0.0000199	0.00002836	0.0000396	—	—
PCB Congeners	PCB-180/193	PCB-180/PCB-193	µg/L	Y	13	4	31	—	—	0.0000191	0.001376775	0.00358	—	—
PCB Congeners	PCB-182/187	PCB-182/PCB-187	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-183/185	PCB-183/PCB-185	µg/L	Y	13	6	46	—	—	0.0000561	0.000381717	0.00103	—	—
PCB Congeners	PCB-196/203	PCB-196/PCB-203	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-197/200	PCB-197/PCB-200	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-198/199	PCB-198/PCB-199	µg/L	Y	13	9	69	—	—	0.0000203	0.000195189	0.000743	—	—
PCB Congeners	PCB-20/21/33	PCB-20/PCB-21/PCB-33	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-20/28	PCB-20/PCB-28	µg/L	Y	13	8	62	—	—	0.0000145	3.47125E-05	0.0000943	—	—
PCB Congeners	PCB-21/33	PCB-21/PCB-33	µg/L	Y	13	1	8	—	—	0.0000144	0.0000144	0.0000144	—	—
PCB Congeners	PCB-24/27	PCB-24/PCB-27	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-26/29	PCB-26/PCB-29	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-4/10	PCB-4/PCB-10	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-40/71	PCB-40/PCB-71	µg/L	Y	13	2	15	—	—	0.0000722	0.0000814	0.0000906	—	—
PCB Congeners	PCB-41-72	PCB-41/PCB-64/PCB-71/PCB-72	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-42/59	PCB-42/PCB-59	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-43/49	PCB-43/PCB-49	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-44/47/65	PCB-44/PCB-47/PCB-65	µg/L	Y	13	1	8	—	—	0.000024	0.000024	0.000024	—	—
PCB Congeners	PCB-45/51	PCB-45/PCB-51	µg/L	Y	13	1	8	—	—	0.0000223	0.0000223	0.0000223	—	—
PCB Congeners	PCB-48/75	PCB-48/PCB-75	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-49/69	PCB-49/PCB-69	µg/L	Y	13	7	54	—	—	0.0000154	8.23857E-05	0.000251	—	—
PCB Congeners	PCB-50/53	PCB-50/PCB-53	µg/L	Y	13	1	8	—	—	0.0000181	0.0000181	0.0000181	—	—
PCB Congeners	PCB-52/69	PCB-52/PCB-69	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-56/60	PCB-56/PCB-60	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-59/62/75	PCB-59/PCB-62/PCB-75	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-61/70	PCB-61/PCB-70	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-61-76	PCB-61/PCB-70/PCB-74/PCB-76	µg/L	Y	13	8	62	—	—	0.0000374	0.00019665	0.00061	—	—
PCB Congeners	PCB-66/76	PCB-66/PCB-76	µg/L	—	10	0	0	—	—	—	—	—	—	—

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
PCB Congeners	PCB-7/9	PCB-7/PCB-9	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-84/92	PCB-84/PCB-92	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-85/116	PCB-85/PCB-116	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-85-117	PCB-85/PCB-116/PCB-117	µg/L	Y	13	4	31	—	—	0.0000252	0.000129925	0.00028	—	—
PCB Congeners	PCB-86-125	PCB-86/87/97/109/119/125	µg/L	Y	13	9	69	—	—	0.0000582	0.000339856	0.00128	—	—
PCB Congeners	PCB-87-125	PCB-87/PCB-117/PCB-125	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-90/101	PCB-90/PCB-101	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-90-113	PCB-90/PCB-101/PCB-113	µg/L	Y	13	9	69	—	—	0.000117	0.000654444	0.00243	—	—
PCB Congeners	PCB-93/100	PCB-93/PCB-100	µg/L	—	13	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-95-102	PCB-95/PCB-98/PCB-102	µg/L	—	10	0	0	—	—	—	—	—	—	—
PCB Congeners	PCB-98/102	PCB-98/PCB-102	µg/L	Y	13	2	15	—	—	0.0000172	0.00002345	0.0000297	—	—
Perchlorate	ClO4	Perchlorate	µg/L	Y	220	189	86	0.05	0.2	0.0521	0.48662328	6.19	—	—
Pesticides	1024-57-3	Heptachlor Epoxide	µg/L	—	49	0	0	0.006	0.02	—	—	—	0.00039	NM HH 00
Pesticides	1031-07-8	Endosulfan Sulfate	µg/L	—	49	0	0	0.009	0.04	—	—	—	89	NM HH 00
Pesticides	309-00-2	Aldrin	µg/L	—	49	0	0	0.006	0.022	—	—	—	0.0005	NM HH 00
Pesticides	319-84-6	BHC[alpha-]	µg/L	—	49	0	0	0.006	0.02	—	—	—	0.049	NM HH 00
Pesticides	319-85-7	BHC[beta-]	µg/L	—	49	0	0	0.008	0.02	—	—	—	0.17	NM HH 00
Pesticides	319-86-8	BHC[delta-]	µg/L	Y	49	1	2	0.006	0.02	0.00859	0.00859	0.00859	—	—
Pesticides	33213-65-9	Endosulfan II	µg/L	—	49	0	0	0.009	0.04	—	—	—	0.22	NM Aqu Acute
Pesticides	50-29-3	DDT[4,4'-]	µg/L	Y	49	1	2	0.01	0.04	0.0147	0.0147	0.0147	0.001	NMWQCC WLDLF HAB
Pesticides	5103-71-9	Chlordane[alpha-]	µg/L	—	49	0	0	0.006	0.02	—	—	—	0.0081	NM HH 00
Pesticides	5103-74-2	Chlordane[gamma-]	µg/L	—	49	0	0	0.006	0.02	—	—	—	0.0081	NM HH 00
Pesticides	53494-70-5	Endrin Ketone	µg/L	—	49	0	0	0.01	0.04	—	—	—	—	—
Pesticides	58-89-9	BHC[gamma-]	µg/L	—	49	0	0	0.006	0.02	—	—	—	0.95	NM Aqu Acute
Pesticides	60-57-1	Dieldrin	µg/L	—	49	0	0	0.009	0.04	—	—	—	0.00054	NM HH 00
Pesticides	72-20-8	Endrin	µg/L	—	49	0	0	0.009	0.04	—	—	—	0.06	NM HH 00
Pesticides	72-43-5	Methoxychlor[4,4'-]	µg/L	—	49	0	0	0.05	0.2	—	—	—	—	—
Pesticides	72-54-8	DDD[4,4'-]	µg/L	Y	49	1	2	0.009	0.04	0.0103	0.0103	0.0103	0.001	NMWQCC WLDLF HAB
Pesticides	72-55-9	DDE[4,4'-]	µg/L	Y	49	1	2	0.006	0.04	0.00563	0.00563	0.00563	0.001	NMWQCC WLDLF HAB
Pesticides	7421-93-4	Endrin Aldehyde	µg/L	Y	49	1	2	0.006	0.04	0.011	0.011	0.011	0.3	NM HH 00
Pesticides	76-44-8	Heptachlor	µg/L	—	49	0	0	0.006	0.02	—	—	—	0.00079	NM HH 00
Pesticides	8001-35-2	Toxaphene (Technical Grade)	µg/L	—	49	0	0	0.16	0.5	—	—	—	0.0028	NM HH 00
Pesticides	959-98-8	Endosulfan I	µg/L	—	49	0	0	0.006	0.02	—	—	—	0.22	NM Aqu Acute
Rad	Ra-226	Radium-226	pCi/L	Y	39	7	18	—	—	0.375	0.721571429	1.68	30	NM LVSTK WTR STD
Rad	Ra-228	Radium-228	pCi/L	Y	39	8	21	—	—	0.612	0.96475	1.83	30	NM LVSTK WTR STD
Rad	Sr-90	Strontium-90	pCi/L	Y	228	38	17	—	—	0.509	19.23763158	136	300	DOE BCG WATER
Rad	H-3	Tritium	pCi/L	Y	3	2	67	—	—	1880	2375	2870	20000	NM LVSTK WTR STD
Rad	H-3	Tritium	pCi/L	Y	59	56	95	—	—	2.1896	34.25516071	589.26	20000	NM LVSTK WTR STD

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
SVOA	100-01-6	Nitroaniline[4-]	µg/L	—	142	0	0	3.3	10	—	—	—	—	—
SVOA	100-02-7	Nitrophenol[4-]	µg/L	—	130	0	0	2.3	10	—	—	—	—	—
SVOA	100-51-6	Benzyl Alcohol	µg/L	—	142	0	0	2.3	10	—	—	—	—	—
SVOA	101-55-3	Bromophenyl-phenylether[4-]	µg/L	Y	142	1	0.7	2.4	10	2.78	2.78	2.78	—	—
SVOA	103-33-3	Azobenzene	µg/L	—	142	0	0	2.4	10	—	—	—	—	—
SVOA	105-67-9	Dimethylphenol[2,4-]	µg/L	—	134	0	0	2.4	10	—	—	—	850	NM HH 00
SVOA	106-44-5	Methylphenol[4-]	µg/L	—	134	0	0	3.3	10	—	—	—	—	—
SVOA	106-46-7	Dichlorobenzene[1,4-]	µg/L	—	142	0	0	2.3	10	—	—	—	190	NM HH 00
SVOA	106-47-8	Chloroaniline[4-]	µg/L	—	142	0	0	2.4	10	—	—	—	—	—
SVOA	108-60-1	Oxybis(1-chloropropane)[2,2'-]	µg/L	—	142	0	0	2.4	10	—	—	—	65000	NM HH 00
SVOA	108-95-2	Phenol	µg/L	—	134	0	0	1.4	10	—	—	—	860000	NM HH 00
SVOA	110-86-1	Pyridine	µg/L	—	142	0	0	2.7	10	—	—	—	—	—
SVOA	111-44-4	Bis(2-chloroethyl)ether	µg/L	—	142	0	0	2.4	10	—	—	—	5.3	NM HH 00
SVOA	111-91-1	Bis(2-chloroethoxy)methane	µg/L	—	142	0	0	3.3	10	—	—	—	—	—
SVOA	117-81-7	Bis(2-ethylhexyl)phthalate	µg/L	Y	142	4	3	2.4	10	2	2.655	3.34	22	NM HH 00
SVOA	117-84-0	Di-n-octylphthalate	µg/L	—	142	0	0	3.3	10	—	—	—	—	—
SVOA	118-74-1	Hexachlorobenzene	µg/L	—	142	0	0	2.4	10	—	—	—	0.0029	NM HH 00
SVOA	120-12-7	Anthracene	µg/L	Y	142	1	0.7	0.24	1	0.236	0.236	0.236	40000	NM HH 00
SVOA	120-82-1	Trichlorobenzene[1,2,4-]	µg/L	—	142	0	0	2.4	10	—	—	—	70	NM HH 00
SVOA	120-83-2	Dichlorophenol[2,4-]	µg/L	—	134	0	0	2.4	10	—	—	—	290	NM HH 00
SVOA	121-14-2	Dinitrotoluene[2,4-]	µg/L	—	142	0	0	2.4	10	—	—	—	34	NM HH 00
SVOA	122-39-4	Diphenylamine	µg/L	—	142	0	0	3.3	10	—	—	—	—	—
SVOA	123-91-1	Dioxane[1,4-]	µg/L	Y	142	3	2	2	10	2.21	8.08	14.5	—	—
SVOA	129-00-0	Pyrene	µg/L	—	142	0	0	0.33	1	—	—	—	4000	NM HH 00
SVOA	131-11-3	Dimethyl Phthalate	µg/L	—	142	0	0	2.4	10	—	—	—	1100000	NM HH 00
SVOA	132-64-9	Dibenzofuran	µg/L	—	142	0	0	2.3	10	—	—	—	—	—
SVOA	1912-24-9	Atrazine	µg/L	—	50	0	0	3	10	—	—	—	—	—
SVOA	191-24-2	Benzo(g,h,i)perylene	µg/L	Y	142	1	0.7	0.24	1	0.288	0.288	0.288	—	—
SVOA	193-39-5	Indeno(1,2,3-cd)pyrene	µg/L	Y	142	1	0.7	0.24	1	0.26	0.26	0.26	0.18	NM HH 00
SVOA	205-99-2	Benzo(b)fluoranthene	µg/L	—	142	0	0	0.25	1	—	—	—	0.18	NM HH 00
SVOA	206-44-0	Fluoranthene	µg/L	Y	142	1	0.7	0.24	1	0.276	0.276	0.276	140	NM HH 00
SVOA	207-08-9	Benzo(k)fluoranthene	µg/L	Y	142	2	1	0.24	1	0.241	0.3735	0.506	0.18	NM HH 00
SVOA	208-96-8	Acenaphthylene	µg/L	—	142	0	0	0.22	1	—	—	—	—	—
SVOA	218-01-9	Chrysene	µg/L	Y	142	1	0.7	0.24	1	0.239	0.239	0.239	0.18	NM HH 00
SVOA	50-32-8	Benzo(a)pyrene	µg/L	Y	142	1	0.7	0.25	1	0.237	0.237	0.237	0.18	NM HH 00
SVOA	51-28-5	Dinitrophenol[2,4-]	µg/L	—	134	0	0	7	20	—	—	—	5300	NM HH 00
SVOA	534-52-1	Dinitro-2-methylphenol[4,6-]	µg/L	—	134	0	0	3.3	10	—	—	—	280	NM HH 00
SVOA	53-70-3	Dibenz(a,h)anthracene	µg/L	—	142	0	0	0.24	1	—	—	—	0.18	NM HH 00

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
SVOA	541-73-1	Dichlorobenzene[1,3-]	µg/L	—	142	0	0	2.3	10	—	—	—	960	NM HH 00
SVOA	55-18-5	Nitrosodiethylamine[N-]	µg/L	—	142	0	0	2.3	10	—	—	—	—	—
SVOA	56-55-3	Benzo(a)anthracene	µg/L	Y	142	2	1	0.24	1	0.25	0.3265	0.403	0.18	NM HH 00
SVOA	58-90-2	Tetrachlorophenol[2,3,4,6-]	µg/L	—	134	0	0	2.4	10	—	—	—	—	—
SVOA	59-50-7	Chloro-3-methylphenol[4-]	µg/L	—	134	0	0	2.4	10	—	—	—	—	—
SVOA	606-20-2	Dinitrotoluene[2,6-]	µg/L	—	142	0	0	2.4	10	—	—	—	—	—
SVOA	608-93-5	Pentachlorobenzene	µg/L	—	142	0	0	3	10	—	—	—	—	—
SVOA	621-64-7	Nitroso-di-n-propylamine[N-]	µg/L	—	142	0	0	2.4	10	—	—	—	5.1	NM HH 00
SVOA	62-53-3	Aniline	µg/L	—	142	0	0	2.8	10	—	—	—	—	—
SVOA	62-75-9	Nitrosodimethylamine[N-]	µg/L	—	142	0	0	2.4	10	—	—	—	30	NM HH 00
SVOA	65-85-0	Benzoic Acid	µg/L	Y	127	2	2	6.6	20	7.52	11.16	14.8	—	—
SVOA	67-72-1	Hexachloroethane	µg/L	—	142	0	0	2.4	10	—	—	—	33	NM HH 00
SVOA	7005-72-3	Chlorophenyl-phenyl[4-] Ether	µg/L	—	142	0	0	2.4	10	—	—	—	—	—
SVOA	77-47-4	Hexachlorocyclopentadiene	µg/L	—	142	0	0	3	10	—	—	—	1100	NM HH 00
SVOA	78-59-1	Isophorone	µg/L	—	142	0	0	3	10	—	—	—	9600	NM HH 00
SVOA	83-32-9	Acenaphthene	µg/L	—	142	0	0	0.34	1	—	—	—	990	NM HH 00
SVOA	84-66-2	Diethylphthalate	µg/L	Y	142	3	2	2.4	10	2.91	11.29	24.8	44000	NM HH 00
SVOA	84-74-2	Di-n-butylphthalate	µg/L	—	142	0	0	2.3	10	—	—	—	4500	NM HH 00
SVOA	85-01-8	Phenanthrene	µg/L	Y	142	2	1	0.24	1	0.26	0.4825	0.705	—	—
SVOA	85-68-7	Butylbenzylphthalate	µg/L	—	142	0	0	2.4	10	—	—	—	1900	NM HH 00
SVOA	86-73-7	Fluorene	µg/L	Y	142	1	0.7	0.24	1	0.226	0.226	0.226	5300	NM HH 00
SVOA	87-68-3	Hexachlorobutadiene	µg/L	—	142	0	0	2.4	10	—	—	—	180	NM HH 00
SVOA	87-86-5	Pentachlorophenol	µg/L	—	134	0	0	2.4	10	—	—	—	19	NM Aqu Acute
SVOA	88-06-2	Trichlorophenol[2,4,6-]	µg/L	—	134	0	0	2.4	10	—	—	—	24	NM HH 00
SVOA	88-74-4	Nitroaniline[2-]	µg/L	—	142	0	0	2.3	10	—	—	—	—	—
SVOA	88-75-5	Nitrophenol[2-]	µg/L	—	134	0	0	2.4	10	—	—	—	—	—
SVOA	88-85-7	Dinoseb	µg/L	—	134	0	0	2.4	10	—	—	—	—	—
SVOA	90-12-0	Methylnaphthalene[1-]	µg/L	—	142	0	0	0.33	1	—	—	—	—	—
SVOA	91-20-3	Naphthalene	µg/L	—	142	0	0	0.33	1	—	—	—	—	—
SVOA	91-57-6	Methylnaphthalene[2-]	µg/L	—	142	0	0	0.33	1	—	—	—	—	—
SVOA	91-58-7	Chloronaphthalene[2-]	µg/L	—	142	0	0	0.35	1	—	—	—	1600	NM HH 00
SVOA	91-94-1	Dichlorobenzidine[3,3'-]	µg/L	—	142	0	0	2	10	—	—	—	0.28	NM HH 00
SVOA	924-16-3	Nitroso-di-n-butylamine[N-]	µg/L	—	142	0	0	3	10	—	—	—	—	—
SVOA	92-87-5	Benzidine	µg/L	—	130	0	0	3	10	—	—	—	0.002	NM HH 00
SVOA	930-55-2	Nitrosopyrrolidine[N-]	µg/L	—	141	0	0	2.3	10	—	—	—	—	—
SVOA	95-48-7	Methylphenol[2-]	µg/L	—	134	0	0	2.3	10	—	—	—	—	—
SVOA	95-50-1	Dichlorobenzene[1,2-]	µg/L	—	142	0	0	2.3	10	—	—	—	1300	NM HH 00
SVOA	95-57-8	Chlorophenol[2-]	µg/L	—	134	0	0	2.4	10	—	—	—	150	NM HH 00

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
SVOA	95-94-3	Tetrachlorobenzene[1,2,4,5]	µg/L	—	142	0	0	3	10	—	—	—	—	—
SVOA	95-95-4	Trichlorophenol[2,4,5-]	µg/L	—	134	0	0	2	10	—	—	—	—	—
SVOA	98-95-3	Nitrobenzene	µg/L	—	142	0	0	3.3	10	—	—	—	690	NM HH 00
SVOA	99-09-2	Nitroaniline[3-]	µg/L	—	142	0	0	2.3	10	—	—	—	—	—
TPH-DRO	TPH-DRO	TPH-DRO	µg/L	Y	1	1	100	60	188	90.6	90.6	90.6	—	—
VOA	100-41-4	Ethylbenzene	µg/L	—	185	0	0	0.25	1	—	—	—	2100	NM HH 00
VOA	100-42-5	Styrene	µg/L	Y	185	1	0.5	0.25	1	0.5	0.5	0.5	—	—
VOA	10061-01-5	Dichloropropene[cis-1,3-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	10061-02-6	Dichloropropene[trans-1,3-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	103-65-1	Propylbenzene[1-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	104-51-8	Butylbenzene[n-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	106-43-4	Chlorotoluene[4-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	106-46-7	Dichlorobenzene[1,4-]	µg/L	—	185	0	0	0.25	1	—	—	—	190	NM HH 00
VOA	106-93-4	Dibromoethane[1,2-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	107-02-8	Acrolein	µg/L	—	103	0	0	1.5	5	—	—	—	9	NM HH 00
VOA	107-05-1	Chloro-1-propene[3-]	µg/L	—	185	0	0	1.8	5	—	—	—	—	—
VOA	107-06-2	Dichloroethane[1,2-]	µg/L	—	185	0	0	0.25	1	—	—	—	370	NM HH 00
VOA	107-12-0	Propionitrile	µg/L	—	71	0	0	1.5	5	—	—	—	—	—
VOA	107-13-1	Acrylonitrile	µg/L	—	184	0	0	1	5	—	—	—	2.5	NM HH 00
VOA	108-05-4	Vinyl acetate	µg/L	—	185	0	0	1.5	5	—	—	—	—	—
VOA	108-10-1	Methyl-2-pentanone[4-]	µg/L	—	185	0	0	1.3	5	—	—	—	—	—
VOA	108-67-8	Trimethylbenzene[1,3,5-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	108-86-1	Bromobenzene	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	108-88-3	Toluene	µg/L	Y	185	2	1	0.25	1	0.398	0.974	1.55	15000	NM HH 00
VOA	108-90-7	Chlorobenzene	µg/L	—	185	0	0	0.25	1	—	—	—	1600	NM HH 00
VOA	110-75-8	Chloroethyl vinyl ether[2-]	µg/L	—	24	0	0	1.5	5	—	—	—	—	—
VOA	120-82-1	Trichlorobenzene[1,2,4-]	µg/L	—	185	0	0	0.3	1	—	—	—	70	NM HH 00
VOA	123-91-1	Dioxane[1,4-]	µg/L	Y	1	1	100	20	60	30.4	30.4	30.4	—	—
VOA	124-48-1	Chlorodibromomethane	µg/L	Y	185	9	5	0.29	1	0.73	2.852222222	4.94	130	NM HH 00
VOA	126-98-7	Methacrylonitrile	µg/L	—	184	0	0	1	5	—	—	—	—	—
VOA	126-99-8	Chloro-1,3-butadiene[2-]	µg/L	—	185	0	0	0.3	1	—	—	—	—	—
VOA	127-18-4	Tetrachloroethene	µg/L	—	185	0	0	0.32	1	—	—	—	33	NM HH 00
VOA	1330-20-7	Xylene (Total)	µg/L	—	1	0	0	0.071	2	—	—	—	—	—
VOA	135-98-8	Butylbenzene[sec-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	142-28-9	Dichloropropane[1,3-]	µg/L	—	185	0	0	0.28	1	—	—	—	—	—
VOA	156-59-2	Dichloroethene[cis-1,2-]	µg/L	—	185	0	0	0.3	1	—	—	—	—	—
VOA	156-60-5	Dichloroethene[trans-1,2-]	µg/L	—	185	0	0	0.3	1	—	—	—	10000	NM HH 00
VOA	1634-04-4	Methyl tert-Butyl Ether	µg/L	—	185	0	0	0.25	1	—	—	—	—	—

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
VOA	541-73-1	Dichlorobenzene[1,3-]	µg/L	—	185	0	0	0.25	1	—	—	—	960	NM HH 00
VOA	56-23-5	Carbon Tetrachloride	µg/L	—	185	0	0	0.3	1	—	—	—	16	NM HH 00
VOA	563-58-6	Dichloropropene[1,1-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	591-78-6	Hexanone[2-]	µg/L	—	185	0	0	1.4	5	—	—	—	—	—
VOA	594-20-7	Dichloropropane[2,2-]	µg/L	—	185	0	0	0.3	1	—	—	—	—	—
VOA	60-29-7	Diethyl Ether	µg/L	Y	185	2	1	0.3	1	0.433	0.5435	0.654	—	—
VOA	630-20-6	Tetrachloroethane[1,1,1,2-]	µg/L	—	185	0	0	0.3	1	—	—	—	—	—
VOA	67-64-1	Acetone	µg/L	Y	184	20	11	3	10	1.35	3.5245	11	—	—
VOA	67-66-3	Chloroform	µg/L	Y	185	12	6	0.25	1	0.289	4.131916667	7.63	4700	NM HH 00
VOA	71-36-3	Butanol[1-]	µg/L	—	93	0	0	15	50	—	—	—	—	—
VOA	71-43-2	Benzene	µg/L	Y	185	2	1	0.3	1	0.32	0.425	0.53	510	NM HH 00
VOA	71-55-6	Trichloroethane[1,1,1-]	µg/L	—	185	0	0	0.32	1	—	—	—	—	—
VOA	74-83-9	Bromomethane	µg/L	—	185	0	0	0.36	1	—	—	—	1500	NM HH 00
VOA	74-87-3	Chloromethane	µg/L	Y	185	2	1	0.37	1	0.33	0.345	0.36	—	—
VOA	74-88-4	Iodomethane	µg/L	—	185	0	0	1.3	5	—	—	—	—	—
VOA	74-95-3	Dibromomethane	µg/L	—	185	0	0	0.3	1	—	—	—	—	—
VOA	74-97-5	Bromochloromethane	µg/L	—	185	0	0	0.3	1	—	—	—	—	—
VOA	75-00-3	Chloroethane	µg/L	—	185	0	0	0.33	1	—	—	—	—	—
VOA	75-01-4	Vinyl Chloride	µg/L	—	185	0	0	0.48	1	—	—	—	24	NM HH 00
VOA	75-05-8	Acetonitrile	µg/L	—	75	0	0	6.6	25	—	—	—	—	—
VOA	75-09-2	Methylene Chloride	µg/L	—	185	0	0	2.8	10	—	—	—	5900	NM HH 00
VOA	75-15-0	Carbon Disulfide	µg/L	Y	185	1	0.5	1.3	5	1.43	1.43	1.43	—	—
VOA	75-25-2	Bromoform	µg/L	Y	185	5	3	0.25	1	0.272	1.07	2.99	1400	NM HH 00
VOA	75-27-4	Bromodichloromethane	µg/L	Y	185	8	4	0.25	1	1.4	5.41875	7.99	170	NM HH 00
VOA	75-34-3	Dichloroethane[1,1-]	µg/L	—	185	0	0	0.3	1	—	—	—	—	—
VOA	75-35-4	Dichloroethene[1,1-]	µg/L	—	185	0	0	0.3	1	—	—	—	7100	NM HH 00
VOA	75-69-4	Trichlorofluoromethane	µg/L	—	185	0	0	0.3	1	—	—	—	—	—
VOA	75-71-8	Dichlorodifluoromethane	µg/L	—	185	0	0	0.36	1	—	—	—	—	—
VOA	76-13-1	Trichloro-1,2,2-trifluoroethane[1,1,2-]	µg/L	—	179	0	0	1	5	—	—	—	—	—
VOA	78-83-1	Isobutyl alcohol	µg/L	—	47	0	0	15	50	—	—	—	—	—
VOA	78-87-5	Dichloropropane[1,2-]	µg/L	—	185	0	0	0.25	1	—	—	—	150	NM HH 00
VOA	78-93-3	Butanone[2-]	µg/L	Y	184	2	1	1.4	5	1.92	2.315	2.71	—	—
VOA	79-00-5	Trichloroethane[1,1,2-]	µg/L	—	185	0	0	0.25	1	—	—	—	160	NM HH 00
VOA	79-01-6	Trichloroethene	µg/L	—	185	0	0	0.25	1	—	—	—	300	NM HH 00
VOA	79-34-5	Tetrachloroethane[1,1,2,2-]	µg/L	—	185	0	0	0.25	1	—	—	—	40	NM HH 00
VOA	80-62-6	Methyl Methacrylate	µg/L	—	185	0	0	1	5	—	—	—	—	—
VOA	87-61-6	Trichlorobenzene[1,2,3-]	µg/L	—	185	0	0	0.32	1	—	—	—	—	—
VOA	87-68-3	Hexachlorobutadiene	µg/L	—	185	0	0	0.32	1	—	—	—	180	NM HH 00

Table B-4.1-3 (continued)

Suite	Symbol or CAS No.	Analyte	Units	Detect Flag	Number of Analyses	Number of Detects	Percent Detected %	Average MDL	Average PQL	Minimum Detected Value	Average Detected Value	Maximum Detected Value	SW Std	SW Type
VOA	91-20-3	Naphthalene	µg/L	Y	185	1	0.5	0.26	1	1.51	1.51	1.51	—	—
VOA	95-47-6	Xylene[1,2-]	µg/L	—	185	0	0	0.28	1	—	—	—	—	—
VOA	95-49-8	Chlorotoluene[2-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	95-50-1	Dichlorobenzene[1,2-]	µg/L	—	185	0	0	0.25	1	—	—	—	1300	NM HH 00
VOA	95-63-6	Trimethylbenzene[1,2,4-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	96-12-8	Dibromo-3-Chloropropane[1,2-]	µg/L	—	185	0	0	0.36	1	—	—	—	—	—
VOA	96-18-4	Trichloropropane[1,2,3-]	µg/L	—	185	0	0	0.3	1	—	—	—	—	—
VOA	97-63-2	Ethyl Methacrylate	µg/L	—	185	0	0	1	5	—	—	—	—	—
VOA	98-06-6	Butylbenzene[tert-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	98-82-8	Isopropylbenzene	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	99-87-6	Isopropyltoluene[4-]	µg/L	—	185	0	0	0.25	1	—	—	—	—	—
VOA	Xylene[m+p]	Xylene[1,3-]+Xylene[1,4-]	µg/L	—	184	0	0	0.44	2	—	—	—	—	—

Notes: CAS = Chemical Abstracts Service; SW = surface water; DOE BCG WATER = DOE Biota Concentration Guide; NM HH OO = New Mexico human health organism only; NM LVSTK WTR STD = New Mexico livestock water standard; NM Aqu Acute; NMWQCC WLDLF HAB = New Mexico Water Quality Control Commission wildlife habitat.

*— = Not available.

Table B-4.2-1
Analytical Methods, PQLs, and MDLs for Analytes Reported by GGRL

Analyte	Analytical Method	Method Description	MDL	PQL	Unit
General Inorganics					
Alkalinity-CO_3	EPA:310.1	Titrimetric	0.8	4	mg/L
Alkalinity-CO_3+HCO_3	EPA:310.1	Titrimetric	0.8	4	mg/L
Ammonia as Nitrogen	EPA:350.3	Ion selective electrode	0.1	0.5	mg/L
Bromide	EPA:300.0	Ion chromatography	0.01	0.05	mg/L
Calcium	EPA:200.7	ICP-AES[a]	0.01	0.05	mg/L
Chloride	EPA:300.0	Ion chromatography	0.01	0.05	mg/L
Fluoride	EPA:300.0	Ion chromatography	0.01	0.05	mg/L
Magnesium	EPA:200.7	ICP-AES	0.01	0.05	mg/L
Nitrite as Nitrogen	EPA:300.0	Ion chromatography	0.003	0.015	mg/L
Nitrate as Nitrogen	EPA:300.0	Ion chromatography	0.002	0.01	mg/L
Oxalate	EPA:300.0	Ion chromatography	0.01	0.05	mg/L
Perchlorate	EPA:314.0	Ion chromatography	2	10	µg/L
pH	EPA:150.1	pH meter	—[b]	—	SU
Phosphorus, Orthophosphate (Expressed as PO_4)	EPA:300.0	Ion chromatography	0.01	—	mg/L
Potassium	EPA:200.7	ICP-AES	0.01	—	mg/L
Sodium	EPA:200.7	ICP-AES	0.01	0.05	mg/L
Sulfate	EPA:300.0	Ion chromatography	0.01	0.05	mg/L
Total Organic Carbon	SW-846:9060	Carbonaceous analyzer	0.2	1	mg/L
Sulfide, Total	Standard Methods 4500-S2-G	Ion Selective Electrode	0.03	0.15	mg/L

Table B-4.2-1 (continued)

Analyte	Analytical Method	Method Description	MDL	PQL	Unit
Metals					
Aluminum	EPA:200.7	ICP-AES	1	5	µg/L
Antimony	EPA:200.8	ICP-MS[c]	1	5	µg/L
Arsenic	EPA:200.8	ICP-MS	0.2	1	µg/L
Barium	EPA:200.7	ICP-AES	1	5	µg/L
Beryllium	EPA:200.8	ICP-MS	1	5	µg/L
Boron	EPA:200.7	ICP-AES	2	10	µg/L
Cadmium	EPA:200.8	ICP-MS	1	5	µg/L
Cesium	EPA:200.8	ICP-MS	1	5	µg/L
Chromium	EPA:200.8	ICP-MS	1	5	µg/L
Chromium Hexavalent Ion	SW-846:7199	Ultraviolet–Visible Spectrophotometry	1	0.5	µg/L
Cobalt	EPA:200.8	ICP-MS	1	5	µg/L
Copper	EPA:200.8	ICP-MS	1	5	µg/L
Iron	EPA:200.7	ICP-AES	10	50	µg/L
Lithium	EPA:200.7	ICP-AES	1	5	µg/L
Lead	EPA:200.8	ICP-MS	0.2	1	µg/L
Manganese	EPA:200.7	ICP-AES	1	5	µg/L
Mercury	EPA:200.8	ICP-MS	0.05	0.25	µg/L
Molybdenum	EPA:200.8	ICP-MS	1	5	µg/L
Nickel	EPA:200.8	ICP-MS	1	5	µg/L
Selenium	EPA:200.8	ICP-MS	1	5	µg/L
Silicon Dioxide	EPA:200.7	ICP-AES	0.0214	0.107	mg/L
Silver	EPA:200.8	ICP-MS	1	5	µg/L
Strontium	EPA:200.7	ICP-AES	1	5	µg/L
Thallium	EPA:200.8	ICP-MS	1	5	µg/L
Tin	EPA:200.8	ICP-MS	1	5	µg/L
Titanium	EPA:200.7	ICP-AES	2	10	µg/L

Table B-4.2-1 (continued)

Analyte	Analytical Method	Method Description	MDL	PQL	Unit
Uranium	EPA:200.8	ICP-MS	0.2	1	µg/L
Vanadium	EPA:200.8	ICP-MS	1	5	µg/L
Zinc	EPA:200.7	ICP-AES	1	5	µg/L
Isotope					
Deuterium Ratio	Generic:Deuterium Ratio	Isotope ratio mass spectrometry	—	—	permil
Oxygen-18/Oxygen-16 Ratio	Generic:Oxygen Isotope Ratio	Isotope ratio mass spectrometry	—	—	permil
Nitrogen-15/Nitrogen-14 Ratio	Generic:Nitrogen Isotope Ratio	Isotope ratio mass spectrometry	—	—	permil

[a] ICP-AES = Inductively coupled plasma atomic emission spectroscopy.

[b] — = Not applicable.

[c] ICP-MS = Inductively coupled plasma mass spectrometry.

Table B-5.0-1
Waste Stream, Estimated Volumes, and Management of IDW

Waste Stream	Estimated Volume	On-Site Management and Final Disposition
Purge water	5 to 3000 gal. per well per sampling event	Land application per ENV-RCRA-SOP-010, Land Application of Groundwater
Contact waste	Less than 110 gal. per watershed monitoring campaign	Accumulation in 55-gal. drums with drum liners. Disposal off-site at a New Mexico solid waste landfill or on-site disposal at TA-54, Area G
Decontamination fluids	Less than 55 gal. per watershed monitoring campaign	Treatment at an on-site or Laboratory-approved off-site wastewater treatment facility for which waste meets waste acceptance criteria

Appendix C

Supplemental Information for Assigned Sampling Suites and Frequencies

This appendix of the Interim Facility-Wide Groundwater Monitoring Plan (the Interim Plan) provides supplemental information relevant to sampling frequencies and analytical suites assigned to locations in each area-specific monitoring group or watershed. The following are primary considerations used to define sampling frequencies and analytical suites that are protective of groundwater:

- general types of contaminants released from upgradient sources
- extent to which contaminant nature and extent have been defined
- expected transport characteristics of the released contaminants
- frequency of detection of contaminants in the monitoring group
- magnitude of concentrations relative to the lowest applicable standard
- nature and rate of change of contaminant concentrations
- regulatory direction specified in New Mexico Environment Department (NMED) approval letters related to earlier Interim Plans
- programmatic data requirements to support decisions regarding corrective actions

The highest sampling frequencies apply to areas where a mobile contaminant has been detected above a standard but its nature and extent may not be characterized sufficiently to support decisions about potential remedial actions to be taken. Lower sampling frequencies apply to analytes that are not of significance for a given monitoring group, are relatively immobile in the subsurface, and have not been detected or have been detected infrequently.

The following general rules of thumb were used to define the lowest sampling frequencies for specific analytical suites (excluding those locations undergoing characterization sampling).

Field Parameters. Field parameters are measured at all locations during every sampling event. Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature. Oxidation-reduction potential will be measured if a flow-through cell is used and will not be measured in surface water, spring water, or water collected from Westbay sampling systems unless specified otherwise.

Inorganic Constituents. General inorganics and metals are typically sampled annually if these suites contain one or more significant contaminants for a monitoring group, the nature and extent of those constituents are well characterized, and additional data are not needed to support regulatory decision-making, such as an investigation report or a corrective measures evaluation (CME). To the extent that additional data are needed to meet project objectives or for new wells, the relevant analytical suite is sampled more frequently. Metals are not always sampled from areas that show no evidence of metals migration.

Organic Constituents. The main characteristic used to determine the lowest sampling frequency for an organic analytical suite is the mobility of its constituents. Suites containing organic constituents with moderate to high mobility in the environment (volatile organic compounds [VOCs] and, to a lesser extent, semivolatile organic compounds [SVOCs]) are sampled annually or not sampled in areas for which there is a history of nondetections and where additional data are not needed to support regulatory decision-making, such as an investigation report or a CME. If consistently detected or if additional data are needed to meet project objectives, then the relevant suite is sampled annually or more frequently. Data from across Los Alamos National Laboratory (the Laboratory) show a history of nondetections for dioxins/furans, pesticides, and polychlorinated biphenyls (PCBs) in deeper groundwater zones, reflecting the tendency for these constituents to sorb to soils and fine-grained materials rather than to migrate to deeper groundwater zones. Therefore, the frequency of sampling for these constituents has been significantly reduced in regional monitoring wells at many locations, and in some cases, these constituents are no longer analyzed. Similarly, high explosives (HE or HEXP) are not present in the northern watersheds (those north of

Pajarito Canyon) and are typically not part of the analytical suite after initial characterization sampling of new wells has been completed. Pesticides are no longer sampled under the interim groundwater monitoring program, as they are not primary contaminants at the Laboratory.

Low–method detection limit (MDL) VOCs and SVOCs refer to analyses of 24 VOCs and SVOCs using lower MDLs as discussed in the Laboratory's letter to NMED, dated April 4, 2013, in its "Response to Approval with Modifications for the 2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1" (LANL 2013, 239555). For 9 of 24 constituents discussed in the letter, lower MDLs have been achieved using other analytical methods. In monitoring year (MY) 2014 (starting October 2013), the Laboratory began to characterize select VOC and SVOC constituents at low method detection limits (MDLs). During MY2015, remaining locations will be sampled for these nine low-MDL VOCs and SVOCs.

For the remaining 15 of 24 constituents discussed in Comment 10 of NMED's approval with modifications (NMED 2012, 520410), the Laboratory is working with its contract laboratory to identify suitable analytical methods for analysis of VOCs and SVOCs. Once suitable analytical methods are identified, the Laboratory will begin collection of samples for analysis of these constituents.

Radionuclides (Excluding Tritium). If there is a history of nondetections or if detections fall within the range of natural background (for naturally occurring radionuclides), then the lowest sampling frequency applies: quarterly or semiannually for new wells, annually if radionuclides are among the significant constituents for an area being monitored, and biennially otherwise.

Tritium. Tritium samples are collected from select springs and deep groundwater on an annual or greater basis. Tritium may not be analyzed at locations where tritium is not a significant contaminant, such as in the Technical Area 16 (TA-16) 260 monitoring group and in some general surveillance locations. Samples are collected for low-level tritium analysis at locations in select monitoring groups where a very low minimum detectable activity is useful to support a conceptual model for fate and transport.

Tritium samples may be submitted for analysis by liquid scintillation if average activities are anticipated to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

Table C-1 provides background information and the objectives generally used to define the sampling frequencies and analytical suites for the area-specific monitoring groups. The specific sampling frequencies and analytical suites for individual sampling locations are provided in Tables 2.4-1 through 8.3-2 of the Interim Plan.

REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

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

LANL (Los Alamos National Laboratory), September 2011. "Corrective Measures Evaluation Report for Material Disposal Area L, Solid Waste Management Unit 54-006, at Technical Area 54, Revision 2," Los Alamos National Laboratory document LA-UR-11-4798, Los Alamos, New Mexico. (LANL 2011, 205756)

LANL (Los Alamos National Laboratory), September 2011. "Corrective Measures Evaluation Report for Material Disposal Area H, Solid Waste Management Unit 54-004, at Technical Area 54, Revision 1," Los Alamos National Laboratory document LA-UR-11-5079, Los Alamos, New Mexico. (LANL 2011, 206319)

LANL (Los Alamos National Laboratory), September 2011. "Corrective Measures Evaluation Report for Material Disposal Area G, Solid Waste Management Unit 54-013(b)-99, at Technical Area 54, Revision 3," Los Alamos National Laboratory document LA-UR-11-4910, Los Alamos, New Mexico. (LANL 2011, 206324)

LANL (Los Alamos National Laboratory), September 2012. "Corrective Measures Evaluation Report for Material Disposal Area C, Solid Waste Management Unit 50-009 at Technical Area 50," Los Alamos National Laboratory document LA-UR-12-24944, Los Alamos, New Mexico. (LANL 2012, 222830)

LANL (Los Alamos National Laboratory), April 4, 2013. "Response to Approval with Modifications for the 2011 Interiam Facility-Wide Groundwater Monitoring Plan, Revision 1," Los Alamos National Laboratory letter (EP2013-0062) to J.E. Keiling (NMED-HWB) from J. Mousseau (LANL) and P. Maggiore (DOE-NA-00-LA), Los Alamos, New Mexico. (LANL 2013, 239555)

NMED (New Mexico Environment Department), May 21, 2012. "Approval with Modifications, 2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1," New Mexico Environment Department letter to P. Maggiore (DOE-LASO) and M.J. Graham (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2012, 520410)

Table C-1
Background Information and Objectives Used to Determine Sampling Frequencies and Analytical Suites for Area-Specific Monitoring Groups

Monitoring Group	Background*	Proposed Frequency	Proposed Analyte Suites	Objectives
TA-21	• Nature and extent of groundwater contamination generally understood • No concentrations exceed standards or screening levels (SLs) in regional groundwater	• Annual sampling of intermediate and regional wells • Semiannual sampling of R-6, R-64, R-66 to monitor Material Disposal Area (MDAs) T and U	• Radionuclide, tritium or low-level tritium, and general inorganics analyses annually for most wells • VOC, and SVOCs sampled annually in select wells and biennially in other wells	• Focus on mobile constituents and radionuclides
Chromium	• Nature and extent of groundwater contamination generally understood • Cr concentrations in regional aquifer exceed New Mexico Groundwater Standard (NM GW STD) • Perchlorate concentrations in regional aquifer exceed SL in the Compliance Order on Consent • Cr concentrations at the downgradient portion of the plume are below NM GW STD and stable, especially in deeper screens where concentrations are at background concentrations	• Quarterly sampling of intermediate and regional wells with chromium (Cr) concentrations that exceed 25 µg/L (half the NM GW STD) • Quarterly sampling of intermediate and regional wells with significant rate of change in Cr concentrations • Quarterly sampling of R-35a, R-35b, R-44 S1, and R-44 S2 to provide "early warning" of possible contamination for supply well PM-3 • Semiannual sampling of intermediate and regional wells with Cr concentrations that are above 10.44 µg/L (background upper tolerance limit) but less than 25 µg/L (half the NM GW STD) • Annual sampling of intermediate and regional with Cr concentrations at background levels	• Metals, tritium, and general inorganics analyses for all samples • Semiannual VOC and SVOC analysis for samples from Mortandad Canyon intermediate wells with consistently detected 1,4-dioxane • Biennial analyses for VOCs and SVOCs in select regional wells and one Sandia Canyon intermediate well • Annual analysis for radionuclides at intermediate wells; biennial for regional wells	• Focus highest frequency sampling and analysis for mobile constituents, including perchlorate • Focus highest frequency sampling and analysis at locations with highest Cr concentrations • Monitor wells located where potential for greatest rate of change is possible because of the presence of Cr in the vadose zone • Monitor wells located at downgradient edge of Cr plume • Monitor wells located between Cr plume and water-supply wells

Table C-1 (continued)

Monitoring Group	Background*	Proposed Frequency	Proposed Analyte Suites	Objectives
MDA C	Current data sufficient to support remedy selection for MDA C CME, submitted to NMED in 2012 (LANL 2012, 222830) • No concentrations of constituents exceed standards or SLs in regional groundwater • Determination that groundwater is protected is supported by vapor-phase VOC sampling conducted to date	• Semiannual sampling of all wells	• Semiannual VOC, SVOC, and low-level tritium analyses for all samples • Semiannual or biennial metals analysis for all samples • Annual analysis for radionuclides, and annual or semiannual for general inorganics • Quinquennial analysis for high explosives (HEXP) at all locations	• Focus highest frequency analysis for mobile constituents known to be present beneath MDA C
TA-54	• Current data sufficient to support remedy selection; CMEs for MDAs G, H, and L submitted to NMED in 2011 (LANL 2011, 205756; LANL 2011, 206319; LANL 2011, 206324) • No constituent concentrations exceed standards or SLs in regional groundwater • Determination that groundwater is protected is supported by vapor-phase VOC sampling conducted to date	• Semiannual sampling of most intermediate and regional wells and quarterly sampling of key wells located downgradient of MDAs • Quarterly monitoring at R-55 S1 and R-23, located downgradient of MDAs at Los Alamos County boundary • Quarterly sampling for VOCs and low-level tritium at key wells located downgradient of MDAs	• Quarterly sampling for VOCs and low-level tritium at key wells located downgradient of MDAs (R-23, R-37 S1 and S2, R-39, R-41 S2, R-55 S1, R-56 S1, and R-57 S1) • Semiannual VOC and low-level tritium analyses for most other wells • Semiannual SVOC analysis for R-37 S1 (1,4-dioxane consistently detected) • VOCs and low-level tritium analysis only at R-40 S1 because of low yield • Annual metals, SVOCs, radionuclides, and general inorganics for all other locations • Quinquennial analysis for PCBs and HEXP at all locations R-57 S1 and R-57 S2	• Focus highest frequency analysis for mobile constituents known to be present beneath TA-54 MDAs

Table C-1 (continued)

Monitoring Group	Background*	Proposed Frequency	Proposed Analyte Suites	Objectives
TA-16 260	• Increased runoff following Las Conchas fire may impact near-surface hydrology and contaminant distributions • Nature and extent of groundwater contamination generally understood • RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) exceeds U.S. Environmental Protection Agency tap water SL in intermediate groundwater • No constituent concentrations exceed standards or SLs in regional groundwater • Historical rate of change in RDX concentrations generally does not require high-frequency (e.g., quarterly) sampling	• Monitor semiannually or annually at base-flow location, alluvial monitoring wells, and springs • Quarterly sampling at R-18 to track increasing RDX concentration • Semiannual sampling of springs and alluvial, intermediate, and regional wells with elevated RDX concentrations • Annual sampling of locations without significant RDX detections	• Metals, VOC, and HEXP analyses semiannually or annually for most other locations • Annual or semiannual analysis for general inorganics and biennial analysis for radionuclides and SVOCs for most other locations • Quinquennial sampling for PCBs and dioxins/furans at shallow sampling locations (base flow, springs, and alluvial wells)	• Reestablish baseline conditions for shallow system following Las Conchas fire • Focus highest frequency analysis for mobile constituents known to be released at the 260 Outfall
MDA AB	• No constituent concentrations exceed standards or SLs in regional groundwater	• Annual sampling of intermediate and regional wells • Semiannual sampling of regional wells R-29 and R-30 to monitor MDA AB	• Metals, VOC, SVOC, HEXP, radionuclide, low-level tritium, and general inorganics analyses for all samples	• General analyte suite for constituents that may have been released from MDA AB

Table C-1 (continued)

Monitoring Group	Background*	Proposed Frequency	Proposed Analyte Suites	Objectives
General Surveillance and White Rock Canyon	• Number of outfalls significantly reduced and remaining outfalls have improved water quality • Nature and extent of groundwater contamination generally understood • Canyons investigations are complete and show contribution to risk from surface water is low and within acceptable limits • Constituent concentrations generally below standards or SLs • Decades of annual monitoring at springs in White Rock Canyon show little evidence of Laboratory contaminants. • Focused monitoring around MDAs and areas of known groundwater contamination along with generally low groundwater velocities support proposing a biennial sampling frequency at White Rock Canyon springs.	• Annual monitoring at key alluvial monitoring wells, springs, and base-flow locations to capture unexpected near-surface conditions • Annual sampling of all intermediate and regional wells • Semiannual monitoring at R-10a to monitor groundwater at Laboratory boundary • Annual sampling at select White Rock Canyon springs and base-flow locations to monitor groundwater at Laboratory boundary • Biennial sampling at other White Rock Canyon base-flow locations and springs	• Metals, radionuclide, and general inorganics analyses for all samples • Analyses of additional constituents at monitoring well 03-B-13 • HEXP analysis for southern watersheds • VOC analysis annually or biennially, and SVOC analysis annually, biennially, or triennially at all locations, except at R-19 and R-31 • Low-level tritium analysis annually or biennially in select wells and springs • Quinquennial sampling for PCBs and dioxins/furans at base-flow locations and alluvial wells • Biennial sampling for metals, VOCs, radionuclides, and general inorganics at most White Rock Canyon springs, with annual sampling at select springs; annual, biennial, or triennial sampling for SVOCs and HEXP at most locations	• Focus highest frequency analysis for mobile constituents known to be present in particular watershed • Limit monitoring in the alluvial groundwater because of limited contamination • Focus on intermediate and regional locations for groundwater protection

* Constituents discussed in this column do not include detections of spurious organic constituents, naturally occurring constituents, or constituents related to well corrosion or to potential drilling effects.

Appendix D

Field Quality Assurance/Quality Control Samples

Sample Type	Summary
General	This appendix summarizes field quality assurance/quality control (QA/QC) samples to be collected during activities conducted under the Interim Facility-Wide Groundwater Monitoring Plan. Field QA/QC samples are collected in accordance with the Compliance Order on Consent, Section IX.B, and include field blanks, equipment rinsate blanks, performance evaluation blanks, field duplicates, and field trip blanks. Field QA/QC samples are used to detect possible field or analytical laboratory contamination and to track analytical laboratory performance. Differences in analytical results between field duplicate samples, for example, may indicate the samples were not uniform or significant variation occurred during analyses. Detection of analytes in deionized water field blanks may indicate contamination of the deionized water source or sample bottles or contamination from the analytical laboratory. This appendix also addresses how field QA/QC results are used and the types of corrective actions that may be taken to address exceedances of target measures for each QA/QC sample type.
Field Blanks	Field blanks are used to monitor for contamination during sampling and are collected at a minimum frequency of 10% of all samples collected in a sampling campaign. Field blanks are collected by filling sample containers in the field with deionized water to check for sources of sample contamination in the field. Field blanks are analyzed for the organic constituents sampled for during the sampling campaign, with the exception of high explosive compounds, which are not analyzed in field or equipment rinsate blanks. Field-blank results are evaluated as part of the secondary data validation process by using the results to validate the associated sample results. If any analytes are detected in the field blank, the result from the associated sample is qualified as undetected if the result is less than 5 times the amount for the analyte found in the associated field blank. A validation reason code is also assigned to describe why the data were qualified.
Equipment Rinsate Blanks	Equipment rinsate blanks are used to detect any contamination resulting from contaminated equipment or poor decontamination techniques. The equipment rinsate blank is prepared by passing deionized water through unused or decontaminated sampling equipment, including Westbay sample bottles. Equipment rinsate blanks are collected before a well is sampled with a nondedicated pump. An equipment rinsate blank is also collected before sampling each well equipped with a Westbay sampling system for which samples are being collected for off-site analysis. Equipment rinsate blanks are not required for wells equipped with Westbay sampling systems from which samples are being collected for on-site analysis only. Equipment rinsate blanks are analyzed for the organic constituents sampled for in the associated well, with the exception of high explosive compounds, which are not analyzed in rinsate blanks. During the secondary data validation process, equipment rinsate blanks are evaluated in the same manner as field blanks, and any detected analytes are qualified in the samples associated with the equipment rinsate blank.
Performance Evaluation Blanks	Performance evaluation blanks (PEBs) are deionized water blanks submitted as regular samples, without any indication that they are QC samples. PEBs are used to evaluate the reagent-grade deionized water used to decontaminate sampling equipment and to prepare the blank samples discussed above. One PEB is collected per sampling campaign and analyzed for total organic carbon and for the full suite of constituents analyzed during the sampling campaign, including metals, organic chemicals, general inorganics, and radionuclides. PEBs are not analyzed for stable isotopes or specialized analytes that may be requested for the sampling campaign.

Sample Type	Summary
Field Duplicates	Field duplicates are split samples that provide information about field variation of sampling results as well as analytical laboratory variation. They may reveal sampling techniques with poor reproducibility and provide information on the reproducibility of the sampling process. Field duplicates are collected at a rate of 10% of all samples collected during a sampling campaign. Field-duplicate samples should be distributed proportionally among surface water, alluvial groundwater, and intermediate/regional groundwater to the relative number of samples collected for each type of media. Field duplicate samples are selected from robust sampling locations requiring full analytical suites and yielding plenty of sample volume. Field duplicate samples should be analyzed for the same suite of analytes for which the primary samples are analyzed. However, field duplicate samples need not be analyzed for specialized nonroutine analytes that may be requested for a sampling campaign unless directed by the project leader. These analytes include stable isotopes and parameters for which microfiltration is requested. Field-duplicate results are compared with the associated sample results, and a relative percent difference is calculated. The acceptable threshold for relative percent differences is 20% for data greater than 5 times the reporting limit.
Field Trip Blanks	Field trip blanks accompany samples collected for volatile organic compound (VOC) analyses and are used to identify potential VOC contamination that may occur during sample handling, shipping, and storage or at the analytical laboratory. Field trip blanks consist of organic-free deionized water prepared by an independent off-site laboratory and are analyzed for VOCs only. A minimum of one trip blank is required for each cooler containing samples for VOC analyses. However, to facilitate data validation and verification, one trip blank may be included with each sample submitted for VOC analysis. During the secondary data validation process, field trip blanks are evaluated the same as field blanks, and any detected analytes are qualified in the samples associated with the trip blank. If any analytes are detected in the field trip blank, the result from the associated sample is qualified as undetected if the result is less than 5 times the amount of the concentration of the analyte found in the associated field blank. These results are given a validation reason code to describe why the data were qualified.
QA/QC Corrective Actions	Exceedances of target measures for each of the QA/QC sections summarized above triggers any number of potential corrective actions. Potential corrective actions are considered on a case-by-case basis and generally follow a graded approach. Corrective actions to be considered include the following. **Data review/focused validation:** A typical first step is to review field paperwork (e.g., chains-of-custody forms, sample collection logs) to ensure sample identifiers align with analytical results. Detailed data review and focused validation may also provide insights into improper use of sample preservatives and other similar errors in sample collection. **Reanalysis:** Review of QA/QC results sometimes detects problems that occur with sample analysis. In these instances, reanalysis of an aliquot of the original sample may be requested of the analytical laboratory, assuming no holding-time issues are associated with the sample aliquot. **Resampling:** If the QA/QC problem is not resolved using the approaches described above, resampling may be necessary. The decision to resample depends largely on the schedule for the subsequent sampling round. For instance, if a site is sampled quarterly, the sample collected for that round should suffice in filling the data gap. If the site is sampled annually, it may be necessary to resample after the discovery of a QA/QC concern if it would result in an important data gap. If an unacceptable QA/QC condition persists, then determining the source of the problem and making root-level corrections in a specific portion of the process will be initiated. For example, corrections or modifications may be made to an equipment decontamination process.

Appendix E

Protocols for Assessing the Performance of Deep Groundwater Monitoring Wells

E-1.0 OBJECTIVES AND SCOPE

This appendix establishes a "watch list" that identifies perched-intermediate and regional groundwater monitoring wells (hereafter referred to as the deep monitoring wells) for which the representativeness of water-quality data for certain constituents is questionable and describes the approaches used for tracking the performance of deep monitoring wells. These deep monitoring wells are sampled at Los Alamos National Laboratory (the Laboratory) under the Interim Facility-Wide Groundwater Monitoring Plan (the Interim Plan). Table E-1.0-1 lists the preliminary watch list of deep monitoring wells for the monitoring year Interim Plan, and describes the reason for this condition.

This appendix is organized as follows:

- Section E-1.0 summarizes the objectives of groundwater monitoring in deep wells.
- Section E-2.0 identifies deep monitoring wells that are purged less than 3 casing volumes (CVs).
- Section E-3.0 defines a protocol for assigning deep monitoring wells to watch lists with appropriate follow-up actions when questions arise concerning the reliability and representativeness of water-quality data from those wells.
- Section E-4.0 outlines an approach for conducting reliability assessments of deep monitoring wells to determine their capability for producing representative water-quality samples and to identify any potential effects of well installation, rehabilitation, or sampling protocol on data quality.

One well is also included on the watch list because of possible construction issues. In addition to wells described in Table E-1.0-1, the representativeness of new water quality samples from other wells is continually reviewed for possible addition to the watch list. The results from newly drilled wells and recently converted Westbay wells are part of this evaluation.

Inclusion of a well on the watch list is intended to be used as a general indicator of data quality and should not be construed as a definitive identification of data usability. The watch list is also dynamic insofar as it will be updated as conditions evolve. Changes will occur when additional water-quality data justify the removal or addition of wells from the list.

E-2.0 DEEP WELLS WITH LIMITED PURGE VOLUMES

Water that remains in a monitoring well for a period of time may not be representative of formation water because of physical, chemical, or biological changes that may occur as the water remains in contact with the well casing, dedicated sampling equipment, and the air space in the upper casing. This stagnant water may not represent formation water at the time of sampling. To ensure samples collected from a monitoring well are representative of formation water, stagnant water in the casing is generally removed (i.e., purged) from the sampling zone within the well before it is sampled. As prescribed in Standard Operating Procedure (SOP) EP-DIV-SOP-20032, Groundwater Sampling, the Laboratory's standard practice is to purge perched-intermediate and regional wells a minimum of 3 CVs plus the volume of the drop pipe and to continue purging until water-quality parameters stabilize. Once the parameters stabilize, it is presumed that all stagnant water has been removed from the well and that fresh formation water is available for sampling.

However, purging 3 CVs is not always possible or feasible, particularly in low-producing monitoring wells that purge dry at low pumping rates. SOP-EP-DIV-SOP-20032 allows deviation from the 3-CV purge requirement for such conditions. However, data users may want to be aware of deep monitoring wells at which the 3-CV purge requirement generally cannot be met to consider potential impacts for data reliability. Table E-1.0-1 lists deep well screens that cannot meet the 3-CV purge requirement and describes the reason for this condition.

E-3.0 WATCH LIST ASSIGNMENTS

This section discusses additional watch list criteria for deep monitoring wells in this Interim Plan for which the representativeness of water-quality data is questionable.

Data examined for the assessment includes field parameters monitored during purging before sample collection, field parameters associated with samples at the time of collection, major-ion concentrations, trace-metal concentrations, and detections of organic constituents. The assessments are based on site-specific geochemical criteria. The assessment may result in recommendations concerning the well's configuration, sampling protocols (such as purging volumes), extension or limitation of the analytical suites to be collected from the well screen, or caveats about data usability.

The specific objective of a reliability assessment is to determine the current reliability of a well (including its sampling system) as it relates to the water-quality data objectives of the specific monitoring network to which it is assigned. In general, reliability assessments may be conducted for a subset of the wells assigned to the watch list described in the preceding section or for deep wells within the context of a specific monitoring network.

The watch list presented in Table E-1.0-1 includes deep well screens for which field parameters monitored during purging consistently fail to meet stability criteria as well as deep well screens which show anomalous chemistry data suggesting groundwater in the screened interval may not be fully equilibrated following construction or rehabilitation. Table E-1.0-1 also provides the rationale for each listed well screen and lists recommended follow-up actions.

E-4.0 RELIABILITY ASSESSMENT PROTOCOL

The specific objective of a reliability assessment is to determine the current reliability of a well (including its sampling system) as it relates to the water-quality data objectives of the specific monitoring network to which it is assigned. In general, reliability assessments may be conducted for a subset of the wells assigned to the watch lists described in the preceding section or for deep wells within the context of a specific monitoring network.

Data examined for the assessment includes field parameters monitored during purging before sample collection, field parameters associated with samples at the time of collection, major-ion concentrations, trace-metal concentrations, and detections of organic constituents. The assessments are based on site-specific geochemical criteria and generally focus on data obtained for the four most recent sampling events. The assessment may result in recommendations concerning the well's configuration, sampling protocols (such as purging volumes), extension or limitation of the analytical suites to be collected from the well screen, or caveats about data usability.

Field parameters. Time-series data for field parameters monitored during purging before sample collection are examined for attainment of stable values by the end of purging. Stabilization criteria are prescribed in SOP EP-DIV-SOP-20032, Groundwater Sampling, and are derived from the stabilization criteria recommended by the U.S. Environmental Protection Agency (EPA) (Yeskis and Zavala 2002, 204429) and from the Compliance Order on Consent. The most sensitive indicator parameters are dissolved oxygen (DO) and turbidity. Other parameters such as water temperature, specific conductance, pH, and oxidation-reduction potential (ORP) are also monitored but are considered less sensitive indicators of formation water.

Field parameters are examined for stability during individual sampling events, and trends are compared for a sequence of events at the same location. Final field-parameter values associated with the sample at the time of collection are compared with the range observed in background locations for perched-intermediate groundwater and regional groundwater.

Inorganic analytes. Analytical data for common inorganic ions and trace metals are examined for stability and for excursions from background concentrations as follows:

- trends in concentrations of key indicators for the presence of the specific materials used in the screened interval, such as sodium, sulfate, and total organic carbon (TOC);
- trends in relative concentrations of major ions; and
- comparison of concentrations for major ions and selected trace metals with lower and upper concentration ranges for plateau-scale and site-specific background groundwater, as described below.

Concentration trends may be depicted using time-series plots, standard trilinear diagrams, or modified Schoeller plots.

- Trilinear diagrams, also called Piper plots, show major ions as percentages of milliequivalents (meq) in two base triangles. The total cations and the total anions are set equal to 100%, and the data points in the two triangles are projected onto an adjacent grid. The main purpose of the Piper diagram is to show clustering of data points to indicate samples that have similar compositions.
- Schoeller plots are semilogarithmic diagrams originally developed to represent major ion analyses in meq/L and to demonstrate different hydrochemical water types on the same diagram. This type of graphical representation has the advantage that, unlike the trilinear diagrams, actual sample concentrations are displayed and compared. The modified Schoeller plot used for the reliability assessment represents analyses as mg/L or µg/L to avoid the need to make assumptions about ion speciation, which may be particularly problematic for trace metals.

Organic analytes. Detections of volatile organic compounds (VOCs) and semivolatile organic compounds are compiled for examination of temporal trends and comparison against area-specific chemicals of potential concern.

Field documentation. As appropriate, field notes, groundwater sampling logs, and sample collection logs for each sampling event are also examined for observations about unusual odors, colors, or other indications of impacted water samples.

Plateau-scale background values for assessment. For naturally occurring analytes, statistical summaries of water-quality data for background groundwater locations establish a range of concentrations against which data from the assessed wells are compared for a preliminary assessment step. Lower and upper bounds of plateau-scale background ranges used in the reliability assessments are derived primarily from statistical tables in the most recent New Mexico Environment Department– (NMED-) approved Groundwater Background Investigation Report.

Site-specific background values for assessment. Representativeness may be assessed with greater specificity by comparing analytical concentrations with those in groundwater from other deep wells in sufficiently similar hydrogeologic settings and at which effects from downhole materials or local contaminants are known to be absent or negligible. The approach allows for the inclusion of wells not hydraulically upgradient of the well being assessed. This is similar to the interwell comparison approach described in sections 5.2.4 and 6.3.2 of the EPA guidance document, “Statistical Analysis of

Groundwater Monitoring Data at RCRA Facilities" ("Unified Guidance") (EPA 2009, 110369). The development and use of site-specific background values is illustrated in the "Reliability Assessment of Well R-47i" (LANL 2011, 201564).

Under some conditions, some or all of the constituents measured in the sample collected at the end of development may also be appropriate to use as the basis of site-specific background values or to augment the background dataset compiled for the interwell comparison. This is similar to the intrawell comparison approach described in sections 5.2.4 and 6.3.2 of EPA's Unified Guidance (EPA 2009, 110369).

E-5.0 REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

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

EPA (U.S. Environmental Protection Agency), March 2009. "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance," EPA 530-R-09-007, Office of Resource Conservation and Recovery, Washington, D.C. (EPA 2009, 110369)

LANL (Los Alamos National Laboratory), March 2011. "Reliability Assessment for Well R-47i," Los Alamos National Laboratory document LA-UR-11-0933, Los Alamos, New Mexico. (LANL 2011, 201564)

LANL (Los Alamos National Laboratory), March 2012. "Technical Area 16 Well Network Evaluation and Recommendations," Los Alamos National Laboratory document LA-UR-12-1082, Los Alamos, New Mexico. (LANL 2012, 213573)

NMED (New Mexico Environment Department), May 10, 2010. "Replacement of the Multi-Screened Monitoring Well R-25," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2010, 109696)

Yeskis, D., and B. Zavala, May 2002. "Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers," a *Ground Water Forum Issue Paper*, EPA 542-S-02-001, Office of Solid Waste and Emergency Response, Washington, D.C. (Yeskis and Zavala 2002, 204429)

Table E-1.0-1
Preliminary Watch List of Deep Monitoring Wells

Location	Monitoring Group	Watch List Rationale	Description of Condition	Action
Limited Water Volume				
MCOI-4	Cr Investigation	Limited water volume	Well no longer yields sufficient water for sampling.	Monitor water levels only.
SCI-1	Cr Investigation	Limited water volume	Low volume of water. Field parameters do not stabilize.	Collect prioritized analytical suite.
R-26 PZ-2	TA-16 260	Limited water volume	Sampled with bailer, with insufficient water available to bail more than 1 CV. High turbidity. NMED requested replacing this piezometer with a monitoring well (LANL 2012, 213573).	Bail dry, allow for recharge, and collect a prioritized analytical suite the same day. Terminate sampling in R-26 PZ-2 after piezometer is replaced.
R-40 S1	TA-54	Limited water volume	Extremely low yield. Approximately 2 wk required to recover water levels after 1 CV purge.	Sample for VOCs and low-level tritium.
Wells with Westbay No-Purge Sampling Systems				
R-5 (S1,S2,S3,S4)	TA-21	Westbay sampling system	No purge sampling	Sample the screens planned for retention (S2, S3) biennially until Westbay well has been reconfigured. Discontinue sampling at R-5 S1 and R-5 S2.
R-7 (S1,S2,S3)	TA-21	Westbay sampling system	S1 and S2 are dry; S3 is impacted by drilling products and is not sampled.	Monitor water levels only until Westbay well has been reconfigured.
R-8 (S1, S2)	TA-21	Westbay sampling system	No purge sampling	Sample biennially until Westbay well has been reconfigured.
R-9i (S1, S2)	TA-21	Westbay sampling system	No purge sampling	Sample the screen planned for retention (S1) biennially until Westbay well has been reconfigured. Discontinue sampling at R-9i S2.
R-25 (S1, S2, S4, S5, S6, S7)	TA-16-260	Westbay sampling system	NMED has determined that R-25 must be replaced with a new regional monitoring well (NMED 2010, 109696).	Discontinue sampling at R-25.
R-19 (S2, S3, S4)	General Surveillance	Westbay sampling system	No purge sampling	Sample biennially until Westbay well has been reconfigured.

Table E-1.0-1 (continued)

Location	Monitoring Group	Watch List Rationale	Description of Condition	Action
Water-Quality				
R-31 (S4, S5)	General Surveillance	Westbay sampling system	No purge sampling	Sample biennially until Westbay well has been reconfigured.
R-43 S2	Cr Investigation	Field parameters monitored during previous extended purging events showed some indication that DO levels were continuing to increase although stability criteria were met earlier in the purge.	Variability in DO levels may be associated with mixing of groundwater with varying geochemical signature originating from different strata accessed during purging.	Conduct an all-day purge study with time-series samples to design a purging sequence that will produce representative samples.
R-61 S1	Cr Investigation	Phosphate levels associated with chemicals used during rehabilitation of the well screen conducted in fall 2012 are elevated above background. Residual drilling lubricants associated with drilling may be present around the borehole near the well screen.	Some water-quality parameters are still affected by residual conditions in the aquifer around R-61. However, key contaminants Cr, NO_3, and ClO_4 in samples from well R-61 S1 are representative of the plume at the R-61 location.	Details of key actions will be presented to NMED in a separate recommendation.
R-61 S2	Cr Investigation	High iron and manganese; reducing conditions in vicinity of well screen. Phosphate levels continue to remain elevated above background. Residual lubricants associated with drilling may be present around the borehole near the well screen.	Evidence indicates residual drilling lubricants remain present around the well screen and possibly around the borehole above the screened interval.	Details of key actions will be presented to NMED in a separate recommendation.

Table E-1.0-1 (continued)

Location	Monitoring Group	Watch List Rationale	Description of Condition	Action
R-62	Cr Investigation	Field parameters monitored during prior extended purging events showed some indication that DO levels were continuing to increase although stability criteria were met earlier in the purge. Additionally, the chromium concentrations vary with purge volumes.	Historical data from sampling conducted under different purge volumes shows variations in chromium concentrations. One conceptual model for the variations in Cr concentration assumes aquifer heterogeneity as the cause.	An extended aquifer test of approximately 45 d is planned for R-62 in fiscal year 2014. Geochemical sampling and detailed measurement of field parameters will be conducted as part of the aquifer test. These data will be used to assess whether current purging sequence is adequate to collect representative samples.
CdV-R-37-2 S2	TA-16-260	High iron and manganese; reducing conditions in vicinity of well screen.	Initial low DO concentrations during purging, along with relatively high iron and manganese, suggest reducing conditions near well screen.	Prepare a work plan for submittal to NMED to address the condition in S2. Submit a work plan to NMED by June 12, 2014. Monitor water levels only until CdV-R-37-2 S2 has been redeveloped.
R-40 Si (formerly R-40i)	TA-54	Screen showed drilling foam and reducing conditions in the past, with high iron and manganese	Recent data suggest improving trends, with increasing DO and decreasing iron and manganese concentrations.	Sample for low-level tritium, general inorganics, and metals only.
R-40 S1	TA-54	High iron and manganese	Residual drilling effects are evident; the yield is extremely low.	Sample for low-level tritium and VOCs.
R-54 S1	TA-54	High iron and manganese; reducing conditions in vicinity of well screen.	Field parameters vary from regional aquifer background values until considerable purging has been conducted. Initial low DO concentrations during purging, along with relatively high iron and manganese, suggest reducing conditions near well screen.	Details of key actions will be presented to NMED in a separate recommendation.
R-55i	TA-54	High iron and manganese	Iron and manganese concentrations are elevated relative to background. Sulfate, nitrate, chloride, and magnesium are also elevated. DO values are low but are improving with extended purging.	Details of key actions will be presented to NMED in a separate recommendation.

Table E-1.0-1 (continued)

Location	Monitoring Group	Watch List Rationale	Description of Condition	Action
R-12 S1	General Surveillance	Screen shows reducing conditions, as indicated by low DO and ORP.	Well screen shows low DO and ORP during purging.	Sample for low-level tritium only.
R-12 S2	General Surveillance	Sample data suggest the possibility of reducing conditions.	Manganese concentrations are elevated; dissolved chromium concentrations are low, and DO is low.	Sample R-12 S2 annually rather than biennially with the intent to reduce the potential for stagnation around the well screen between sampling events. Conduct an all-day purge study with time-series samples to design a purging sequence that will produce representative samples.
R-16 S4	General Surveillance	Screen shows reducing conditions, as indicated by potentially low, but stable, DO, even after extended purging.	Concentrations of phosphate above background persist in samples from R-12 S4.	Conduct an all-day purge study with time-series samples to design a purging sequence that will produce representative samples.

Appendix F

Geologic Cross-Sections

This appendix presents six east-west and three north-south geologic cross-sections that show the relationship of sampling locations in this Interim Facility-Wide Groundwater Monitoring Plan (the Interim Plan) to the hydrogeologic setting of the Los Alamos National Laboratory (LANL or the Laboratory) site. Figure F-1 is an overview of the cross-section locations.

The east-west cross-sections follow the stream channel in the following canyons:

- A–A' Water Canyon/Cañon de Valle (Figure F-2)
- B–B' Pajarito Canyon (Figure F-3)
- C–C' Mortandad Canyon (Figure F-4)
- D–D' Sandia Canyon (Figure F-5)
- E–E' Los Alamos Canyon (Figure F-6)
- F–F' Pueblo Canyon (Figure F-7)

The north-south cross-sections are distributed across the Laboratory site and include the following:

- G–G' in the eastern part of the Laboratory (Figure F-8)
- H–H' in the central part of the Laboratory (Figure F-9)
- I–I' in the western part of the Laboratory (Figure F-10)

The cross-sections are based on the three-dimensional geologic framework model (GFM) for the Laboratory that was developed using borehole and outcrop map data. The geologic model used in this report is an updated version of the Laboratory's fiscal year (FY) 2009 three-dimensional geologic framework model (Cole et al. 2010, 106101). The GFM was developed in 2008 using the geospatial modeling software EarthVision, developed by Dynamic Graphics, Inc. The updated GFM model is designated WC11a and incorporates new regional and perched-intermediate wells installed since 2009, reinterpretation of stratigraphic contacts in a few existing well logs, and the addition of shallow Technical Area 21 data and data that were not incorporated into the FY2009 model. The cross-sections were generated using the updated WC11a model to best represent the current conceptual understanding of the Laboratory's hydrogeology.

The 2012 model update is based on updated database with subsurface geological information obtained from drill holes installed since the Cole et al. (2010, 106101) model update and uses the latest water table map published in early 2012.

The cross-sections show sampling locations that fall within a 1500-ft buffer on both sides of the respective transect lines. Perched-intermediate and regional monitoring wells are shown as vertical lines, and the locations of well screens are shown as boxes presented to actual scale. Wells located within 500 ft of transects are indicated by solid lines, and wells offset more than 500 ft are demarcated by a dashed pattern. Because of their offset from the transect, some well screens in the outer portions of the buffer zones may not appear to plot within the proper geologic unit because of dipping geologic contacts. The relative positions of alluvial wells, surface-water sampling stations, and springs located along the transects are arrayed horizontally above the cross-sections to show the spatial relationship between the shallow, intermediate, and deep water-quality monitoring network and the GFM. The cross-sections are based on the 2012 model update described above and show some locations that have been removed from the 2015 Interim Plan because they are no longer sampled (e.g., R-25).

REFERENCE

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

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

Cole, G., D. Coblentz, E. Jacobs, D. Koning, D. Broxton, D. Vaniman, F. Goff, and G. WoldeGabriel, April 2010. "The 2009 Three-Dimensional Geologic Models of the Los Alamos National Laboratory Site, Southern Española Basin, and Española Basin," Los Alamos National Laboratory document LA-UR-09-3701, Los Alamos, New Mexico. (Cole et al. 2010, 106101)

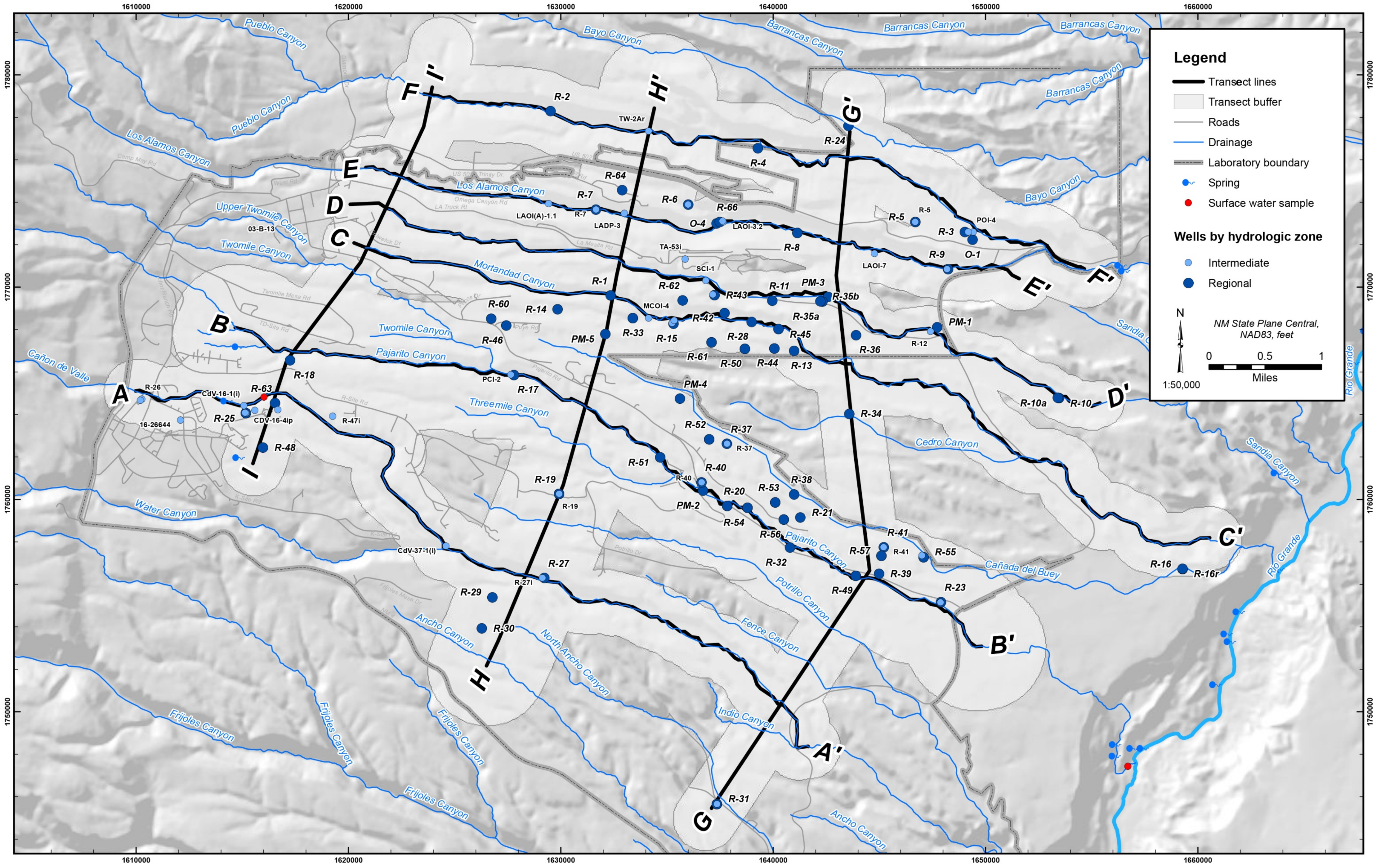
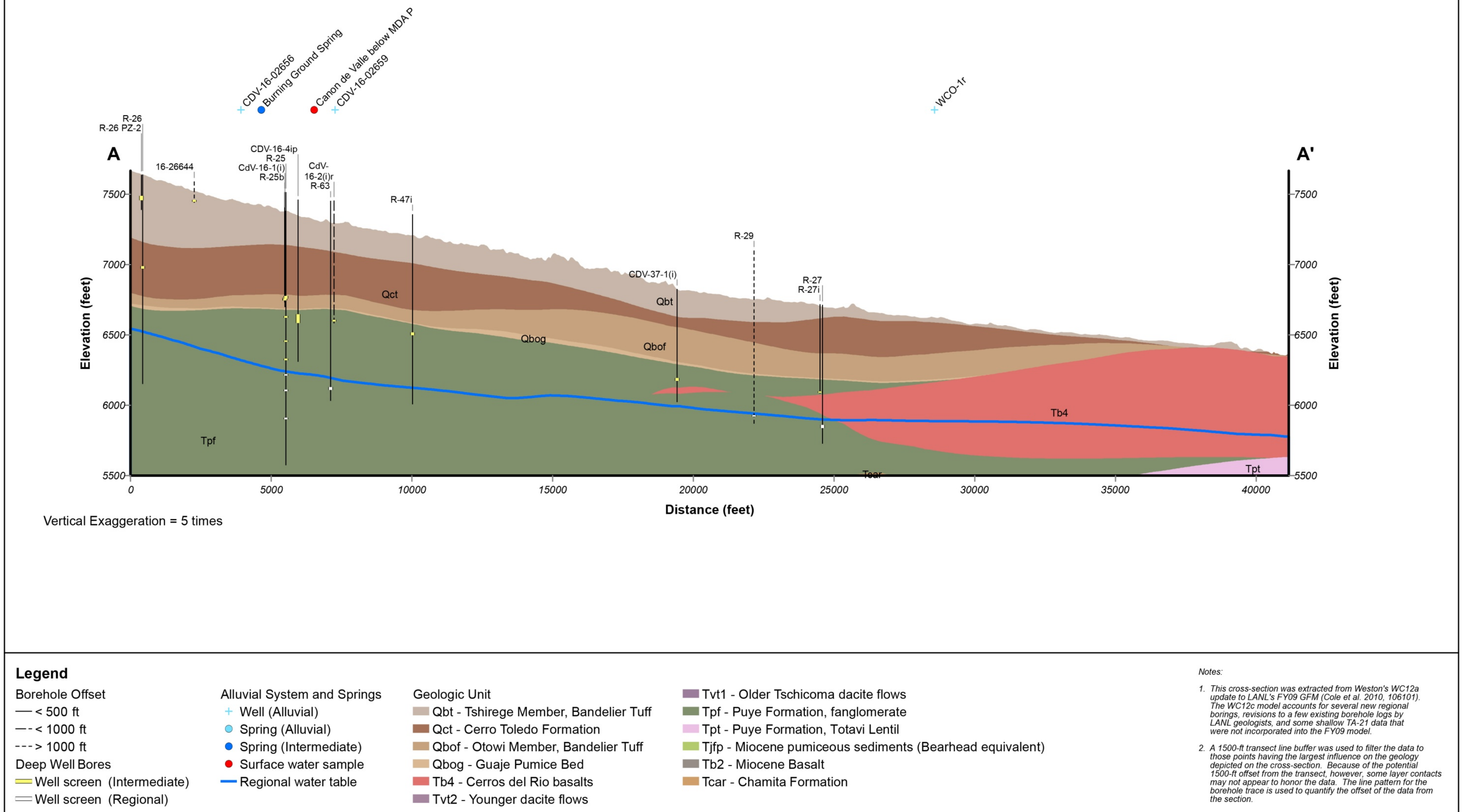


Figure F-1 Transect location map

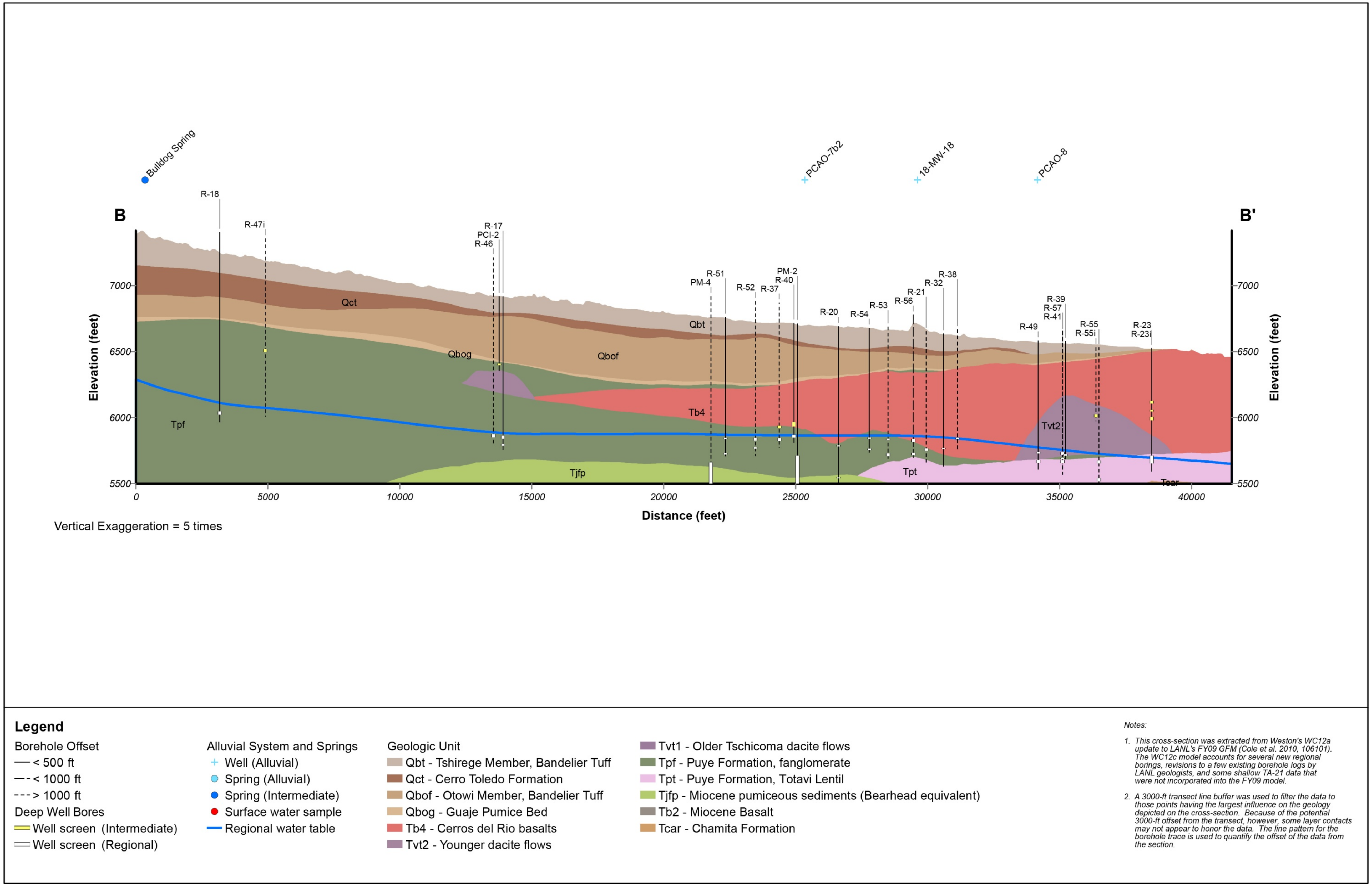


Notes:

1. *This cross-section was extracted from Weston's WC12a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC12c model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 data that were not incorporated into the FY09 model.*

2. *A 1500-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1500-ft offset from the transect, however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quantify the offset of the data from the section.*

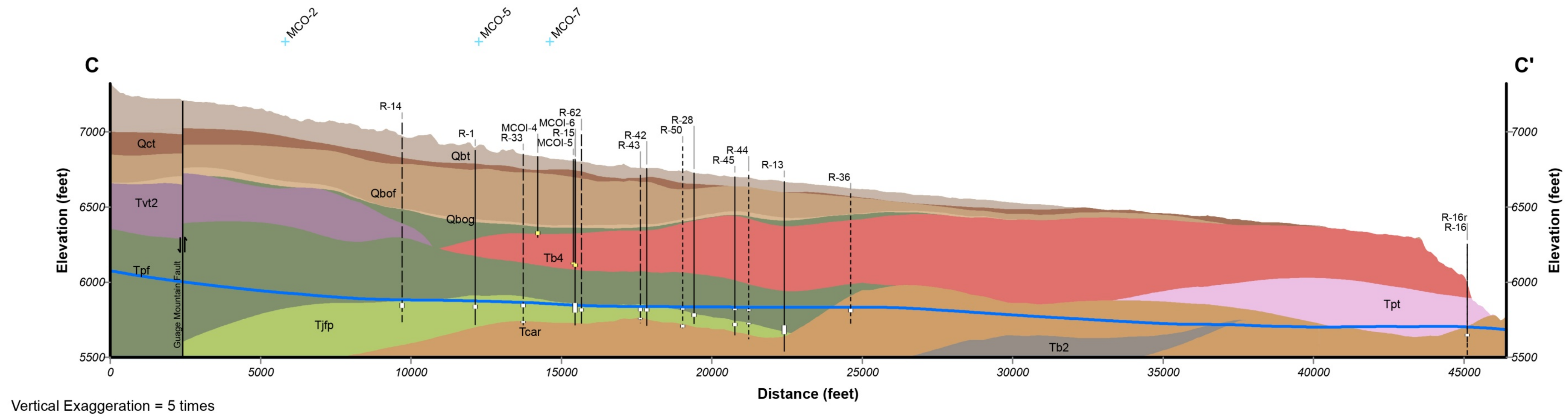
Figure F-2 Cross-section A–A′ Water Canyon/Cañon de Valle



Notes:

1. *This cross-section was extracted from Weston's WC12a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC12c model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 data that were not incorporated into the FY09 model.*
2. *A 3000-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 3000-ft offset from the transect, however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quantify the offset of the data from the section.*

Figure F-3 Cross-section B–B′ Pajarito Canyon



Vertical Exaggeration = 5 times

Legend

Borehole Offset
— < 500 ft
—-- < 1000 ft
---> 1000 ft
Deep Well Bores
═ Well screen (Intermediate)
═ Well screen (Regional)

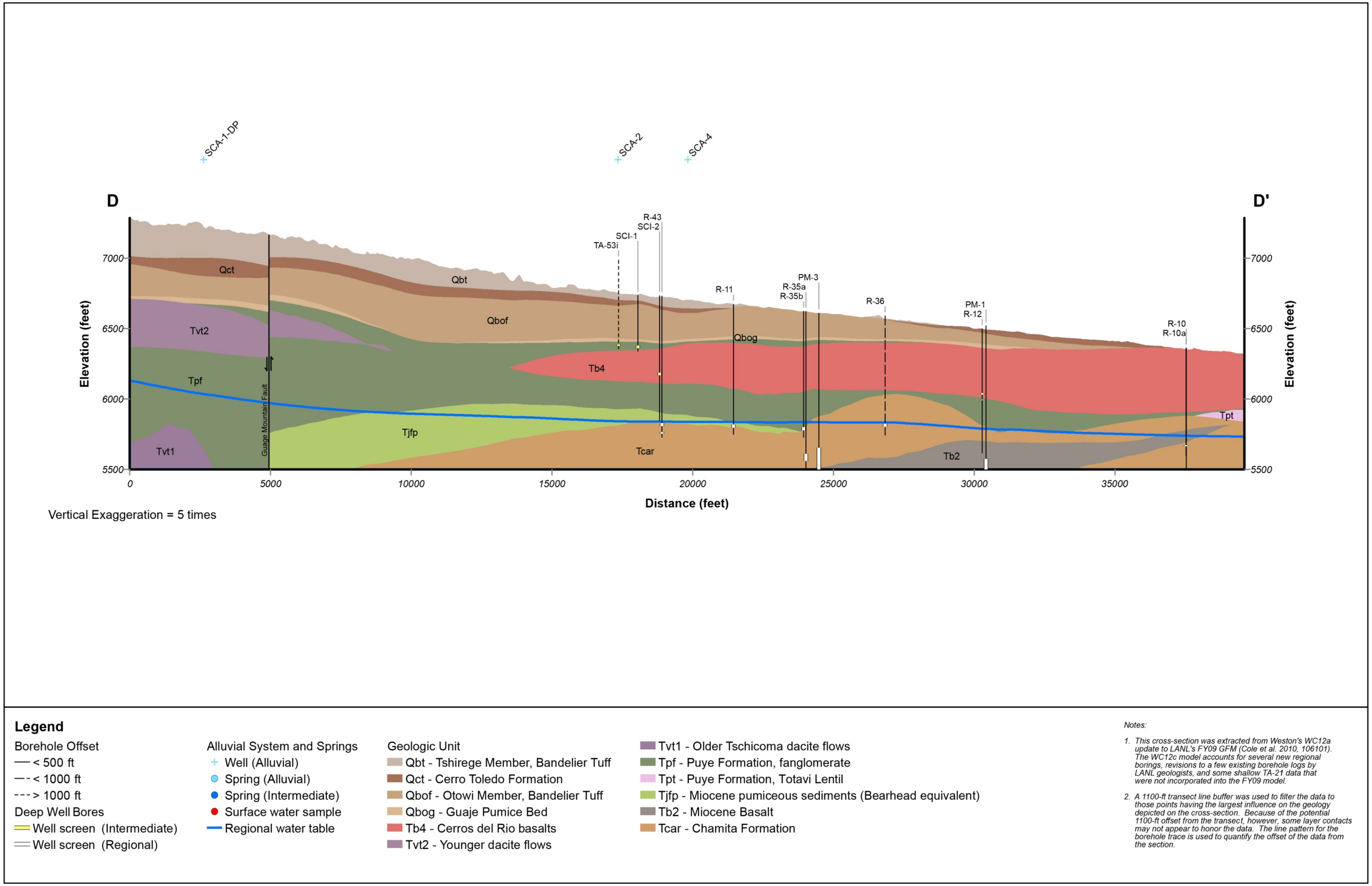
Alluvial System and Springs
+ Well (Alluvial)
● Spring (Alluvial)
● Spring (Intermediate)
● Surface water sample
— Regional water table

Geologic Unit
■ Qbt - Tshirege Member, Bandelier Tuff
■ Qct - Cerro Toledo Formation
■ Qbof - Otowi Member, Bandelier Tuff
■ Qbog - Guaje Pumice Bed
■ Tb4 - Cerros del Rio basalts
■ Tvt2 - Younger dacite flows
■ Tvt1 - Older Tschicoma dacite flows
■ Tpf - Puye Formation, fanglomerate
■ Tpt - Puye Formation, Totavi Lentil
■ Tjfp - Miocene pumiceous sediments (Bearhead equivalent)
■ Tb2 - Miocene Basalt
■ Tcar - Chamita Formation

Notes:

1. *This cross-section was extracted from Weston's WC12a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC12c model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 data that were not incorporated into the FY09 model.*
2. *A 1500-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1500-ft offset from the transect, however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quantify the offset of the data from the section.*

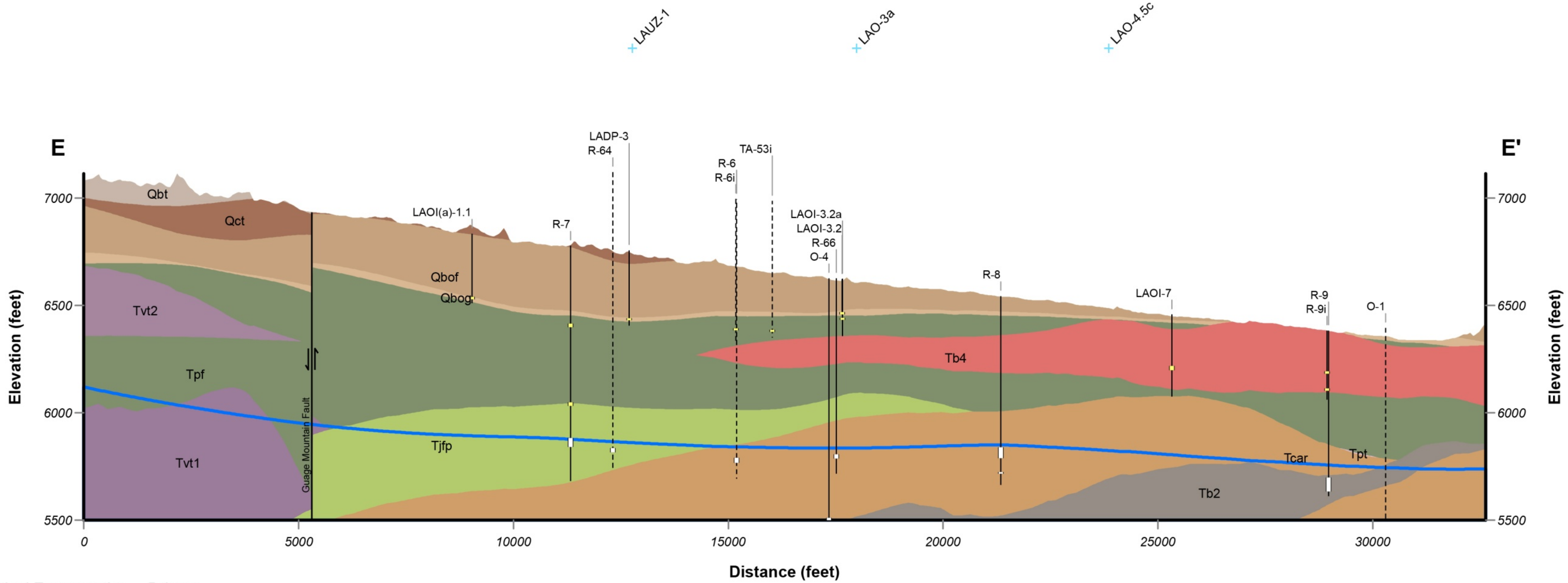
Figure F-4 Cross-section C–C′ Mortandad Canyon



Notes:

1. *This cross-section was extracted from Weston's WC12a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC12c model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 data that were not incorporated into the FY09 model.*
2. *A 1100-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1100-ft offset from the transect, however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quantify the offset of the data from the section.*

Figure F-5 Cross-section D–D′ Sandia Canyon



Vertical Exaggeration = 5 times

Legend

Borehole Offset
- —— < 500 ft
- —·— < 1000 ft
- - - - > 1000 ft

Deep Well Bores
- 🟨 Well screen (Intermediate)
- ⬜ Well screen (Regional)

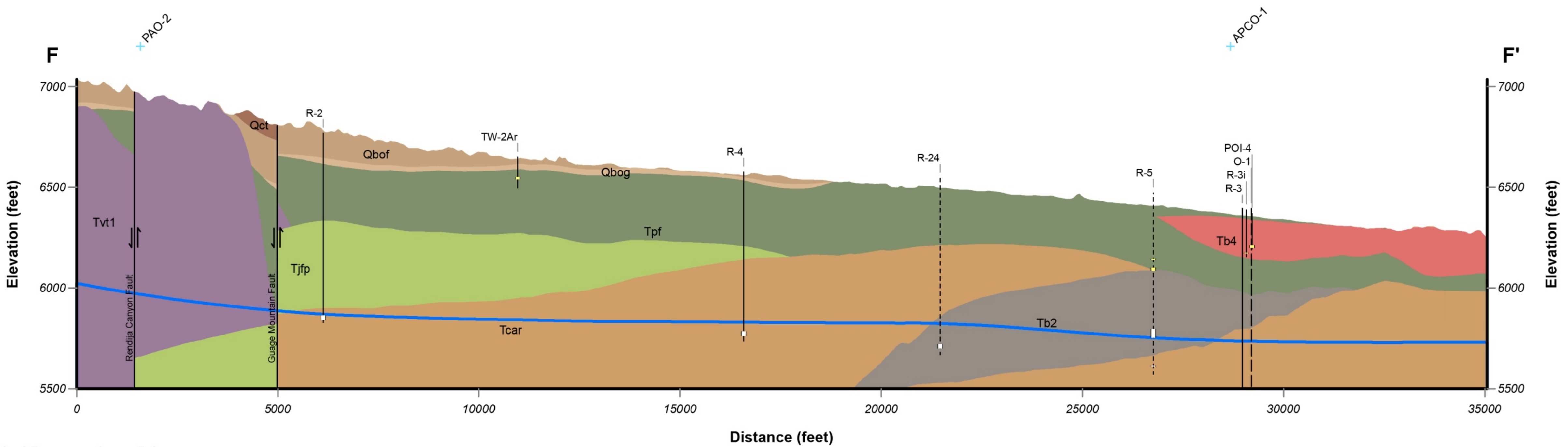
Alluvial System and Springs
- + Well (Alluvial)
- ● Spring (Alluvial)
- ● Spring (Intermediate)
- ● Surface water sample
- —— Regional water table

Geologic Unit
- ■ Qbt - Tshirege Member, Bandelier Tuff
- ■ Qct - Cerro Toledo Formation
- ■ Qbof - Otowi Member, Bandelier Tuff
- ■ Qbog - Guaje Pumice Bed
- 🟥 Tb4 - Cerros del Rio basalts
- 🟪 Tvt2 - Younger dacite flows
- 🟪 Tvt1 - Older Tschicoma dacite flows
- 🟩 Tpf - Puye Formation, fanglomerate
- ■ Tpt - Puye Formation, Totavi Lentil
- 🟩 Tjfp - Miocene pumiceous sediments (Bearhead equivalent)
- ■ Tb2 - Miocene Basalt
- 🟧 Tcar - Chamita Formation

Notes:

1. *This cross-section was extracted from Weston's WC12a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC12c model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 data that were not incorporated into the FY09 model.*
2. *A 1500-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1500-ft offset from the transect, however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quantify the offset of the data from the section.*

Figure F-6 **Cross-section E–E′ Los Alamos Canyon**



Vertical Exaggeration = 5 times

Legend

Borehole Offset
— < 500 ft
—·- < 1000 ft
- - - > 1000 ft
Deep Well Bores
▭ Well screen (Intermediate)
▭ Well screen (Regional)

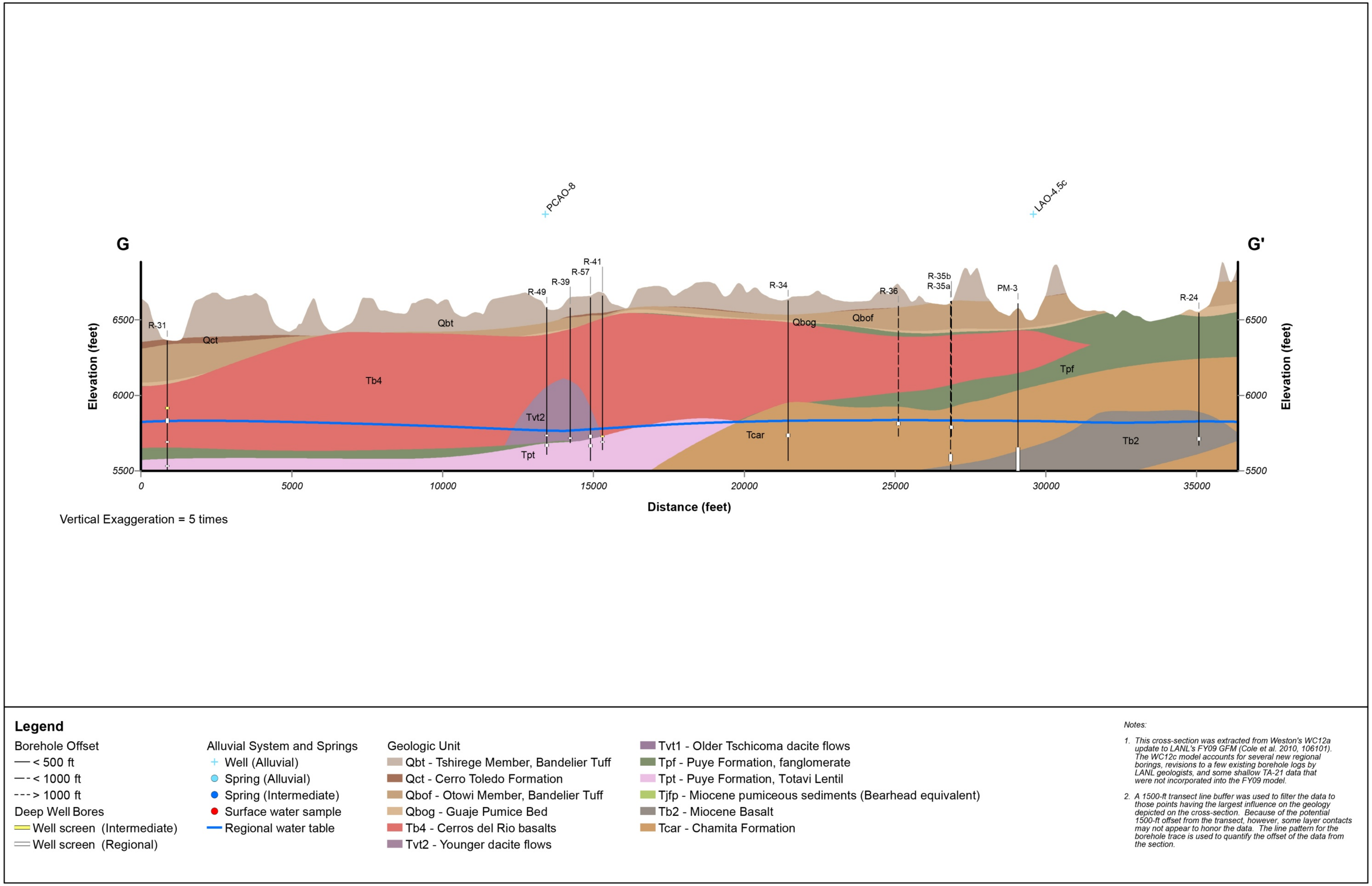
Alluvial System and Springs
+ Well (Alluvial)
● Spring (Alluvial)
● Spring (Intermediate)
● Surface water sample
— Regional water table

Geologic Unit
■ Qbt - Tshirege Member, Bandelier Tuff
■ Qct - Cerro Toledo Formation
■ Qbof - Otowi Member, Bandelier Tuff
■ Qbog - Guaje Pumice Bed
■ Tb4 - Cerros del Rio basalts
■ Tvt2 - Younger dacite flows
■ Tvt1 - Older Tschicoma dacite flows
■ Tpf - Puye Formation, fanglomerate
■ Tpt - Puye Formation, Totavi Lentil
■ Tjfp - Miocene pumiceous sediments (Bearhead equivalent)
■ Tb2 - Miocene Basalt
■ Tcar - Chamita Formation

Notes:

1. *This cross-section was extracted from Weston's WC12a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC12c model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 data that were not incorporated into the FY09 model.*
2. *A 1800-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1800-ft offset from the transect, however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quantify the offset of the data from the section.*

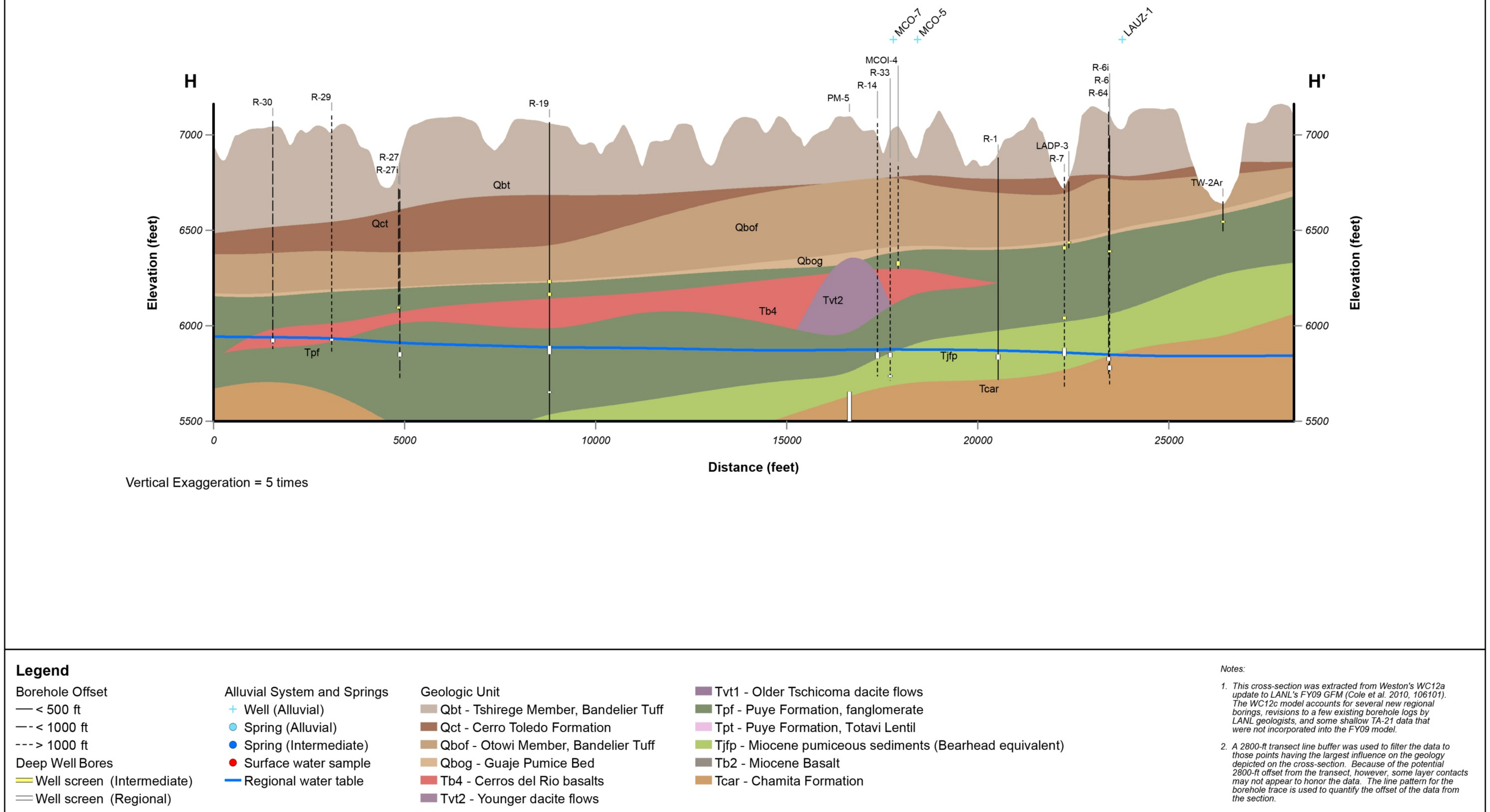
Figure F-7 Cross-section F–F′ Pueblo Canyon



Notes:

1. *This cross-section was extracted from Weston's WC12a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC12c model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 data that were not incorporated into the FY09 model.*
2. *A 1500-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1500-ft offset from the transect, however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quantify the offset of the data from the section.*

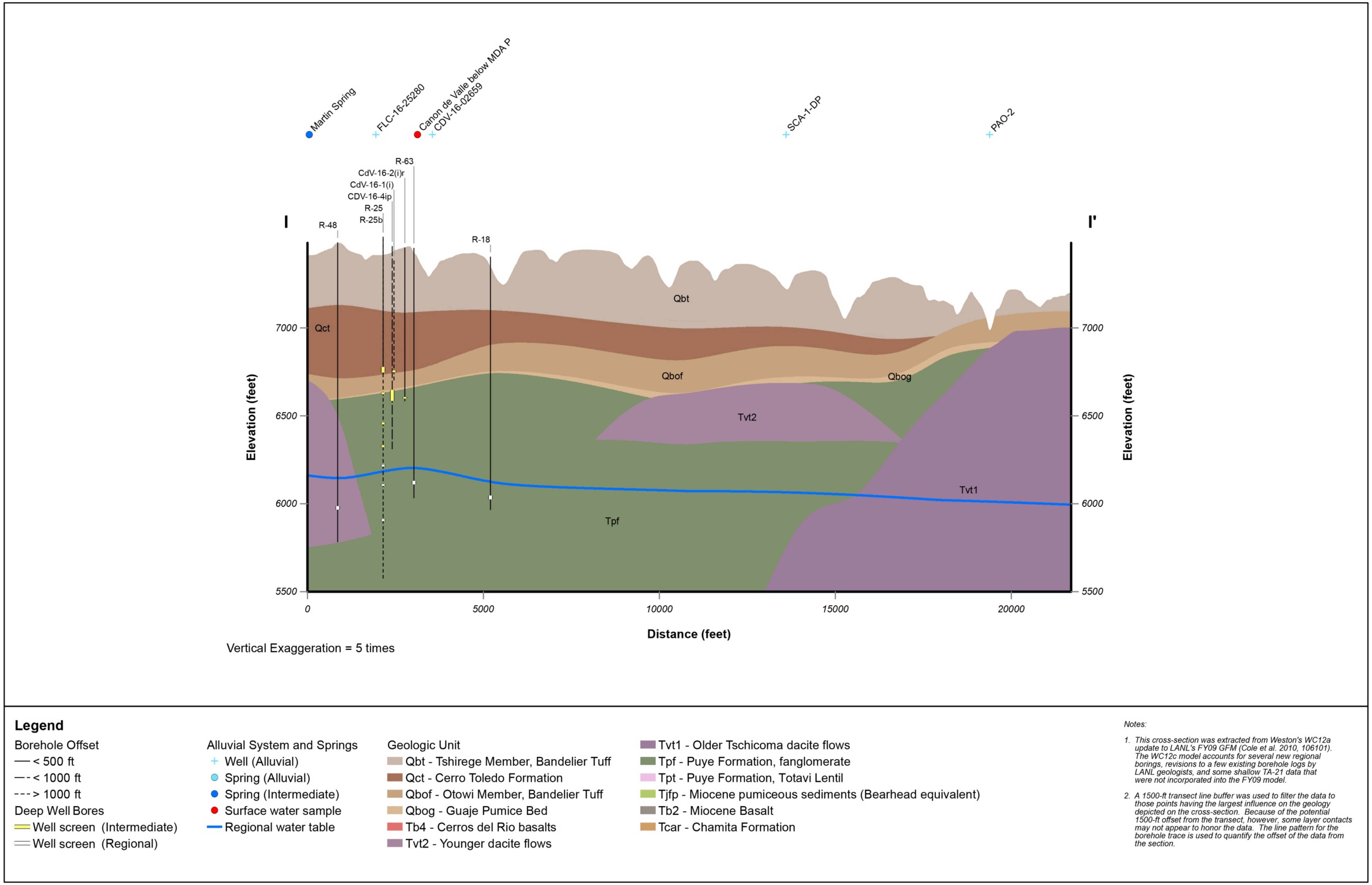
Figure F-8 Cross-section G–G′ in the eastern part of the Laboratory (north-south)



Notes:

1. *This cross-section was extracted from Weston's WC12a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC12c model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 data that were not incorporated into the FY09 model.*
2. *A 2800-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 2800-ft offset from the transect, however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quantify the offset of the data from the section.*

Figure F-9 Cross-section H–H′ in the central part of the Laboratory (north-south)



Notes:

1. *This cross-section was extracted from Weston's WC12a update to LANL's FY09 GFM (Cole et al. 2010, 106101). The WC12c model accounts for several new regional borings, revisions to a few existing borehole logs by LANL geologists, and some shallow TA-21 data that were not incorporated into the FY09 model.*
2. *A 1500-ft transect line buffer was used to filter the data to those points having the largest influence on the geology depicted on the cross-section. Because of the potential 1500-ft offset from the transect, however, some layer contacts may not appear to honor the data. The line pattern for the borehole trace is used to quantify the offset of the data from the section.*

Figure F-10 Cross-section I–I′ in the western part of the Laboratory (north-south)