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Date: AUG 30 2012
Refer To: EP2012-0190

John Kieling, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Submittal of the Response to the Approval with Modifications for the 2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1, and the Interim Facility-Wide Groundwater Monitoring Plan for the 2013 Monitoring Year, October 2012–September 2013

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the Response to the Approval with Modifications for the 2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1, and the Interim Facility-Wide Groundwater Monitoring Plan for the 2013 Monitoring Year, October 2012–September 2013.

If you have any questions, please contact Steve Paris at (505) 606-0915 (smparis@lanl.gov) or Hai Shen at (505) 665-5046 (hai.shen@nnsa.doe.gov).

Sincerely,

Michael J. Graham, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

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

MG/PM/CD/SP:vt

Enclosures: Two hard copies with electronic files:

(1) Response to the Approval with Modifications for the 2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1 (LA-UR-12-23856)

(2) Interim Facility-Wide Groundwater Monitoring Plan for the 2013 Monitoring Year, October 2012–September 2013 (LA-UR-12-21331)

Cy: (w/enc.)
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Tim Goering, EP-ET, MS M992 (w/ MS Word files on CD) (8 extra copies)
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Response to the Approval with Modifications for the
2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1,
Los Alamos National Laboratory, EPA ID No. NM0890010515, HWB-LANL-11-058,
Dated May 21, 2012

INTRODUCTION

To facilitate review of this response, the New Mexico Environment Department's (NMED's) comments are included verbatim. Los Alamos National Laboratory's (LANL's or the Laboratory's) responses follow each NMED comment. This response contains data on radioactive materials, including source, special nuclear, and byproduct material. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with U.S. Department of Energy (DOE) policy.

PART I: MODIFICATIONS

The following modifications must be implemented as part of the Approved Revised Plan.

NMED Comment

1. Table 2.4-1, Interim Monitoring Plan for TA-21 Monitoring Group, pages 52-55:

Make the following changes to the proposed sampling locations, analytical suites and sampling frequencies:

1. *Add biennial (once every two years) sampling for metals, VOCs, and SVOCs at wells LADP-3, LAOI(a)-1.1, and R-6.*
2. *Add annual sampling for metals and biennial sampling for VOCs and SVOCs at wells LAOI-3.2 and LAOI-3.2(a).*
3. *Add biennial sampling for metals at well R-6i.*
4. *Add biennial sampling for metals and annual sampling for VOCs and SVOCs at well TA-53i.*
5. *Add quinquennial (once every five years) sampling for high explosives, PCBs, and dioxins/furans at all wells. The quinquennial sampling may be changed to sexennial (once every six years) for sampling locations that are sampled biennially or triennially for all other constituents.*
6. *For characterization sampling, reduce the sampling frequency for high explosives to annual and add annual sampling for PCBs and dioxins/furans.*
7. *Move wells LAOI-7, R-8 Screen 1 and Screen 2 (S1 and S2), R-9, and R-9i S1 and S2 from General Surveillance Monitoring to the TA-21 Monitoring Group. Add biennial sampling for VOCs and SVOCs at wells LAOI-7 and R-9, annual sampling for tritium at well R-9, and annual sampling for low-level tritium at well R-8 S1 and S2.*

LANL Response

1.1. The Laboratory agrees to sample wells LADP-3, LAOI(a)-1.1, and R-6 biennially for metals, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs).

1.2. The Laboratory agrees to sample wells LAOI-3.2 and LAOI-3.2(a) annually for metals and biennially for VOCs and SVOCs.

1.3. The Laboratory agrees to sample well R-6i biennially for metals.

1.4. The Laboratory agrees to sample well TA-53i annually for VOCs and SVOCs and biennially for metals.

1.5. The Laboratory has evaluated NMED's request to include high explosives (HE), polychlorinated biphenyls (PCBs), and dioxins/furans at the Technical Area 21 (TA-21) monitoring group wells and finds no basis for including these constituents. HE is not a contaminant at TA-21 or in the Los Alamos/Pueblo watershed, and PCBs and dioxins/furans are strongly adsorptive to soils and are highly unlikely to migrate to groundwater in the vicinity of the TA-21 monitoring group. All TA-21 monitoring group wells drilled since 1998 have been sampled numerous times for HE, PCBs, and dioxins/furans, and the record of nondetects for these constituents supports the conceptual model that these constituents are not likely to migrate to groundwater even if they may be present in surface media in the watershed.

1.6. The Laboratory agrees to sample annually for HE, PCBs, and dioxins/furans at new wells in the TA-21 monitoring group undergoing characterization sampling.

1.7. The Laboratory has reassigned wells LAOI-7, R-8 (S1 and S2), R-9, and R-9i (S1 and S2) from the General Surveillance monitoring group to the TA-21 monitoring group in the 2013 monitoring year plan. The Laboratory also agrees to sample wells LAOI-7 and R-9 biennially for VOCs and SVOCs. Well R-9 will be sampled annually for tritium, and R-8 (S1 and S2) will be sampled annually for low-level tritium.

NMED Comment

2. Table 3.4-1, Interim Monitoring Plan for Chromium Investigation Monitoring Group, pages 56-61:

Make the following changes to the proposed analytical suites and sampling frequencies:

1. *Add biennial sampling for VOCs and SVOCs at wells SCI-1, SCI-2, R-11, R-35a, R-35b, R-43 S1 and S2, R-1, R-13, R-15, R-28, R-42, R-44 S1 and S2, R-45 S1 and S2, and R-50 S1 and S2.*
2. *Increase the sampling frequency from annual to semiannual for metals and general inorganics at wells R-35a, R-35b, R-36, and R-13.*
3. *Add annual sampling for VOCs and SVOCs at well R-36.*
4. *Increase the sampling frequency from annual to semiannual for SVOCs at wells MCOI-4, MCOI-5, and MCOI-6.*

5. *Increase the sampling frequency from annual to semiannual for metals, general inorganics, and perchlorate at well MCOI-5.*

6. *Add quinquennial sampling for high explosives, PCBs, and dioxins/furans at all wells. The quinquennial sampling may be changed to sexennial for sampling locations that are sampled biennially or triennially for all other constituents.*

7. *For characterization sampling, reduce the sampling frequency for high explosives to annual and add annual sampling for PCBs and dioxins/furans.*

LANL Response

2.1. Mortandad Canyon intermediate wells MCOI-4, MCOI-5, and MCOI-6 will continue to be sampled semiannually for VOCs and SVOCs because these wells indicate organic contamination from sources in Mortandad Canyon; specifically 1,4-dioxane is present in perched-intermediate groundwater. VOCs and SVOCs will also be analyzed annually in samples from R-36 (see NMED Comment 3 below) and semiannually in characterization samples collected from R-61 (S1 and S2) and R-62.

With the exception of the Mortandad Canyon source of 1,4-dioxane, VOCs and SVOCs are not constituents known to have been released in Sandia Canyon. Historical data show very few sporadic detections of these constituents in regional wells in this monitoring group. However, the Laboratory agrees to sample for VOCs and SVOCs every 2 yr at the following wells within this monitoring group to ensure potential changes at the edge of the plume would be detected: R-1, R-35a, R-35b, R-42, R-44 (S1 and S2), and R-45 (S1 and S2).

2.2. The Laboratory agrees to sample for metals and general inorganics at wells R-35a, R-35b, R-36, and the sampling frequency has been increased from annually to semiannually at well R-13.

2.5. The Laboratory agrees to increase the sampling frequency from annually to semiannually for metals, general inorganics, and perchlorate at well MCOI-5.

2.6. The Laboratory has evaluated NMED’s request to add sampling for HE, PCBs, and dioxins/furans in Chromium Investigation monitoring group wells and finds no basis for including these constituents. The effluent releases into Sandia Canyon, which were the source for the chromium and other contaminants that have migrated to regional groundwater, were not known to contain HE or dioxins/furans. PCBs and dioxins/furans are strongly adsorptive to soils and are not likely to migrate to the regional groundwater. However, because PCBs are present in the Sandia Canyon wetland, they will be monitored in perched-intermediate wells SCI-1 and SCI-2, located within a key infiltration pathway in Sandia Canyon. Monitoring will be conducted every 2 yr (rather than every 5 yr) for potential early detection for PCBs. All wells within the Chromium Investigation monitoring group drilled since 1998 have been sampled numerous times for HE, PCBs, and dioxins/furans, and the history of nondetects supports the conceptual model that these constituents do not need to be monitored in this group.

2.7. The Laboratory concurs. New wells within the Chromium Investigation monitoring group undergoing characterization sampling will be sampled annually for HE, PCBs, and dioxins furans.

NMED Comment

3. Table 4.4-1, Interim Monitoring Plan for MDA C Monitoring Group, pages 62-63:

Make the following changes to the proposed analytical suites and sampling frequencies:

1. *Add biennial sampling for metals at well R-14.*
2. *Add semiannual sampling for metals at well R-46.*
3. *Increase the sampling frequency from annual to semiannual for general inorganics at well R-46.*
4. *Add biennial sampling for perchlorate at all wells.*
5. *Add quinquennial sampling for high explosives, PCBs, and dioxins/furans at all wells. The quinquennial sampling may be changed to sexennial for sampling locations that are sampled biennially or triennially for all other constituents.*

LANL Response

3.1. The Laboratory agrees to sample well R-14 biennially for metals.

3.2. The Laboratory agrees to sample well R-46 semiannually for metals.

3.3. The Laboratory agrees to increase the sampling frequency from annually to semiannually for general inorganics at well R-46.

3.4. The Laboratory agrees to sample all Material Disposal Area (MDA) C monitoring group wells biennially for perchlorate.

3.5. The Laboratory concurs with NMED's request to sample for HE every 5 yr in MDA C monitoring wells because some evidence indicates TNT (trinitrotoluene[2,4,6-]) may have been disposed of at MDA C. However, PCBs and dioxins/furans have not been added to the MDA C monitoring because these constituents are strongly adsorptive to soils and are not likely to migrate to regional groundwater. Furthermore, all wells within the MDA C monitoring group drilled since 1998 and wells elsewhere around the Laboratory have been sampled numerous times for PCBs and dioxins/furans, and the results do not show any evidence of migration to deep groundwater.

NMED Comment

4. Table 5.4-1, Interim Monitoring Plan for TA-54 Monitoring Group, pages 64-70:

Make the following changes to the proposed analytical suites and sampling frequencies:

1. *Add biennial sampling for perchlorate at all wells, with the exception of well R-40 S1.*
2. *Increase the sampling frequency from semiannual to quarterly for VOCs and low-level tritium at wells R-37 S1 and S2, R-56 S1, R-39, R-41, and R-57 S1.*
3. *For characterization sampling, reduce the sampling frequency for high explosives to annual and add annual sampling for PCBs and dioxins/furans.*

4. *Add quinquennial sampling for high explosives, PCBs, and dioxins/furans at all wells, with the exception of well R-40 S1. The quinquennial sampling may be changed to sexennial for sampling locations that are sampled biennially or triennially for all other constituents.*

LANL Response

4.1. The Laboratory agrees to add biennial sampling for perchlorate at all TA-54 monitoring group wells, with the exception of R-40 S1 and R-55i. Perchlorate will be sampled semiannually in R-55i and will not be sampled in R-40 S1 because of issues with well yield.

4.2. The Laboratory has evaluated NMED's request to increase the sampling frequency for VOCs and low-level tritium at wells R-37 S1 and S2, R-56 S1, R-39, R-41, and R-57 S1 and finds no technical basis for increasing the frequency of monitoring for these constituents at this time. A long record of monitoring for these constituents in vadose zone and groundwater indicates stability in the vapor plume. Detections of organic compounds in groundwater have been very limited and consistently below standards. Additionally, the Laboratory has proposed soil-vapor extraction of the vapor-phase contamination at MDAs L and G, which will further protect the regional groundwater from potential impacts.

4.3. The Laboratory agrees to reduce the sampling frequency for HE to annually and to include PCBs and dioxins/furans in the characterization sampling for wells in the TA-54 monitoring group.

4.4. The Laboratory agrees to sample for HE and PCBs in all TA-54 monitoring group wells every 5 yr but has evaluated the request to conduct sampling for dioxins/furans at TA-54 monitoring group wells and finds no basis for adding dioxins/furans to the suite because of its environmental behavior and the lack of a significant dioxin/furan source term at TA-54.

The Laboratory agrees to sample for HE in all TA-54 monitoring group wells every 5 yr because HE (including RDX [hexahydro-1,3,5,trinitro-1,3,5-triazine]) is present in the inventory at MDA H.

PCBs are also present in the TA-54 waste inventory and were disposed of in Areas G and L. For this reason, the Laboratory agrees to sample for PCBs every 5 yr in TA-54 monitoring wells. However, both PCBs and dioxins/furans are highly sorptive to soils and are not likely to migrate to perched-intermediate or regional groundwater.

NMED Comment

5. ***Table 6.4-1, Interim Monitoring Plan for TA-16 260 Monitoring Group, pages 71-75:***

Make the following changes to the proposed sampling locations, analytical suites and sampling frequencies:

1. *Add biennial sampling for perchlorate and SVOCs at all wells and springs that are not already sampled for this constituent, with the exception of well R-25 (all screens).*

2. *For characterization sampling, add annual sampling for PCBs and dioxins/furans. All other constituents, with the exception of radionuclides, must be sampled quarterly. Radionuclides may be sampled annually.*

3. *Conduct quarterly characterization sampling at well CdV-16-4ip S1 until S2 is abandoned and a permanent sampling system is installed at S1. After the permanent sampling system is installed*

at S1, conduct one additional quarterly characterization sampling at S1 and compare the analytical results with previous data to determine the appropriate sampling frequency for future monitoring of S1.

4. *Add biennial sampling for low-level tritium at wells CdV-37-1(i), R-18, R-47i, and R-48.*

5. *Increase the sampling frequency from annual to semiannual for metals, VOCs, high explosives, and general inorganics for well R-25b.*

6. *Move Bulldog Spring from General Surveillance Monitoring to the TA-16 260 Monitoring Group and sample the spring in the same manner as the other springs in the Group.*

7. *Add quinquennial sampling for PCBs and dioxins/furans at all wells and springs. The quinquennial sampling may be changed to sexennial for sampling locations that are sampled biennially or triennially for all other constituents.*

LANL Response

5.1. The Laboratory agrees to add biennial sampling for perchlorate and SVOCs at all TA-16 260 monitoring group wells and springs not already sampled for perchlorate and SVOCs (with the exception of all screens at R-25).

5.2. The Laboratory agrees to add annual sampling for PCBs and dioxins/furans to the characterization sampling suite for new wells in the TA-16 260 monitoring group.

5.3. The Laboratory concurs with this modification. CdV-16-4ip will be sampled quarterly for the characterization suite for the TA-16 260 monitoring group using a portable Bennett pump. Following reconfiguration and installation of the permanent sampling pump in CdV-16-4ip, the well will be sampled for one additional quarter, the analytical data will be evaluated, and if it is not significantly different with the permanent sampling system, sampling will revert to the semiannual default sampling frequency for the TA-16 260 monitoring group.

5.4. The Laboratory concurs with this modification. Wells CdV-37-1(i), R-18, R-47i, and R-48 will be sampled biennially for low-level tritium.

5.5. The Laboratory concurs with this modification. The sampling frequency for metals, VOCs, HE, and general inorganics will be increased from annually to semiannually for well R-25b.

5.6. The Laboratory concurs with this modification. Bulldog Spring has been moved administratively from the General Surveillance monitoring group to the TA-16 260 monitoring group and will be sampled at the same frequency as the other springs of the group.

5.7. The Laboratory concurs with NMED's request to sample for PCBs and dioxins/furans every 5 yr (quinquennially) at shallow monitoring locations within the TA-16 260 monitoring group, including base-flow locations, alluvial monitoring wells, and springs. However, because PCBs and dioxins/furans are strongly sorptive to soils and are unlikely to migrate through the extensive vadose zone to deep perched-intermediate and regional groundwater, sampling for PCBs and dioxins/furans at these deeper locations is not necessary to protect human health and the environment. Historical data also show relatively few detections of PCBs and dioxins/furans in deep perched-intermediate and regional groundwater locations within the TA-16 260 monitoring group.

NMED Comment

6. Table 7.4-1, Interim Monitoring Plan for MDA AB Monitoring Group, pages 76-77:

Make the following changes to the proposed analytical suites and sampling frequencies:

1. *Add biennial sampling for perchlorate at all wells.*
2. *Add quinquennial sampling for PCBs and dioxins/furans at all wells. The quinquennial sampling may be changed to sexennial for sampling locations that are sampled biennially or triennially for all other constituents.*

LANL Response

6.1. The Laboratory concurs with this modification. All MDA AB monitoring group wells will be sampled biennially for perchlorate.

6.2. The Laboratory has evaluated NMED's request to add sampling for PCBs and dioxins/furans at all wells in the MDA AB monitoring group and finds no basis for adding these constituents.

PCBs and dioxins/furans are not contaminants of concern at MDA AB. Additionally, PCBs and dioxins/furans are strongly adsorptive to soils and are highly unlikely to migrate to regional groundwater. In addition, the preponderance of nondetects for PCBs and dioxins/furans in MDA AB monitoring locations and elsewhere across the Laboratory provides additional justification not to sample further for these constituents.

NMED Comment

7. Table 8.3-1, Interim Monitoring Plan for General Surveillance Monitoring, pages 78-88:

Make the following changes to the proposed analytical suites and sampling frequencies:

1. *Add biennial sampling for VOCs and SVOCs at all wells that are not already sampled for these constituents, with the exception of wells R-19 (all screens) and R-31 S4 and S5.*
2. *Reduce the sampling frequency for VOCs and SVOCs to biennial at well R-3i.*
3. *Add biennial sampling for low-level tritium at wells R-3, R-4, R-24, R-10a, R-10 S1, R-33 S1, R-34, PCI-2, and R-17 S1.*
4. *Reduce the sampling frequency for tritium to biennial at well 03-B-13.*
5. *Reduce the sampling frequency for perchlorate to biennial at wells R-12 S1 and S2, CDBO-6, 18-MW-18, PCAO-8, 03-B-13, R-19 (all screens), PCI-2, WCO-1r, and R-31 S4 and S5.*
6. *Reduce the sampling frequency for metals and general inorganics to biennial at wells R-12 S2, CDBO-6, R-19 (all screens), and WCO-1r.*
7. *Reduce the sampling frequency for high explosives to biennial at well R-19 S2 and to quinquennial at wells 18-MW-18, PCAO-8, 03-B-13, R-19 S3 and S4, WCO-1r, and R-31 S4 and S5. Add quinquennial sampling for high explosives at all wells that are not otherwise scheduled to be sampled for this constituent. The quinquennial sampling may be changed to*

sexennial for sampling locations that are sampled biennially or triennially for all other constituents.

8. *Add quinquennial sampling for PCBs and dioxins/furans at all wells and springs. The quinquennial sampling may be changed to sexennial for sampling locations that are sampled biennially or triennially for all other constituents.*

9. *The Permittees may, at their own discretion, reduce the sampling frequency for radionuclides to biennial at wells POI-4, R-3i, TW-2Ar, R-2, R-3, R-4, R-24, R-12 S1 and S2, CDBO-6, 18-MW-18, PCAO-8, PCI-2, R-17 S1 and S2, WCO-1r, R-19 (all screens), and R-31 S4 and S5.*

LANL Response

7.1. The Laboratory concurs with this modification. All General Surveillance monitoring group wells not already sampled for VOCs and SVOCs will be sampled biennially for these constituents starting in fiscal year (FY) 2013, with the exception of wells R-19 (all screens) and R-31 (S4 and S5).

7.2. The Laboratory concurs with this modification. VOCs and SVOCs will be sampled biennially at well R-3i.

7.3. The Laboratory concurs with this modification. Low-level tritium will be sampled biennially at wells R-3, R-4, R-24, R-33 S1, PCI-2, and R-17 S1. Low level tritium is sampled annually at R-10a, R-10 (S1 and S2), and R-34 under the memorandum of understanding (MOU) with San Ildefonso Pueblo.

7.4. The Laboratory concurs with this modification. The sampling frequency for tritium at well 03-B-13 has been reduced to biennial.

7.5. The Laboratory concurs with this modification. Perchlorate will be sampled biennially for wells R-12 (S1 and S2), CDBO-6, 18-MW-18, PCAO-8, 03-B-13, R-19 (all screens), PCI-2, WCO-1r, and R-31 (S4 and S5).

7.6. The Laboratory concurs with this modification. The sampling frequency for metals and general inorganics has been reduced to biennial at wells R-12 S2, CDBO-6, R-19 (all screens), and WCO-1r.

7.7. The Laboratory concurs with the request to reduce the sampling frequency for HE to biennially at well R-19 S2 and to quinquennially at wells 18-MW-18, PCAO-8, 03-B-13, R-19 (S3 and S4), WCO-1r, and R-31 (S4 and S5). The Laboratory has evaluated NMED's request to add sampling for HE at all General Surveillance sampling locations not already scheduled to be sampled for HE and finds no basis for adding the monitoring. Locations with potential for HE contamination are well constrained at the Laboratory, and wells in those locations already include HE in the sampling suite. Additionally, the historical HE groundwater data across the Laboratory show a preponderance of nondetects for HE at these locations.

7.8. The Laboratory concurs with the request to sample for PCBs and dioxins/furans every 5 yr (quinquennially) at shallow monitoring locations within the General Surveillance monitoring group, including base-flow locations, alluvial monitoring wells, and springs. However, because PCBs and dioxins/furans are strongly sorptive to soils and are not likely to migrate to perched-intermediate and regional groundwater, sampling for PCBs and dioxins/furans at these deeper locations is not necessary. Historical data also show few and sporadic detections of PCBs and dioxins/furans in perched-intermediate and regional groundwater locations within the General Surveillance monitoring group.

7.9. The sampling frequency for radionuclides in the Interim Plan represents the Laboratory's approach for meeting DOE's monitoring objectives.

NMED Comment

8. Table 8.3-2, Interim Monitoring Plan for White Rock Canyon and Rio Grande Watershed, pages 89-94:

Make the following changes to the proposed analytical suites and sampling frequencies:

1. *Discontinue sampling for pesticides at all locations that are not subject to the MOU with the San Ildefonso Pueblo.*

2. *Reduce the sampling frequency for metals, VOCs, general inorganics, perchlorate, and suspended sediment to biennial at all base-flow locations that are not subject to the MOU with the San Ildefonso Pueblo.*

3. *Discontinue sampling for suspended sediment and reduce sampling frequency for SVOCs and high explosives to biennial at all springs that are not subject to the MOU with the San Ildefonso Pueblo*

4. *The Permittees may, at their own discretion, reduce the sampling frequency for radionuclides to biennial at all base-flow locations that are not subject to the MOU with the San Ildefonso Pueblo.*

5. *The Permittees may, at their own discretion, reduce the sampling frequency for radionuclides to triennial (once every three years) at all springs that are not subject to the MOU with the San Ildefonso Pueblo.*

LANL Response

8.1. The Laboratory concurs with this modification. Pesticides are not primary contaminants of concern at the Laboratory, and analysis for pesticides has been discontinued at all locations, except those stipulated in the MOU, including the White Rock Canyon and Rio Grande watershed locations.

8.2. The Laboratory concurs with this modification. The sampling frequency for metals, VOCs, general inorganics, perchlorate, and suspended sediment has been reduced to biennially at all base-flow locations not subject to the MOU.

8.3. The Laboratory concurs with this modification. Suspended sediments are no longer sampled in spring samples The sampling frequency for SVOCs and HE has been reduced to biennially at all springs not subject to the MOU. However, SVOCs are sampled annually at Springs 3 and 4 to meet a 1996 U.S. Environmental Protection Agency (EPA) authorization/agreement regarding disposal of PCBs at TA-54, Area G.

8.4. The sampling frequency for radionuclides in the plan represents the Laboratory's approach for meeting DOE's monitoring objectives.

8.5. The sampling frequency for radionuclides in the plan represents the Laboratory's approach for meeting DOE's monitoring objectives.

NMED Comment

9. Appendix B, B-2.0 Protocol for Selecting Screening Levels for Groundwater Data, second paragraph, page B-3:

The protocol for selecting screening levels for groundwater data must match the procedure described in Section 11.4.1, Groundwater Cleanup Levels, of the LANL Hazardous Waste Permit (Permit) and the Consent Order. If no EPA MCL or WQCC water quality standard exists for an analyte, use the most recent version of NMED Tap Water Screening Levels. In the absence of an NMED tap water screening level, use EPA Regional Screening Levels for tap water multiplied by a factor of ten.

LANL Response

9. In accordance with the Compliance Order on Consent (the Consent Order), the Laboratory has been using EPA's tap water screening levels in its screening process for constituents that have neither a New Mexico groundwater standard or an EPA maximum contaminant level. To remain consistent with the Laboratory's historical approach to screening under the Consent Order, the Laboratory proposes to continue this practice.

NMED Comment

10. Appendix C, C-4.0 Analytical Methods – Groundwater Analytical Suites, pages C-9 and C-10:

Section IX.C of the Consent Order and Section 11.10.2 of the Permit state that the detection limits for each analytic method for chemical analyses of environmental samples must be less than applicable background, screening and regulatory cleanup levels. Furthermore, the same sections state that analytical methods used by the Permittees must be approved by NMED.

The following VOC and SVOC contaminants have been routinely analyzed by the Permittees using analytical methods with detection limits that were consistently equal to or exceeding the corresponding regulatory cleanup levels at all groundwater (and/or, in some instances, base-flow) sampling locations (Group A Contaminants): azobenzene, benzidine, benzo(a)pyrine (only base-flow sampling), bis(2-chloroethyl)ether, dibenz(a,h)anthracene, 3,3'-dichlorobenzidine, 4,6-dinitro-2-methylphenol, hexachlorobenzene (both groundwater and base-flow sampling), n-nitrosodiethylamine, n-nitrosodimethylamine, n-nitroso-di-n-butylamine, n-nitroso-di-n-propylamine, n-nitrosopyrrolidine, pentachlorophenol, acrolein, acrylonitrile, 2-chloro-1,3-butadiene, 1,2-dibromo-3-chloropropane, 1,2-dibromoethane, methacrylonitrile, and 1,2,3-trichloropropane.

In addition, the following SVOC contaminants have been routinely analyzed by the Permittees using analytical methods with detection limits that were frequently equal to or exceeding the corresponding regulatory cleanup levels at multiple groundwater sampling locations (Group B Contaminants): atrazine, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and 2,2'-oxybis(1-chloropropane).

In order for NMED to approve the continuing use of the current analytical methods for the aforementioned groundwater contaminants, the Permittees must first demonstrate that these contaminants do not occur at concentrations that would constitute a potential threat to human *health and the environment. By the end of the calendar year 2013, the Permittees must analyze all Group A Contaminants at all relevant sampling locations at least once by analytical methods with detection limits that are lower than the corresponding regulatory cleanup levels. Correspondingly, by the end of the calendar year 2013, the Permittees must analyze, in a similar manner, those Group B Contaminants at those sampling locations that have not been analyzed with proper detection limits at least once since January 1, 2010.*

Preference in the selection of analytical methods must be given to the EPA-approved methods; however, if an EPA-approved method that can achieve the required detection limit for a particular contaminant is not available, the Permittees may choose any industry-accepted analytical method that attains the required detection limit or, if such method is not offered by any North American analytical laboratory, the method that provides the lowest achievable detection limit. If, for a particular Group A or Group B contaminant and a particular sampling location, the Permittees select an analytical method that has practical quantitation limit (PQL) no greater than the corresponding regulatory cleanup level (or, if such method is not available, a method with the lowest achievable PQL), and none of the detectable analytical results, including J-flagged results, exceeds one-half of the regulatory cleanup level, then the Permittees must use this, or equivalent, analytical method at least quinquennially (sexennially for sampling locations that are sampled biennially or triennially for all other constituents). If, for a particular Group A or Group B contaminant and a particular sampling location, the Permittees select an analytical method that has PQL greater than the corresponding regulatory cleanup level (unless this is the method with the lowest achievable PQL), and none of the detectable analytical results, including J-flagged results, exceeds one-half of the regulatory cleanup level but one or more of U-flagged results exceeds one-half of the regulatory cleanup level, then the Permittees must use this, or equivalent, analytical method at least triennially (quadrennially [once every four years] for sampling locations that are sampled biennially for all other constituents); however, if none of the U-flagged results exceeds one-half of the regulatory cleanup level, then the Permittees may use this, or equivalent, analytical method at least quinquennially (sexennially for sampling locations that are sampled biennially or triennially for all other constituents). If, for a particular Group A or Group B contaminant and a particular sampling location, any detectable analytical result, including any J-flagged result, exceeds one-half of the regulatory cleanup level, then the Permittees must propose to NMED a sampling protocol for this contaminant at the particular sampling location that is protective of human health and the environment.

LANL Response

10. The Laboratory has evaluated NMED's request to use alternative analytical methods to obtain lower practical quantitation limits (PQLs) and does not find a basis for applying resources to lower the PQLs for the group of constituents presented in NMED's comment. The Laboratory's position is discussed below.

    Of the 26 analytes listed by NMED, 6 constituents have method detection limits (MDLs) that are less than the regulatory cleanup level, thereby meeting the requirements of the Consent Order. The remaining 20 constituents have MDLs greater than the corresponding regulatory cleanup levels. However, the Laboratory believes that MDLs and PQLs obtained for these constituents are sufficient to ensure groundwater monitoring is protective.

    The Consent Order establishes corrective action requirements for historical releases of hazardous constituents from solid waste management units (SWMUs) and areas of concern (AOCs) at the Laboratory. The Group A and Group B constituents at issue are typically not related to any releases from SWMUs or AOCs. The Laboratory proposes that obtaining lower MDLs or PQLs for these constituents is not necessary to characterize the nature and extent of contamination and would only divert resources from the corrective actions process.

The January 5, 2012, Framework Agreement between DOE and NMED acknowledges that collecting and reporting characterization and monitoring data should be limited to what is “necessary and sufficient” and that DOE and NMED should follow pertinent EPA guidance, except where such guidance is not supported by sound science. EPA’s “results-based” corrective action guidance, which was developed to comply with the 1993 Government Performance and Results Act, directs EPA and the regulated community to focus on collecting data that strike a balance between having sufficient information to proceed with remedy selection and gathering additional site-characterization information.

The detection frequency of an analyte is a useful indicator of the presence of a contaminant. The Laboratory has evaluated the detection frequency for analytes identified by NMED with PQLs exceeding screening levels, and the results have been presented to NMED previously in the Laboratory’s response to NMED’s approval with modifications to the 2010 Interim Plan (NMED 2010, 109327; LANL 2011, 205230). For most of the organic compounds where MDLs or PQLs are greater than the screening levels, the compound has seldom or never been detected in thousands of samples (LANL 2011, 205230). Based on the extremely low frequency of detects for most of these organic compounds, these contaminants are not considered to be Laboratory constituents of concern for groundwater. Additionally, if these constituents were associated with releases from SWMUs and AOCs at the Laboratory, they would not likely be present in groundwater without collocated organic compounds for which MDLs and PQLs are lower than screening levels. Therefore, other mobile organic compounds with MDLs lower than screening levels may be used as conservative measures of groundwater contamination in a given area. Detections of organic compounds in groundwater are very limited at the Laboratory and are consistent with site knowledge of limited release or disposal of such compounds.

NMED Comment

11. Table F-1.0-1, page F-5:

1. *Add well R-64 to the watch list. The well produces significant amounts of fine-grained suspended solids with a chemical signature typical of annular-fill bentonite.*
2. *Add wells R-55i and R-53 S1 to the watch list. Field data and trace-metal analytical results suggest that water samples from these wells are likely not representative of aquifer conditions.*
3. *Add well R-29 to the watch list. Turbidity and water chemistry data indicate possible impacts from drilling fluids. The well must be purged ten (10) casing volumes before sampling or until dissolved oxygen concentrations (DO) are within 10% of average DO at nearby well R-30, whichever comes first.*

LANL Response

11.1. The Laboratory agrees to add well R-64 to the watch list presented in Appendix E of the FY2013 Interim Plan.

11.2. The Laboratory agrees to add well R-55i to the watch list presented in Table E-1.0-1 of Appendix E in the Interim Plan.

The Laboratory has evaluated NMED's request to add well R-53 S1 to the watch list and does not find a basis for including the well. A review of water-quality data collected from R-53 S1, including an analysis of field parameter data, general inorganic data, and trace metal data, indicates the water-quality data from screen 1 are currently representative. Nonrepresentative water-quality parameters from earlier samples were limited to a small number of trace metals.

11.3. The Laboratory has evaluated NMED's request to add well R-29 to the watch list and does not find a basis for including the well in the watch list. Concentrations of iron and manganese have decreased significantly in recent samples collected from R-29, and the recent iron and manganese data collected from R-29 are representative do not merit adding this well to the watch list.

PART II: COMMENTS

Resolve the following comments and concerns in future Plans, beginning in May 2012.

NMED Comment

1. *Due to reduction in groundwater monitoring by the Permittees caused, in part, by budgetary constraints, NMED may decide to collect and analyze a number of groundwater samples at its own cost. To facilitate sample collection by NMED, the Permittees must provide notification to NMED of upcoming groundwater sampling events at least 15 calendar days before commencing each event in accordance with Permit Section 11.3.6 and Consent Order Section IX.*

LANL Response

1. The Laboratory will continue to notify NMED at least 15 calendar days before each sampling campaign, in accordance with the requirements of Section 11.3.6 of the Resource Conservation and Recovery Act Permit and Section IX of the Consent Order. In addition, the Laboratory will continue to notify NMED as early as possible before nonroutine sampling activities are conducted, although the 15-d advance notification requirements may not always be feasible given scheduling constraints.

NMED Comment

2. *In future Plans, the Permittees must follow the expanded document format established in the Original Plan.*

LANL Response

2. The Interim Plan will continue to include the key elements required by Section IV.A.3.b of the Consent Order. All interim plans will state the proposed locations and frequency of groundwater sampling, the proposed parameters for analysis, and the proposed methods for sampling and analysis, as established in the original plan.

NMED Comment

3. *In future Plans, the Permittees must include maps of groundwater contaminants, similar to Plates 5 to 7 in 2011 General Facility Information (EP2011-0070). The maps must be created separately for alluvial, intermediate and regional aquifers, and must show the following information:*

   1. *boundaries of area-specific monitoring groups;*

   2. *all monitoring wells in the corresponding aquifer, with well names;*

   3. *wells on the watch list, which must be identified by different color scheme, highlight, or font;*

   4. *contaminant information text boxes for wells where contaminant detection(s) occurred during any of the two most recent sampling events for that well and contaminant (regardless of sampling frequency). Contaminant detection means a validated concentration (including J-flagged results) greater than one-half of applicable groundwater cleanup level. A contaminant information box must include the following items: well name, depth, contaminant name (can be abbreviated), dates (month and year) and contaminant concentrations for the two most recent sampling events for the contaminant (including J-flag where applicable), concentration units, and proposed frequency of sampling for the contaminant. Contaminant concentrations greater than the corresponding groundwater cleanup levels must be emphasized by using bold or different color font (for example, RDX 3/11 9/11 5.9* ***10.7*** *μg/L S). If the amount of information would make a map difficult to read, the Permittees must create separate maps for different classes of contaminants.*

LANL Response

3. The inclusion of contaminant distribution maps, such as those described above, is not a requirement of the Consent Order. Periodic monitoring reports already include consistently updated contaminant distribution maps highlighting monitoring wells where contaminant concentrations are above applicable screening levels. The Laboratory will continue to reference the most recent applicable periodic monitoring report that will include the most current contaminant distribution map for a particular monitoring group.

NMED Comment

4. Section 2.2, Background, Contaminant Sources and Distributions, last paragraph, page 11:

Well R-6i is not located near the confluence of DP and Los Alamos Canyons. It is located in DP Canyon, approximately half-way between the confluence and TA-21. Correct this inaccuracy.

LANL Response

4. The text in section 2.2 of the Interim Plan has been revised to correct the inaccuracy and now states that R-6i is located near the north boundary of TA-21 and DP Canyon.

NMED Comment

5. Section 6.2, Background, Contaminant Sources and Distributions, first paragraph, page 11:

The Permittees incorrectly identified one of VOC contaminants as tetrachloroethane. The correct contaminant name is tetrachloroethene (PCE). In addition, the Permittees failed to mention that low-level concentrations of RDX have been detected in the regional aquifer well R-63. Correct the error and provide information on RDX detections in R-63.

LANL Response

5. The text has been corrected to identify the VOC contaminant as tetrachloroethene. The following statement on RDX detections in the regional aquifer has been added to the Interim Plan: "Low level concentrations of RDX have also been detected in the regional aquifer in wells R-18 and R-63."

NMED Comment

6. Tables 1.6-2 and 1.6-3, pages 44 – 47:

If sampling at a specific location for a specific analytical suite is performed at two or more different frequencies, all sampling frequencies must be listed in the tables.

LANL Response

6. Tables 1.6-2 and 1.6.-3 have been updated and now list all sampling frequencies.

NMED Comment

7. Table 1.8-1, page 48:

Expand the table (or create a separate table) to provide the next anticipated sampling time (year and quarter) for biennial, triennial, and lower-frequency sampling that is not included in the sampling schedule for the upcoming monitoring year.

LANL Response

7. Table 1.8-1 has been expanded to provide additional information on the year each analyte will be collected.

NMED Comment

8. Appendix B, B-1.0 Overview, second bullet list, page B-2:

The description of column headings for Tables B1-1 and B1-2 contains inaccuracies. For example, contrary to the information in the bullet list, Tables B1-1 and B1-2 do not include 'Number of Nondetects' column, and include 'Avg' column instead of 'Mean'. Correct all inaccuracies.

LANL Response

8. Because this Interim Plan was developed based primarily on the 2011 Interim Monitoring Plan, Revision 1 (LANL 2011, 208811) and on direction received from NMED for the 2011 Interim Plan,

Revision 1 (NMED 2012, 520410), the data screening process used to develop previous Interim Plans was not used. The analytical data screening tables, Tables B1-1 through B1-4, are not included in this year's Interim Plan.

NMED Comment

9. Appendix D, Table D-1, page D-3:

The Background column for Chromium Monitoring Group contains inconsistent information. First, the Permittees state that "Cr concentrations in regional aquifer exceed New Mexico Groundwater Standard", and then, in the same table cell, they state that "[n]o constituent concentrations exceed standards or SLs in regional aquifer." Correct the discrepancy.

LANL Response

9. The discrepancy in Table D-1 has been corrected. The statement, "No constituent concentrations exceed standards of SLs in regional groundwater," has been removed.

NMED Comment

10. Appendix F, F-2.0 Deep Wells with Limited Purge Volumes, page F-1:

The Permittees omitted, from their discussion, wells with non-purgeable Westbay systems. Include Westbay wells in future listings and discussions of wells with limited purge volumes.

LANL Response

10. A discussion of wells with limited purge volumes is presented in section E-2.0, Deep Wells with Limited Purge Volumes, of the Interim Plan. A list of wells with nonpurgeable Westbay systems has been added to Table E-1.0-1, Preliminary Watch List of Deep Monitoring Wells.

NMED Comment

11. Plate 1, Monitoring Group Overview:

Boundaries of some area-specific monitoring groups are incorrect. Ensure that the Plate properly represents the area-specific monitoring groups.

LANL Response

11. The boundaries of area-specific monitoring groups have been updated on the plate and in the monitoring group maps, as necessary, to ensure the maps accurately reflect the proper boundaries of the monitoring groups.

REFERENCES

LANL (Los Alamos National Laboratory), August 2011. "Response to the Approval with Modification for the 2010 Interim Facility-Wide Groundwater Monitoring Plan," Los Alamos National Laboratory document LA-UR-11-4671, Los Alamos, New Mexico. (LANL 2011, 205230)

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)

NMED (New Mexico Environment Department), May 4, 2010. "Approval with Direction, 2009 Interim Facility-Wide Groundwater Monitoring Plan," 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, 109327)

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)

LA-UR-12-21331
August 2012
EP2012-0092

Interim Facility-Wide Groundwater Monitoring Plan for the 2013 Monitoring Year, October 2012–September 2013

Prepared by the Environmental Programs Directorate

EP2012-0092

Interim Facility-Wide Groundwater Monitoring Plan for the 2013 Monitoring Year, October 2012–September 2013

August 2012

Responsible project manager:

Steve Paris	[signature]	Project Manager	Environmental Programs	8/28/12
Printed Name	Signature	Title	Organization	Date

Responsible LANS representative:

Michael J. Graham	[signature]	Associate Director	Environmental Programs	28 Aug '12
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Responsible DOE representative:

Peter Maggiore	[signature] for	Assistant Manager	DOE-LASO	8-30-2012
Printed Name	Signature	Title	Organization	Date

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 2013 Interim Plan applies to the 2013 monitoring year (MY) from October 1, 2012, to September 30, 2013. The monitoring conducted under this plan is designed to enhance understanding of the 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 been conducted 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 the Laboratory 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 the Consent Order, revised April 2012, are reported monthly to the NMED Hazardous Waste Bureau.

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1.0 INTRODUCTION

The monitoring year (MY) 2013 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 MY2013, from October 1, 2012, to September 30, 2013.

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 presents an increased focus of monitoring activities on area-specific monitoring groups and key analytes 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 or discontinued under the focused monitoring approach introduced in the 2011 Interim Plan, Revision 1 (LANL 2011, 208811).

The scope of this focused 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
- 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 gathering 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 was 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.

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 New Mexico Water Quality Control Commission Regulations

Currently, the TA-46 Sanitary Wastewater Systems (SWWS) Plant operates under a groundwater discharge permit (discharge plan number DP-857) issued by NMED pursuant to 20.6.2 New Mexico Administrative Code (NMAC). Sampling locations, monitoring frequencies, and reporting requirements are specified in the NMED-approved DP-857, under which the Laboratory conducts quarterly sampling at two NPDES outfalls, the SWWS Plant reuse wet well, and CDBO-6, an alluvial monitoring well located in Cañada del Buey. Monitoring under DP-857 began when the SWWS Plant opened in 1993 and is expected to continue indefinitely, with appropriate modifications made as discharge conditions change over time. The plan was renewed in 1998, and a second request for plan renewal was submitted to NMED in 2002.

On August 20, 1996, at NMED's request, the Laboratory submitted a discharge permit application for the Radioactive Liquid Waste Treatment Facility (RLWTF) at TA-50; NMED approval was pending at the end of 2011. On November 18, 2011, NMED requested a new, comprehensive, and up-to-date discharge permit application for the TA-50 RLWTF and the TA-52 Zero Liquid Discharge Solar Evaporation Tanks (after construction is completed in 2012, the tanks will evaporate treated effluent from the TA-50 RLWTF). The revised discharge permit application was submitted to NMED on February 16, 2012. Since 1999, the Laboratory has conducted voluntary quarterly sampling of the RLWTF's effluent and alluvial groundwater monitoring wells MCO-3, MCO-4B, MCO-6, and MCO-7 in Mortandad Canyon for nitrate (as N), fluoride, and total dissolved solids. The Laboratory voluntarily reports the analytical results quarterly to NMED.

1.4.2 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 the Intellus New Mexico database. The environmental reports contain descriptions of the surveillance monitoring network, key results and trends, and the QA/QC program.

1.4.3 Hazardous Waste Facility Permit

Section III.W of the Consent Order describes the integration of the current and any future Hazardous Waste Facility Permits (hereafter, the 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 support of 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 a 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 provided in its approval with modifications for the 2011 Interim Plan, Revision 1 (LANL 2011, 208811; NMED 2012, 520410).

Table 1.6-1 presents applicable standards for surface water and groundwater. In previous updates to the Interim Plan, the monitoring approach was developed by screening groundwater and base-flow data from the previous 6 yr against one-half the lowest applicable or other risk-based screening levels presented in Table 1.6-1. This process was used for monitoring conducted under the 2011 Interim Plan (LANL 2011, 208811), with summaries of the previous 6 yr of groundwater and base-flow data presented in Appendix B and included in Attachment B-1 of the 2011 Interim Plan.

Because this Interim Plan was developed based primarily on the 2011 Interim Plan, Revision 1, and on direction received from NMED in its approval with modifications for the 2011 Interim Plan, Revision 1 (LANL 2011, 208811; NMED 2012, 520410), the data-screening process used to develop previous Interim Plans was not used, and summaries of the last 6 yr of groundwater and base-flow data are not presented.

Table 1.6-2 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 1.6-3 summarizes the analytical suites and sampling frequencies for General Surveillance monitoring locations (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 1.6-2 and 1.6-3 also list characterization suites and sampling frequencies for newly installed wells (wells installed on or after October 1, 2011). New wells will be sampled for at least four rounds for the monitoring group–specific characterization suites for new wells presented in Tables 1.6-2 and 1.6-3.

Exceptions to the analytical suites and sampling frequencies presented in Tables 1.6-2 and 1.6-3 occur in some cases. These exceptions may be the result of a number of factors such as additional regulatory or permit requirements and 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.

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 monitoring year 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 MY2013, from October 2012 to September 2013. 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 location 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. 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.

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 X1.D.7 and X1.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 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 historically operational 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.

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 ephemeral flow in Los Alamos and DP Canyons. Ephemeral 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 adjacent 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 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 infiltration.

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 infiltration 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 infiltration 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 infiltration 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. No perched-intermediate groundwater has been encountered to date 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 SWMU 21-011(k), the adsorption beds and disposal shafts at MDA T, DP West, and waste lines and sumps. Other potential sources include DP East and a diesel spill as well as past releases from the former Omega West Reactor that was located near the confluence of Los Alamos and DP Canyon.

Mobile contaminants, such as tritium, nitrate, and perchlorate, released at the SWMU 21-011(k) outfall have dispersed down DP and Los Alamos Canyons by surface water and alluvial groundwater. 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 infiltration for mobile contaminants such as tritium, nitrate, and perchlorate detected in perched groundwater at R-6i, LAOI-3.2, and LAOI-3.2a. Infiltration 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 infiltration 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. For MY2013, monitoring wells LAOI-7, R-8, R-9i, and R-9 have been moved from the General Surveillance monitoring group to the TA-21 monitoring group.

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 1.6-2 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. New well R-66 (completed November 16, 2011) and recently redeveloped well R-64 will be sampled quarterly during MY2013. 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 discharges from the RLWTF in the Mortandad Canyon watershed. Effluent volumes were considerably reduced in 2010 and 2011 because process changes at the RLWTF have minimized discharges to the outfall.

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 aquifer 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. The only known perennial spring in the watershed (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 these TAs.

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.

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 stormwater runoff and snowmelt contributing the remainder (LANL 2008, 102996, Appendix C).

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. Surface water flows past gage E124 typically only during times of high alluvial groundwater levels, increased effluent volume, or stormwater-runoff events.

Surface water in Mortandad Canyon is ephemeral and occurs infrequently in lower Mortandad Canyon. Effluent releases from the RLWTF have historically supported surface water in middle Mortandad Canyon, but those contributions are currently minimal. 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 that reach 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 stormwater. 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.

In Mortandad Canyon (LANL 2006, 094161), 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 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, 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 NMED groundwater standards and EPA maximum contaminant levels (MCLs) in the regional aquifer at wells R-28, R-42, and R-50, located in Mortandad Canyon, and R-62, located on the mesa between Sandia and Mortandad Canyons. Perchlorate exceeds the Consent Order screening level of 4 µg/L in R-15 and R-61. Other constituents detected above background in wells in the monitoring group include nitrate and tritium. A conceptual model for the sources and distribution of these contaminants is presented in the Investigation Report for Sandia Canyon (hereafter, the Sandia Canyon IR) (LANL 2009, 107453). The Sandia Canyon IR presented the results of all 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. Lateral migration from Los Alamos Canyon sources (including the Omega West

Reactor in TA-02) appears also to be detected. These sources and the migration pathways are discussed in the Sandia Canyon IR (LANL 2006, 094161; 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. For the past 7 yr, 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 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, other metals, 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 Sandia Canyon IR (LANL 2009, 107453).

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 1.6-2 for the Chromium Investigation 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).

Following submittal of the Sandia Canyon IR (LANL 2009, 107453), more intensive monitoring is now focused on the perched-intermediate and regional groundwater, with an emphasis on chromium and general inorganic chemicals (particularly nitrate), as presented in Table 1.6-2. 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. New well R-62 (completed October 3, 2011) will be sampled quarterly during MY2013. Well R-61 is planned for rehabilitation in September 2012, after which it will be sampled quarterly through the remainder of MY2013. The objectives for the sampling frequency and analytical suites are presented in Table C-1.

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 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 volatile organic compounds (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), tetrachloroethene, 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 upcoming corrective measures evaluation (CME) activities.

4.4 Scope of Activities

The MDA C Area 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 1.6-2 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.

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 predominantly in the Pajarito Canyon watershed, 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).

Sources of surface water in the Pajarito watershed currently include snowmelt, stormwater 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 infiltrating the deeper tuff units and transiently into the Cerros del Rio basalt, which is very near the surface at well R-23. The extent of this groundwater helps define deeper infiltration zones within the canyon. Overall, lateral flow within the alluvium and deeper infiltration 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 infiltration, such as nearby wells R-17 and R-23. At well R-37, relic regional groundwater may have become disconnected or stranded from the current regional groundwater as drawdown associated with water-supply production has occurred. 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 infiltration.

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 infiltration 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 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 that have transported 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 a several organic compounds. Data from the last four sampling rounds 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. 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 1.6-2 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 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.

Because well screen R-40 Si continues to show impacts from drilling foam, monitoring in this screen is limited to tritium only.

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 for almost 50 yr 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. 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 stormwater 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 stormwater 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-16-06295). 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 infiltration along the Pajarito fault zone east of TA-16 and along canyons (e.g., infiltration 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 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, 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 a 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 during the past 50 yr at Consolidated Unit 16-021(c)-99 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). Low-level concentrations of RDX have 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 infiltration 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).

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 (Plate 1) (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 1.6-2).

Characterization sampling for a wide range of potential contaminants in groundwater from TA-16 (e.g., fission-product radionuclides, semivolatile organic compounds [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. For MY2013, Bulldog Spring has been moved from the General Surveillance monitoring group to the TA-16 260 monitoring group, although contaminants detected in Bulldog Spring are not related to releases from the TA-16 260 Outfall. Sampling locations, frequencies, analytical suites, and the rationale for these locations are presented in Table 6.4-1.

Additional base-flow, spring, 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 well CdV-16-4ip is undergoing characterization sampling and will be sampled quarterly until a permanent sampling system is installed in this well. 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. The testing produced large inventories of radioactive and hazardous materials: isotopes of uranium and plutonium, lead, and beryllium; explosives such as TNT, RDX, 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 can be found 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.

7.2 Background

Both main 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, above the confluence with the north fork, and approximately 2.3 mi^2 (5.8 km^2) is drained by main Ancho Canyon. Surface-water flow is ephemeral 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 using mild carbon steel during that period, 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.

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 infiltration 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 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. New 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 effectively been replaced by wells R-29 and R-30.

7.4 Scope of Activities

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

8.3 Scope of Activities

These objectives can be met at all General Surveillance monitoring group locations through annual monitoring at the majority of all General Surveillance 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.

During MY2011, base flow was monitored at five locations using dedicated multiparameter probes (sondes) to measure specific conductance, temperature, and pH on an hourly basis. However, review of the sonde data indicated significant additional effort on calibration, data review, and maintenance would be required to account for instrument drift and to ensure data usability.

Because of these technical difficulties, the base-flow sonde monitoring program will be discontinued, and base-flow samples will be collected at existing base-flow monitoring locations in the proximity of where the sondes were deployed. When possible, the base-flow locations will be sampled during periods of the year when the alluvial wells in the same watershed are not being sampled to provide additional spatial and temporal monitoring coverage within each watershed.

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 locations in the General Surveillance monitoring group are sampled annually, with the exceptions noted above. The objectives for the sampling frequency and analytical suites are presented in Table C-1. General Surveillance location Spring 2B rarely has sufficient water for sampling and has been removed from the White Rock Canyon sampling campaign.

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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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.

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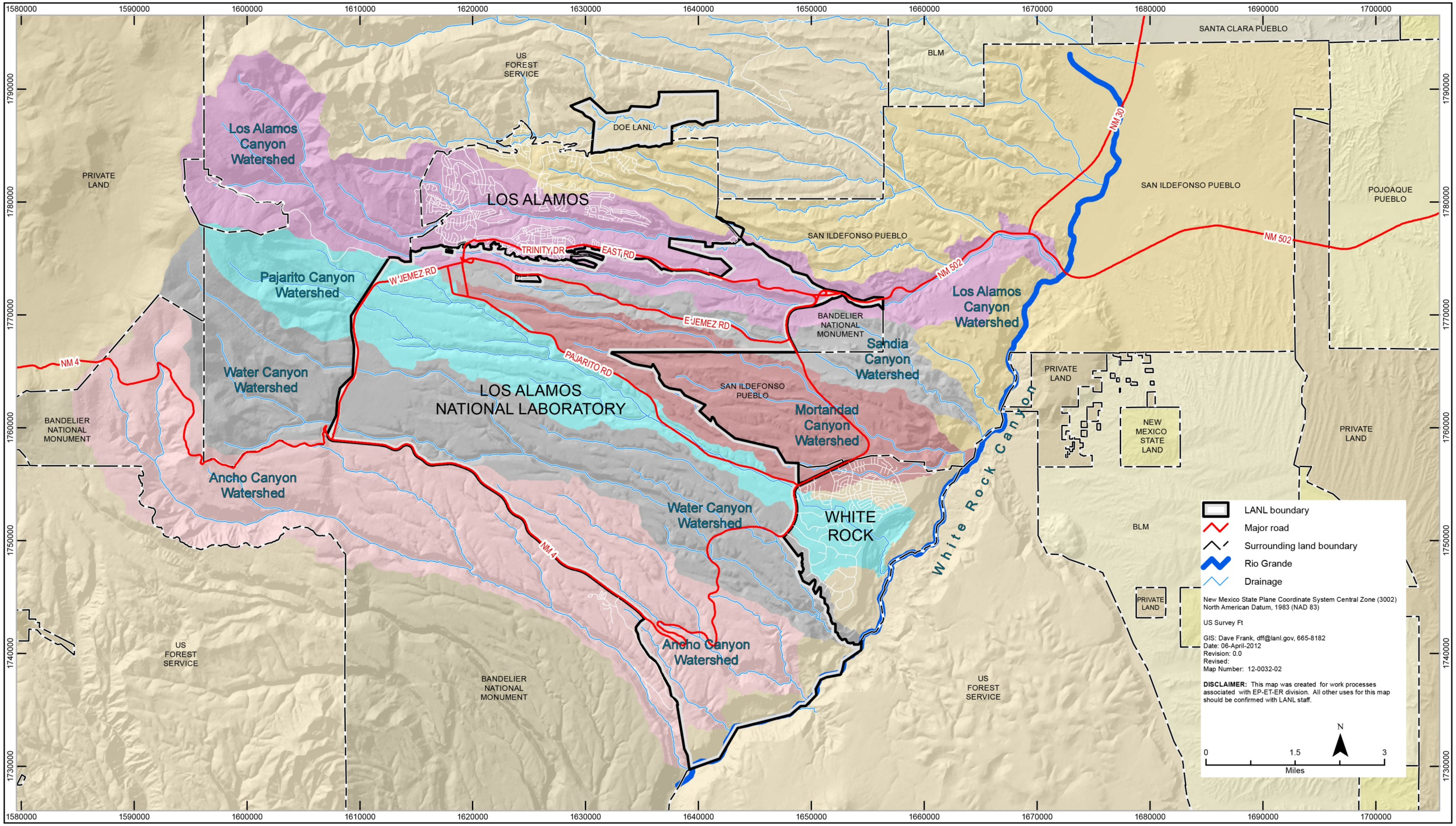

Figure 1.2-1 Watersheds at Los Alamos National Laboratory

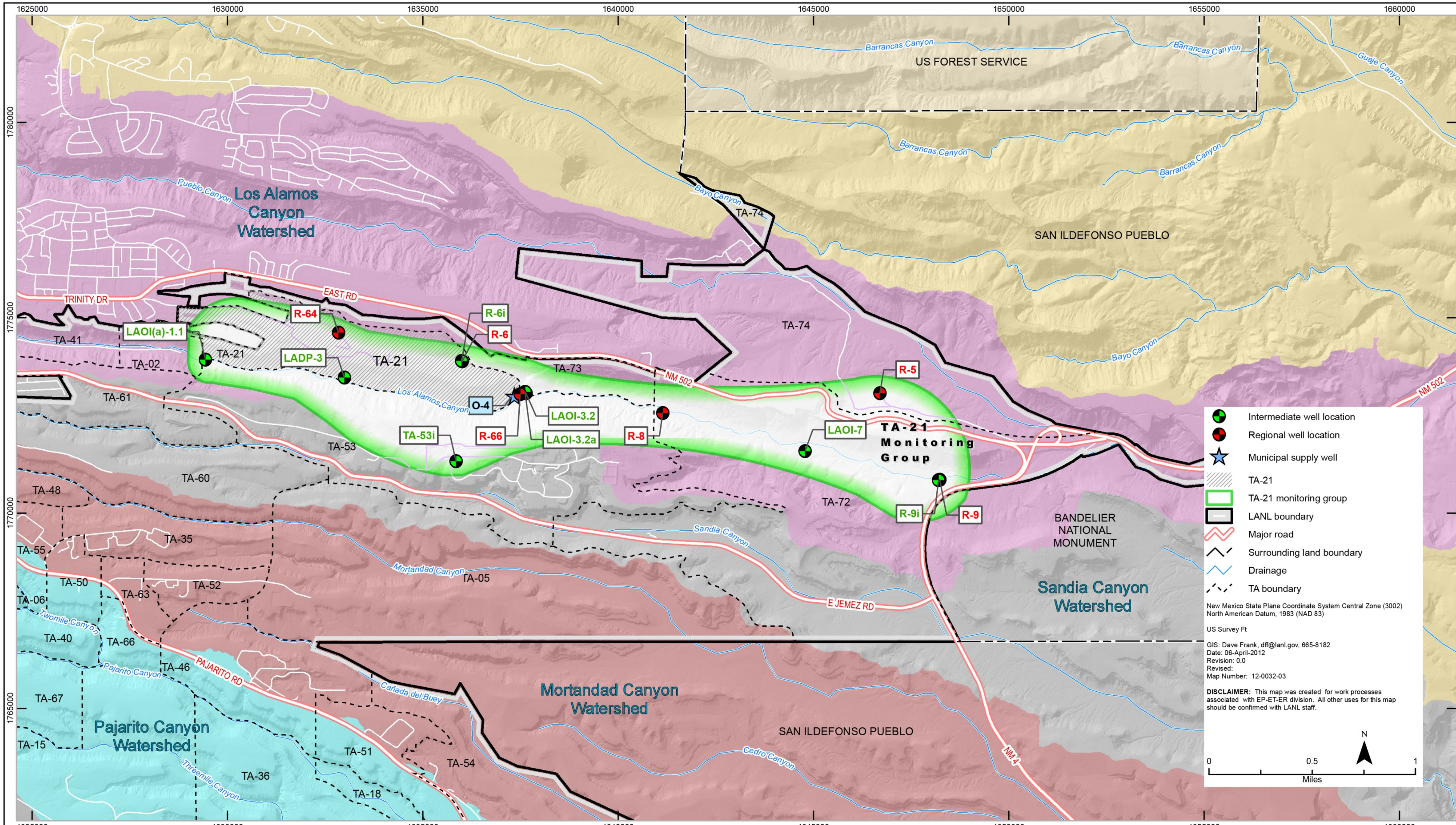

Figure 2.1-1 TA-21 monitoring group

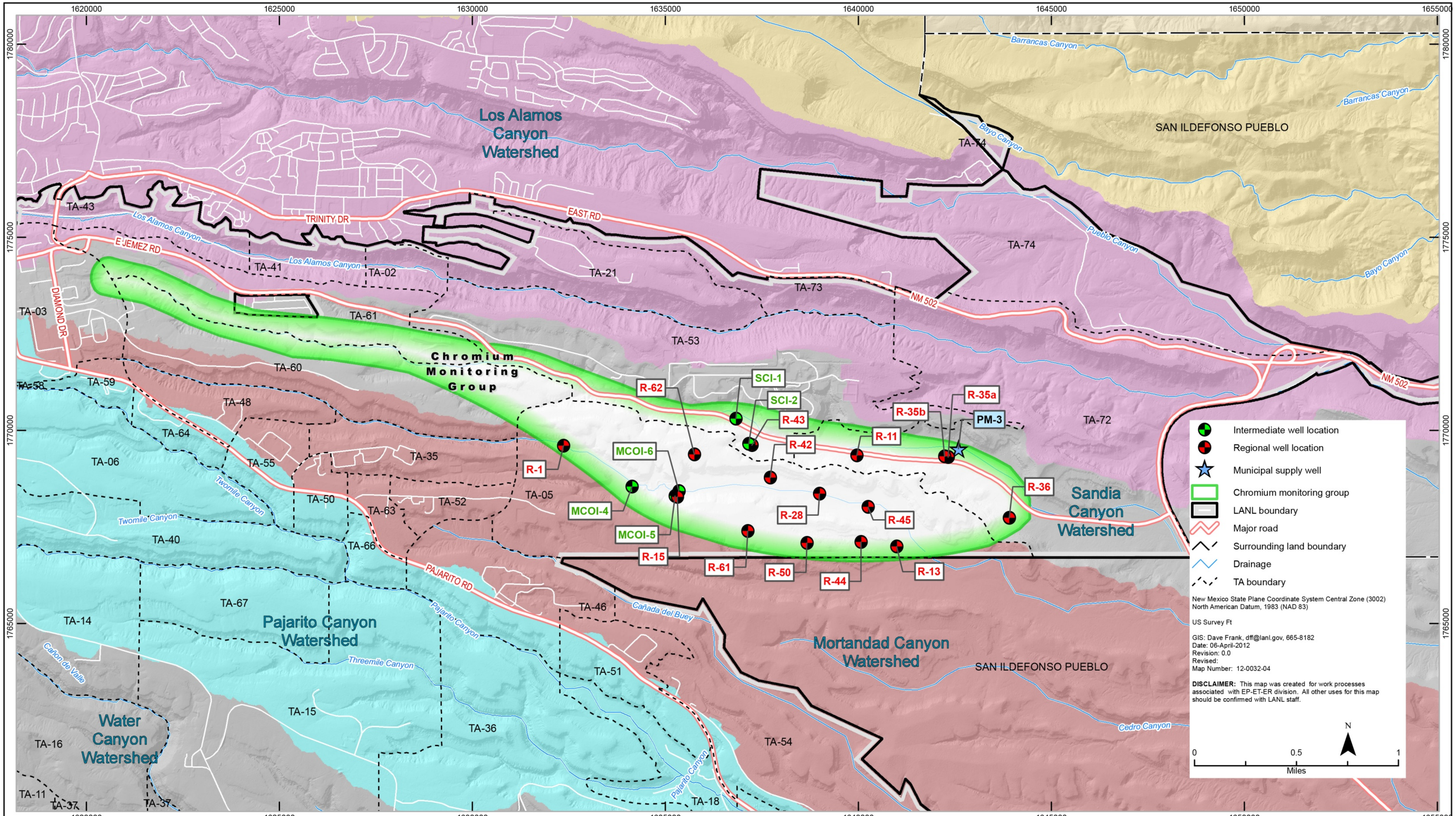

Figure 3.1-1 Chromium investigation monitoring group

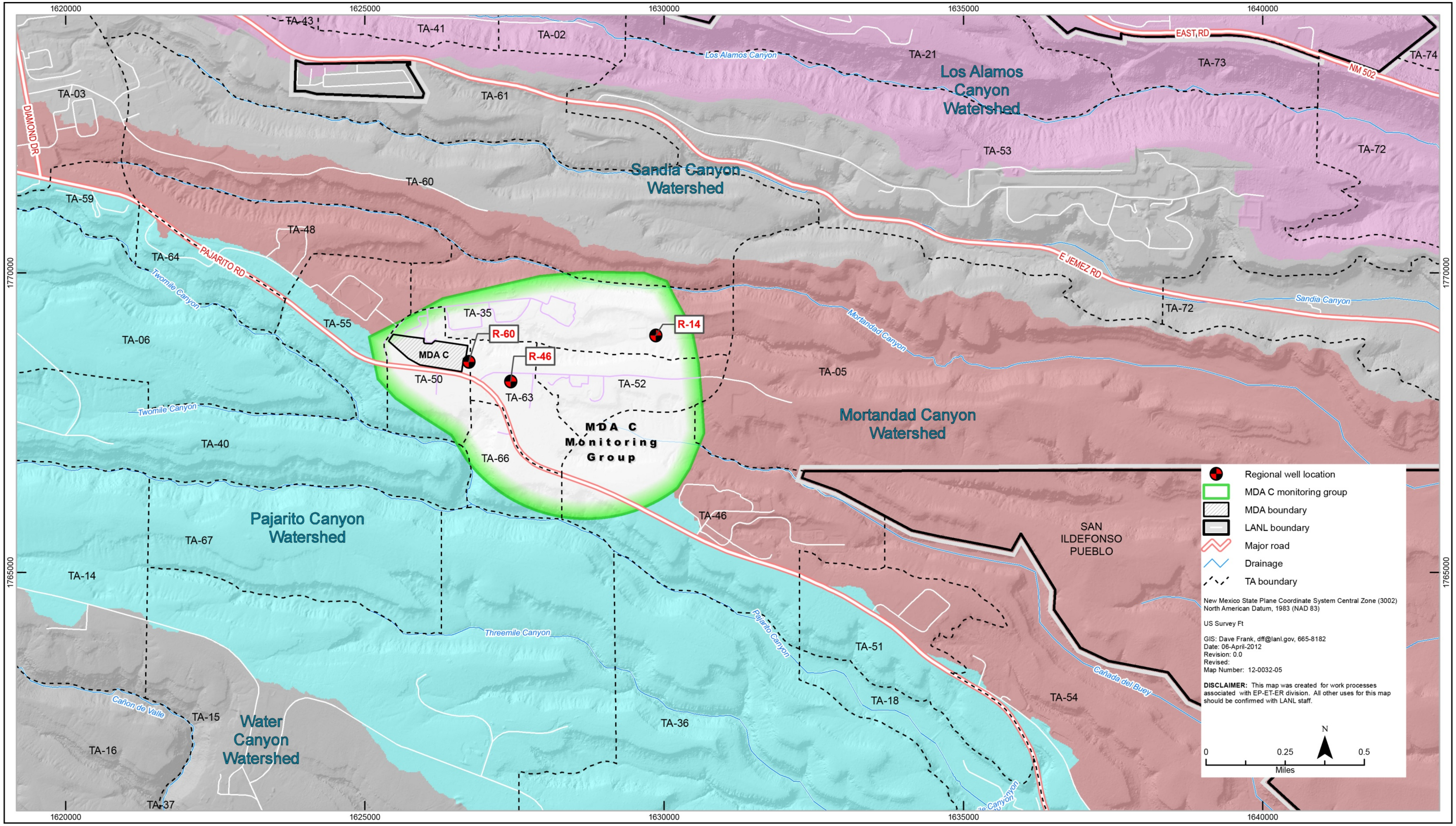

Figure 4.1-1 MDA C monitoring group

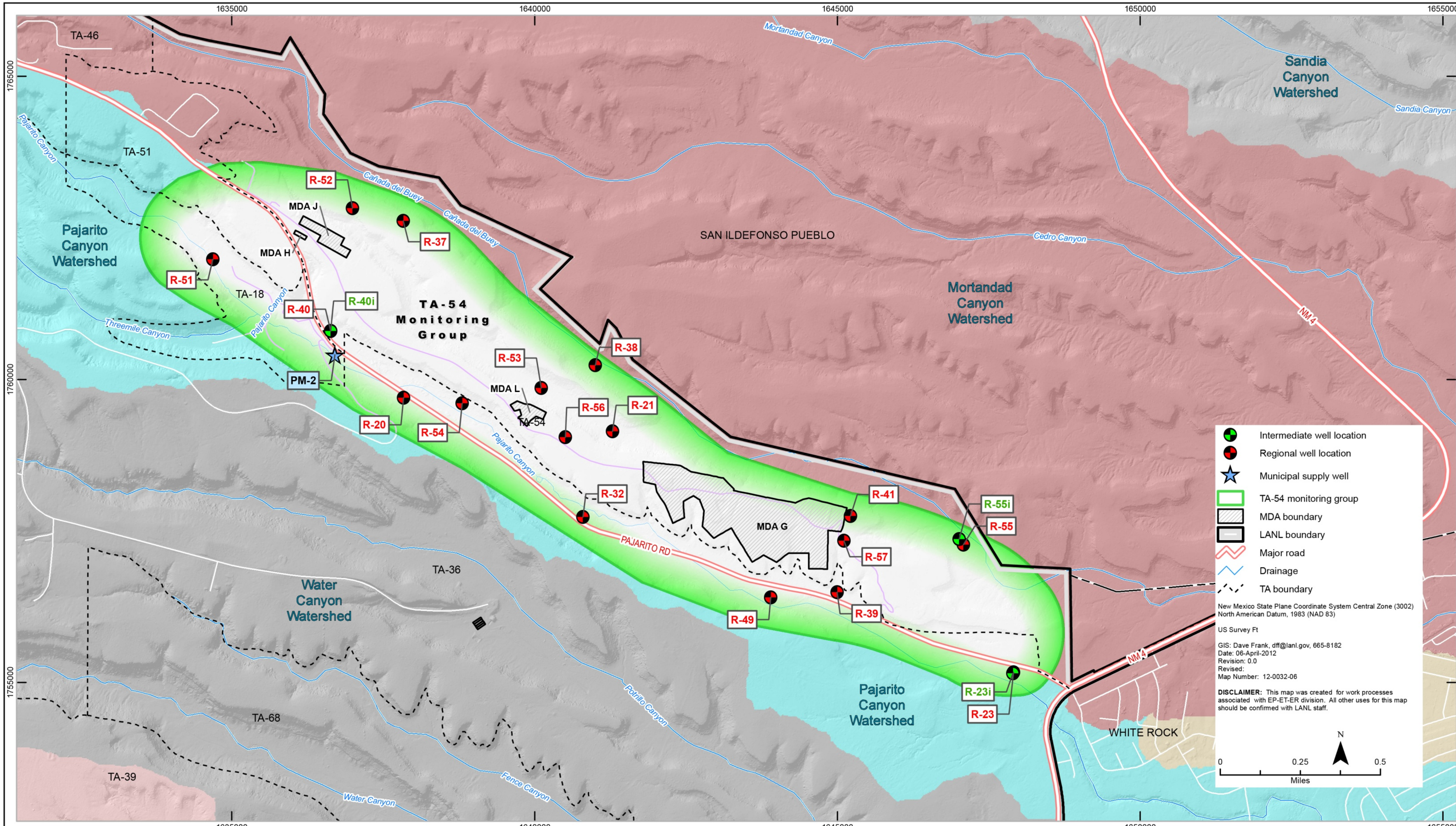

Figure 5.1-1 Monitoring well network for TA-54 MDAs H, L, and G

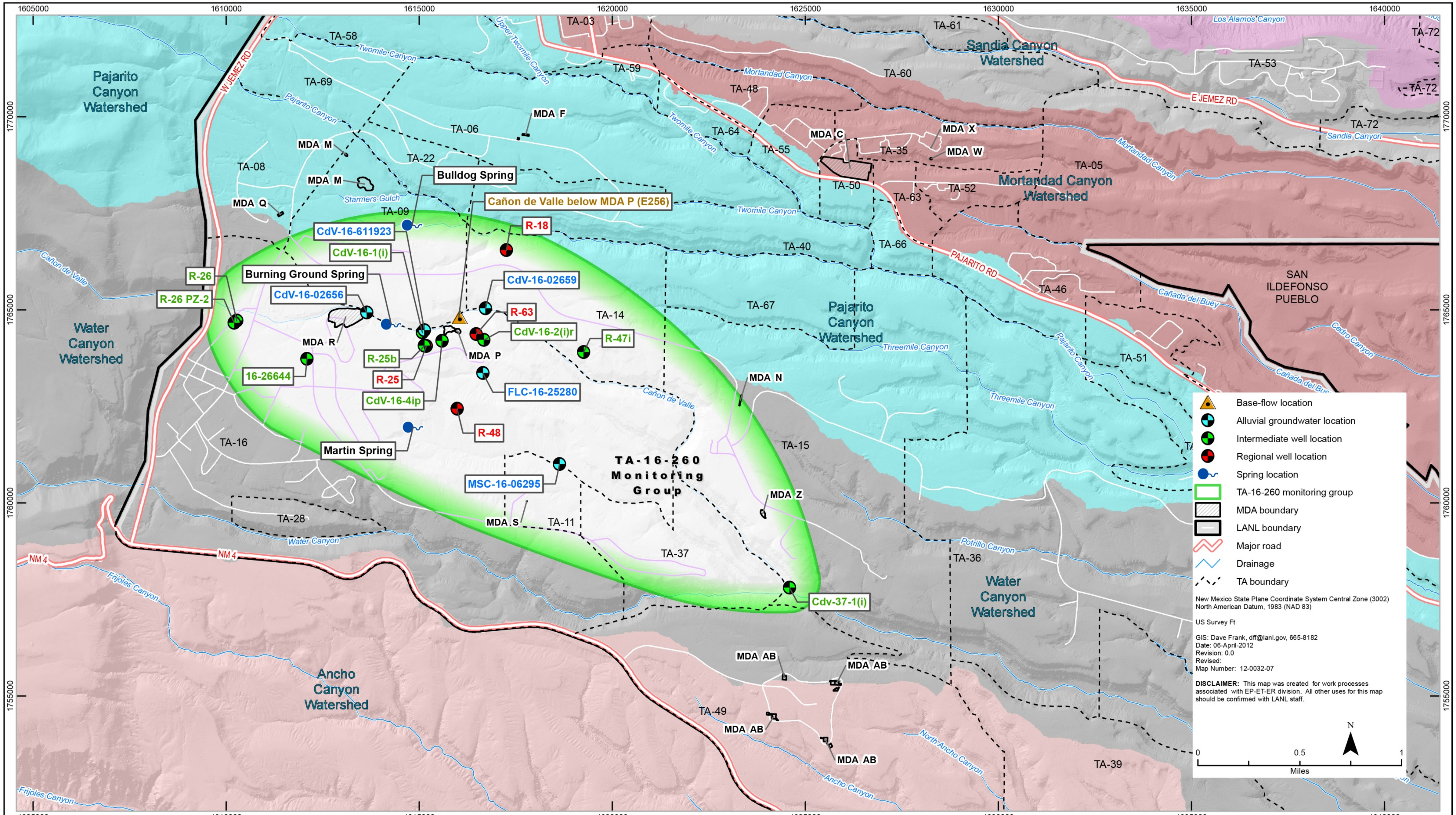

Figure 6.1-1 TA-16 260 Outfall monitoring group

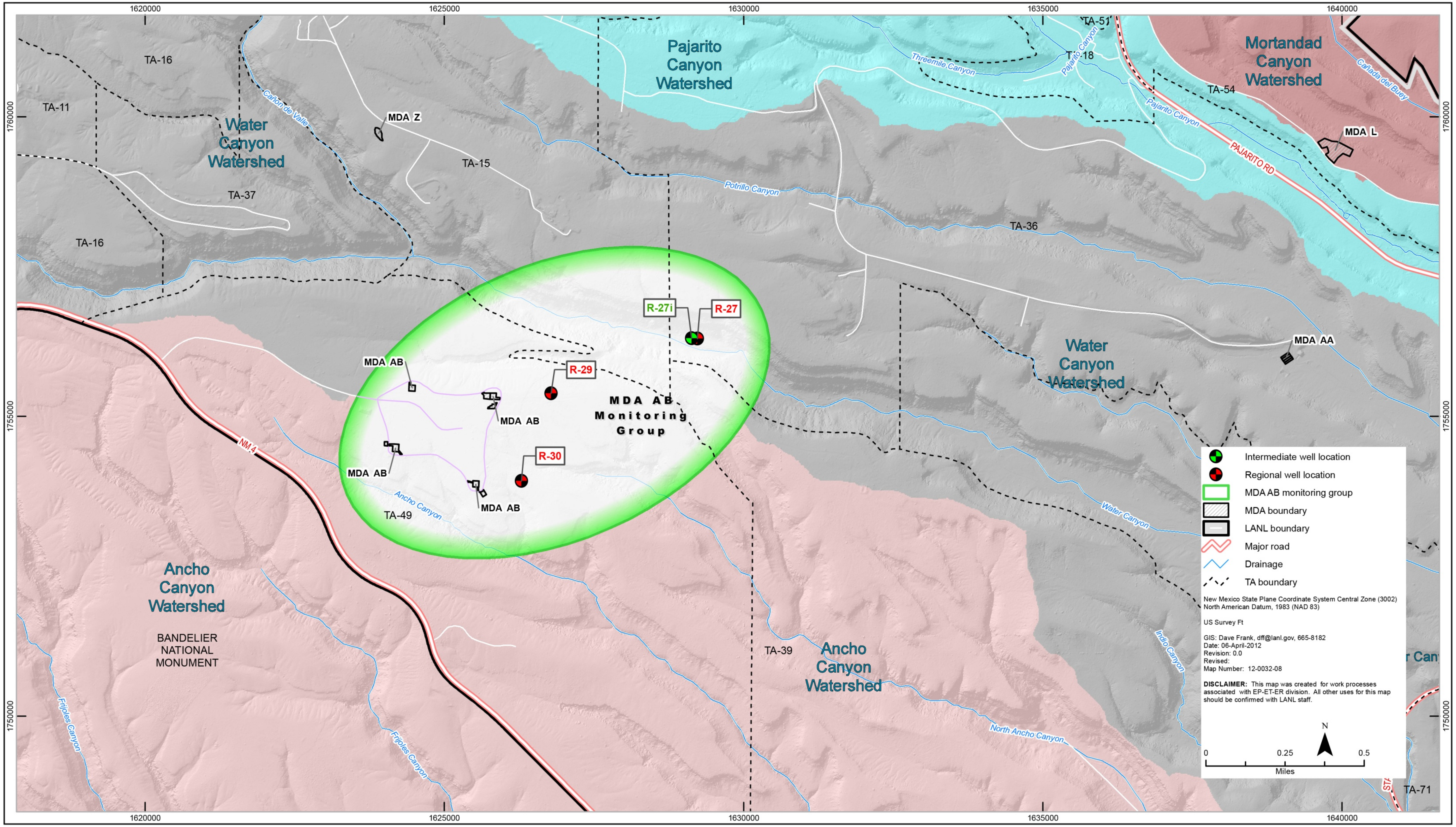

Figure 7.1-1 MDA AB monitoring group

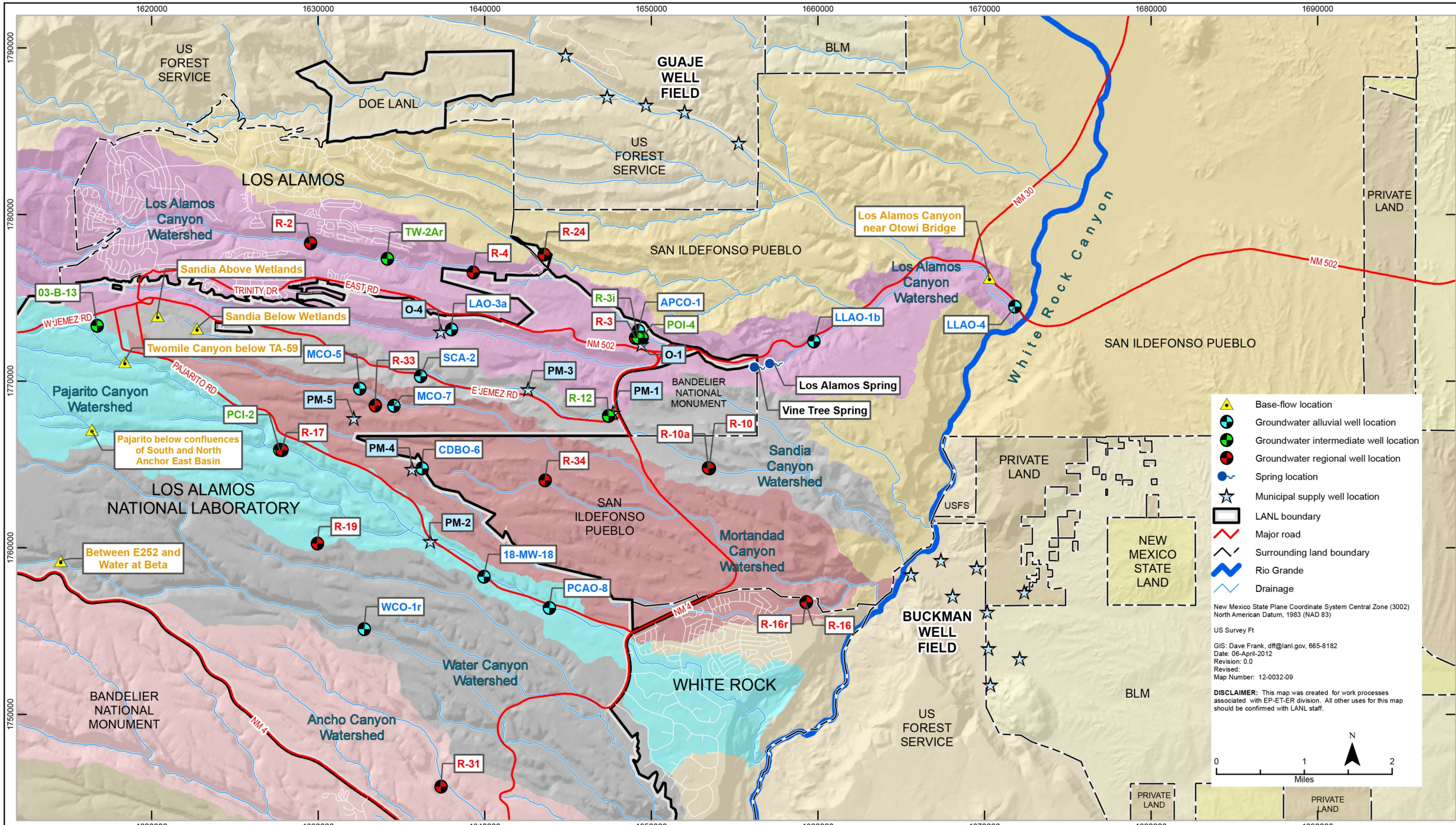

Figure 8.1-1 General surveillance

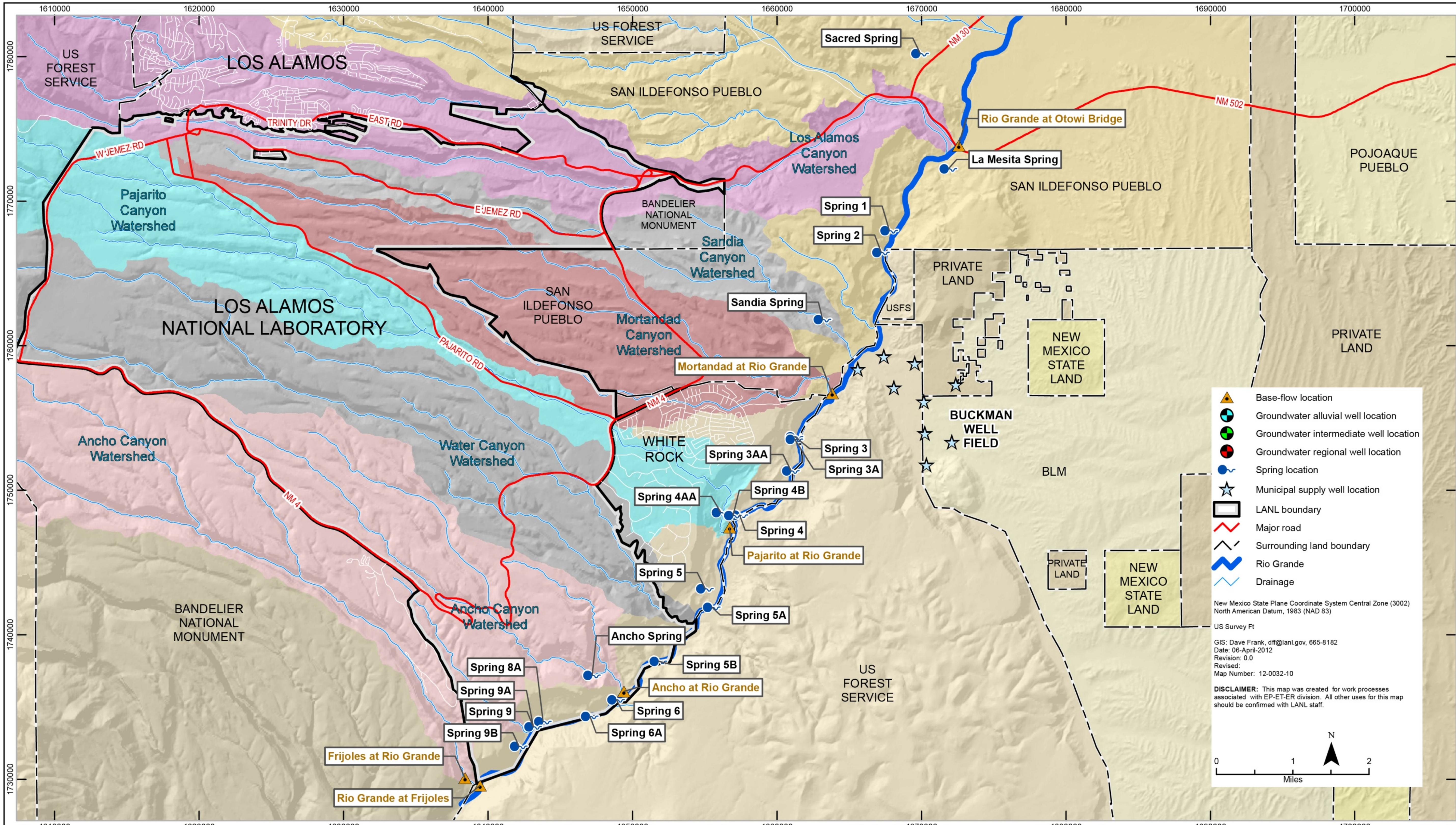

Figure 8.1-2 **General surveillance, White Rock Canyon**

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

Type	Potential 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 Guidelines		X

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

[b] EPA Regional Screening Levels (EPA 2011, 204336).

Table 1.6-2
Analytical Suites and Frequencies for Locations Assigned to Area-Specific Monitoring Groups

Surface Water Body or Source Aquifer	Metals[a] (filtered)	Organics					Radionuclides			Inorganics		Field Data[f]
		VOCs	SVOCs	PCBs	HEXP[b]	Dioxins/Furans	Radionuclides[c]	Tritium[d]	Low-Level Tritium[d]	General Inorganics[e]	Perchlorate	
TA-21 Monitoring Group (Upper Los Alamos and Sandia Canyons)												
Intermediate	A, B, —[g]	A, B, —	A, B, —	—	—	—	A	A, —	A, —	A	A	A
Regional	A, B, —	B, —	B, —	—	—	—	A	A, —	A, —	A	A	A
Characterization of new deep groundwater wells[h]	Q	Q	Q	A	A	A	Q	—	Q	Q	Q	Q
Chromium Investigation Monitoring Group (Sandia and Mortandad Canyons)												
Intermediate (Sandia)	Q, S	B, —	B, —	B	—	—	A	A	—	Q, S	Q, S	Q, S
Intermediate (Mortandad)	Q,S	S	S	—	—	—	A	A	—	Q, S	Q, S	Q, S
Regional	A, Q, S	A, B, —	A, B, —	—	—	—	B	A, —	S, A, —	Q, S, A	Q, S, A	Q, S, A
Characterization of new deep groundwater wells	Q	S	S	A	A	A	S	—	S	Q	Q	Q
MDA C Monitoring Group (Mortandad and Pajarito Canyons)												
Regional	S, B	S	S	—	V	—	A	—	S	S, A	B	S
Characterization of new deep groundwater wells	Q	Q	Q	A	A	A	S	—	S	Q	Q	Q
TA-54 Monitoring Group (Mortandad Canyon/Cañada del Buey and Pajarito Canyons)												
Intermediate	S, A, —	S, —	A, —	V, —	A, V, —	—	A, —	A,—	S	S, A, —	S, B, —	S
Regional	S, A	S	A	V	V	—	A	—	S	S, A	B	S
Characterization of new deep groundwater wells	Q	Q	Q	Q	Q	S	S	—	S	Q	Q	Q

Table 1.6-2 (continued)

Surface Water Body or Source Aquifer	Metals[a] (filtered)	Organics					Radionuclides			Inorganics		Field Data[f]
		VOCs	SVOCs	PCBs	HEXP[b]	Dioxins/Furans	Radionuclides[c]	Tritium[d]	Low-Level Tritium[d]	General Inorganics[e]	Perchlorate	
TA-16 260 Monitoring Group (Water Canyon/Cañon de Valle and Pajarito Canyon)												
Base flow	S	S	B	V	S	V	B	—	—	A	B	S
Springs	S	S	B	V	S	V	B	—	—	A	B	S
Alluvial	S, A	S, A	B	V	S, A	V	B	—	—	A	B	S, A
Intermediate	S, A, —	S, A	B, —	—	S, A	—	—	—	B, —	S, A	B, —	S
Regional	S, A	S, A	B, —	—	S, A	—	B	—	B, —	S, A	B, —	S, A
Characterization of new deep groundwater wells	Q	Q	Q	A	Q	A	A	—	—	Q	Q	Q
MDA AB Monitoring Group (Ancho and Water Canyons)												
Intermediate	A	A	A	—	A	—	A	—	A	A	B	A
Regional	A	A	A	—	A	—	A	—	A	A	B	A

Note: 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] Metals analysis includes 23 metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn) plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[b] HEXP = High explosive (compounds). The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate; triaminotrinitrobenzene; 3,5-dinitroaniline, tri(o-cresyl)phosphate; 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene.

[c] The radionuclide suite includes gross alpha, gross beta, strontium-90, and radionuclides analyzed by alpha and gamma spectroscopy.

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

[e] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus; total organic carbon (TOC); total dissolved solids; alkalinity; specific conductivity; pH; and hardness. TKN, TOC, and total cyanide are analyzed only in unfiltered samples.

[f] Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature at all locations. 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.

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

[h] 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, 2011.

Table 1.6-3
Analytical Suites and Frequencies for Locations Assigned to General Surveillance Monitoring

Surface Water Body or Source Aquifer	Metals[a] (filtered)	Organics					Radionuclides			Inorganics		Suspended Sediments	Field Data[f]
		VOCs	SVOCs	PCBs	HEXP[b]	Dioxins/Furans	Radionuclides[c]	Tritium[c]	Low-Level Tritium[d]	General Inorganics[e]	Perchlorate		
Northern Locations (Los Alamos/Pueblo, Sandia, and Mortandad Canyons)													
Springs	S, A	S, A	T	T	T	V	A	—[i]	A	S, A	S, A	—	S, A
Alluvial	A, B	A, B	B, T	V	T, V, —	V	A	—	—	A, B	A, B	—	A
Intermediate	A, B	B	B	V	V, —	—	A, B	—	B, —	A, B	A, B	—	A
Regional	A, Q	A, B	A, B	T, —	T, —	—	A	—	A, B, —	A	A	—	A
Southern Locations (Pajarito, Water Canyon/Cañon de Valle, Frijoles, Ancho, and Chaquehui Canyons)													
Alluvial	A, B	B	B	V	V	V	A	—	—	A, B	B	—	A
Intermediate	S, A, B	S, B, —	S, B, —	V, —	A, B, V	V, —	A	A, —	B, —	S, A, B	B	—	S, A
Regional	A, B	B, —	B, —	—	A, V	—	A	—	B, —	A, B	A, B	—	A
White Rock Canyon and Rio Grande Watershed													
Base flow	A, B	A, B	A, T	A, T	A, T	A, T	A	—	A, —	A, B	A, B	B	A
Springs	A	A	A, B, T	A, T, —	B, T	A, —	A	—	A, —	A	A	—	A

Note: 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] Metals analysis includes 23 metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn) plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[b] HEXP = High explosive (compounds). The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate; triaminotrinitrobenzene; 3,5-dinitroaniline, tri(o-cresyl)phosphate; 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene.

[c] The radionuclide suite includes gross alpha, gross beta, strontium-90, and radionuclides analyzed by alpha and gamma spectroscopy.

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

[e] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus; total organic carbon (TOC); total dissolved solids; alkalinity; specific conductivity; pH; and hardness. TKN, TOC, and total cyanide are analyzed only in unfiltered samples.

[f] Field parameters include pH, turbidity, specific conductance, dissolved oxygen, and temperature at all locations. 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.

[g] — = 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 MY2013: October 1, 2012–September 30, 2013

Monitoring Group or Watershed	Location Type	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
		Oct–Dec 2012	Jan–Mar 2013	Apr–Jun 2013	Jul–Sep 2013
Monitoring Groups					
TA-54	Routine	B, A, **S**	—	**S**	—
Chromium Investigation	Routine	B, A, S, **Q**	**Q**	S, **Q**	**Q**
MDA C	Routine	B, A, **S**	—	**S**	—
TA-21	Routine	Q[a]	Q[a]	Q[a]	B, **A**, Q[a]
MDA AB	Routine	—	B, **A**	—	—
TA-16 260	Routine	Q	B, A, **S,** Q	Q	S, Q
General Surveillance					
Los Alamos and Pueblo Canyons	Routine	S[b]	—	**A**, S[b]	—
Mortandad and Sandia Canyons	Routine	Q[c]	Q[c]	Q[c]	**A**, B, Q[c]
Pajarito Canyon	Routine	S[d]	—	B, **A**, S[d]	—
Frijoles, Ancho, and Chaquehui Canyons	Routine	—	**A**	—	
Water Canyon	Routine	—	—	—	B, **A**
White Rock Canyon	Routine	T, B, **A**	—	—	—
Characterization					
All Watersheds	Characterization	Q	Q	Q	Q

Notes: Bold indicates the frequency of sampling for the majority of wells in the monitoring group and for which periodic monitoring reports 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); — = no samples are scheduled to be collected from this monitoring group during this period.

[a] R-64 and R-66.

[b] Vine Tree Spring.

[c] R-34.

[d] 03-B-13.

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 down canyon 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 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 Aqua Troll transducer to collect data on salinity impacts from snowmelt runoff.	Alluvial	C
Sandia Canyon Watershed				
General Surveillance	SCA-1	Well located in wetland in upper Sandia Canyon. Sampling events were moved to nearby drive point well SCA-1-DP because of silting in of the screen in SCA-1. Continuous water levels are monitored in SCA-1, and manual measurements are taken at SCA-1-DP during sampling events (Koch and Schmeer 2011, 201566).	Alluvial	C
	SCA-4	Well located in lower Sandia Canyon approximately mid-way between SCA-3 and the easternmost drainage from the TA-53 complex. Water-level monitoring will provide data regarding impacts from Sandia wetlands mitigation activities.	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 Aqua Troll transducer to collect data on salinity impacts from snowmelt runoff.	Alluvial	C
	MCO-3	Well monitors upper part of Mortandad Canyon. Water-level data from MCO-3 will be used to document hydrologic characteristics of the alluvial groundwater following reduction of discharges from the TA-50 RLWTF outfall since 2010. Aqua Troll transducer will be used to assess salinity impacts from snowmelt runoff.	Alluvial	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 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
Water Canyon/Cañon de Valle Watershed				
TA-16 260 Monitoring Group	R-25 screen 3	Located at TA-16 within the Cañon de Valle watershed. Screen 3 has always been dry but the screen was damaged during installation and is not reliable for water-level monitoring (Koch and Schmeer 2011, 201566). Pump water at screen 3 responded to drilling and installation of adjacent well R-25c (replacement for R-25 screen 3) in August 2008.	Intermediate	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}

Table 1.8-1 (continued)

Assigned Monitoring Group	Location	Rationale for Selection of Location	Source Aquifer	Water Level*
	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

					Analytical Suites											
					Metals	Organics					Radionuclides			Inorganics		Field[h]
Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs	SVOCs	PCBs	HEXP[c]	Dioxins/Furans	Radionuclides[d]	Tritium[d]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate[g]	DO, ORP, pH, SC, T, Turb
LADP-3	Los Alamos	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	C	B[2014 i]	B[2014]	B[2014]	—[j]	—	—	A	—	A	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	C	B[2014]	B[2014]	B[2014]	—	—	—	A	—	A	A	A	A
LAOI-3.2	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	C	A	B[2014]	B[2014]	—	—	—	A	A	—	A	A	A
LAOI-3.2a	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	C	A	B[2014]	B[2014]	—	—	—	A	A	—	A	A	A
LAOI-7	Upper Los Alamos Canyon	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	C	A	B[2014]	B[2014]	—	—	—	A	A	—	A	A	A
R-5 S2	Los Alamos	Monitors for potential contaminants from upper Pueblo and Acid Canyons.	Intermediate	C	—	—	—	—	—	—	A	—	A	A	A	A
R-6i	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Intermediate	C	B[2014]	A	A	—	—	—	A	A	—	A	A	A
R-9i S1	Upper Los Alamos Canyon	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	C	A	—	—	—	—	—	A	—	—	A	A	A
R-9i S2	Upper Los Alamos Canyon	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	C	A	—	—	—	—	—	A	—	—	A	A	A
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	C	B[2014]	A	A	—	—	—	A	A	—	A	A	A
R-5 S3	Los Alamos	Monitors for potential contaminants from upper Pueblo and Acid Canyons.	Regional	C	—	—	—	—	—	—	A	—	A	A	A	A
R-5 S4	Los Alamos	Monitors for potential contaminants from upper Pueblo and Acid Canyons.	Regional	C	—	—	—	—	—	—	A	—	A	A	A	A
R-6	Los Alamos	Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21. Background location in GBIR R4.	Regional	C	B[2014]	B[2014]	B[2014]	—	—	—	A	A	—	A	A	A
R-64	Los Alamos	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21 MDA T. Completed July 15, 2011.	Regional	C	Q	Q	Q	A	A	A	Q	—	Q	Q	Q	Q
R-66	Los Alamos	New regional well to replace TW-3, located near Otowi-4. Monitors for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21. Completed November 16, 2011.	Regional	C	Q	Q	Q	A	A	A	Q	—	Q	Q	Q	Q
R-8 S1	Upper Los Alamos Canyon	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Regional	C	A	—	—	—	—	—	A	—	A	A	A	A
R-8 S2	Upper Los Alamos Canyon	Monitors downgradient location for potential contaminants from upper Los Alamos Canyon, DP Canyon, and TA-21.	Regional	C	A	—	—	—	—	—	A	—	A	A	A	A
R-9	Upper Los Alamos Canyon	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	C	A	B[2014]	B[2014]	—	—	—	A	A	—	A	A	A

Table 2.4-1 (continued)

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). Samples collected for filtered analysis include metals, anions, cations, nitrate plus nitrite, ammonia, total phosphorus, specific conductance, pH, total dissolved solids (TDS), alkalinity, hardness, perchlorate and nitrogen isotopes. Samples collected for unfiltered analysis include VOCs, SVOCs, pesticides, PCBs, high explosive (compounds) (HEXP), dioxins/furans, radionuclides, tritium, total Kjeldahl nitrogen (TKN), total organic carbon (TOC), suspended sediment analysis, and deuterium and oxygen isotopes.

[a] 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). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals. Spring discharge is measured during semiannual (S) or annual (A) sampling.

[b] Metals analysis includes 23 metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn) plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate; triaminotrinitrobenzene; 3,5-dinitroaniline, tri(o-cresyl)phosphate; 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[d] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy (for americium-241 and uranium-235), gamma spectroscopy (for cesium-137, cobalt-60, neptunium-237, potassium-40, and sodium-22), and strontium-90.

[e] 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.

[f] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); TKN; ammonia; total phosphorus, TOC; TDS; alkalinity; specific conductivity; pH; and hardness. TKN, TOC, and total cyanide are analyzed only in unfiltered samples.

[g] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[h] Field parameters include pH, turbidity (Turb), specific conductance (SC), dissolved oxygen (DO), and temperature (T) at all locations. Oxidation-reduction potential (ORP) 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.

[i] [2014] = Samples scheduled to be collected during implementation of MY2014 Interim Plan.

[j] — = 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

					Analytical Suites											
					Metals	Organics					Radionuclides			Inorganics		Field[h]
Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs	SVOCs	PCBs	HEXP[c]	Dioxins/Furans	Radionuclides[d]	Tritium[d]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate[g]	DO, ORP, pH, SC, T, Turb
MCOI-4	Mortandad	Monitors for potential contaminants from upper Mortandad and Ten Site Canyons or possibly Sandia Canyon.	Intermediate	C	S	S	S	—[i]	—	—	A	A	—	S	S	S
MCOI-5	Mortandad	Monitors for potential contaminants from upper Mortandad and Ten Site Canyons or possibly Sandia Canyon.	Intermediate	C	S	S	S	—	—	—	A	A	—	S	S	S
MCOI-6	Mortandad	Monitors for potential contaminants from upper Mortandad and Ten Site Canyons or possibly Sandia Canyon.	Intermediate	C	Q	S	S	—	—	—	A	A	—	Q	Q	Q
SCI-1	Sandia	Monitors the first perched-intermediate groundwater encountered along the key infiltration pathway in Sandia Canyon.	Intermediate	C	S	—	—	B[2013]	—	—	A	A	—	S	S	S
SCI-2	Sandia	Monitors key infiltration pathway in Sandia Canyon.	Intermediate	C	Q	B[2014 j]	B[2014]	B[2013 k]	—	—	A	A	—	Q	Q	Q
R-1	Mortandad	Monitors for potential contaminants from upper Mortandad Canyon or possibly Sandia Canyon. Background location in GBIR R3.	Regional	C	A	B[2014]	B[2014]	—	—	—	B[2013]	—	A	A	A	A
R-11	Sandia	Monitors for potential contaminants from Sandia Canyon and possibly Los Alamos Canyon.	Regional	C	Q	—	—	—	—	—	B[2013]	—	A	Q	Q	Q
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	C	S	—	—	—	—	—	B[2013]	—	A	S	A	S
R-15	Mortandad	Monitors for potential contaminants from upper Ten Site or Mortandad Canyons.	Regional	C	S	B[2014]	B[2014]	—	—	—	B[2014]	—	A	S	S	S
R-28	Mortandad	Monitors for potential contaminants from upper Sandia, Mortandad, or Ten Site Canyons or possibly sources in canyons to the north.	Regional	C	Q	—	—	—	—	—	B[2013]	A	—	Q	Q	Q
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	C	S	B[2014]	B[2014]	—	—	—	B[2013]	—	A	S	A	S
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	C	S	B[2014]	B[2014]	—	—	—	B[2013]	—	A	S	A	S
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	C	S	A	A	—	—	—	B[2013]	—	A	S	A	S
R-42	Mortandad	Key characterization and monitoring point located upgradient of R-28.	Regional	C	Q	B[2014]	B[2014]	—	—	—	B[2013]	A	—	Q	Q	Q
R-43 S1	Sandia	Monitors downgradient extent of contamination originating in Sandia Canyon and possibly canyons to the north.	Regional	C	Q	B[2014]	B[2014]	—	—	—	B[2013]	—	A	Q	Q	Q
R-43 S2	Sandia	Monitors downgradient extent of contamination originating in Sandia Canyon and possibly canyons to the north.	Regional	C	Q	B[2014]	B[2014]	—	—	—	B[2013]	—	A	Q	Q	Q
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	C	S	B[2014]	B[2014]	—	—	—	B[2013]	—	A	S	A	S
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	C	S	B[2014]	B[2014]	—	—	—	B[2013]	—	A	S	A	S
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	C	S	B[2014]	B[2014]	—	—	—	B[2013]	—	A	S	A	S

Table 3.4-1 (continued)

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites: Metals	Organics					Radionuclides			Inorganics		Field[h]
					Metals (Filtered)[b]	VOCs	SVOCs	PCBs	HEXP[c]	Dioxins/Furans	Radionuclides[d]	Tritium[d]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate[g]	DO, ORP, pH, SC, T, Turb
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	C	S	B[2014]	B[2014]	—	—	—	B[2013]	—	A	S	A	S
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	C	Q	B[2014]	B[2014]	—	—	—	B[2013]	—	S	Q	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	C	Q	B[2013]	B[2013]	—	—	—	B[2013]	—	S	Q	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. Completed May 3, 2011.[l]	Regional	C	Q	S	S	A	A	A	S	—	S	Q	Q	Q
R-61 S2	Mortandad	Located on the mesa south of Mortandad Canyon to define the western extent of the flow path for chromium migration. Completed May 3, 2011.[l]	Regional	C	Q	S	S	A	A	A	S	—	S	Q	Q	Q
R-62	Mortandad	New well located on a ridge between Sandia and Mortandad Canyon at the east end of Sigma Mesa. Completed October 3, 2011.[l]	Regional	C	Q	S	S	A	A	A	S	—	S	Q	Q	Q

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). Samples collected for filtered analysis include metals, anions, cations, nitrate plus nitrite, ammonia, total phosphorus, specific conductance, pH, total dissolved solids (TDS), alkalinity, hardness, perchlorate and nitrogen isotopes. Samples collected for unfiltered analysis include VOCs, SVOCs, pesticides, PCBs, high explosive (compounds) (HEXP), dioxins/furans, radionuclides, tritium, total Kjeldahl nitrogen (TKN), total organic carbon (TOC), suspended sediment analysis, and deuterium and oxygen isotopes.

[a] 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). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals. Spring discharge is measured during semiannual (S) or annual (A) sampling.

[b] Metals analysis includes 23 metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn) plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate; triaminotrinitrobenzene; 3,5-dinitroaniline, tri(o-cresyl)phosphate; 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[d] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy (for americium-241 and uranium-235), gamma spectroscopy (for cesium-137, cobalt-60, neptunium-237, potassium-40, and sodium-22), and strontium-90.

[e] 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.

[f] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); TKN; ammonia; total phosphorus, TOC; TDS; alkalinity; specific conductivity; pH; and hardness. TKN, TOC, and total cyanide are analyzed only in unfiltered samples.

[g] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[h] Field parameters include pH, turbidity (Turb), specific conductance (SC), dissolved oxygen (DO), and temperature (T) at all locations. Oxidation-reduction potential (ORP) 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.

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

[j] [2014] = Samples scheduled to be collected during implementation of MY2014 Interim Plan.

[k] [2013] = Samples scheduled to be collected during implementation of MY2013 Interim Plan.

[l] Characterization suites and frequencies apply to new groundwater wells and are provided in Table 1.6-2. Following four quarterly consecutive rounds of sampling for the characterization suites at the location, these suites and frequencies convert to the zone type (e.g., intermediate and regional) classification presented in Table 1.6-2. "New" wells are defined as those completed, rehabilitated, or converted on or after October 1, 2011.

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	Water Level or Flow[a]	Analytical Suites								
					Metals	Organics			Radionuclides		Inorganics		Field[h]
					Metals (Filtered)[b]	VOCs	SVOCs	HEXP[c]	Radionuclides[d]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate[g]	DO, ORP, pH, SC, T, Turb
R-14	Mortandad	Monitors for potential contaminants from Ten Site Canyon or upper Mortandad Canyon, including MDA C. Background location in GBIR R4.	Regional	C	B[2013 i]	S	S	V[2015 j]	A	S	A	B[2014 k]	S
R-46	Mortandad	Monitors groundwater quality downgradient of MDA C.	Regional	C	S	S	S	V[2015]	A	S	S	B[2014]	S
R-60	Mortandad	Located east of MDA C. Monitors for potential contaminant releases from MDA C. Completed October 18, 2010.	Regional	C	S	S	S	V[2015]	A	S	S	B[2014]	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). Samples collected for filtered analysis include metals, anions, cations, nitrate plus nitrite, ammonia, total phosphorus, specific conductance, pH, total dissolved solids (TDS), alkalinity, hardness, perchlorate and nitrogen isotopes. Samples collected for unfiltered analysis include VOCs, SVOCs, pesticides, PCBs, high explosive (compounds) (HEXP), dioxins/furans, radionuclides, tritium, total Kjeldahl nitrogen (TKN), total organic carbon (TOC), suspended sediment analysis, and deuterium and oxygen isotopes.

[a] 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). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals. Spring discharge is measured during semiannual (S) or annual (A) sampling.

[b] Metals analysis includes 23 metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn) plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate; triaminotrinitrobenzene; 3,5-dinitroaniline, tri(o-cresyl)phosphate; 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[d] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy (for americium-241 and uranium-235), gamma spectroscopy (for cesium-137, cobalt-60, neptunium-237, potassium-40, and sodium-22), and strontium-90.

[e] 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.

[f] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); TKN; ammonia; total phosphorus, TOC; TDS; alkalinity; specific conductivity; pH; and hardness. TKN, TOC, and total cyanide are analyzed only in unfiltered samples.

[g] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[h] Field parameters include pH, turbidity (Turb), specific conductance (SC), dissolved oxygen (DO), and temperature (T) at all locations. Oxidation-reduction potential (ORP) 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.

[i] 2013 = Samples scheduled to be collected during implementation of MY2013 Interim Plan.

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

[k] 2014 = Samples scheduled to be collected during implementation of MY2014 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	Water Level or Flow[a]	Analytical Suites										
					Metals	Organics				Radionuclides			Inorganics		Field[h]
					Metals (Filtered)[b]	VOCs	SVOCs	PCBs	HEXP[c]	Radionuclides[d]	Tritium[d]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate[g]	DO, ORP, pH, SC, T, Turb
R-23i PIEZ	Pajarito	Downgradient monitoring location for TA-54. Monitors potential sources in Pajarito watershed and potential sources in canyons to the north.	Intermediate	A	A	S	A	V[2015 i]	V[2015]	A	A	—[j]	A	B[2014 k]	S
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	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
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	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-37 S1	Mortandad	Monitors perched-intermediate groundwater downgradient of MDA H.	Intermediate	C	A	S	S	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-40 Si	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed. Screen impacted by drilling fluids.	Intermediate	C	—	—	—	—	—	—	—	S	—	—	S
R-40 S1	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Intermediate	C	—	S	—	—	—	—	—	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. Completed January 18, 2011.	Intermediate	C	S	S	A	V[2015]	A	A	—	S	S	S	S
R-20 S1	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2013 l]	S
R-20 S2	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-21	Mortandad	Monitors regional groundwater in Mortandad Canyon. Background location in GBIR R3 and GBIR R4.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
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	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-32	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-37 S2	Mortandad	Monitors regional groundwater downgradient of MDA H.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-38	Mortandad	Monitors groundwater downgradient of MDA L in the north fork of Cañada del Buey in the Mortandad watershed.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-39	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-40 S2	Pajarito	Monitors TA-54 and potential sources in Pajarito watershed.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-41 S2	Pajarito	Monitors groundwater near northeast corner of MDA G.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-49 S1	Pajarito	Monitors groundwater south of Area G in Pajarito Canyon.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-49 S2	Pajarito	Monitors groundwater south of Area G in Pajarito Canyon. Background location in GBIR R4.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
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. Completed February 8, 2010.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
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. Completed February 8, 2010.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
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. Completed March 31, 2010.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
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. Completed March 31, 2010.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-53 S1	Pajarito	Located north of MDA L in Cañada del Buey; monitors for potential releases from MDA L. Completed March 29, 2010.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S

Table 5.4-1 (continued)

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites										
					Metals	Organics				Radionuclides			Inorganics		Field[h]
					Metals (Filtered)[b]	VOCs	SVOCs	PCBs	HEXP[c]	Radionuclides[d]	Tritium[d]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate[g]	DO, ORP, pH, SC, T, Turb
R-53 S2	Pajarito	Located north of MDA L in Cañada del Buey; monitors for potential releases from MDA L. Completed March 29, 2010.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-54 S1	Pajarito	Monitoring well installed immediately west of MDA L in Pajarito Canyon; monitors for potential releases from MDA L. Completed January 29, 2010.	Regional	C	S	S	A	V[2015]	V[2015]	A	—	S	S	B[2014]	S
R-54 S2	Pajarito	Monitoring well installed immediately west of MDA L in Pajarito Canyon; monitors for potential releases from MDA L. Completed January 29, 2010.	Regional	C	S	S	A	V[2015]	V[2015]	A	—	S	S	B[2014]	S
R-55 S1	Mortandad	Located downgradient of MDA G. Monitors for potential contaminant releases from MDA G and other sources in Pajarito Canyon. Completed August 25, 2010.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-55 S2	Mortandad	Located downgradient of MDA G. Monitors for potential contaminant releases from MDA G and other sources in Pajarito Canyon. Completed August 25, 2010.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
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. Completed July 19, 2010.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
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. Completed July 19, 2010.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-57 S1	Pajarito	Located downgradient of MDA G at the eastern end of TA-54; monitors for potential releases from MDA G. Completed June 8, 2010.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	S
R-57 S2	Pajarito	Located downgradient of MDA G at the eastern end of TA-54; monitors for potential releases from MDA G. Completed June 8, 2010.	Regional	C	A	S	A	V[2015]	V[2015]	A	—	S	A	B[2014]	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). Samples collected for filtered analysis include metals, anions, cations, nitrate plus nitrite, ammonia, total phosphorus, specific conductance, pH, total dissolved solids (TDS), alkalinity, hardness, perchlorate and nitrogen isotopes. Samples collected for unfiltered analysis include VOCs, SVOCs, pesticides, PCBs, high explosive (compounds) (HEXP), dioxins/furans, radionuclides, tritium, total Kjeldahl nitrogen (TKN), total organic carbon (TOC), suspended sediment analysis, and deuterium and oxygen isotopes.

[a] 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). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals. Spring discharge is measured during semiannual (S) or annual (A) sampling.

[b] Metals analysis includes 23 metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn) plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate; triaminotrinitrobenzene; 3,5-dinitroaniline, tri(o-cresyl)phosphate; 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[d] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy (for americium-241 and uranium-235), gamma spectroscopy (for cesium-137, cobalt-60, neptunium-237, potassium-40, and sodium-22), and strontium-90.

[e] 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.

[f] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); TKN; ammonia; total phosphorus, TOC; TDS; alkalinity; specific conductivity; pH; and hardness. TKN, TOC, and total cyanide are analyzed only in unfiltered samples.

[g] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[h] Field parameters include pH, turbidity (Turb), specific conductance (SC), dissolved oxygen (DO), and temperature (T) at all locations. Oxidation-reduction potential (ORP) 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.

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

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

[k] [2014] = Samples scheduled to be collected during implementation of MY2014 Interim Plan.

[l] [2013] = Samples scheduled to be collected during implementation of MY2013 Interim Plan.

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	Water Level or Flow[a]	Analytical Suites										
					Metals	Organics					Radionuclides		Inorganics		Field[h]
					Metals (Filtered)[b]	VOCs	SVOCs	PCBs	HEXP[c]	Dioxins/Furans	Radionuclides[d]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate[g]	DO, ORP, pH, SC, T, Turb
Canon de Valle below MDA P	Water	Downgradient surface water location for 260 Outfall. Monitors HE and other contaminants in support of surface CME.	Base flow	C	S	S	B[2013 i]	V[2015 j]	S	V[2015]	B[2014 k]	—[l]	A	B[2013]	S
Bulldog Spring	Pajarito	Monitors HE contamination downgradient of TA-09.	Spring	S	S	S	B[2013]	V[2015]	S	V[2015]	B[2014]	—	A	B[2014]	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	S	B[2013]	V[2015]	S	V[2015]	B[2014]	—	A	B[2014]	S
Martin Spring	Water	Spring located in upper Martin/S-Site Canyon.	Spring	S	S	S	B[2013]	V[2015]	S	V[2015]	B[2014]	—	A	B[2014]	S
16-25280	Water	Alluvial well downgradient of Fishladder and Burning Ground.	Alluvial	C	S	S	B[2013]	V[2015]	S	V[2015]	B[2013]	—	A	B[2013]	S
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	C	S	S	B[2013]	V[2015]	S	V[2015]	B[2014]	—	A	B[2013]	S
CdV-16-02659	Water	Downgradient alluvial well from 260 Outfall drainage confluence. Monitors HE and other contaminants in support of surface CME.	Alluvial	C	S	S	B[2013]	V[2015]	S	V[2015]	B[2014]	—	A	B[2014]	S
CdV-16-611923	Water	Key alluvial well downgradient from TA-16 260 Outfall.	Alluvial	C	S	S	B[2013]	V[2015]	S	V[2015]	B[2014]	—	A	B[2014]	S
MSC-16-06295	Water	Alluvial well in S-Site/Martin Canyon downgradient of Martin Spring and several TA-16 SWMU sites.	Alluvial	C	A	A	B[2013]	V[2015]	A	V[2015]	B[2014]	—	A	B[2014]	A
16-26644	Water	Intermediate well located at TA-16 southeast and downgradient of the 90 Line Pond.	Intermediate	C	S	S	B[2013]	—	S	—	B[2014]	—	A	B[2014]	S
CdV-16-1(i)	Water	Located downgradient of the 260 Outfall [Consolidated Unit 16-021(c)-99].	Intermediate	C	S	S	B[2013]	—	S	—	B[2014]	—	A	B[2014]	S
CdV-16-2(i)r	Water	Located downgradient of the 260 Outfall.	Intermediate	C	S	S	B[2013]	—	S	—	B[2014]	—	A	B[2013]	S
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. Completed August 23, 2010.	Intermediate	C	Q	Q	Q	A	Q	A	A	—	Q	Q	Q
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	C	A	A	B[2013]	—	A	—	B[2014]	B[2013]	A	B[2014]	A
R-25 S1	Water	Downgradient monitoring location for the 260 Outfall.	Intermediate	C	—	S	—	—	S	—	B[2014]	—	A	—	S
R-25 S2	Water	Downgradient monitoring location for the 260 Outfall.	Intermediate	C	—	S	—	—	S	—	B[2014]	—	A	—	S
R-25 S4	Water	Downgradient monitoring location for the 260 Outfall.	Intermediate	C	S	S	—	—	S	—	B[2014]	—	A	—	S
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	C	S	S	B[2013]	—	S	—	B[2014]	—	S	B[2014]	S
R-26 PZ-2	Water	Piezometer installed near R-26. Provides data for perched-intermediate groundwater upgradient of TA-16.	Intermediate	C	S	S	B[2013]	—	S	—	B[2014]	—	A	B[2013]	S
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	C	A	A	B[2014]	—	A	—	B[2014]	—	A	B[2014]	A
R-47i	Water	Located northeast of the 260 Outfall. Provides data in support of the 260 Outfall CME.	Intermediate	C	A	A	B[2013]	—	A	—	B[2014]	B[2013]	A	B[2014]	A
R-18	Pajarito	Monitors for potential contaminants from sources in TA-16.	Regional	C	S	S	B[2013]	—	S	—	B[2014]	B[2013]	S	B[2014]	S
R-25 S5	Water	Downgradient monitoring location for the 260 Outfall.	Regional	C	A	A	—	—	A	—	B[2013]	—	A	—	A
R-25 S6	Water	Downgradient monitoring location for the 260 Outfall.	Regional	C	A	A	—	—	A	—	B[2014]	—	A	—	A

Table 6.4-1 (continued)

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites: Metals – Metals (Filtered)[b]	Organics – VOCs	Organics – SVOCs	Organics – PCBs	Organics – HEXP[c]	Organics – Dioxins/Furans	Radionuclides – Radionuclides[d]	Radionuclides – Low-Level Tritium[e]	Inorganics – General Inorganics[f]	Inorganics – Perchlorate[g]	Field[h] – DO, ORP, pH, SC, T, Turb
R-25 S7	Water	Downgradient monitoring location for the 260 Outfall.	Regional	C	A	A	—	—	A	—	B[2014]	—	A	—	A
R-48	Water	Completed by deepening open borehole CdV-16-3(i). Monitors historical TA-16 sources.	Regional	C	A	A	B[2013]	—	A	—	B[2014]	B[2013]	A	B[2014]	A
R-63	Water	Single-screen regional well installed as a replacement for R-25 screen 5. Completed February 9, 2011.	Regional	C	S	S	B[2014]	—	S	—	B[2014]	B[2013]	S	B[2014]	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). Samples collected for filtered analysis include metals, anions, cations, nitrate plus nitrite, ammonia, total phosphorus, specific conductance, pH, total dissolved solids (TDS), alkalinity, hardness, perchlorate and nitrogen isotopes. Samples collected for unfiltered analysis include VOCs, SVOCs, pesticides, PCBs, high explosive (compounds) (HEXP), dioxins/furans, radionuclides, tritium, total Kjeldahl nitrogen (TKN), total organic carbon (TOC), suspended sediment analysis, and deuterium and oxygen isotopes.

[a] 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). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals. Spring discharge is measured during semiannual (S) or annual (A) sampling.

[b] Metals analysis includes 23 metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn) plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate; triaminotrinitrobenzene; 3,5-dinitroaniline, tri(o-cresyl)phosphate; 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[d] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy (for americium-241 and uranium-235), gamma spectroscopy (for cesium-137, cobalt-60, neptunium-237, potassium-40, and sodium-22), and strontium-90.

[e] 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.

[f] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); TKN; ammonia; total phosphorus, TOC; TDS; alkalinity; specific conductivity; pH; and hardness. TKN, TOC, and total cyanide are analyzed only in unfiltered samples.

[g] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[h] Field parameters include pH, turbidity (Turb), specific conductance (SC), dissolved oxygen (DO), and temperature (T) at all locations. Oxidation-reduction potential (ORP) 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.

[i] [2013] = Samples scheduled to be collected during implementation of MY2013 Interim Plan.

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

[k] [2014] = Samples scheduled to be collected during implementation of MY2014 Interim Plan.

[l] — = 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	Water Level or Flow[a]	Analytical Suites: Metals	Organics			Radionuclides		Inorganics		Field[h]
					Metals (Filtered)[b]	VOCs	SVOCs	HEXP[c]	Radionuclides[d]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate[g]	DO, ORP, pH, SC, T, Turb
R-27i	Water	Monitors potential contamination associated with the perched-intermediate zone downgradient of historical TA-16 sources.	Intermediate	C	A	A	A	A	A	A	A	B[2014]	A
R-27	Water	Monitors TA-16 in support of the TA-16 260 Outfall CME. Background location in GBIR R4.	Regional	C	A	A	A	A	A	A	A	B[2014 i]	A
R-29	Ancho	Located downgradient of TA-49 MDA AB. Installed to determine whether zones of perched-intermediate groundwater occur under MDA AB. Completed March 12, 2010.	Regional	C	A	A	A	A	A	A	A	B[2014]	A
R-30	Ancho	Located at the eastern edge of TA-49 and downgradient of MDA AB. Installed to determine whether zones of perched-intermediate groundwater occur under MDA AB. Completed April 3, 2010.	Regional	C	A	A	A	A	A	A	A	B[2014]	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). Samples collected for filtered analysis include metals, anions, cations, nitrate plus nitrite, ammonia, total phosphorus, specific conductance, pH, total dissolved solids (TDS), alkalinity, hardness, perchlorate and nitrogen isotopes. Samples collected for unfiltered analysis include VOCs, SVOCs, pesticides, PCBs, high explosive (compounds) (HEXP), dioxins/furans, radionuclides, tritium, total Kjeldahl nitrogen (TKN), total organic carbon (TOC), suspended sediment analysis, and deuterium and oxygen isotopes.

[a] 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). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals. Spring discharge is measured during semiannual (S) or annual (A) sampling.

[b] Metals analysis includes 23 metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn) plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate; triaminotrinitrobenzene; 3,5-dinitroaniline, tri(o-cresyl)phosphate; 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[d] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy (for americium-241 and uranium-235), gamma spectroscopy (for cesium-137, cobalt-60, neptunium-237, potassium-40, and sodium-22), and strontium-90.

[e] 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.

[f] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); TKN; ammonia; total phosphorus, TOC; TDS; alkalinity; specific conductivity; pH; and hardness. TKN, TOC, and total cyanide are analyzed only in unfiltered samples.

[g] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[h] Field parameters include pH, turbidity (Turb), specific conductance (SC), dissolved oxygen (DO), and temperature (T) at all locations. Oxidation-reduction potential (ORP) 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.

[i] [2014] = Samples scheduled to be collected during implementation of MY2014 Interim Plan.

Table 8.3-1
Interim Monitoring Plan for General Surveillance Monitoring

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Analytical Suites: Metals	Organics					Radionuclides			Inorganics		Field[h]
					Metals (Filtered)[b]	VOCs	SVOCs	PCBs	HEXP[c]	Dioxins/Furans	Radionuclides[d]	Tritium[d]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate[g]	DO, ORP, pH, SC, T, Turb
LA Canyon near Otowi Bridge	Lower Los Alamos Canyon	Measures quality of persistent surface water in Los Alamos Canyon above the confluence of Los Alamos Canyon and Rio Grande. Located on San Ildefonso land and sampled under the MOU.	Base flow	A	A	A	A	V[2015 i]	T[2014 j]	V[2015]	A	—[k]	—	A	A	A
Los Alamos Spring	Lower Los Alamos Canyon	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	A	T[2014]	T[2014]	T[2014]	V[2015]	A	—	A	A	A	A
Vine Tree Spring	Lower Los Alamos Canyon	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	S	T[2014]	T[2014]	T[2014]	V[2015]	A	—	A	S	S	S
LLAO-1b	Lower Los Alamos Canyon	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	C	A	A	T[2014]	T[2014]	T[2014]	V[2015]	A	—	—	A	A	A
LLAO-4	Lower Los Alamos Canyon	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	C	A	A	T[2014]	T[2014]	T[2014]	V[2015]	A	—	—	A	A	A
LAO-3a	Upper Los Alamos Canyon	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	C	A	B[2013 l]	B[2013]	V[2015]	—	V[2015]	A	—	—	A	A	A
APCO-1	Pueblo	Monitors within the wetland below the Pueblo WWTP. Most downcanyon monitoring point in Pueblo Canyon.	Alluvial	C	A	B[2013]	B[2013]	V[2015]	—	V[2015]	A	—	—	A	A	A
POI-4	Pueblo	Monitors for potential contaminants from sources in upper Pueblo and Acid Canyons.	Intermediate	C	A	B[2013]	B[2013]	—	—	—	A	—	—	A	A	A
R-3i	Pueblo	Monitors along the potential infiltration pathway originating in lower Pueblo Canyon.	Intermediate	C	A	B[2014]	B[2014]	—	—	—	A	—	—	A	A	A
TW-2Ar	Pueblo	Replacement monitoring well for TW-2A. Monitors perched-intermediate groundwater in lower Pueblo Canyon. Completed March 4, 2010.	Intermediate	C	A	B[2013]	B[2013]	—	—	—	A	A	—	A	A	A
R-2	Pueblo	Monitors for potential contaminants from upper Pueblo and Acid Canyons. Background location in GBIR R4.	Regional	C	A	B[2013]	B[2013]	—	—	—	A	—	—	A	A	A
R-24	Pueblo	Monitors for potential contaminants from upper Pueblo and Acid Canyons and Guaje Canyon. Background location in GBIR R4.	Regional	C	A	B[2013]	B[2013]	—	—	—	A	—	B[2013]	A	A	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. Completed June 21, 2010.	Regional	C	A	B[2013]	B[2013]	—	—	—	A	—	B[2013]	A	A	A
R-4	Pueblo	Monitors for potential contaminants from upper Pueblo and Acid Canyons.	Regional	C	A	A	A	—	—	—	A	—	B[2013]	A	A	A
Sandia above Wetlands	Sandia	Monitors water quality of base flow above wetland.	Base flow	A	A	A	A	A	T[2014]	V[2015]	A	—	—	A	A	A
Sandia below Wetlands	Sandia	Monitors water quality of base flow from wetland.	Base flow	A	A	A	A	A	T[2014]	V[2015]	A	—	—	A	A	A
SCA-2	Sandia	Located at the upper portion of the lower canyon where the valley floor first opens up and the first significant alluvial storage is present along the canyon.	Alluvial	C	A	B[2013]	B[2013]	V[2015]	—	V[2015]	A	—	—	A	A	A

Table 8.3-1 (continued)

					Analytical Suites											
					Metals	Organics					Radionuclides			Inorganics		Field[h]
Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs	SVOCs	PCBs	HEXP[c]	Dioxins/Furans	Radionuclides[d]	Tritium[d]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate[g]	DO, ORP, pH, SC, T, Turb
R-12 S1	Sandia	Monitors for potential contaminants from Sandia Canyon or possibly Los Alamos or Pueblo Canyons.	Intermediate	C	A	B^{2013}	B^{2013}	—	—	—	A	—	—	A	B^{2013}	A
R-12 S2	Sandia	Monitors for potential contaminants from Sandia Canyon or possibly Los Alamos or Pueblo Canyons.	Intermediate	C	B^{2013}	B^{2013}	B^{2013}	—	—	—	B^{2013}	—	—	B^{2013}	B^{2013}	B^{2013}
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	C	A	A	A	T^{2014}	T^{2014}	—	A	—	A	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	C	A	A	A	T^{2014}	T^{2014}	—	A	—	A	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	C	A	A	A	T^{2014}	T^{2014}	—	A	—	A	A	A	A
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	C	B^{2013}	B^{2013}	B^{2013}	V^{2015}	—	V^{2015}	A	—	—	B^{2013}	B^{2013}	A
MCO-5	Mortandad	Monitors trends in alluvial groundwater quality following upgrades to the RLWTF.	Alluvial	C	A	B^{2014}	B^{2013}	V^{2015}	—	V^{2015}	A	A	—	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	C	A	B^{2014}	B^{2014}	V^{2015}	—	V^{2015}	A	A	—	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	C	A	B^{2013}	B^{2013}	—	—	—	A	—	—	A	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	C	A	B^{2013}	B^{2013}	—	—	—	A	—	—	A	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	C	A	B^{2013}	B^{2013}	—	—	—	A	—	—	A	A	A
R-33 S1	Mortandad	Monitors for potential contaminants from upper Ten Site or Mortandad Canyons. Background location in GBIR R4.	Regional	C	A	B^{2013}	B^{2013}	—	—	—	A	—	B^{2013}	A	A	A
R-33 S2	Mortandad	Monitors for potential contaminants from upper Ten Site or Mortandad Canyons. Background location in GBIR R4.	Regional	C	A	B^{2013}	B^{2013}	—	—	—	A	—	—	A	A	A
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	C	Q	A	A	T^{2014}	T^{2014}	—	A	—	A	Q	A	Q
Pajarito 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	A	V^{2015}	A	V^{2015}	A	—	—	A	A	A
Pajarito below confluence of South and North Anchor East Basin (PBF-1)	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	A	V^{2015}	A	V^{2015}	A	—	—	A	A	A

Table 8.3-1 (continued)

					Analytical Suites											
					Metals	Organics					Radionuclides			Inorganics		Field[h]
Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs	SVOCs	PCBs	HEXP[c]	Dioxins/Furans	Radionuclides[d]	Tritium[d]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate[g]	DO, ORP, pH, SC, T, Turb
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	C	A	B[2013]	B[2013]	V[2015]	V[2015]	V[2015]	A	—	—	A	B[2014]	A
PCAO-8	Pajarito	Characterizes potential impacts from runoff associated with TA-54 near PCTH-5 (between PCO 2 and PCO-3).	Alluvial	C	A	B[2013]	B[2013]	V[2015]	V[2015]	V[2015]	A	—	—	A	B[2014]	A
03-B-13	Pajarito	Near TA-03 building SM-30. Monitored in support of project at SWMU 03-010(a).	Intermediate	C	S	S	S	—	V[2015]	—	A	B[2013]	—	S	B[2014]	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	C	A	B[2013]	B[2013]	—	V[2015]	—	A	—	B[2013]	A	B[2014]	A
R-19 S2	Pajarito	Monitors for potential contaminants from TA-16. Also provides baseline characterization data for downgradient areas including TA-54.	Intermediate	C	B[2013]	—	—	—	B[2013]	—	A	—	—	B[2014]	B[2014]	A
R-17 S1	Pajarito	Monitors MDA C, TA-16, and potential sources in upper Pajarito watershed. Background location in GBIR R4.	Regional	C	A	B[2013]	B[2013]	—	A	—	A	—	B[2013]	A	A	A
R-17 S2	Pajarito	Monitors MDA C, TA-16, and potential sources in upper Pajarito watershed. Background location in GBIR R4.	Regional	C	A	B[2013]	B[2013]	—	A	—	A	—	—	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	C	B[2013]	—	—	—	V[2015]	—	A	—	—	B[2014]	B[2014]	A
R-19 S4	Pajarito	Monitors for potential contaminants from TA-16. Also provides baseline characterization data for downgradient areas including TA-54.	Regional	C	B[2013]	—	—	—	V[2015]	—	A	—	—	B[2014]	B[2014]	A
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	A	V[2015]	A	V[2015]	A	—	—	A	A	A
WCO-1r	Water	Replacement well for WCO-1.	Alluvial	C	B[2013]	B[2013]	B[2013]	V[2015]	V[2015]	V[2015]	A	—	—	B[2013]	B[2013]	A
R-31 S4	Frijoles, Ancho, and Chaquehui	Part of interim monitoring network pending well network assessment for MDA AB.	Regional	C	A	—	—	—	V[2015]	—	A	—	—	A	B[2014]	A
R-31 S5	Frijoles, Ancho, and Chaquehui	Part of interim monitoring network pending well network assessment for MDA AB.	Regional	C	A	—	—	—	V[2015]	—	A	—	—	A	B[2014]	A

Table 8.3-1 (continued)

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). Samples collected for filtered analysis include metals, anions, cations, nitrate plus nitrite, ammonia, total phosphorus, specific conductance, pH, total dissolved solids (TDS), alkalinity, hardness, perchlorate and nitrogen isotopes. Samples collected for unfiltered analysis include VOCs, SVOCs, pesticides, PCBs, high explosive (compounds) (HEXP), dioxins/furans, radionuclides, tritium, total Kjeldahl nitrogen (TKN), total organic carbon (TOC), suspended sediment analysis, and deuterium and oxygen isotopes.

[a] 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). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals. Spring discharge is measured during semiannual (S) or annual (A) sampling.

[b] Metals analysis includes 23 metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn) plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate; triaminotrinitrobenzene; 3,5-dinitroaniline, tri(o-cresyl)phosphate; 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[d] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy (for americium-241 and uranium-235), gamma spectroscopy (for cesium-137, cobalt-60, neptunium-237, potassium-40, and sodium-22), and strontium-90.

[e] 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.

[f] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); TKN; ammonia; total phosphorus, TOC; TDS; alkalinity; specific conductivity; pH; and hardness. TKN, TOC, and total cyanide are analyzed only in unfiltered samples.

[g] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[h] Field parameters include pH, turbidity (Turb), specific conductance (SC), dissolved oxygen (DO), and temperature (T) at all locations. Oxidation-reduction potential (ORP) 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.

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

[j] [2014] = Samples scheduled to be collected during implementation of MY2014 Interim Plan.

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

[l] [2013] = Samples scheduled to be collected during implementation of MY2013 Interim Plan.

Table 8.3-2
Interim Monitoring Plan for White Rock Canyon and Rio Grande Watershed

				Analytical Suites											
					Metals	Organics					Radionuclides		Inorganics		Field[h]
Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals (Filtered)[b]	VOCs	SVOCs	PCBs	HEXP[c]	Dioxins/Furans	Radionuclides[d]	Low-Level Tritium[e]	General Inorganics[f]	Perchlorate[g]	DO, ORP, pH, SC, T, Turb
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	A	B[2013 i]	B[2013]	T[2013]	T[2013]	T[2013]	T[2013]	A	—[j]	B[2013]	B[2013]	A
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	A	B[2013]	B[2013]	T[2013]	T[2013]	T[2013]	T[2013]	A	—	B[2013]	B[2013]	A
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	A	A	A	A	A	A	T[2014 k]	A	A	A	A	A
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	A	B[2014]	B[2014]	T[2014]	T[2014]	T[2014]	T[2014]	A	—	B[2014]	B[2014]	A
Rio Grande at Frijoles	White Rock	Monitors base flow in the Rio Grande at Frijoles Canyon.	Base flow	A	B[2013]	B[2013]	T[2013]	T[2013]	T[2013]	T[2013]	A	—	B[2013]	B[2013]	A
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	A	A	—	A	A	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	B[2014]	—	B[2014]	—	A	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	A	T[2014]	T[2014]	T[2014]	—	A	A	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	A	T[2014]	T[2014]	T[2014]	—	A	A	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	A	A	A	T[2014]	T[2014]	T[2014]	—	A	A	A	A	A
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	T[2014]	T[2014]	T[2014]	—	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	A	A	A	T[2014]	T[2014]	T[2014]	—	A	A	A	A	A
Spring 3	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	A	A	B[2013]	A	A	—	A	A	A
Spring 3A	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	B[2014]	—	B[2014]	—	A	—	A	A	A
Spring 3AA	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	B[2014]	—	B[2014]	—	A	—	A	A	A
Spring 4	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	A	A	B[2014]	A	A	—	A	A	A
Spring 4A	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	B[2014]	—	B[2014]	—	A	—	A	A	A
Spring 4AA	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	B[2014]	—	B[2014]	—	A	—	A	A	A

Table 8.3-2 (continued)

Location	Watershed	Rationale for Selection of Location	Surface Water Body or Source Aquifer	Water Level or Flow[a]	Metals: Metals (Filtered)[b]	Organics: VOCs	Organics: SVOCs	Organics: PCBs	Organics: HEXP[c]	Organics: Dioxins/Furans	Radionuclides: Radionuclides[d]	Radionuclides: Low-Level Tritium[e]	Inorganics: General Inorganics[f]	Inorganics: Perchlorate[g]	Field[h]: DO, ORP, pH, SC, T, Turb
Spring 4B	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	B[2014]	—	B[2014]	—	A	—	A	A	A
Spring 5	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	B[2014]	—	B[2014]	—	A	—	A	A	A
Spring 5A	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	B[2013]	—	B[2013]	—	A	—	A	A	A
Spring 5B	White Rock	Monitors regional aquifer downgradient of the Laboratory.	Spring	A	A	A	B[2014]	—	B[2014]	—	A	—	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	B[2014]	—	B[2014]	—	A	—	A	A	A
Spring 6A	White Rock	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	B[2013]	—	B[2013]	—	A	—	A	A	A
Spring 8A	White Rock	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3.	Spring	A	A	A	B[2014]	—	B[2014]	—	A	—	A	A	A
Spring 9	White Rock	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3 and GBIR R4.	Spring	A	A	A	B[2013]	—	B[2013]	—	A	—	A	A	A
Spring 9A	White Rock	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3.	Spring	A	A	A	B[2014]	—	B[2014]	—	A	—	A	A	A
Spring 9B	White Rock	Monitors regional aquifer downgradient of the Laboratory. Background location in GBIR R3.	Spring	A	A	A	B[2013]	—	B[2013]	—	A	—	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). Samples collected for filtered analysis include metals, anions, cations, nitrate plus nitrite, ammonia, total phosphorus, specific conductance, pH, total dissolved solids (TDS), alkalinity, hardness, perchlorate and nitrogen isotopes. Samples collected for unfiltered analysis include VOCs, SVOCs, pesticides, PCBs, high explosive (compounds) (HEXP), dioxins/furans, radionuclides, tritium, total Kjeldahl nitrogen (TKN), total organic carbon (TOC), suspended sediment analysis, and deuterium and oxygen isotopes.

[a] 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). Continuous stream-flow monitoring refers to the measurement of stream flow by a base-flow stream gage that is programmed to collect stream-flow measurements at highly frequent intervals. Spring discharge is measured during semiannual (S) or annual (A) sampling.

[b] Metals analysis includes 23 metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn) plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[c] The HEXP analytical suite includes the Consent Order list of the normal SW-846:8330 analytes plus pentaerythritol tetranitrate; triaminotrinitrobenzene; 3,5-dinitroaniline, tri(o-cresyl)phosphate; 2,4-diamino-6-nitrotoluene; and 2,6-diamino-4-nitrotoluene. These additional analytes are analyzed by SW-846:8321A.

[d] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy (for americium-241 and uranium-235), gamma spectroscopy (for cesium-137, cobalt-60, neptunium-237, potassium-40, and sodium-22), and strontium-90.

[e] 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.

[f] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); TKN; ammonia; total phosphorus, TOC; TDS; alkalinity; specific conductivity; pH; and hardness. TKN, TOC, and total cyanide are analyzed only in unfiltered samples.

[g] Analysis for perchlorate using high-performance liquid chromatography coupled with electrospray ionization mass spectrometry or tandem mass spectrometry (EPA Method 6850).

[h] Field parameters include pH, turbidity (Turb), specific conductance (SC), dissolved oxygen (DO), and temperature (T) at all locations. Oxidation-reduction potential (ORP) 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.

[i] 2013 = Samples scheduled to be collected during implementation of MY2013 Interim Plan.

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

[k] 2014 = Samples scheduled to be collected during implementation of MY2014 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
BART	Biological Activity Reaction Tests
BCG	Biota Concentration Guides (DOE)
bgs	below ground surface
CAS	Chemical Abstract Service
CME	corrective measures evaluation
Consent Order	Compliance Order on Consent
COPC	chemical of potential concern
CV	casing volume
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 mass spectrometry
IDW	investigation-derived waste
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
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
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
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
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).

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-DIV-SOP-20032	Groundwater Sampling	Procedure for sampling groundwater using a dedicated submersible pump, Baski sampling system, or a portable pump
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 or details):
❖ A minimum of 1 CV has been removed for alluvial wells and a minimum of 3 CVs (plus the drop pipe) have 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% when turbidity is greater than 10 nephelometric turbidity units (NTU)</td></tr><tr><td>Dissolved Oxygen</td><td>± 0.3 mg/L,</td></tr><tr><td>pH</td><td>± 0.1 Standard Unit (SU)</td></tr><tr><td>Specific Conductance</td><td>± 3%</td></tr><tr><td>Temperature</td><td>± 10% (per the Consent Order)</td></tr></table>
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>

<table>
<tr><th>Method</th><th>Summary</th></tr>
<tr><td>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</td><td>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.</td></tr>
<tr><td>Collection of Spring and Surface Water Samples
Referenced Procedures:
SOP-5224, Spring and Surface Water Sampling
EP-ERSS-SOP-5056, Sample Containers and Preservation</td><td>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 the sample is 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 by using 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.</td></tr>
</table>

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.
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 frequency of 10% of all samples collected. • Equipment rinsate blanks are collected at a minimum frequency of 1 per day when nondedicated sampling equipment is used. • Field duplicates are collected at a rate of 10% of all samples by media type, with a minimum of one duplicate collected per sample batch. • Trip blanks are included with any coolers containing samples submitted for volatile organic compound analysis. • Performance evaluation blanks will be submitted on an as-needed basis to evaluate the reagent-grade water used for decontamination and preparation of blanks.

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 18^{th}, 19^{th}, 20^{th}	YSI 650 Handheld Multiparameter Instrument	YSI 650 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 on the meter using the manufacturer's instructions with standard buffers traceable to National Institute of Standards and Technology (NIST) and recorded. Standards are purchased from commercial vendors.
Temperature	Temperature, thermometric (°C)	EPA: Method 170.1 Standard Methods, 2550 B Editions 18^{th}, 19^{th}, 20^{th}	YSI 650 Handheld Multiparameter Instrument	YSI 650 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 18^{th}, 19^{th}, 20^{th}	YSI 650 Handheld Multiparameter Instrument	YSI 650 cell	Samples will be analyzed for specific conductance 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 on the meter using the manufacturer's instructions with standard buffers traceable to NIST and is recorded. Standards are purchased from commercial vendors.
Dissolved Oxygen	Oxygen, dissolved (mg/L): electrode	EPA: Method 360.1 Standard Methods, 4500-O G Editions 18^{th}, 19^{th}, 20^{th}	YSI 650 Handheld Multiparameter Instrument	YSI 650 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 meter is calibrated using the manufacturer's instructions and is recorded.

Field Parameter	Method Description	U.S. Environmental Agency–Approved Methods	Primary Field Instrument(s)	Primary Flow-Through Cell Used/Type	Description
Turbidity	NTU	EPA: Method 180.1 Standard Methods, 2130 B Editions 18th, 19th, 20th	Hach 2100P, YSI 650 Handheld Multiparameter Instrument	Single sample aliquot application	Samples will be analyzed for turbidity in the field using a single aliquot during well purging and at the time of sample collection. The listed instruments are commercially available, and a calibration check is performed on the meter using the manufacturer's instructions. The YSI 650 Handheld Multiparameter Instrument serves as a back-up in case the primary instrument fails.
Oxidation-Reduction Potential	Oxidation-reduction potential (mV): electrode method	Standard Methods, 2580 A Editions 18th, 19th, 20th	YSI 650 Handheld Multiparameter Instrument	YSI 650 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 on the meter using 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. 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-4.1-1 and B-4.1-2 provide the mode (that is, most frequent value) for MDL and PQLs reported for 2010 analyses of groundwater and base-flow samples for the Laboratory by contract laboratories, organized by analytical suite and method. The number of sample analyses and detections (that is, results greater than the MDL) for the period from 2006 to 2010 are given. The tables include values for applicable cleanup and/or background levels for each analyte listed. The cleanup levels are derived as described in Appendix B-2.0, Protocol for Selecting Cleanup Levels, from the revised 2011 Interim Plan (LANL 2011, 208811).

The background values are from the most recent NMED-approved report (LANL 2009, 106115, Table 4.2-3; NMED 2010, 109327).

A subset of Tables B-4.1-1 and B-4.1-2 appears in three tables that compare the PQLs with cleanup or background levels.

Table B-4.1-3 shows analytes with a PQL above the applicable groundwater cleanup level.

Table B-4.1-4 shows analytes with a PQL above the background values for alluvial, intermediate, and regional groundwater from Laboratory guidance (LANL 2009, 106115).

Table B-4.1-5 shows analytes with a PQL above the base-flow cleanup level.

Comments in these tables indicate the cases where the MDL is below the cleanup level for the analyte, thus meeting the Consent Order requirement (Section IX).

The background levels for seldom-detected analytes were based on the MDL. In some cases, background values were determined using data from an internal analytical laboratory. As a result of differences in analytical methods and variation of reported MDLs over time, some MDL values are slightly above a groundwater background level.

For comparison, the lowest of background values for intermediate and regional groundwater identified in the Groundwater Background Investigation Report, Revision 4 (LANL 2010, 110535) are also shown in Table B-4.1-4. These background values are substantially higher for several analytes.

For most of the organic compounds where the MDL is higher than the cleanup level, the compound has seldom or never been detected in years of water samples, as indicated in Table B-4.1-3 for groundwater and Table B-4.1-5 for base flow.

The analytical services provided under contract to the Laboratory meet EPA requirements. Based on EPA 530-R-09-007 Unified Guidance (p. 2-7), “Any practical quantification limit (PQL) approved by the Regional Administrator under §264.97(h) [or §258.53(g)] that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions available to the facility.”

The Laboratory’s primary analytical services provider is GEL Laboratories, LLC. GEL’s client base includes 15 U.S. Department of Energy sites, 8 districts of the U.S. Army Corps of Engineers, the southern division of the U.S. Navy, several of the largest industrial manufacturers in southeastern U.S., and over 50 nuclear power plants in the U.S.

For the few instances where MDLs for analytes are higher than the cleanup levels for results reported in 2010, the MDLs are based on routine laboratory operating conditions available to the Laboratory. Most of these cases involve volatile or semivolatile organic compounds analyzed by EPA Methods SW-846:8260B and SW-846:8270C. Eighty compounds are analyzed by volatile organic Method SW-846:8260B. Of these 80 compounds, 67 have groundwater cleanup levels, and in 61 of these cases the MDL is below the cleanup level. The Laboratory also receives 80 analytes analyzed by semivolatile organic Method SW-846:8270C. Of these 80 compounds, 69 have groundwater cleanup levels, and in 55 of these cases the MDL is below the cleanup level.

B-4.2 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 are stable isotope analyses and filtration studies.
- When a well screen is impacted by 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 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), May 2007. “Groundwater Background Investigation Report, Revision 3,” Los Alamos National Laboratory document LA-UR-07-2853, Los Alamos, New Mexico. (LANL 2007, 095817)

LANL (Los Alamos National Laboratory), May 2009. “2009 Interim Facility-Wide Groundwater Monitoring Plan,” Los Alamos National Laboratory document LA-UR-09-1340, Los Alamos, New Mexico. (LANL 2009, 106115)

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), August 2010. "Groundwater Background Investigation Report, Revision 4," Los Alamos National Laboratory document LA-UR-10-4827, Los Alamos, New Mexico. (LANL 2010, 110535)

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)

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 4, 2010. "Approval with Direction, 2009 Interim Facility-Wide Groundwater Monitoring Plan," 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, 109327)

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
Analytes, Analytical Methods, and MDLs and PQLs Obtained for 2010 Analyses of Groundwater Samples by Contract Laboratories and Number of Sample Analyses and Detections for the Period 2006 to 2010

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
Diox/Fur	35822-46-9	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	525	44	SW-846:8290		0.00005			µg/L	
Diox/Fur	37871-00-4	Heptachlorodibenzodioxins (Total)	525	91	SW-846:8290		0.00005			µg/L	
Diox/Fur	67562-39-4	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	525	28	SW-846:8290		0.00005			µg/L	
Diox/Fur	55673-89-7	Heptachlorodibenzofuran[1,2,3,4,7,8,9-]	525	0	SW-846:8290		0.00005			µg/L	
Diox/Fur	38998-75-3	Heptachlorodibenzofurans (Total)	525	47	SW-846:8290		0.00005			µg/L	
Diox/Fur	39227-28-6	Hexachlorodibenzodioxin[1,2,3,4,7,8-]	525	1	SW-846:8290		0.00005			µg/L	
Diox/Fur	57653-85-7	Hexachlorodibenzodioxin[1,2,3,6,7,8-]	525	2	SW-846:8290		0.00005			µg/L	
Diox/Fur	19408-74-3	Hexachlorodibenzodioxin[1,2,3,7,8,9-]	525	2	SW-846:8290		0.00005			µg/L	
Diox/Fur	34465-46-8	Hexachlorodibenzodioxins (Total)	525	8	SW-846:8290		0.00005			µg/L	
Diox/Fur	70648-26-9	Hexachlorodibenzofuran[1,2,3,4,7,8-]	525	11	SW-846:8290		0.00005			µg/L	
Diox/Fur	57117-44-9	Hexachlorodibenzofuran[1,2,3,6,7,8-]	525	4	SW-846:8290		0.00005			µg/L	
Diox/Fur	72918-21-9	Hexachlorodibenzofuran[1,2,3,7,8,9-]	525	0	SW-846:8290		0.00005			µg/L	
Diox/Fur	60851-34-5	Hexachlorodibenzofuran[2,3,4,6,7,8-]	525	2	SW-846:8290		0.00005			µg/L	
Diox/Fur	55684-94-1	Hexachlorodibenzofurans (Total)	525	32	SW-846:8290		0.00005			µg/L	
Diox/Fur	3268-87-9	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	525	79	SW-846:8290		0.0001			µg/L	
Diox/Fur	39001-02-0	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	525	35	SW-846:8290		0.0001			µg/L	
Diox/Fur	40321-76-4	Pentachlorodibenzodioxin[1,2,3,7,8-]	525	2	SW-846:8290		0.00005			µg/L	
Diox/Fur	36088-22-9	Pentachlorodibenzodioxins (Total)	525	5	SW-846:8290		0.00005			µg/L	
Diox/Fur	57117-41-6	Pentachlorodibenzofuran[1,2,3,7,8-]	525	3	SW-846:8290		0.00005			µg/L	
Diox/Fur	57117-31-4	Pentachlorodibenzofuran[2,3,4,7,8-]	525	5	SW-846:8290		0.00005			µg/L	
Diox/Fur	30402-15-4	Pentachlorodibenzofurans (Totals)	525	26	SW-846:8290		0.00005			µg/L	
Diox/Fur	1746-01-6	Tetrachlorodibenzodioxin[2,3,7,8-]	525	0	SW-846:8290		0.00001	0.00003		µg/L	EPA MCL
Diox/Fur	41903-57-5	Tetrachlorodibenzodioxins (Total)	525	1	SW-846:8290		0.00001			µg/L	
Diox/Fur	51207-31-9	Tetrachlorodibenzofuran[2,3,7,8-]	525	1	SW-846:8290		0.00001			µg/L	
Diox/Fur	55722-27-5	Tetrachlorodibenzofurans (Totals)	525	7	SW-846:8290		0.00001			µg/L	
DRO	TPH-DRO	Total Petroleum Hydrocarbons Diesel Range Organics	64	25	SW-846:8015M	65	200			µg/L	
Geninorg	ALK-CO_3	Alkalinity-CO_3	2678	351	EPA:310.1	0.73	1			mg/L	
Geninorg	ALK-CO_3+HCO_3	Alkalinity-CO_3+HCO_3	2680	2677	EPA:310.1	0.73	1		52	mg/L	
Geninorg	NH_3-N	Ammonia as Nitrogen	2706	497	EPA:350.1	0.016	0.05		0.04	mg/L	
Geninorg	Br(-1)	Bromide	2699	669	EPA:300.0	0.066	0.2		0.03	mg/L	
Geninorg	Ca	Calcium	4761	4756	SW-846:6010B	0.05	0.2		17.3	mg/L	
Geninorg	Cl(-1)	Chloride	2733	2727	EPA:300.0	0.066	0.2	250	3.57	mg/L	NM GW STD
Geninorg	CN(TOTAL)	Cyanide (Total)	2169	222	EPA:335.4	0.0017	0.005	0.2		mg/L	EPA MCL
Geninorg	F(-1)	Fluoride	2748	2647	EPA:300.0	0.033	0.1	1.6	0.23	mg/L	NM GW STD
Geninorg	HARDNESS	Hardness	4733	4727	SM:A2340B	0.35	1.24			mg/L	

Table B-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
Geninorg	Mg	Magnesium	4761	4748	SW-846:6010B	0.085	0.3		4.15	mg/L	
Geninorg	NO_3+NO_2-N	Nitrate-Nitrite as Nitrogen	2700	2343	EPA:353.2	0.01	0.05	10	0.57	mg/L	EPA MCL
Geninorg	C_2O_4	Oxalate	7	0	EPA:300.0	0.33	1			mg/L	
Geninorg	ClO_4	Perchlorate	3364	2541	SW-846:6850	0.05	0.2	4	0.05	µg/L	NM GW CONS
Geninorg	pH	pH	2671	2671	EPA:150.1	0.01	0.1			SU	
Geninorg	K	Potassium	4761	4748	SW-846:6010B	0.05	0.15		2.63	mg/L	
Geninorg	Na	Sodium	4761	4756	SW-846:6010B	0.1	0.3		12.2	mg/L	
Geninorg	SO_4(-2)	Sulfate	2731	2712	EPA:300.0	0.1	0.4	600	7.2	mg/L	NM GW STD
Geninorg	SSC	Suspended Sediment Concentration	502	245	EPA:160.2	0.76	3.33			mg/L	
Geninorg	TDS	Total Dissolved Solids	2708	2703	EPA:160.1	2.4	10	1000	127	mg/L	NM GW STD
Geninorg	TKN	Total Kjeldahl Nitrogen	3142	1084	EPA:351.2	0.033	0.1		0.04	mg/L	
Geninorg	TOC	Total Organic Carbon	2273	1898	SW-846:9060	0.33	1		0.33	mg/L	
Geninorg	PO_4-P	Total Phosphate as Phosphorus	2606	821	EPA:365.4	0.015	0.05		0.05	mg/L	
Geninorg	TSS	Total Suspended Solids	116	65	EPA:160.2	2.3	10			mg/L	
GRO	TPH-GRO	Total Petroleum Hydrocarbons Gasoline Range Organics	11	7	SW-846:8015M	11	50			µg/L	
Herb	94-75-7	2,4-Dichlorophenoxy	388	0	SW-846:8151A	0.087	0.26	70		µg/L	EPA MCL
Herb	75-99-0	Dalapon	388	0	SW-846:8151A	1.3	5.3	200		µg/L	EPA MCL
Herb	94-82-6	2,4-Dichlorophenoxy butyric acid	388	2	SW-846:8151A	0.087	0.26	290		µg/L	EPA TAP SCRN LVL
Herb	1918-00-9	Dicamba	388	0	SW-846:8151A	0.087	0.26	1100		µg/L	EPA TAP SCRN LVL
Herb	120-36-5	Dichlorprop	388	0	SW-846:8151A	0.087	0.26			µg/L	
Herb	88-85-7	Dinoseb	388	0	SW-846:8151A	0.087	0.26	7		µg/L	EPA MCL
Herb	94-74-6	2-Methyl-4-chlorophenoxy acetic acid	388	0	SW-846:8151A	12	53	18		µg/L	EPA TAP SCRN LVL
Herb	93-65-2	2-4-Chloro-2-methylphenoxy propanoic acid	388	0	SW-846:8151A	11	53	37		µg/L	EPA TAP SCRN LVL
Herb	93-76-5	2,4,5-Trichlorophenoxy acetic acid	388	0	SW-846:8151A	0.087	0.26	370		µg/L	EPA TAP SCRN LVL
Herb	93-72-1	2,4,5-Trichlorophenoxy propionic acid	388	0	SW-846:8151A	0.087	0.26	50		µg/L	EPA MCL
Hexp	6629-29-4	2,4-Diamino-6-nitrotoluene	1739	17	SW-846:8321	0.39	1.3			µg/L	
Hexp	59229-75-3	2,6-Diamino-4-nitrotoluene	1739	9	SW-846:8321	0.39	1.3			µg/L	
Hexp	618-87-1	3,5-Dinitroaniline	1739	25	SW-846:8321	0.39	1.3			µg/L	
Hexp	19406-51-0	Amino-2,6-dinitrotoluene[4-]	1740	121	SW-846:8321	0.1	0.33	73		µg/L	EPA TAP SCRN LVL
Hexp	35572-78-2	Amino-4,6-dinitrotoluene[2-]	1740	97	SW-846:8321	0.1	0.33	73		µg/L	EPA TAP SCRN LVL
Hexp	99-65-0	Dinitrobenzene[1,3-]	1740	1	SW-846:8321	0.1	0.33	3.7		µg/L	EPA TAP SCRN LVL
Hexp	121-14-2	Dinitrotoluene[2,4-]	1740	14	SW-846:8321	0.1	0.33	2.2		µg/L	EPA TAP SCRN LVL
Hexp	606-20-2	Dinitrotoluene[2,6-]	1740	2	SW-846:8321	0.1	0.33	37		µg/L	EPA TAP SCRN LVL
Hexp	DNX	Dexahydro-1,3-dinitro-5-nitro-1,3,5-triazine	1234	42	SW-846:8330	0.069	0.5			µg/L	
Hexp	2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	1742	231	SW-846:8321	0.1	0.33	1800		µg/L	EPA TAP SCRN LVL
Hexp	MNX	Hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine	1234	80	SW-846:8330	0.091	0.5			µg/L	
Hexp	98-95-3	Nitrobenzene	1740	2	SW-846:8321	0.1	0.33	1.2		µg/L	EPA TAP SCRN LVL

Table B-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
Hexp	88-72-2	Nitrotoluene[2-]	1740	7	SW-846:8321	0.1	0.33	3.1		µg/L	EPA TAP SCRN LVL
Hexp	99-08-1	Nitrotoluene[3-]	1740	1	SW-846:8321	0.1	0.33	3.7		µg/L	EPA TAP SCRN LVL
Hexp	99-99-0	Nitrotoluene[4-]	1740	0	SW-846:8321	0.1	0.65	42		µg/L	EPA TAP SCRN LVL
Hexp	78-11-5	Pentaerythritol tetranitrate	1740	0	SW-846:8321	0.13	1.3			µg/L	
Hexp	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine	1742	260	SW-846:8321	0.1	0.33	6.1		µg/L	EPA TAP SCRN LVL
Hexp	3058-38-6	Triaminotrinitrobenzene	1739	3	SW-846:8321	0.39	1.3			µg/L	
Hexp	479-45-8	Tetryl	1740	0	SW-846:8321	0.13	0.65	150		µg/L	EPA TAP SCRN LVL
Hexp	TNX	Hexahydro-1,3,5-trinitroso-1,3,5-triazine	1234	43	SW-846:8330	0.082	0.5			µg/L	
Hexp	99-35-4	Trinitrobenzene[1,3,5-]	1740	54	SW-846:8321	0.1	0.33	1100		µg/L	EPA TAP SCRN LVL
Hexp	118-96-7	Trinitrotoluene[2,4,6-]	1740	42	SW-846:8321	0.1	0.33	22		µg/L	EPA TAP SCRN LVL
Hexp	78-30-8	Tris (o-cresyl) phosphate	1739	0	SW-846:8321	0.39	1.3			µg/L	
Metals	Al	Aluminum	4766	1573	SW-846:6010B	68	200	5000	68	µg/L	NM GW STD
Metals	Sb	Antimony	4757	130	SW-846:6020	0.5	3	6	0.5	µg/L	EPA MCL
Metals	As	Arsenic	4758	1054	SW-846:6020	1.5	5	10	4.32	µg/L	EPA MCL
Metals	Ba	Barium	4761	4747	SW-846:6010B	1	5	1000	56.8	µg/L	NM GW STD
Metals	Be	Beryllium	4761	59	SW-846:6010B	1	5	4	1	µg/L	EPA MCL
Metals	B	Boron	4752	3373	SW-846:6010B	15	50	750	15.1	µg/L	NM GW STD
Metals	Cd	Cadmium	4756	183	SW-846:6020	0.11	1	5	1	µg/L	EPA MCL
Metals	Cr	Chromium	5093	3290	SW-846:6020	2.5	10	50	1	µg/L	NM GW STD
Metals	Co	Cobalt	4761	458	SW-846:6010B	1	5	50	0.5	µg/L	NM GW STD
Metals	Cu	Copper	4761	702	SW-846:6010B	3	10	1000	3	µg/L	NM GW STD
Metals	Fe	Iron	4766	2600	SW-846:6010B	30	100	1000	21	µg/L	NM GW STD
Metals	Pb	Lead	4756	857	SW-846:6020	0.5	2	15	0.5	µg/L	EPA MCL
Metals	Mn	Manganese	4766	2632	SW-846:6010B	2	10	200	2	µg/L	NM GW STD
Metals	Hg	Mercury	4732	103	EPA:245.2	0.066	0.2	2	0.06	µg/L	EPA MCL
Metals	Mo	Molybdenum	4730	2929	SW-846:6020	0.1	0.5	1000	2	µg/L	NM GW STD
Metals	Ni	Nickel	4756	3849	SW-846:6020	0.5	2	200	1	µg/L	NM GW STD
Metals	Se	Selenium	4756	269	SW-846:6020	1	5	50	6	µg/L	EPA MCL
Metals	SiO_2	Silicon Dioxide	1718	1710	SW-846:6010B	0.053	0.213		50.7	mg/L	
Metals	Ag	Silver	4756	157	SW-846:6020	0.2	1	50	1	µg/L	NM GW STD
Metals	Sr	Strontium	4733	4728	SW-846:6010B	1	5	22000	120	µg/L	EPA TAP SCRN LVL
Metals	Tl	Thallium	4756	372	SW-846:6020	0.3	1	2	1	µg/L	EPA MCL
Metals	Sn	Tin	4733	84	SW-846:6010B	2.5	10	22000	3.26	µg/L	EPA TAP SCRN LVL
Metals	U	Uranium	4732	3954	SW-846:6020	0.05	0.2	30	0.72	µg/L	EPA MCL
Metals	V	Vanadium	4761	3819	SW-846:6010B	1	5	180	1	µg/L	EPA TAP SCRN LVL
Metals	Zn	Zinc	4763	2777	SW-846:6010B	3.3	10	10000	2	µg/L	NM GW STD
PCB	12674-11-2	Aroclor-1016	1170	1	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL

Table B-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
PCB	11104-28-2	Aroclor-1221	1170	0	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
PCB	11141-16-5	Aroclor-1232	1170	0	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
PCB	53469-21-9	Aroclor-1242	1170	5	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
PCB	12672-29-6	Aroclor-1248	1170	0	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
PCB	11097-69-1	Aroclor-1254	1171	9	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
PCB	11096-82-5	Aroclor-1260	1170	8	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
PCB	37324-23-5	Aroclor-1262	1169	0	SW-846:8082	0.033	0.1	0.5		µg/L	EPA MCL
Pest	309-00-2	Aldrin	1229	4	SW-846:8081A	0.005	0.02	0.04		µg/L	EPA TAP SCRN LVL
Pest	319-84-6	Benzene hexachloride[alpha-]	1229	1	SW-846:8081A	0.005	0.02	0.11		µg/L	EPA TAP SCRN LVL
Pest	319-85-7	Benzene hexachloride[beta-]	1229	1	SW-846:8081A	0.006	0.02	0.37		µg/L	EPA TAP SCRN LVL
Pest	319-86-8	Benzene hexachloride[delta-]	1229	4	SW-846:8081A	0.005	0.02			µg/L	
Pest	58-89-9	Benzene hexachloride [gamma-]	1229	4	SW-846:8081A	0.005	0.02	0.2		µg/L	EPA MCL
Pest	5103-71-9	Chlordane[alpha-]	1229	0	SW-846:8081A	0.005	0.02			µg/L	
Pest	5103-74-2	Chlordane[gamma-]	1229	3	SW-846:8081A	0.005	0.02			µg/L	
Pest	72-54-8	Dichlorodiphenyldichloroethane[4,4'-]	1229	14	SW-846:8081A	0.01	0.04	2.8		µg/L	EPA TAP SCRN LVL
Pest	72-55-9	Dichlorodiphenyldichloroethylene[4,4'-]	1229	15	SW-846:8081A	0.005	0.04	2		µg/L	EPA TAP SCRN LVL
Pest	50-29-3	Dichlorophenyltrichloroethylene[4,4'-]	1229	8	SW-846:8081A	0.01	0.04	2		µg/L	EPA TAP SCRN LVL
Pest	60-57-1	Dieldrin	1229	8	SW-846:8081A	0.01	0.04	0.042		µg/L	EPA TAP SCRN LVL
Pest	959-98-8	Endosulfan I	1229	4	SW-846:8081A	0.005	0.02			µg/L	
Pest	33213-65-9	Endosulfan II	1229	5	SW-846:8081A	0.011	0.045			µg/L	
Pest	1031-07-8	Endosulfan Sulfate	1229	6	SW-846:8081A	0.01	0.04			µg/L	
Pest	72-20-8	Endrin	1229	5	SW-846:8081A	0.01	0.04	2		µg/L	EPA MCL
Pest	7421-93-4	Endrin Aldehyde	1229	3	SW-846:8081A	0.005	0.04			µg/L	
Pest	53494-70-5	Endrin Ketone	1229	0	SW-846:8081A	0.01	0.04			µg/L	
Pest	76-44-8	Heptachlor	1229	10	SW-846:8081A	0.005	0.02	0.4		µg/L	EPA MCL
Pest	1024-57-3	Heptachlor Epoxide	1229	3	SW-846:8081A	0.005	0.02	0.2		µg/L	EPA MCL
Pest	72-43-5	Methoxychlor[4,4'-]	1229	0	SW-846:8081A	0.05	0.2	40		µg/L	EPA MCL
Pest	8001-35-2	Toxaphene (technical grade)	1229	1	SW-846:8081A	0.15	0.5	3		µg/L	EPA MCL
Rad	Am-241	Americium-241	2578	61	Alpha Spectroscopy	0.05		1.2	0.04	pCi/L	DOE DW DCG
Rad	Cs-137	Cesium-137	2552	3	Gamma Spectroscopy	8		120	5.8	pCi/L	DOE DW DCG
Rad	Co-60	Cobalt-60	2552	0	Gamma Spectroscopy	8		200		pCi/L	DOE DW DCG
Rad	GROSSA	Gross alpha	1821	377	Gas Proportional Counting	3		15	2.98	pCi/L	EPA MCL
Rad	GROSSB	Gross beta	1817	1079	Gas Proportional Counting	3			4	pCi/L	
Rad	GROSSG	Gross gamma	2552	145	Gamma Spectroscopy	120			648	pCi/L	
Rad	Np-237	Neptunium-237	2649	1	Alpha Spectroscopy	0.05		1.2		pCi/L	DOE DW DCG
Rad	Pu-238	Plutonium-238	2551	18	Alpha Spectroscopy	0.05		1.6	0.06	pCi/L	DOE DW DCG
Rad	Pu-239/240	Plutonium-239/240	2551	57	Alpha Spectroscopy	0.05		1.2		pCi/L	DOE DW DCG

Table B-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
Rad	K-40	Potassium-40	2552	12	Gamma Spectroscopy	10		280		pCi/L	DOE DW DCG
Rad	Ra-226	Radium-226	612	187	Gas Proportional Counting	1		4		pCi/L	DOE DW DCG
Rad	Ra-226	Radium-226	612	187	Alpha Spectroscopy	1		4		pCi/L	DOE DW DCG
Rad	Ra-228	Radium-228	615	216	Gas Proportional Counting	1		4		pCi/L	DOE DW DCG
Rad	Na-22	Sodium-22	2552	0	Gamma Spectroscopy	10		400		pCi/L	DOE DW DCG
Rad	Sr-90	Strontium-90	2585	184	Gas Proportional Counting	0.5		8	0.29	pCi/L	EPA MCL
Rad	Tc-99	Technetium-99	60	0	Gas Proportional Counting	1		4000		pCi/L	DOE DW DCG
Rad	Th-228	Thorium-228	163	16	Alpha Spectroscopy	0.05				pCi/L	
Rad	Th-230	Thorium-230	163	10	Alpha Spectroscopy	0.05				pCi/L	
Rad	Th-232	Thorium-232	163	21	Alpha Spectroscopy	0.05				pCi/L	
Rad	H-3	Tritium	2454	1197	Liquid Scintillation Counting	250		20000	0.32	pCi/L	EPA MCL
Rad	U-234	Uranium-234	2559	2177	Alpha Spectroscopy	0.05		20	0.18	pCi/L	DOE DW DCG
Rad	U-235/236	Uranium-235/236	2559	360	Alpha Spectroscopy	0.05		24		pCi/L	DOE DW DCG
Rad	U-238	Uranium-238	2559	2144	Alpha Spectroscopy	0.05		24	0.19	pCi/L	DOE DW DCG
SVOA	83-32-9	Acenaphthene	2074	2	SW-846:8270C	0.33	1.1	2200		µg/L	EPA TAP SCRN LVL
SVOA	208-96-8	Acenaphthylene	2074	3	SW-846:8270C	0.21	1.1			µg/L	
SVOA	62-53-3	Aniline	2074	0	SW-846:8270C	2.5	10	120		µg/L	EPA TAP SCRN LVL
SVOA	120-12-7	Anthracene	2074	4	SW-846:8270C	0.21	1.1	11000		µg/L	EPA TAP SCRN LVL
SVOA	1912-24-9	Atrazine	2074	0	SW-846:8270C	3	10	3		µg/L	EPA MCL
SVOA	103-33-3	Azobenzene	2074	0	SW-846:8270C	2	10	1.3		µg/L	EPA TAP SCRN LVL
SVOA	92-87-5	Benzidine	2074	0	SW-846:8270C	3	10	0.00094		µg/L	EPA TAP SCRN LVL
SVOA	56-55-3	Benzo(a)anthracene	2074	6	SW-846:8270C	0.2	1	0.29		µg/L	EPA TAP SCRN LVL
SVOA	50-32-8	Benzo(a)pyrene	2074	9	SW-846:8270C	0.2	1	0.2		µg/L	EPA MCL
SVOA	205-99-2	Benzo(b)fluoranthene	2074	10	SW-846:8270C	0.2	1	0.29		µg/L	EPA TAP SCRN LVL
SVOA	191-24-2	Benzo(g,h,i)perylene	2074	6	SW-846:8270C	0.2	1			µg/L	
SVOA	207-08-9	Benzo(k)fluoranthene	2074	9	SW-846:8270C	0.2	1	2.9		µg/L	EPA TAP SCRN LVL
SVOA	65-85-0	Benzoic Acid	2074	28	SW-846:8270C	6	20	150000		µg/L	EPA TAP SCRN LVL
SVOA	100-51-6	Benzyl Alcohol	2074	0	SW-846:8270C	2	10	3700		µg/L	EPA TAP SCRN LVL
SVOA	111-91-1	Bis(2-chloroethoxy)methane	2074	0	SW-846:8270C	3	10	110		µg/L	EPA TAP SCRN LVL
SVOA	111-44-4	Bis(2-chloroethyl)ether	2074	0	SW-846:8270C	2	10	0.12		µg/L	EPA TAP SCRN LVL
SVOA	117-81-7	Bis(2-ethylhexyl)phthalate	2074	128	SW-846:8270C	2	10	6		µg/L	EPA MCL
SVOA	101-55-3	Bromophenyl-phenylether[4-]	2074	0	SW-846:8270C	2	10			µg/L	
SVOA	85-68-7	Butylbenzylphthalate	2074	0	SW-846:8270C	2	10	350		µg/L	EPA TAP SCRN LVL
SVOA	59-50-7	Chloro-3-methylphenol[4-]	2074	0	SW-846:8270C	2	10	3700		µg/L	EPA TAP SCRN LVL
SVOA	106-47-8	Chloroaniline[4-]	2074	0	SW-846:8270C	2	10	3.4		µg/L	EPA TAP SCRN LVL
SVOA	91-58-7	Chloronaphthalene[2-]	2074	2	SW-846:8270C	0.3	1	2900		µg/L	EPA TAP SCRN LVL
SVOA	95-57-8	Chlorophenol[2-]	2074	0	SW-846:8270C	2	10	180		µg/L	EPA TAP SCRN LVL

Table B-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
SVOA	7005-72-3	Chlorophenyl-phenyl[4-] Ether	2074	0	SW-846:8270C	2	10			µg/L	
SVOA	218-01-9	Chrysene	2074	5	SW-846:8270C	0.2	1	29		µg/L	EPA TAP SCRN LVL
SVOA	53-70-3	Dibenz(a,h)anthracene	2074	4	SW-846:8270C	0.2	1	0.029		µg/L	EPA TAP SCRN LVL
SVOA	132-64-9	Dibenzofuran	2074	0	SW-846:8270C	2	10	37		µg/L	EPA TAP SCRN LVL
SVOA	95-50-1	Dichlorobenzene[1,2-]	2074	1	SW-846:8270C	2	10	600		µg/L	EPA MCL
SVOA	541-73-1	Dichlorobenzene[1,3-]	2074	16	SW-846:8270C	2	10			µg/L	
SVOA	106-46-7	Dichlorobenzene[1,4-]	2074	0	SW-846:8270C	2	10	75		µg/L	EPA MCL
SVOA	91-94-1	Dichlorobenzidine[3,3'-]	2074	0	SW-846:8270C	2	10	1.5		µg/L	EPA TAP SCRN LVL
SVOA	120-83-2	Dichlorophenol[2,4-]	2074	0	SW-846:8270C	2	10	110		µg/L	EPA TAP SCRN LVL
SVOA	84-66-2	Diethylphthalate	2074	48	SW-846:8270C	2	10	29000		µg/L	EPA TAP SCRN LVL
SVOA	131-11-3	Dimethyl Phthalate	2074	0	SW-846:8270C	2	10			µg/L	
SVOA	105-67-9	Dimethylphenol[2,4-]	2074	0	SW-846:8270C	2	10	730		µg/L	EPA TAP SCRN LVL
SVOA	84-74-2	Di-n-butylphthalate	2074	0	SW-846:8270C	2	10	3700		µg/L	EPA TAP SCRN LVL
SVOA	534-52-1	Dinitro-2-methylphenol[4,6-]	2074	0	SW-846:8270C	3	10	2.9		µg/L	EPA TAP SCRN LVL
SVOA	51-28-5	Dinitrophenol[2,4-]	2074	0	SW-846:8270C	5	20	73		µg/L	EPA TAP SCRN LVL
SVOA	121-14-2	Dinitrotoluene[2,4-]	2074	14	SW-846:8270C	2	10	2.2		µg/L	EPA TAP SCRN LVL
SVOA	606-20-2	Dinitrotoluene[2,6-]	2073	2	SW-846:8270C	2	10	37		µg/L	EPA TAP SCRN LVL
SVOA	117-84-0	Di-n-octylphthalate	2074	5	SW-846:8270C	3	10			µg/L	
SVOA	88-85-7	Dinoseb	2074	0	SW-846:8270C	2	10	7		µg/L	EPA MCL
SVOA	123-91-1	Dioxane[1,4-]	2010	119	SW-846:8270C	2	10	6.7		µg/L	EPA TAP SCRN LVL
SVOA	122-39-4	Diphenylamine	2069	0	SW-846:8270C	3	10	910		µg/L	EPA TAP SCRN LVL
SVOA	206-44-0	Fluoranthene	2074	4	SW-846:8270C	0.2	1	1500		µg/L	EPA TAP SCRN LVL
SVOA	86-73-7	Fluorene	2074	3	SW-846:8270C	0.2	1	1500		µg/L	EPA TAP SCRN LVL
SVOA	118-74-1	Hexachlorobenzene	2074	0	SW-846:8270C	2	10	1		µg/L	EPA MCL
SVOA	87-68-3	Hexachlorobutadiene	2074	0	SW-846:8270C	2	10	8.6		µg/L	EPA TAP SCRN LVL
SVOA	77-47-4	Hexachlorocyclopentadiene	2074	0	SW-846:8270C	3	10	50		µg/L	EPA MCL
SVOA	67-72-1	Hexachloroethane	2074	0	SW-846:8270C	2	10	48		µg/L	EPA TAP SCRN LVL
SVOA	193-39-5	Indeno(1,2,3-cd)pyrene	2074	5	SW-846:8270C	0.2	1	0.29		µg/L	EPA TAP SCRN LVL
SVOA	78-59-1	Isophorone	2074	0	SW-846:8270C	3	10	710		µg/L	EPA TAP SCRN LVL
SVOA	90-12-0	Methylnaphthalene[1-]	2072	3	SW-846:8270C	0.3	1	23		µg/L	EPA TAP SCRN LVL
SVOA	91-57-6	Methylnaphthalene[2-]	2074	2	SW-846:8270C	0.3	1	150		µg/L	EPA TAP SCRN LVL
SVOA	95-48-7	Methylphenol[2-]	2074	2	SW-846:8270C	2	10	1800		µg/L	EPA TAP SCRN LVL
SVOA	106-44-5	Methylphenol[4-]	1341	2	SW-846:8270C	3	10	180		µg/L	EPA TAP SCRN LVL
SVOA	91-20-3	Naphthalene	2074	3	SW-846:8270C	0.3	1	30		µg/L	NM GW STD
SVOA	88-74-4	Nitroaniline[2-]	2074	0	SW-846:8270C	2	10	370		µg/L	EPA TAP SCRN LVL
SVOA	99-09-2	Nitroaniline[3-]	2074	0	SW-846:8270C	2	10			µg/L	
SVOA	100-01-6	Nitroaniline[4-]	2074	0	SW-846:8270C	3	10	34		µg/L	EPA TAP SCRN LVL

Table B-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
SVOA	98-95-3	Nitrobenzene	2074	2	SW-846:8270C	3	10	1.2		µg/L	EPA TAP SCRN LVL
SVOA	88-75-5	Nitrophenol[2-]	2074	0	SW-846:8270C	2	10			µg/L	
SVOA	100-02-7	Nitrophenol[4-]	2074	0	SW-846:8270C	2	10			µg/L	
SVOA	55-18-5	Nitrosodiethylamine[N-]	2074	0	SW-846:8270C	2	10	0.0014		µg/L	EPA TAP SCRN LVL
SVOA	62-75-9	Nitrosodimethylamine[N-]	2074	0	SW-846:8270C	2	10	0.0042		µg/L	EPA TAP SCRN LVL
SVOA	924-16-3	Nitroso-di-n-butylamine[N-]	2074	0	SW-846:8270C	3	10	0.024		µg/L	EPA TAP SCRN LVL
SVOA	621-64-7	Nitroso-di-n-propylamine[N-]	2074	0	SW-846:8270C	2	10	0.096		µg/L	EPA TAP SCRN LVL
SVOA	930-55-2	Nitrosopyrrolidine[N-]	2074	0	SW-846:8270C	2	10	0.32		µg/L	EPA TAP SCRN LVL
SVOA	108-60-1	Oxybis(1-chloropropane)[2,2'-]	2074	0	SW-846:8270C	2	10	3.2		µg/L	EPA TAP SCRN LVL
SVOA	608-93-5	Pentachlorobenzene	2074	0	SW-846:8270C	3	10	29		µg/L	EPA TAP SCRN LVL
SVOA	87-86-5	Pentachlorophenol	2074	1	SW-846:8270C	2	10	1		µg/L	EPA MCL
SVOA	85-01-8	Phenanthrene	2074	5	SW-846:8270C	0.2	1			µg/L	
SVOA	108-95-2	Phenol	2074	5	SW-846:8270C	1	10	5		µg/L	NM GW STD
SVOA	129-00-0	Pyrene	2074	2	SW-846:8270C	0.3	1	1100		µg/L	EPA TAP SCRN LVL
SVOA	110-86-1	Pyridine	1564	0	SW-846:8270C	3	10	37		µg/L	EPA TAP SCRN LVL
SVOA	95-94-3	Tetrachlorobenzene[1,2,4,5]	2074	0	SW-846:8270C	3	10	11		µg/L	EPA TAP SCRN LVL
SVOA	58-90-2	Tetrachlorophenol[2,3,4,6-]	2074	1	SW-846:8270C	2	10	1100		µg/L	EPA TAP SCRN LVL
SVOA	120-82-1	Trichlorobenzene[1,2,4-]	2074	1	SW-846:8270C	2	10	70		µg/L	EPA MCL
SVOA	95-95-4	Trichlorophenol[2,4,5-]	2074	0	SW-846:8270C	2	10	3700		µg/L	EPA TAP SCRN LVL
SVOA	88-06-2	Trichlorophenol[2,4,6-]	2074	0	SW-846:8270C	2	10	61		µg/L	EPA TAP SCRN LVL
VOA	67-64-1	Acetone	2543	253	SW-846:8260B	3.5	10	22000		µg/L	EPA TAP SCRN LVL
VOA	75-05-8	Acetonitrile	2543	5	SW-846:8260B	6.3	25	130		µg/L	EPA TAP SCRN LVL
VOA	107-02-8	Acrolein	2543	2	SW-846:8260B	1.3	5	0.042		µg/L	EPA TAP SCRN LVL
VOA	107-13-1	Acrylonitrile	2543	0	SW-846:8260B	1	5	0.45		µg/L	EPA TAP SCRN LVL
VOA	71-43-2	Benzene	2543	10	SW-846:8260B	0.3	1	5		µg/L	EPA MCL
VOA	108-86-1	Bromobenzene	2543	0	SW-846:8260B	0.25	1	88		µg/L	EPA TAP SCRN LVL
VOA	74-97-5	Bromochloromethane	2543	0	SW-846:8260B	0.3	1			µg/L	
VOA	75-27-4	Bromodichloromethane	2543	0	SW-846:8260B	0.25	1	80		µg/L	EPA MCL
VOA	75-25-2	Bromoform	2543	1	SW-846:8260B	0.25	1	80		µg/L	EPA MCL
VOA	74-83-9	Bromomethane	2543	2	SW-846:8260B	0.3	1	8.7		µg/L	EPA TAP SCRN LVL
VOA	71-36-3	Butanol[1-]	2004	6	SW-846:8260B	15	50	3700		µg/L	EPA TAP SCRN LVL
VOA	78-93-3	Butanone[2-]	2543	75	SW-846:8260B	1.3	5	7100		µg/L	EPA TAP SCRN LVL
VOA	104-51-8	Butylbenzene[n-]	2543	0	SW-846:8260B	0.25	1			µg/L	
VOA	135-98-8	Butylbenzene[sec-]	2543	0	SW-846:8260B	0.25	1			µg/L	
VOA	98-06-6	Butylbenzene[tert-]	2543	0	SW-846:8260B	0.25	1			µg/L	
VOA	75-15-0	Carbon Disulfide	2543	14	SW-846:8260B	1.3	5	1000		µg/L	EPA TAP SCRN LVL
VOA	56-23-5	Carbon Tetrachloride	2543	0	SW-846:8260B	0.3	1	5		µg/L	EPA MCL

Table B-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
VOA	126-99-8	Chloro-1,3-butadiene[2-]	2543	0	SW-846:8260B	0.3	1	0.16		µg/L	EPA TAP SCRN LVL
VOA	107-05-1	Chloro-1-propene[3-]	2543	0	SW-846:8260B	1.5	5	6.5		µg/L	EPA TAP SCRN LVL
VOA	108-90-7	Chlorobenzene	2543	0	SW-846:8260B	0.25	1	100		µg/L	EPA MCL
VOA	124-48-1	Chlorodibromomethane	2543	1	SW-846:8260B	0.3	1	80		µg/L	EPA MCL
VOA	75-00-3	Chloroethane	2543	0	SW-846:8260B	0.3	1	21000		µg/L	EPA TAP SCRN LVL
VOA	67-66-3	Chloroform	2543	127	SW-846:8260B	0.25	1	80		µg/L	EPA MCL
VOA	74-87-3	Chloromethane	2543	77	SW-846:8260B	0.3	1	190		µg/L	EPA TAP SCRN LVL
VOA	95-49-8	Chlorotoluene[2-]	2543	0	SW-846:8260B	0.25	1	730		µg/L	EPA TAP SCRN LVL
VOA	106-43-4	Chlorotoluene[4-]	2543	0	SW-846:8260B	0.25	1	2600		µg/L	EPA TAP SCRN LVL
VOA	96-12-8	Dibromo-3-Chloropropane[1,2-]	2543	0	SW-846:8260B	0.3	1	0.2		µg/L	EPA MCL
VOA	106-93-4	Dibromoethane[1,2-]	2543	0	SW-846:8260B	0.25	1	0.05		µg/L	EPA MCL
VOA	74-95-3	Dibromomethane	2543	0	SW-846:8260B	0.3	1	8.2		µg/L	EPA TAP SCRN LVL
VOA	95-50-1	Dichlorobenzene[1,2-]	2543	1	SW-846:8260B	0.25	1	600		µg/L	EPA MCL
VOA	541-73-1	Dichlorobenzene[1,3-]	2543	16	SW-846:8260B	0.25	1			µg/L	
VOA	106-46-7	Dichlorobenzene[1,4-]	2543	0	SW-846:8260B	0.25	1	75		µg/L	EPA MCL
VOA	75-71-8	Dichlorodifluoromethane	2543	0	SW-846:8260B	0.3	1	390		µg/L	EPA TAP SCRN LVL
VOA	75-34-3	Dichloroethane[1,1-]	2543	66	SW-846:8260B	0.3	1	25		µg/L	NM GW STD
VOA	107-06-2	Dichloroethane[1,2-]	2543	6	SW-846:8260B	0.25	1	5		µg/L	EPA MCL
VOA	75-35-4	Dichloroethene[1,1-]	2543	65	SW-846:8260B	0.3	1	5		µg/L	NM GW STD
VOA	156-59-2	Dichloroethene[cis-1,2-]	2543	8	SW-846:8260B	0.3	1	70		µg/L	EPA MCL
VOA	156-60-5	Dichloroethene[trans-1,2-]	2543	0	SW-846:8260B	0.3	1	100		µg/L	EPA MCL
VOA	78-87-5	Dichloropropane[1,2-]	2543	0	SW-846:8260B	0.25	1	5		µg/L	EPA MCL
VOA	142-28-9	Dichloropropane[1,3-]	2543	0	SW-846:8260B	0.3	1	730		µg/L	EPA TAP SCRN LVL
VOA	594-20-7	Dichloropropane[2,2-]	2543	0	SW-846:8260B	0.3	1			µg/L	
VOA	563-58-6	Dichloropropene[1,1-]	2543	0	SW-846:8260B	0.25	1			µg/L	
VOA	10061-01-5	Dichloropropene[cis-1,3-]	2543	0	SW-846:8260B	0.25	1			µg/L	
VOA	10061-02-6	Dichloropropene[trans-1,3-]	2543	0	SW-846:8260B	0.25	1			µg/L	
VOA	60-29-7	Diethyl Ether	2004	5	SW-846:8260B	0.3	1	7300		µg/L	EPA TAP SCRN LVL
VOA	97-63-2	Ethyl Methacrylate	2543	0	SW-846:8260B	1	5	3300		µg/L	EPA TAP SCRN LVL
VOA	100-41-4	Ethylbenzene	2543	4	SW-846:8260B	0.25	1	700		µg/L	EPA MCL
VOA	87-68-3	Hexachlorobutadiene	2543	0	SW-846:8260B	0.3	1	8.6		µg/L	EPA TAP SCRN LVL
VOA	591-78-6	Hexanone[2-]	2543	1	SW-846:8260B	1.3	5	47		µg/L	EPA TAP SCRN LVL
VOA	74-88-4	Iodomethane	2543	1	SW-846:8260B	1.3	5			µg/L	
VOA	78-83-1	Isobutyl alcohol	2543	1	SW-846:8260B	13	50	11000		µg/L	EPA TAP SCRN LVL
VOA	98-82-8	Isopropylbenzene	2543	11	SW-846:8260B	0.25	1	680		µg/L	EPA TAP SCRN LVL
VOA	99-87-6	Isopropyltoluene[4-]	2543	4	SW-846:8260B	0.25	1			µg/L	
VOA	126-98-7	Methacrylonitrile	2542	0	SW-846:8260B	1	5	1		µg/L	EPA TAP SCRN LVL

Table B-4.1-1 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Unit	Cleanup-Level Type
VOA	80-62-6	Methyl Methacrylate	2543	1	SW-846:8260B	1	5	1400		μg/L	EPA TAP SCRN LVL
VOA	1634-04-4	Methyl tert-Butyl Ether	2004	32	SW-846:8260B	0.25	1	120		μg/L	EPA TAP SCRN LVL
VOA	108-10-1	Methyl-2-pentanone[4-]	2543	8	SW-846:8260B	1.3	5	2000		μg/L	EPA TAP SCRN LVL
VOA	75-09-2	Methylene Chloride	2543	15	SW-846:8260B	3	10	5		μg/L	EPA MCL
VOA	91-20-3	Naphthalene	2543	7	SW-846:8260B	0.25	1	30		μg/L	NM GW STD
VOA	107-12-0	Propionitrile	2543	0	SW-846:8260B	1.5	5			μg/L	
VOA	103-65-1	Propylbenzene[1-]	2543	0	SW-846:8260B	0.25	1	1300		μg/L	EPA TAP SCRN LVL
VOA	100-42-5	Styrene	2543	5	SW-846:8260B	0.25	1	100		μg/L	EPA MCL
VOA	630-20-6	Tetrachloroethane[1,1,1,2-]	2543	0	SW-846:8260B	0.3	1	5.2		μg/L	EPA TAP SCRN LVL
VOA	79-34-5	Tetrachloroethane[1,1,2,2-]	2543	0	SW-846:8260B	0.25	1	10		μg/L	NM GW STD
VOA	127-18-4	Tetrachloroethene	2543	86	SW-846:8260B	0.3	1	5		μg/L	EPA MCL
VOA	108-88-3	Toluene	2543	245	SW-846:8260B	0.25	1	750		μg/L	NM GW STD
VOA	76-13-1	Trichloro-1,2,2-trifluoroethane[1,1,2-]	2541	1	SW-846:8260B	1	5	59000		μg/L	EPA TAP SCRN LVL
VOA	87-61-6	Trichlorobenzene[1,2,3-]	2543	2	SW-846:8260B	0.33	1	29		μg/L	EPA TAP SCRN LVL
VOA	120-82-1	Trichlorobenzene[1,2,4-]	2543	1	SW-846:8260B	0.3	1	70		μg/L	EPA MCL
VOA	71-55-6	Trichloroethane[1,1,1-]	2543	54	SW-846:8260B	0.33	1	60		μg/L	NM GW STD
VOA	79-00-5	Trichloroethane[1,1,2-]	2543	9	SW-846:8260B	0.25	1	5		μg/L	EPA MCL
VOA	79-01-6	Trichloroethene	2543	150	SW-846:8260B	0.25	1	5		μg/L	EPA MCL
VOA	75-69-4	Trichlorofluoromethane	2543	0	SW-846:8260B	0.3	1	1300		μg/L	EPA TAP SCRN LVL
VOA	96-18-4	Trichloropropane[1,2,3-]	2543	0	SW-846:8260B	0.3	1	0.0072		μg/L	EPA TAP SCRN LVL
VOA	95-63-6	Trimethylbenzene[1,2,4-]	2543	3	SW-846:8260B	0.25	1	15		μg/L	EPA TAP SCRN LVL
VOA	108-67-8	Trimethylbenzene[1,3,5-]	2543	0	SW-846:8260B	0.25	1	370		μg/L	EPA TAP SCRN LVL
VOA	108-05-4	Vinyl acetate	2543	0	SW-846:8260B	1.5	5	410		μg/L	EPA TAP SCRN LVL
VOA	75-01-4	Vinyl Chloride	2543	0	SW-846:8260B	0.5	1	1		μg/L	NM GW STD
VOA	95-47-6	Xylene[1,2-]	2543	4	SW-846:8260B	0.3	1	1200		μg/L	EPA TAP SCRN LVL
VOA	Xylene[1,3 and 1,4]	Xylene[1,3-]+Xylene[1,4-]	2541	20	SW-846:8260B	0.5	2			μg/L	

Note: Blank cells indicate there are no values.

[a] Mode (most frequent) of values reported for 2010 data.

[b] This value is derived as a result of logic provided in Appendix B-2.0, Protocol for Selecting Cleanup Levels are from the 2011 Interim Plan, Revision 1 (LANL 2011, 208811).

[c] Lowest of background values for alluvial, intermediate, and regional groundwater as identified in the Laboratory's 2007 groundwater background report (LANL 2007, 095817).

Table B-4.1-2
Analytes, Analytical Methods, and MDLs and PQLs Obtained for 2010 Analyses of Base-Flow Samples by Contract Laboratories and Number of Sample Analyses and Detections for the Period 2006 to 2010

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
Diox/Fur	35822-46-9	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	75	27	SW-846:8290		0.00005		µg/L	
Diox/Fur	37871-00-4	Heptachlorodibenzodioxins (Total)	75	45	SW-846:8290		0.00005		µg/L	
Diox/Fur	67562-39-4	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	75	16	SW-846:8290		0.00005		µg/L	
Diox/Fur	55673-89-7	Heptachlorodibenzofuran[1,2,3,4,7,8,9-]	75	6	SW-846:8290		0.00005		µg/L	
Diox/Fur	38998-75-3	Heptachlorodibenzofurans (Total)	75	28	SW-846:8290		0.00005		µg/L	
Diox/Fur	39227-28-6	Hexachlorodibenzodioxin[1,2,3,4,7,8-]	75	4	SW-846:8290		0.00005		µg/L	
Diox/Fur	57653-85-7	Hexachlorodibenzodioxin[1,2,3,6,7,8-]	75	5	SW-846:8290		0.00005		µg/L	
Diox/Fur	19408-74-3	Hexachlorodibenzodioxin[1,2,3,7,8,9-]	75	4	SW-846:8290		0.00005		µg/L	
Diox/Fur	34465-46-8	Hexachlorodibenzodioxins (Total)	75	14	SW-846:8290		0.00005		µg/L	
Diox/Fur	70648-26-9	Hexachlorodibenzofuran[1,2,3,4,7,8-]	75	5	SW-846:8290		0.00005		µg/L	
Diox/Fur	57117-44-9	Hexachlorodibenzofuran[1,2,3,6,7,8-]	75	4	SW-846:8290		0.00005		µg/L	
Diox/Fur	72918-21-9	Hexachlorodibenzofuran[1,2,3,7,8,9-]	75	1	SW-846:8290		0.00005		µg/L	
Diox/Fur	60851-34-5	Hexachlorodibenzofuran[2,3,4,6,7,8-]	75	6	SW-846:8290		0.00005		µg/L	
Diox/Fur	55684-94-1	Hexachlorodibenzofurans (Total)	75	22	SW-846:8290		0.00005		µg/L	
Diox/Fur	3268-87-9	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	75	37	SW-846:8290		0.0001		µg/L	
Diox/Fur	39001-02-0	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	75	21	SW-846:8290		0.0001		µg/L	
Diox/Fur	40321-76-4	Pentachlorodibenzodioxin[1,2,3,7,8-]	75	2	SW-846:8290		0.00005		µg/L	
Diox/Fur	36088-22-9	Pentachlorodibenzodioxins (Total)	75	10	SW-846:8290		0.00005		µg/L	
Diox/Fur	57117-41-6	Pentachlorodibenzofuran[1,2,3,7,8-]	75	6	SW-846:8290		0.00005		µg/L	
Diox/Fur	57117-31-4	Pentachlorodibenzofuran[2,3,4,7,8-]	75	4	SW-846:8290		0.00005		µg/L	
Diox/Fur	30402-15-4	Pentachlorodibenzofurans (Totals)	75	17	SW-846:8290		0.00005		µg/L	
Diox/Fur	1746-01-6	Tetrachlorodibenzodioxin[2,3,7,8-]	75	3	SW-846:8290		0.00001	5.1E-08	µg/L	NM HH OO
Diox/Fur	41903-57-5	Tetrachlorodibenzodioxins (Total)	75	10	SW-846:8290		0.00001		µg/L	
Diox/Fur	51207-31-9	Tetrachlorodibenzofuran[2,3,7,8-]	75	6	SW-846:8290		0.00001		µg/L	
Diox/Fur	55722-27-5	Tetrachlorodibenzofurans (Totals)	75	11	SW-846:8290		0.00001		µg/L	
DRO	TPH-DRO	Total Petroleum Hydrocarbons Diesel Range Organics	1	1	SW-846:8015M	65	200		µg/L	
Geninorg	ALK-CO_3	Alkalinity-CO_3	399	81	EPA:310.1	0.73	1		mg/L	
Geninorg	ALK-CO_3+HCO_3	Alkalinity-CO_3+HCO_3	399	396	EPA:310.1	0.73	1		mg/L	
Geninorg	NH_3-N	Ammonia as Nitrogen	404	197	EPA:350.1	0.016	0.05		mg/L	
Geninorg	Br(-1)	Bromide	399	135	EPA:300.0	0.066	0.2		mg/L	
Geninorg	Ca	Calcium	724	724	SW-846:6010B	0.05	0.2		mg/L	
Geninorg	Cl(-1)	Chloride	395	395	EPA:300.0	0.066	0.2		mg/L	
Geninorg	CN(TOTAL)	Cyanide (Total)	338	71	EPA:335.4	0.0017	0.005		mg/L	
Geninorg	F(-1)	Fluoride	402	380	EPA:300.0	0.033	0.1		mg/L	
Geninorg	HARDNESS	Hardness	721	721	SM:A2340B	0.35	1.24		mg/L	

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
Geninorg	Mg	Magnesium	724	724	SW-846:6010B	0.085	0.3		mg/L	
Geninorg	NO_3+NO_2-N	Nitrate-Nitrite as Nitrogen	404	247	EPA:353.2	0.01	0.05	132	mg/L	NM LVSTK WTR STD
Geninorg	ClO_4	Perchlorate	460	305	SW-846:6850	0.05	0.2		µg/L	
Geninorg	pH	pH	395	395	EPA:150.1	0.01	0.1		SU	
Geninorg	K	Potassium	724	724	SW-846:6010B	0.05	0.15		mg/L	
Geninorg	Na	Sodium	724	724	SW-846:6010B	0.1	0.3		mg/L	
Geninorg	SO_4(-2)	Sulfate	402	400	EPA:300.0	0.1	0.4		mg/L	
Geninorg	SSC	Suspended Sediment Concentration	339	262	EPA:160.2	0.76	3.33		mg/L	
Geninorg	TDS	Total Dissolved Solids	392	390	EPA:160.1	2.4	10		mg/L	
Geninorg	TKN	Total Kjeldahl Nitrogen	487	380	EPA:351.2	0.033	0.1		mg/L	
Geninorg	TOC	Total Organic Carbon	353	352	SW-846:9060	0.33	1		mg/L	
Geninorg	PO_4-P	Total Phosphate as Phosphorus	398	233	EPA:365.4	0.015	0.05		mg/L	
Geninorg	TSS	Total Suspended Solids	19	15	EPA:160.2	2.3	10		mg/L	
Herb	94-75-7	D[2,4-]	42	0	SW-846:8151A	0.087	0.26		µg/L	
Herb	75-99-0	Dalapon	42	0	SW-846:8151A	1.3	5.3		µg/L	
Herb	94-82-6	DB[2,4-]	42	0	SW-846:8151A	0.087	0.26		µg/L	
Herb	1918-00-9	Dicamba	42	0	SW-846:8151A	0.087	0.26		µg/L	
Herb	120-36-5	Dichlorprop	42	0	SW-846:8151A	0.087	0.26		µg/L	
Herb	88-85-7	Dinoseb	42	0	SW-846:8151A	0.087	0.26		µg/L	
Herb	94-74-6	2-Methyl-4-chlorophenoxyacetic acid	42	0	SW-846:8151A	12	53		µg/L	
Herb	93-65-2	2-(4-Chloro-2-methylphenoxy) propanoic acid	42	0	SW-846:8151A	11	53		µg/L	
Herb	93-76-5	T[2,4,5-]	42	0	SW-846:8151A	0.087	0.26		µg/L	
Herb	93-72-1	TP[2,4,5-]	42	0	SW-846:8151A	0.087	0.26		µg/L	
Hexp	6629-29-4	2,4-Diamino-6-nitrotoluene	175	4	SW-846:8321	0.39	1.3		µg/L	
Hexp	59229-75-3	2,6-Diamino-4-nitrotoluene	175	2	SW-846:8321	0.39	1.3		µg/L	
Hexp	618-87-1	3,5-Dinitroaniline	175	1	SW-846:8321	0.39	1.3		µg/L	
Hexp	19406-51-0	Amino-2,6-dinitrotoluene[4-]	175	12	SW-846:8321	0.1	0.33		µg/L	
Hexp	35572-78-2	Amino-4,6-dinitrotoluene[2-]	175	14	SW-846:8321	0.1	0.33		µg/L	
Hexp	99-65-0	Dinitrobenzene[1,3-]	175	0	SW-846:8321	0.1	0.33		µg/L	
Hexp	121-14-2	Dinitrotoluene[2,4-]	175	0	SW-846:8321	0.1	0.33		µg/L	
Hexp	606-20-2	Dinitrotoluene[2,6-]	175	0	SW-846:8321	0.1	0.33		µg/L	
Hexp	DNX	Dexahydro-1,3-dinitro-5-nitro-1,3,5-triazine	131	8	SW-846:8330	0.069	0.5		µg/L	
Hexp	2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	175	46	SW-846:8321	0.1	0.33		µg/L	
Hexp	MNX	Hexahydro-1-nitroso-3,5-dinitro-1,3,5-triazine	131	9	SW-846:8330	0.091	0.5		µg/L	
Hexp	98-95-3	Nitrobenzene	175	0	SW-846:8321	0.1	0.33	690	µg/L	NM HH OO
Hexp	88-72-2	Nitrotoluene[2-]	175	0	SW-846:8321	0.1	0.33		µg/L	
Hexp	99-08-1	Nitrotoluene[3-]	175	0	SW-846:8321	0.1	0.33		µg/L	

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
Hexp	99-99-0	Nitrotoluene[4-]	175	0	SW-846:8321	0.1	0.65		µg/L	
Hexp	78-11-5	Pentaerythritol tetranitrate	175	0	SW-846:8321	0.13	1.3		µg/L	
Hexp	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine	175	30	SW-846:8321	0.1	0.33		µg/L	
Hexp	3058-38-6	Triaminotrinitrobenzene	175	0	SW-846:8321	0.39	1.3		µg/L	
Hexp	479-45-8	Tetryl	175	0	SW-846:8321	0.13	0.65		µg/L	
Hexp	TNX	Hexahydro-1,3,5-trinitroso-1,3,5-triazine	131	7	SW-846:8330	0.082	0.5		µg/L	
Hexp	99-35-4	Trinitrobenzene[1,3,5-]	175	0	SW-846:8321	0.1	0.33		µg/L	
Hexp	118-96-7	Trinitrotoluene[2,4,6-]	175	0	SW-846:8321	0.1	0.33		µg/L	
Hexp	78-30-8	Tris (o-cresyl) phosphate	175	0	SW-846:8321	0.39	1.3		µg/L	
Metals	Al	Aluminum	724	519	SW-846:6010B	68	200	391	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Sb	Antimony	724	36	SW-846:6020	0.5	3	640	µg/L	NM HH OO
Metals	As	Arsenic	730	205	SW-846:6020	1.5	5	9	µg/L	NM HH OO
Metals	Ba	Barium	724	724	SW-846:6010B	1	5		µg/L	
Metals	Be	Beryllium	724	20	SW-846:6010B	1	5		µg/L	
Metals	B	Boron	716	540	SW-846:6010B	15	50	5000	µg/L	NM LVSTK WTR STD
Metals	Cd	Cadmium	724	70	SW-846:6020	0.11	1	0.23	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Cr	Chromium	728	419	SW-846:6020	2.5	10	35	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Co	Cobalt	724	117	SW-846:6010B	1	5	1000	µg/L	NM LVSTK WTR STD
Metals	Cu	Copper	724	264	SW-846:6010B	3	10	4	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Fe	Iron	724	627	SW-846:6010B	30	100		µg/L	
Metals	Pb	Lead	724	286	SW-846:6020	0.5	2	1	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Mn	Manganese	724	660	SW-846:6010B	2	10	1216	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Hg	Mercury	719	17	EPA:245.2	0.066	0.2	0.77	µg/L	NM WQCC WLDLF HAB
Metals	Mo	Molybdenum	724	495	SW-846:6020	0.1	0.5		µg/L	
Metals	Ni	Nickel	724	643	SW-846:6020	0.5	2	24	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Se	Selenium	724	45	SW-846:6020	1	5	5	µg/L	NM WQCC WLDLF HAB
Metals	SiO2	Silicon Dioxide	225	225	SW-846:6010B	0.053	0.213		mg/L	
Metals	Ag	Silver	724	78	SW-846:6020	0.2	1	0.7	µg/L	NM Aqu Chronic 30 mg/L hardness
Metals	Sr	Strontium	716	716	SW-846:6010B	1	5		µg/L	
Metals	Tl	Thallium	724	69	SW-846:6020	0.3	1	0.47	µg/L	NM HH OO
Metals	Sn	Tin	716	10	SW-846:6010B	2.5	10		µg/L	
Metals	U	Uranium	716	524	SW-846:6020	0.05	0.2		µg/L	
Metals	V	Vanadium	724	603	SW-846:6010B	1	5	100	µg/L	NM LVSTK WTR STD
Metals	Zn	Zinc	724	490	SW-846:6010B	3.3	10	53	µg/L	NM Aqu Chronic 30 mg/L hardness
PCB	12674-11-2	Aroclor-1016	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB	11104-28-2	Aroclor-1221	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB	11141-16-5	Aroclor-1232	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB	53469-21-9	Aroclor-1242	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB	12672-29-6	Aroclor-1248	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB	11097-69-1	Aroclor-1254	216	6	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB	11096-82-5	Aroclor-1260	216	7	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB	37324-23-5	Aroclor-1262	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO
PCB Cong	2051-60-7	Polychlorinated biphenyl (PCB) 1	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	33146-45-1	PCB-10	10	0	EPA:1668A		0.000035		µg/L	
PCB Cong	39485-83-1	PCB-100	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	60145-21-3	PCB-103	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	56558-16-8	PCB-104	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	32598-14-4	PCB-105	53	7	EPA:1668A		0.000035		µg/L	
PCB Cong	70424-69-0	PCB-106	35	3	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-106/118	PCB-106/PCB-118	18	3	EPA:1668A		0.0000097		µg/L	
PCB Cong	70424-68-9	PCB-107	35	3	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-107/109	PCB-107/PCB-109	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-108/112	PCB-108/PCB-112	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-108/124	PCB-108/PCB-124	10	1	EPA:1668A		0.0000139		µg/L	
PCB Cong	2050-67-1	PCB-11	53	4	EPA:1668A		0.000056		µg/L	
PCB Cong	38380-03-9	PCB-110	43	5	EPA:1668A		0.000028		µg/L	
PCB Cong	39635-32-0	PCB-111	35	0	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-111/115	PCB-111/PCB-115	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-36-9	PCB-112	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	68194-10-5	PCB-113	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-37-0	PCB-114	53	1	EPA:1668A		0.000007		µg/L	
PCB Cong	56558-17-9	PCB-119	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-12/13	PCB-12/PCB-13	53	0	EPA:1668A		0.000056		µg/L	
PCB Cong	68194-12-7	PCB-120	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	56558-18-0	PCB-121	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	76842-07-4	PCB-122	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	65510-44-3	PCB-123	53	1	EPA:1668A		0.000035		µg/L	
PCB Cong	70424-70-3	PCB-124	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	57465-28-8	PCB-126	53	1	EPA:1668A		0.000007		µg/L	
PCB Cong	39635-33-1	PCB-127	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-128/162	PCB-128/PCB-162	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	55215-18-4	PCB-129	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-66-8	PCB-130	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	61798-70-7	PCB-131	53	1	EPA:1668A		0.000028		µg/L	

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB Cong	PCB-132/161	PCB-132/PCB-161	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	35694-04-3	PCB-133	35	2	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-133/142	PCB-133/PCB-142	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52704-70-8	PCB-134	35	2	EPA:1668A		0.000035		µg/L	
PCB Cong	PCB-134/143	PCB-134/PCB-143	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52744-13-5	PCB-135	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	38411-22-2	PCB-136	53	6	EPA:1668A		0.000028		µg/L	
PCB Cong	35694-06-5	PCB-137	53	3	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-139/140	PCB-139/PCB-140	10	1	EPA:1668A		0.0000139		µg/L	
PCB Cong	PCB-139/149	PCB-139/PCB-149	18	1	EPA:1668A		0.000028		µg/L	
PCB Cong	34883-41-5	PCB-14	53	0	EPA:1668A		0.000056		µg/L	
PCB Cong	59291-64-4	PCB-140	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52712-04-6	PCB-141	53	8	EPA:1668A		0.000028		µg/L	
PCB Cong	41411-61-4	PCB-142	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	68194-15-0	PCB-143	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	68194-14-9	PCB-144	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-40-5	PCB-145	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-146/165	PCB-146/PCB-165	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	68194-13-8	PCB-147	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-41-6	PCB-148	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	2050-68-2	PCB-15	53	3	EPA:1668A		0.000056		µg/L	
PCB Cong	68194-08-1	PCB-150	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-63-5	PCB-151	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	68194-09-2	PCB-152	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	60145-22-4	PCB-154	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	33979-03-2	PCB-155	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	38380-08-4	PCB-156	43	5	EPA:1668A		0.000004		µg/L	
PCB Cong	PCB-156/157	PCB-156/PCB-157	10	4	EPA:1668A		0.0000138		µg/L	
PCB Cong	69782-90-7	PCB-157	43	1	EPA:1668A		0.000005		µg/L	
PCB Cong	PCB-158/160	PCB-158/PCB-160	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	39635-35-3	PCB-159	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	38444-78-9	PCB-16	10	0	EPA:1668A		0.000035		µg/L	
PCB Cong	PCB-16/32	PCB-16/PCB-32	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	41411-62-5	PCB-160	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	74472-43-8	PCB-161	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	39635-34-2	PCB-162	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	74472-46-1	PCB-165	10	0	EPA:1668A		0.000007		µg/L	

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB Cong	41411-63-6	PCB-166	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-72-6	PCB-167	53	6	EPA:1668A		0.000007		µg/L	
PCB Cong	59291-65-5	PCB-168	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	32774-16-6	PCB-169	53	0	EPA:1668A		0.000007		µg/L	
PCB Cong	37680-66-3	PCB-17	53	2	EPA:1668A		0.000028		µg/L	
PCB Cong	35065-30-6	PCB-170	53	7	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-71-5	PCB-171	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-171/173	PCB-171/PCB-173	10	4	EPA:1668A		0.0000138		µg/L	
PCB Cong	52663-74-8	PCB-172	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	68194-16-1	PCB-173	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	38411-25-5	PCB-174	53	8	EPA:1668A		0.000028		µg/L	
PCB Cong	40186-70-7	PCB-175	53	2	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-65-7	PCB-176	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-70-4	PCB-177	53	6	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-67-9	PCB-178	53	3	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-64-6	PCB-179	53	7	EPA:1668A		0.000028		µg/L	
PCB Cong	37680-65-2	PCB-18	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-18/30	PCB-18/PCB-30	10	3	EPA:1668A		0.0000138		µg/L	
PCB Cong	PCB-180/193	PCB-180/PCB-193	10	1	EPA:1668A		0.0000139		µg/L	
PCB Cong	74472-47-2	PCB-181	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	60145-23-5	PCB-182	35	3	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-182/187	PCB-182/PCB-187	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-69-1	PCB-183	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-183/185	PCB-183/PCB-185	10	3	EPA:1668A		0.0000139		µg/L	
PCB Cong	74472-48-3	PCB-184	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52712-05-7	PCB-185	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-49-4	PCB-186	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	74487-85-7	PCB-188	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	39635-31-9	PCB-189	53	3	EPA:1668A		0.000007		µg/L	
PCB Cong	38444-73-4	PCB-19	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41411-64-7	PCB-190	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-50-7	PCB-191	53	3	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-51-8	PCB-192	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	69782-91-8	PCB-193	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	35694-08-7	PCB-194	53	7	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-78-2	PCB-195	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-196/203	PCB-196/PCB-203	18	0	EPA:1668A		0.000028		µg/L	

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB Cong	33091-17-7	PCB-197	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-197/200	PCB-197/PCB-200	10	0	EPA:1668A		0.0000139		µg/L	
PCB Cong	68194-17-2	PCB-198	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-75-9	PCB-199	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	2051-61-8	PCB-2	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-20/21/33	PCB-20/PCB-21/PCB-33	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-73-7	PCB-200	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	40186-71-8	PCB-201	53	3	EPA:1668A		0.000028		µg/L	
PCB Cong	2136-99-4	PCB-202	53	4	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-52-9	PCB-204	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-53-0	PCB-205	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	40186-72-9	PCB-206	53	6	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-79-3	PCB-207	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-77-1	PCB-208	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	2051-24-3	PCB-209	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-21/33	PCB-21/PCB-33	10	1	EPA:1668A		0.0000139		µg/L	
PCB Cong	38444-85-8	PCB-22	53	4	EPA:1668A		0.000028		µg/L	
PCB Cong	55720-44-0	PCB-23	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	55702-45-9	PCB-24	35	0	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-24/27	PCB-24/PCB-27	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	55712-37-3	PCB-25	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	38444-81-4	PCB-26	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-26/29	PCB-26/PCB-29	10	0	EPA:1668A		0.0000139		µg/L	
PCB Cong	38444-76-7	PCB-27	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	7012-37-5	PCB-28	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	15862-07-4	PCB-29	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	2051-62-9	PCB-3	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	35693-92-6	PCB-30	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	16606-02-3	PCB-31	53	7	EPA:1668A		0.000028		µg/L	
PCB Cong	38444-77-8	PCB-32	10	1	EPA:1668A		0.000007		µg/L	
PCB Cong	37680-68-5	PCB-34	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	37680-69-6	PCB-35	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	38444-87-0	PCB-36	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	38444-90-5	PCB-37	53	4	EPA:1668A		0.000028		µg/L	
PCB Cong	53555-66-1	PCB-38	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	38444-88-1	PCB-39	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	13029-08-8	PCB-4	35	0	EPA:1668A		0.000035		µg/L	

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB Cong	PCB-4/10	PCB-4/PCB-10	18	0	EPA:1668A		0.000056		µg/L	
PCB Cong	38444-93-8	PCB-40	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-40/71	PCB-40/PCB-71	10	1	EPA:1668A		0.0000139		µg/L	
PCB Cong	52663-59-9	PCB-41	35	1	EPA:1668A		0.000035		µg/L	
PCB Cong	PCB-41/64/71/72	PCB-41/PCB-64/PCB-71/PCB-72	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	36559-22-5	PCB-42	35	1	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-42/59	PCB-42/PCB-59	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	70362-46-8	PCB-43	35	1	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-43/49	PCB-43/PCB-49	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41464-39-5	PCB-44	43	2	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-44/47/65	PCB-44/PCB-47/PCB-65	10	1	EPA:1668A		0.00002		µg/L	
PCB Cong	70362-45-7	PCB-45	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-45/51	PCB-45/PCB-51	10	0	EPA:1668A		0.0000139		µg/L	
PCB Cong	41464-47-5	PCB-46	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	70362-47-9	PCB-48	35	0	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-48/75	PCB-48/PCB-75	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-49/69	PCB-49/PCB-69	10	4	EPA:1668A		0.0000138		µg/L	
PCB Cong	16605-91-7	PCB-5	53	2	EPA:1668A		0.000056		µg/L	
PCB Cong	62796-65-0	PCB-50	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-50/53	PCB-50/PCB-53	10	0	EPA:1668A		0.0000139		µg/L	
PCB Cong	68194-04-7	PCB-51	43	13	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-52/69	PCB-52/PCB-69	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41464-41-9	PCB-53	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	15968-05-5	PCB-54	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	74338-24-2	PCB-55	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41464-43-1	PCB-56	35	5	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-56/60	PCB-56/PCB-60	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	70424-67-8	PCB-57	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41464-49-7	PCB-58	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-59/62/75	PCB-59/PCB-62/PCB-75	10	0	EPA:1668A		0.00002		µg/L	
PCB Cong	25569-80-6	PCB-6	53	0	EPA:1668A		0.000056		µg/L	
PCB Cong	33025-41-1	PCB-60	10	3	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-61/70	PCB-61/PCB-70	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	54230-22-7	PCB-62	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	74472-34-7	PCB-63	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	52663-58-8	PCB-64	10	4	EPA:1668A		0.000007		µg/L	
PCB Cong	33284-54-7	PCB-65	43	0	EPA:1668A		0.000028		µg/L	

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB Cong	32598-10-0	PCB-66	10	3	EPA:1668A		0.000035		µg/L	
PCB Cong	PCB-66/PCB-76	PCB-66/PCB-76	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	73575-53-8	PCB-67	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	73575-52-7	PCB-68	53	2	EPA:1668A		0.000028		µg/L	
PCB Cong	33284-50-3	PCB-7	35	0	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-7/9	PCB-7/PCB-9	18	0	EPA:1668A		0.000056		µg/L	
PCB Cong	41464-42-0	PCB-72	10	1	EPA:1668A		0.000007		µg/L	
PCB Cong	74338-23-1	PCB-73	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	32690-93-0	PCB-74	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	32598-13-3	PCB-77	53	5	EPA:1668A		0.000007		µg/L	
PCB Cong	70362-49-1	PCB-78	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41464-48-6	PCB-79	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	34883-43-7	PCB-8	10	2	EPA:1668A		0.0000114		µg/L	
PCB Cong	33284-52-5	PCB-80	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	70362-50-4	PCB-81	53	0	EPA:1668A		0.000007		µg/L	
PCB Cong	52663-62-4	PCB-82	53	5	EPA:1668A		0.000028		µg/L	
PCB Cong	60145-20-2	PCB-83	53	2	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-84/PCB-92	PCB-84/PCB-92	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-85/116	PCB-85/PCB-116	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-85/116/117	PCB-85/PCB-116/PCB-117	10	1	EPA:1668A		0.00002		µg/L	
PCB Cong	55312-69-1	PCB-86	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-87/117/125	PCB-87/PCB-117/PCB-125	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	55215-17-3	PCB-88/91	53	3	EPA:1668A		0.000028		µg/L	
PCB Cong	73575-57-2	PCB-89	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	34883-39-1	PCB-9	10	0	EPA:1668A		0.000007		µg/L	
PCB Cong	PCB-90/101	PCB-90/PCB-101	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	73575-56-1	PCB-93	43	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-93/100	PCB-93/PCB-100	10	0	EPA:1668A		0.0000139		µg/L	
PCB Cong	73575-55-0	PCB-94	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-95/98/102	PCB-95/PCB-98/PCB-102	18	0	EPA:1668A		0.000028		µg/L	
PCB Cong	73575-54-9	PCB-96	53	0	EPA:1668A		0.000028		µg/L	
PCB Cong	41464-51-1	PCB-97	43	1	EPA:1668A		0.000028		µg/L	
PCB Cong	PCB-98/102	PCB-98/PCB-102	10	1	EPA:1668A		0.0000139		µg/L	
PCB Cong	38380-01-7	PCB-99	53	6	EPA:1668A		0.000035		µg/L	
PCB Cong	DECACB(Total)	Total Decachlorobiphenyls	53	1	EPA:1668A		0.000028		µg/L	
PCB Cong	25512-42-9	Total Dichlorobiphenyls	53	8	EPA:1668A		0.000056		µg/L	
PCB Cong	27323-18-8	Total Monochlorobiphenyls	53	0	EPA:1668A		0.000028		µg/L	

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
PCB Cong	53742-07-7	Total Nonachlorobiphenyls	53	6	EPA:1668A		0.000028		µg/L	
PCB Cong	55722-26-4	Total Octachlorobiphenyls	53	7	EPA:1668A		0.000028		µg/L	
PCB Cong	25429-29-2	Total Pentachlorobiphenyls	53	13	EPA:1668A		0.00003		µg/L	
PCB Cong	25323-68-6	Total Trichlorobiphenyls	53	7	EPA:1668A		0.000028		µg/L	
Pest	309-00-2	Aldrin	197	1	SW-846:8081A	0.005	0.02	0.0005	µg/L	NM HH OO
Pest	319-84-6	Benzene Hexachloride[alpha-]	197	1	SW-846:8081A	0.005	0.02		µg/L	
Pest	319-85-7	Benzene Hexachloride[beta-]	197	1	SW-846:8081A	0.006	0.02		µg/L	
Pest	319-86-8	Benzene Hexachloride[delta-]	197	4	SW-846:8081A	0.005	0.02		µg/L	
Pest	58-89-9	Benzene Hexachloride[gamma-]	197	1	SW-846:8081A	0.005	0.02	0.95	µg/L	NM Aqu Acute
Pest	5103-71-9	Chlordane[alpha-]	197	1	SW-846:8081A	0.005	0.02	0.0043	µg/L	NM Aqu Chronic
Pest	5103-74-2	Chlordane[gamma-]	197	2	SW-846:8081A	0.005	0.02	0.0043	µg/L	NM Aqu Chronic
Pest	72-54-8	Dichlorodiphenyldichloroethane[4,4'-]	197	3	SW-846:8081A	0.01	0.04	0.001	µg/L	NM WQCC WLDLF HAB
Pest	72-55-9	Dichlorodiphenyldichloroethylene[4,4'-]	197	5	SW-846:8081A	0.005	0.04	0.001	µg/L	NM WQCC WLDLF HAB
Pest	50-29-3	Dichlorophenyltrichloroethylene[4,4'-]	197	4	SW-846:8081A	0.01	0.04	0.001	µg/L	NM WQCC WLDLF HAB
Pest	60-57-1	Dieldrin	197	2	SW-846:8081A	0.01	0.04	0.00054	µg/L	NM HH OO
Pest	959-98-8	Endosulfan I	197	2	SW-846:8081A	0.005	0.02	0.056	µg/L	NM Aqu Chronic
Pest	33213-65-9	Endosulfan II	197	2	SW-846:8081A	0.011	0.045	0.056	µg/L	NM Aqu Chronic
Pest	1031-07-8	Endosulfan Sulfate	197	2	SW-846:8081A	0.01	0.04	89	µg/L	NM HH OO
Pest	72-20-8	Endrin	197	2	SW-846:8081A	0.01	0.04	0.036	µg/L	NM Aqu Chronic
Pest	7421-93-4	Endrin Aldehyde	197	3	SW-846:8081A	0.005	0.04	0.3	µg/L	NM HH OO
Pest	53494-70-5	Endrin Ketone	197	1	SW-846:8081A	0.01	0.04		µg/L	
Pest	76-44-8	Heptachlor	197	2	SW-846:8081A	0.005	0.02	0.0038	µg/L	NM Aqu Chronic
Pest	1024-57-3	Heptachlor Epoxide	197	2	SW-846:8081A	0.005	0.02	0.0038	µg/L	NM Aqu Chronic
Pest	72-43-5	Methoxychlor[4,4'-]	197	1	SW-846:8081A	0.05	0.2		µg/L	
Pest	8001-35-2	Toxaphene (technical grade)	197	0	SW-846:8081A	0.15	0.5	0.0002	µg/L	NM Aqu Chronic
Rad	Am-241	Americium-241	434	25	Alpha Spectroscopy	0.05		400	pCi/L	DOE BCG WATER
Rad	Cs-137	Cesium-137	427	9	Gamma Spectroscopy	8		40	pCi/L	DOE BCG WATER
Rad	Co-60	Cobalt-60	427	0	Gamma Spectroscopy	8		4000	pCi/L	DOE BCG WATER
Rad	GROSSA	Gross alpha	292	71	Gas Proportional Counting	3		15	pCi/L	NM LVSTK WTR STD
Rad	GROSSB	Gross beta	292	237	Gas Proportional Counting	3			pCi/L	
Rad	GROSSG	Gross gamma	427	1	Gamma Spectroscopy	120			pCi/L	
Rad	Np-237	Neptunium-237	437	0	Alpha Spectroscopy	0.05			pCi/L	
Rad	Pu-238	Plutonium-238	433	30	Alpha Spectroscopy	0.05			pCi/L	
Rad	Pu-239/240	Plutonium-239/240	433	44	Alpha Spectroscopy	0.05		200	pCi/L	DOE BCG WATER
Rad	K-40	Potassium-40	427	5	Gamma Spectroscopy	10			pCi/L	
Rad	Ra-226	Radium-226	73	11	Alpha Spectroscopy	1		30	pCi/L	NM LVSTK WTR STD
Rad	Ra-226	Radium-226	73	11	Gas Proportional Counting	1		30	pCi/L	NM LVSTK WTR STD

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
Rad	Ra-228	Radium-228	69	15	Gas Proportional Counting	1		30	pCi/L	NM LVSTK WTR STD
Rad	Na-22	Sodium-22	427	0	Gamma Spectroscopy	10			pCi/L	
Rad	Sr-90	Strontium-90	427	59	Gas Proportional Counting	0.5		300	pCi/L	DOE BCG WATER
Rad	Th-228	Thorium-228	69	21	Alpha Spectroscopy	0.05			pCi/L	
Rad	Th-230	Thorium-230	69	16	Alpha Spectroscopy	0.05			pCi/L	
Rad	Th-232	Thorium-232	69	23	Alpha Spectroscopy	0.05		300	pCi/L	DOE BCG WATER
Rad	H-3	Tritium	195	190	Liquid Scintillation Counting	250		20000	pCi/L	NM LVSTK WTR STD
Rad	U-234	Uranium-234	431	295	Alpha Spectroscopy	0.05		200	pCi/L	DOE BCG WATER
Rad	U-235/236	Uranium-235/236	431	39	Alpha Spectroscopy	0.05			pCi/L	
Rad	U-238	Uranium-238	431	309	Alpha Spectroscopy	0.05		200	pCi/L	DOE BCG WATER
SVOA	83-32-9	Acenaphthene	281	1	SW-846:8270C	0.33	1.1	990	µg/L	NM HH OO
SVOA	208-96-8	Acenaphthylene	281	1	SW-846:8270C	0.21	1.1		µg/L	
SVOA	62-53-3	Aniline	281	0	SW-846:8270C	2.5	10		µg/L	
SVOA	120-12-7	Anthracene	281	2	SW-846:8270C	0.21	1.1	40000	µg/L	NM HH OO
SVOA	1912-24-9	Atrazine	281	0	SW-846:8270C	3	10		µg/L	
SVOA	103-33-3	Azobenzene	281	0	SW-846:8270C	2	10		µg/L	
SVOA	92-87-5	Benzidine	281	0	SW-846:8270C	3	10		µg/L	
SVOA	56-55-3	Benzo(a)anthracene	281	2	SW-846:8270C	0.2	1		µg/L	
SVOA	50-32-8	Benzo(a)pyrene	281	3	SW-846:8270C	0.2	1	0.18	µg/L	NM HH OO
SVOA	205-99-2	Benzo(b)fluoranthene	281	1	SW-846:8270C	0.2	1		µg/L	
SVOA	191-24-2	Benzo(g,h,i)perylene	281	3	SW-846:8270C	0.2	1		µg/L	
SVOA	207-08-9	Benzo(k)fluoranthene	281	3	SW-846:8270C	0.2	1		µg/L	
SVOA	65-85-0	Benzoic Acid	281	3	SW-846:8270C	6	20		µg/L	
SVOA	100-51-6	Benzyl Alcohol	281	1	SW-846:8270C	2	10		µg/L	
SVOA	111-91-1	Bis(2-chloroethoxy)methane	281	1	SW-846:8270C	3	10		µg/L	
SVOA	111-44-4	Bis(2-chloroethyl)ether	281	1	SW-846:8270C	2	10		µg/L	
SVOA	117-81-7	Bis(2-ethylhexyl)phthalate	281	13	SW-846:8270C	2	10		µg/L	
SVOA	101-55-3	Bromophenyl-phenylether[4-]	281	1	SW-846:8270C	2	10		µg/L	
SVOA	85-68-7	Butylbenzylphthalate	281	0	SW-846:8270C	2	10	1900	µg/L	NM HH OO
SVOA	59-50-7	Chloro-3-methylphenol[4-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	106-47-8	Chloroaniline[4-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	91-58-7	Chloronaphthalene[2-]	281	1	SW-846:8270C	0.3	1	1600	µg/L	NM HH OO
SVOA	95-57-8	Chlorophenol[2-]	281	0	SW-846:8270C	2	10	150	µg/L	NM HH OO
SVOA	7005-72-3	Chlorophenyl-phenyl[4-] Ether	281	0	SW-846:8270C	2	10		µg/L	
SVOA	218-01-9	Chrysene	281	2	SW-846:8270C	0.2	1		µg/L	
SVOA	53-70-3	Dibenz(a,h)anthracene	281	3	SW-846:8270C	0.2	1		µg/L	
SVOA	132-64-9	Dibenzofuran	281	0	SW-846:8270C	2	10		µg/L	

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
SVOA	95-50-1	Dichlorobenzene[1,2-]	281	0	SW-846:8270C	2	10	1300	µg/L	NM HH OO
SVOA	541-73-1	Dichlorobenzene[1,3-]	281	0	SW-846:8270C	2	10	960	µg/L	NM HH OO
SVOA	106-46-7	Dichlorobenzene[1,4-]	281	1	SW-846:8270C	2	10	190	µg/L	NM HH OO
SVOA	91-94-1	Dichlorobenzidine[3,3'-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	120-83-2	Dichlorophenol[2,4-]	281	0	SW-846:8270C	2	10	290	µg/L	NM HH OO
SVOA	84-66-2	Diethylphthalate	281	3	SW-846:8270C	2	10	44000	µg/L	NM HH OO
SVOA	131-11-3	Dimethyl Phthalate	281	0	SW-846:8270C	2	10	1100000	µg/L	NM HH OO
SVOA	105-67-9	Dimethylphenol[2,4-]	281	0	SW-846:8270C	2	10	850	µg/L	NM HH OO
SVOA	84-74-2	Di-n-butylphthalate	281	0	SW-846:8270C	2	10	4500	µg/L	NM HH OO
SVOA	534-52-1	Dinitro-2-methylphenol[4,6-]	281	0	SW-846:8270C	3	10	280	µg/L	NM HH OO
SVOA	51-28-5	Dinitrophenol[2,4-]	281	0	SW-846:8270C	5	20	5300	µg/L	NM HH OO
SVOA	121-14-2	Dinitrotoluene[2,4-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	606-20-2	Dinitrotoluene[2,6-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	117-84-0	Di-n-octylphthalate	281	0	SW-846:8270C	3	10		µg/L	
SVOA	88-85-7	Dinoseb	281	0	SW-846:8270C	2	10		µg/L	
SVOA	123-91-1	Dioxane[1,4-]	270	6	SW-846:8270C	2	10		µg/L	
SVOA	122-39-4	Diphenylamine	281	0	SW-846:8270C	3	10		µg/L	
SVOA	206-44-0	Fluoranthene	281	2	SW-846:8270C	0.2	1	140	µg/L	NM HH OO
SVOA	86-73-7	Fluorene	281	2	SW-846:8270C	0.2	1	5300	µg/L	NM HH OO
SVOA	118-74-1	Hexachlorobenzene	281	0	SW-846:8270C	2	10	0.0029	µg/L	NM HH OO
SVOA	87-68-3	Hexachlorobutadiene	281	0	SW-846:8270C	2	10		µg/L	
SVOA	77-47-4	Hexachlorocyclopentadiene	281	0	SW-846:8270C	3	10	1100	µg/L	NM HH OO
SVOA	67-72-1	Hexachloroethane	281	0	SW-846:8270C	2	10		µg/L	
SVOA	193-39-5	Indeno(1,2,3-cd)pyrene	281	4	SW-846:8270C	0.2	1		µg/L	
SVOA	78-59-1	Isophorone	281	0	SW-846:8270C	3	10		µg/L	
SVOA	90-12-0	Methylnaphthalene[1-]	281	1	SW-846:8270C	0.3	1		µg/L	
SVOA	91-57-6	Methylnaphthalene[2-]	281	2	SW-846:8270C	0.3	1		µg/L	
SVOA	95-48-7	Methylphenol[2-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	106-44-5	Methylphenol[4-]	161	0	SW-846:8270C	3	10		µg/L	
SVOA	91-20-3	Naphthalene	281	1	SW-846:8270C	0.3	1		µg/L	
SVOA	88-74-4	Nitroaniline[2-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	99-09-2	Nitroaniline[3-]	281	1	SW-846:8270C	2	10		µg/L	
SVOA	100-01-6	Nitroaniline[4-]	281	1	SW-846:8270C	3	10		µg/L	
SVOA	98-95-3	Nitrobenzene	281	0	SW-846:8270C	3	10	690	µg/L	NM HH OO
SVOA	88-75-5	Nitrophenol[2-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	100-02-7	Nitrophenol[4-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	55-18-5	Nitrosodiethylamine[N-]	281	1	SW-846:8270C	2	10		µg/L	

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
SVOA	62-75-9	Nitrosodimethylamine[N-]	281	1	SW-846:8270C	2	10		µg/L	
SVOA	924-16-3	Nitroso-di-n-butylamine[N-]	281	1	SW-846:8270C	3	10		µg/L	
SVOA	621-64-7	Nitroso-di-n-propylamine[N-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	930-55-2	Nitrosopyrrolidine[N-]	281	1	SW-846:8270C	2	10		µg/L	
SVOA	108-60-1	Oxybis(1-chloropropane)[2,2'-]	281	0	SW-846:8270C	2	10	65000	µg/L	NM HH OO
SVOA	608-93-5	Pentachlorobenzene	281	1	SW-846:8270C	3	10		µg/L	
SVOA	87-86-5	Pentachlorophenol	281	0	SW-846:8270C	2	10	15	µg/L	NM Aqu Chronic
SVOA	85-01-8	Phenanthrene	281	3	SW-846:8270C	0.2	1		µg/L	
SVOA	108-95-2	Phenol	281	0	SW-846:8270C	1	10	860000	µg/L	NM HH OO
SVOA	129-00-0	Pyrene	281	1	SW-846:8270C	0.3	1	4000	µg/L	NM HH OO
SVOA	110-86-1	Pyridine	185	0	SW-846:8270C	3	10		µg/L	
SVOA	95-94-3	Tetrachlorobenzene[1,2,4,5]	281	1	SW-846:8270C	3	10		µg/L	
SVOA	58-90-2	Tetrachlorophenol[2,3,4,6-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	120-82-1	Trichlorobenzene[1,2,4-]	281	0	SW-846:8270C	2	10	70	µg/L	NM HH OO
SVOA	95-95-4	Trichlorophenol[2,4,5-]	281	0	SW-846:8270C	2	10		µg/L	
SVOA	88-06-2	Trichlorophenol[2,4,6-]	281	0	SW-846:8270C	2	10		µg/L	
VOA	67-64-1	Acetone	309	64	SW-846:8260B	3.5	10		µg/L	
VOA	75-05-8	Acetonitrile	309	0	SW-846:8260B	6.3	25		µg/L	
VOA	107-02-8	Acrolein	309	2	SW-846:8260B	1.3	5	9	µg/L	NM HH OO
VOA	107-13-1	Acrylonitrile	309	0	SW-846:8260B	1	5		µg/L	
VOA	71-43-2	Benzene	309	2	SW-846:8260B	0.3	1	510	µg/L	NM HH OO
VOA	108-86-1	Bromobenzene	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	74-97-5	Bromochloromethane	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	75-27-4	Bromodichloromethane	309	9	SW-846:8260B	0.25	1		µg/L	
VOA	75-25-2	Bromoform	309	7	SW-846:8260B	0.25	1		µg/L	
VOA	74-83-9	Bromomethane	309	0	SW-846:8260B	0.3	1	1500	µg/L	NM HH OO
VOA	71-36-3	Butanol[1-]	219	0	SW-846:8260B	15	50		µg/L	
VOA	78-93-3	Butanone[2-]	309	7	SW-846:8260B	1.3	5		µg/L	
VOA	104-51-8	Butylbenzene[n-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	135-98-8	Butylbenzene[sec-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	98-06-6	Butylbenzene[tert-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	75-15-0	Carbon Disulfide	309	0	SW-846:8260B	1.3	5		µg/L	
VOA	56-23-5	Carbon Tetrachloride	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	126-99-8	Chloro-1,3-butadiene[2-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	107-05-1	Chloro-1-propene[3-]	294	0	SW-846:8260B	1.5	5		µg/L	
VOA	108-90-7	Chlorobenzene	309	0	SW-846:8260B	0.25	1	1600	µg/L	NM HH OO
VOA	124-48-1	Chlorodibromomethane	309	10	SW-846:8260B	0.3	1		µg/L	

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
VOA	75-00-3	Chloroethane	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	67-66-3	Chloroform	309	14	SW-846:8260B	0.25	1		µg/L	
VOA	74-87-3	Chloromethane	309	2	SW-846:8260B	0.3	1		µg/L	
VOA	95-49-8	Chlorotoluene[2-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	106-43-4	Chlorotoluene[4-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	96-12-8	Dibromo-3-Chloropropane[1,2-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	106-93-4	Dibromoethane[1,2-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	74-95-3	Dibromomethane	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	95-50-1	Dichlorobenzene[1,2-]	309	0	SW-846:8260B	0.25	1	1300	µg/L	NM HH OO
VOA	541-73-1	Dichlorobenzene[1,3-]	309	0	SW-846:8260B	0.25	1	960	µg/L	NM HH OO
VOA	106-46-7	Dichlorobenzene[1,4-]	309	1	SW-846:8260B	0.25	1	190	µg/L	NM HH OO
VOA	75-71-8	Dichlorodifluoromethane	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	75-34-3	Dichloroethane[1,1-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	107-06-2	Dichloroethane[1,2-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	75-35-4	Dichloroethene[1,1-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	156-59-2	Dichloroethene[cis-1,2-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	156-60-5	Dichloroethene[trans-1,2-]	309	0	SW-846:8260B	0.3	1	10000	µg/L	NM HH OO
VOA	78-87-5	Dichloropropane[1,2-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	142-28-9	Dichloropropane[1,3-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	594-20-7	Dichloropropane[2,2-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	563-58-6	Dichloropropene[1,1-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	10061-01-5	Dichloropropene[cis-1,3-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	10061-02-6	Dichloropropene[trans-1,3-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	60-29-7	Diethyl Ether	219	3	SW-846:8260B	0.3	1		µg/L	
VOA	97-63-2	Ethyl Methacrylate	309	0	SW-846:8260B	1	5		µg/L	
VOA	100-41-4	Ethylbenzene	309	0	SW-846:8260B	0.25	1	2100	µg/L	NM HH OO
VOA	87-68-3	Hexachlorobutadiene	309	0	SW-846:8260B	0.3	1	180	µg/L	NM HH OO
VOA	591-78-6	Hexanone[2-]	309	0	SW-846:8260B	1.3	5		µg/L	
VOA	74-88-4	Iodomethane	309	0	SW-846:8260B	1.3	5		µg/L	
VOA	78-83-1	Isobutyl alcohol	309	0	SW-846:8260B	13	50		µg/L	
VOA	98-82-8	Isopropylbenzene	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	99-87-6	Isopropyltoluene[4-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	126-98-7	Methacrylonitrile	309	0	SW-846:8260B	1	5		µg/L	
VOA	80-62-6	Methyl Methacrylate	309	0	SW-846:8260B	1	5		µg/L	
VOA	1634-04-4	Methyl tert-Butyl Ether	219	0	SW-846:8260B	0.25	1		µg/L	
VOA	108-10-1	Methyl-2-pentanone[4-]	309	0	SW-846:8260B	1.3	5		µg/L	
VOA	75-09-2	Methylene Chloride	309	2	SW-846:8260B	3	10		µg/L	

Table B-4.1-2 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Unit	Cleanup-Level Type
VOA	91-20-3	Naphthalene	309	1	SW-846:8260B	0.25	1		µg/L	
VOA	107-12-0	Propionitrile	309	0	SW-846:8260B	1.5	5		µg/L	
VOA	103-65-1	Propylbenzene[1-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	100-42-5	Styrene	309	1	SW-846:8260B	0.25	1		µg/L	
VOA	630-20-6	Tetrachloroethane[1,1,1,2-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	79-34-5	Tetrachloroethane[1,1,2,2-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	127-18-4	Tetrachloroethene	309	0	SW-846:8260B	0.3	1	33	µg/L	NM HH OO
VOA	108-88-3	Toluene	309	5	SW-846:8260B	0.25	1	15000	µg/L	NM HH OO
VOA	76-13-1	Trichloro-1,2,2-trifluoroethane[1,1,2-]	309	0	SW-846:8260B	1	5		µg/L	
VOA	87-61-6	Trichlorobenzene[1,2,3-]	309	0	SW-846:8260B	0.33	1		µg/L	
VOA	120-82-1	Trichlorobenzene[1,2,4-]	309	0	SW-846:8260B	0.3	1	70	µg/L	NM HH OO
VOA	71-55-6	Trichloroethane[1,1,1-]	309	2	SW-846:8260B	0.33	1		µg/L	
VOA	79-00-5	Trichloroethane[1,1,2-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	79-01-6	Trichloroethene	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	75-69-4	Trichlorofluoromethane	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	96-18-4	Trichloropropane[1,2,3-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	95-63-6	Trimethylbenzene[1,2,4-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	108-67-8	Trimethylbenzene[1,3,5-]	309	0	SW-846:8260B	0.25	1		µg/L	
VOA	108-05-4	Vinyl acetate	309	0	SW-846:8260B	1.5	5		µg/L	
VOA	75-01-4	Vinyl Chloride	309	0	SW-846:8260B	0.5	1		µg/L	
VOA	95-47-6	Xylene[1,2-]	309	0	SW-846:8260B	0.3	1		µg/L	
VOA	Xylene[1,3 and 1,4]	Xylene[1,3-]+Xylene[1,4-]	308	0	SW-846:8260B	0.5	2		µg/L	

Note: Blank cells indicate there are no values.

[a] Mode (most frequent) of values reported for 2010 data.

[b] This value is derived as a result of logic provided in Appendix B-2.0, Protocol for Selecting Cleanup Levels are from the 2011 Interim Plan, Revision 1 (LANL 2011, 208811).

Table B-4.1-3
Analytes with PQLs above Groundwater Cleanup Levels

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Background[d]	Unit	Cleanup-Level Type	Comment
Herb	94-74-6	2-Methyl-4-chlorophenoxyacetic acid	388	0	SW-846:8151A	12	53	18			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Herb	93-65-2	2-(4-Chloro-2-methylphenoxy)propanoic acid	388	0	SW-846:8151A	11	53	37			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Be	Beryllium	4761	59	SW-846:6010B	1	5	4	1	1	µg/L	EPA MCL	Although the PQL is higher, the MDL is less than the EPA maximum contaminant level (MCL). The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	1912-24-9	Atrazine	2074	0	SW-846:8270C	3	10	3			µg/L	EPA MCL	Although the PQL is higher, the MDL is equal to the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	103-33-3	Azobenzene	2074	0	SW-846:8270C	2	10	1.3			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	92-87-5	Benzidine	2074	0	SW-846:8270C	3	10	0.00094			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	56-55-3	Benzo(a)anthracene	2074	6	SW-846:8270C	0.2	1	0.29			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	50-32-8	Benzo(a)pyrene	2074	9	SW-846:8270C	0.2	1	0.2			µg/L	EPA MCL	Although the PQL is higher, the MDL is equal to the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	205-99-2	Benzo(b)fluoranthene	2074	10	SW-846:8270C	0.2	1	0.29			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	111-44-4	Bis(2-chloroethyl)ether	2074	0	SW-846:8270C	2	10	0.12			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	117-81-7	Bis(2-ethylhexyl)phthalate	2074	128	SW-846:8270C	2	10	6			µg/L	EPA MCL	Although the PQL is higher, the MDL is less than the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	106-47-8	Chloroaniline[4-]	2074	0	SW-846:8270C	2	10	3.4			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	53-70-3	Dibenz(a,h)anthracene	2074	4	SW-846:8270C	0.2	1	0.029			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	91-94-1	Dichlorobenzidine[3,3'-]	2074	0	SW-846:8270C	2	10	1.5			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	534-52-1	Dinitro-2-methylphenol[4,6-]	2074	0	SW-846:8270C	3	10	2.9			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.

Table B-4.1-3 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Background[d]	Unit	Cleanup-Level Type	Comment
SVOA	121-14-2	Dinitrotoluene[2,4-]	2074	14	SW-846:8270C	2	10	2.2			µg/L	EPA TAP SCRN LVL	The Laboratory also analyzes this compound by SW-846:8321; that PQL is below the EPA tap water screening level.
SVOA	88-85-7	Dinoseb	2074	0	SW-846:8270C	2	10	7			µg/L	EPA MCL	The Laboratory also analyzes this compound by SW-846:8151A; that PQL is below the EPA MCL.
SVOA	123-91-1	Dioxane[1,4-]	2010	119	SW-846:8270C	2	10	6.7			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	118-74-1	Hexachlorobenzene	2074	0	SW-846:8270C	2	10	1			µg/L	EPA MCL	The MDL exceeds the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	87-68-3	Hexachlorobutadiene	2074	0	SW-846:8270C	2	10	8.6			µg/L	EPA TAP SCRN LVL	The Laboratory also analyzes this compound by SW-846:8260B; that PQL is below the EPA tap water screening level
SVOA	193-39-5	Indeno(1,2,3-cd)pyrene	2074	5	SW-846:8270C	0.2	1	0.29			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	98-95-3	Nitrobenzene	2074	2	SW-846:8270C	3	10	1.2			µg/L	EPA TAP SCRN LVL	The Laboratory also analyzes this compound by SW-846:8321; that PQL is below the EPA tap water screening level
SVOA	55-18-5	Nitrosodiethylamine[N-]	2074	0	SW-846:8270C	2	10	0.0014			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	62-75-9	Nitrosodimethylamine[N-]	2074	0	SW-846:8270C	2	10	0.0042			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	924-16-3	Nitroso-di-n-butylamine[N-]	2074	0	SW-846:8270C	3	10	0.024			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	621-64-7	Nitroso-di-n-propylamine[N-]	2074	0	SW-846:8270C	2	10	0.096			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	930-55-2	Nitrosopyrrolidine[N-]	2074	0	SW-846:8270C	2	10	0.32			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	108-60-1	Oxybis(1-chloropropane)[2,2'-]	2074	0	SW-846:8270C	2	10	3.2			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is less than the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	87-86-5	Pentachlorophenol	2074	1	SW-846:8270C	2	10	1			µg/L	EPA MCL	The MDL exceeds the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	108-95-2	Phenol	2074	5	SW-846:8270C	1	10	5			µg/L	NM GW STD	Although the PQL is higher, the MDL is less than the NM groundwater standard. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	107-02-8	Acrolein	2543	2	SW-846:8260B	1.3	5	0.042			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.

Table B-4.1-3 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Background[d]	Unit	Cleanup-Level Type	Comment
VOA	107-13-1	Acrylonitrile	2543	0	SW-846:8260B	1	5	0.45			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	126-99-8	Chloro-1,3-butadiene[2-]	2543	0	SW-846:8260B	0.3	1	0.16			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	96-12-8	Dibromo-3-Chloropropane[1,2-]	2543	0	SW-846:8260B	0.3	1	0.2			µg/L	EPA MCL	The MDL exceeds the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	106-93-4	Dibromoethane[1,2-]	2543	0	SW-846:8260B	0.25	1	0.05			µg/L	EPA MCL	The MDL exceeds the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	126-98-7	Methacrylonitrile	2542	0	SW-846:8260B	1	5	1			µg/L	EPA TAP SCRN LVL	Although the PQL is higher, the MDL is equal to the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	75-09-2	Methylene Chloride	2543	15	SW-846:8260B	3	10	5			µg/L	EPA MCL	Although the PQL is higher, the MDL is less than the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
VOA	96-18-4	Trichloropropane[1,2,3-]	2543	0	SW-846:8260B	0.3	1	0.0072			µg/L	EPA TAP SCRN LVL	The MDL exceeds the EPA tap water screening level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.

Note: Blank cells indicate there are no values.

[a] Mode (most frequent) of values reported for 2010 data.

[b] This value is derived as a result of logic provided in Appendix B-2.0, Protocol for Selecting Cleanup Levels are from the 2011 Interim Plan, Revision 1 (LANL 2011, 208811).

[c] Lowest of background values for alluvial, intermediate, and regional groundwater as identified in the Laboratory's 2007 groundwater background report (LANL 2007, 095817).

[d] Lowest of background values for intermediate and regional groundwater as identified in the Laboratory's 2010 groundwater background report (LANL 2010, 110535).

Table B-4.1-4
Analytes with PQLs above Groundwater Background Levels

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Background[d]	Unit	Cleanup-Level Type	Comment
Geninorg	NH_3-N	Ammonia as Nitrogen	2706	497	EPA:350.1	0.016	0.05		0.04	0.07	mg/L		The PQL exceeds the background. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Geninorg	Br(-1)	Bromide	2699	669	EPA:300.0	0.066	0.2		0.03	0.07	mg/L		The MDL exceeds the background. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Geninorg	ClO_4	Perchlorate	3364	2541	SW-846:6850	0.05	0.2	4	0.05	0.48	µg/L	NM GW CONS	While the PQL is above background, the MDL and the PQL are less than the Consent Order screening value.
Geninorg	TKN	Total Kjeldahl Nitrogen	3142	1084	EPA:351.2	0.033	0.1		0.04	0.29	mg/L		The PQL exceeds the background. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Geninorg	TOC	Total Organic Carbon	2273	1898	SW-846:9060	0.33	1		0.33	0.07	mg/L		The PQL exceeds the background. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Al	Aluminum	4766	1573	SW-846:6010B	68	200	5000	68	68	µg/L	NM GW STD	While the PQL is above background, the MDL and the PQL are less than the New Mexico groundwater standard.
Metals	Sb	Antimony	4757	130	SW-846:6020	0.5	3	6	0.5	0.5	µg/L	EPA MCL	While the PQL is above background, the MDL and the PQL are less than the EPA MCL.
Metals	As	Arsenic	4758	1054	SW-846:6020	1.5	5	10	4.32	3.43	µg/L	EPA MCL	While the PQL is above background, the MDL and the PQL are less than the EPA MCL.
Metals	Be	Beryllium	4761	59	SW-846:6010B	1	5	4	1	1	µg/L	EPA MCL	The MDL is less than the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	B	Boron	4752	3373	SW-846:6010B	15	50	750	15.1	35.42	µg/L	NM GW STD	While the PQL is above background, the MDL and the PQL are less than the New Mexico groundwater standard.
Metals	Cr	Chromium	5093	3290	SW-846:6020	2.5	10	50	1	4.74	µg/L	NM GW STD	The MDL is less than the New Mexico groundwater standard. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Co	Cobalt	4761	458	SW-846:6010B	1	5	50	0.5	1	µg/L	NM GW STD	The MDL is less than the New Mexico groundwater standard. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Cu	Copper	4761	702	SW-846:6010B	3	10	1000	3	3	µg/L	NM GW STD	While the PQL is above background, the MDL and the PQL are less than the New Mexico groundwater standard
Metals	Fe	Iron	4766	2600	SW-846:6010B	30	100	1000	21	30	µg/L	NM GW STD	The MDL is less than the New Mexico groundwater standard. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Pb	Lead	4756	857	SW-846:6020	0.5	2	15	0.5	0.5	µg/L	EPA MCL	While the PQL is above background, the MDL and the PQL are less than the EPA MCL.
Metals	Mn	Manganese	4766	2632	SW-846:6010B	2	10	200	2	36	µg/L	NM GW STD	While the PQL is above background, the MDL and the PQL are less than the New Mexico groundwater standard.
Metals	Hg	Mercury	4732	103	EPA:245.2	0.066	0.2	2	0.06	0.07	µg/L	EPA MCL	The MDL is less than the EPA MCL. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Ni	Nickel	4756	3849	SW-846:6020	0.5	2	200	1	2.98	µg/L	NM GW STD	While the PQL is above background, the MDL and the PQL are less than the New Mexico groundwater standard.
Metals	Sn	Tin	4733	84	SW-846:6010B	2.5	10	22000	3.26	25	µg/L	EPA TAP SCRN LVL	While the PQL is above background, the MDL and the PQL are less than the EPA tap water screening level.
Metals	V	Vanadium	4761	3819	SW-846:6010B	1	5	180	1	15.21	µg/L	EPA TAP SCRN LVL	While the PQL is above background, the MDL and the PQL are less than the EPA tap water screening level.

Table B-4.1-4 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Cleanup Level[b]	Background[c]	Background[d]	Unit	Cleanup-Level Type	Comment
Metals	Zn	Zinc	4763	2777	SW-846:6010B	3.3	10	10000	2	3.3	µg/L	NM GW STD	The MDL is less than the New Mexico groundwater standard. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Rad	Am-241	Americium-241	2578	61	Alpha spectroscopy	0.05		1.2	0.04	0.05	pCi/L	DOE DW DCG	The minimum detectable activity is less than the DOE Derived Concentration Guidelines (DCG). The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Rad	Cs-137	Cesium-137	2552	3	Gamma spectroscopy	8		120	5.8	6.92	pCi/L	DOE DW DCG	The minimum detectable activity is less than the DOE DCG. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Rad	GROSSA	Gross alpha	1821	377	Gas proportional counting	3		15	2.98	2.75	pCi/L	EPA action level	The minimum detectable activity is less than the EPA action level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Rad	Sr-90	Strontium-90	2585	184	Gas proportional counting	0.5		8	0.29	0.51	pCi/L	EPA action level	The minimum detectable activity is less than the EPA action level. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Rad	H-3	Tritium	2454	1197	Liquid scintillation counting	250		20000	0.32	6.26	pCi/L	EPA action level	The MDL exceeds the background but is below the EPA action level. This background value was determined using data from a laboratory no longer under contract. The Laboratory uses a routine analytical method for this compound under its contract analytical program.

Note: Blank cells indicate there are no values.

[a] Mode (most frequent) of values reported for 2010 data.

[b] This value is derived as a result of logic provided in Appendix B-2.0, Protocol for Selecting Cleanup Levels are from the 2011 Interim Plan, Revision 1 (LANL 2011, 208811).

[c] Lowest of background values for alluvial, intermediate, and regional groundwater as identified in the Laboratory's 2007 groundwater background report (LANL 2007, 095817).

[d] Lowest of background values for intermediate and regional groundwater as identified in the Laboratory's 2010 groundwater background report (LANL 2010, 110535).

Table B-4.1-5
Analytes with a PQL above Base-Flow Cleanup Levels

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Screening Level[b]	Unit	Screening-Level Type	Comment
Diox/Fur	1746-01-6	Tetrachlorodibenzodioxin[2,3,7,8-]	75	3	SW-846:8290		0.00001	5.1E-08	µg/L	NM HH OO	The PQL exceeds the New Mexico human health numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Cd	Cadmium	724	70	SW-846:6020	0.11	1	0.23	µg/L	NM Aquatic Chronic 30 mg/L hardness	Although the PQL is higher, the MDL is less than the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Cu	Copper	724	264	SW-846:6010B	3	10	4	µg/L	NM Aquatic Chronic 30 mg/L hardness	Although the PQL is higher, the MDL is less than the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Pb	Lead	724	286	SW-846:6020	0.5	2	1	µg/L	NM Aquatic Chronic 30 mg/L hardness	Although the PQL is higher, the MDL is less than the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Ag	Silver	724	78	SW-846:6020	0.2	1	0.7	µg/L	NM Aquatic Chronic 30 mg/L hardness	Although the PQL is higher, the MDL is less than the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Metals	Tl	Thallium	724	69	SW-846:6020	0.3	1	0.47	µg/L	NM HH OO	Although the PQL is higher, the MDL is less than the New Mexico human health numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
PCB	12674-11-2	Aroclor-1016	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	11104-28-2	Aroclor-1221	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	11141-16-5	Aroclor-1232	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	53469-21-9	Aroclor-1242	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	12672-29-6	Aroclor-1248	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	11097-69-1	Aroclor-1254	216	6	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	11096-82-5	Aroclor-1260	216	7	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
PCB	37324-23-5	Aroclor-1262	216	0	SW-846:8082	0.033	0.1	0.00064	µg/L	NM HH OO	The Laboratory also analyzes PCBs by EPA:1668A; the PQL for that method is less than the New Mexico human health numerical criterion.
Pest	309-00-2	Aldrin	197	1	SW-846:8081A	0.005	0.02	0.0005	µg/L	NM HH OO	The MDL exceeds the New Mexico human health numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	5103-71-9	Chlordane[alpha-]	197	1	SW-846:8081A	0.005	0.02	0.0043	µg/L	NM Aquatic Chronic	The MDL exceeds the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	5103-74-2	Chlordane[gamma-]	197	2	SW-846:8081A	0.005	0.02	0.0043	µg/L	NM Aquatic Chronic	The MDL exceeds the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	72-54-8	Dichlorodiphenyldichloroethane	197	3	SW-846:8081A	0.01	0.04	0.001	µg/L	NM WQCC WLDLF HAB	The MDL exceeds the New Mexico wildlife habitat numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	72-55-9	Dichlorodiphenyldichloroethylene	197	5	SW-846:8081A	0.005	0.04	0.001	µg/L	NM WQCC WLDLF HAB	The MDL exceeds the New Mexico wildlife habitat numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.

Table B-4.1-5 (continued)

Suite	Analyte or CAS No.	Analyte Name	Total Samples 2006–2010	Total Detects 2006–2010	Method	MDL[a]	PQL[a]	Screening Level[b]	Unit	Screening-Level Type	Comment
Pest	50-29-3	Dichlorophenyltrichloroethylen	197	4	SW-846:8081A	0.01	0.04	0.001	µg/L	NM WQCC WLDLF HAB	The MDL exceeds the New Mexico wildlife habitat numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	60-57-1	Dieldrin	197	2	SW-846:8081A	0.01	0.04	0.00054	µg/L	NM HH OO	The MDL exceeds the New Mexico human health numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	72-20-8	Endrin	197	2	SW-846:8081A	0.01	0.04	0.036	µg/L	NM Aquatic Chronic	Although the PQL is higher, the MDL is less than the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	76-44-8	Heptachlor	197	2	SW-846:8081A	0.005	0.02	0.0038	µg/L	NM Aquatic Chronic	The MDL exceeds the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	1024-57-3	Heptachlor Epoxide	197	2	SW-846:8081A	0.005	0.02	0.0038	µg/L	NM Aquatic Chronic	The MDL exceeds the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
Pest	8001-35-2	Toxaphene (technical grade)	197	0	SW-846:8081A	0.15	0.5	0.0002	µg/L	NM Aquatic Chronic	The MDL exceeds the New Mexico aquatic chronic numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	50-32-8	Benzo(a)pyrene	281	3	SW-846:8270C	0.2	1	0.18	µg/L	NM HH OO	The MDL exceeds the New Mexico human health numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.
SVOA	118-74-1	Hexachlorobenzene	281	0	SW-846:8270C	2	10	0.0029	µg/L	NM HH OO	The MDL exceeds the New Mexico human health numerical criterion. The Laboratory uses a routine analytical method for this compound under its contract analytical program.

Note: Blank cells indicate there are no values.

[a] Mode (most frequent) of values reported for 2010 data.

[b] This value is derived as a result of logic provided in Appendix B-2.0, Protocol for Selecting Screening Levels are from the 2011 Interim Plan, Revision 1 (LANL 2011, 208811).

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	EPA:376.2	Colorimetric	0.01	0.05	mg/L
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-846:7196A	Ultraviolet–Visible Spectrophotometry	0.05	0.25	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

Table B-4.2-1 (continued)

Analyte	Analytical Method	Method Description	MDL	PQL	Unit
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
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

Appendix C 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 the 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 in which a mobile contaminant has been detected above a standard but where 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).

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. Perchlorate is generally sampled annually or more frequently in new wells and in the northern monitoring groups where it is a potentially significant constituent but may be sampled less frequently in wells from the southern monitoring groups where it was not used.

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, these constituents have been eliminated from the regional groundwater sampling suite at many locations. Similarly, high explosives (HEXP) are not present in the northern watersheds (those north of Pajarito Canyon) and are 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.

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. Annual or greater frequencies apply except 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 where a very low minimum detectable activity is useful to support a conceptual model for fate and transport.

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)

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	• Quarterly sampling of new regional wells • Annual sampling of all other intermediate and regional wells	• Metals, VOC, SVOC, radionuclide, low-level tritium, general inorganics, and perchlorate analyses for all quarterly samples from new wells; PCB, HEXP, and dioxins/furans annually at new wells • Radionuclide, tritium or low-level tritium, and general inorganics and perchlorate analyses annually for most other wells; • Metals, VOCs, and SVOCs sampled annually in select wells and biennially in other wells • Annual VOC and SVOC analyses at R-6i	• Focus on mobile constituents and radionuclides
Chromium	• Nature and extent of groundwater contamination generally understood • Chromium (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 below NM GW STD and stable, especially in deeper screens where concentrations are at background concentrations	• Quarterly sampling of new regional wells • Quarterly sampling of intermediate and regional wells with 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 • 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, general inorganics, and perchlorate analyses for all quarterly samples from new regional wells; VOCs, SVOCs, radionuclides and low-level tritium semiannually; PCB, HEXP, and dioxins/furans annually from new regional wells • Metals, radionuclide, tritium, general inorganics, and perchlorate 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 that are not new	• 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 Material Disposal Area (MDA) C CME • 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 • Biennial analyses for perchlorate • Quinquennial analysis for 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 (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 all intermediate and regional wells	• Quarterly metals, VOC, SVOC, PCB, HEXP, low-level tritium, general inorganics, and perchlorate analyses for all samples from new wells; dioxins/furans, radionuclides, and low-level tritium semiannually for all samples from new wells • Semiannual VOC and low-level tritium analyses for most other samples • Semiannual SVOC analysis for R-37 screen 1 (1,4-dioxane consistently detected) • VOCs and low-level tritium analysis only at R-40 screen 1 because of low yield • Annual metals, SVOCs, radionuclides, and general inorganics for all other locations not considered new wells • Perchlorate analyzed biennially for most wells • Quinquennial analysis for PCBs and HEXP at all locations except R-40 Si and R-40 S1	• 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 does not require high-frequency (e.g., quarterly) sampling	• Monitor semiannually or annually at base-flow location, alluvial monitoring wells, and springs • Quarterly sampling of new wells • Semiannual sampling of springs, and alluvial, intermediate, and regional wells with elevated RDX concentrations • Annual sampling of locations without significant RDX detections	• Metals, VOC, SVOC, HEXP, general inorganics, and perchlorate analyses quarterly for all samples from new wells; semiannual analysis for low-level tritium at new wells; annual analysis for PCBs, dioxins/furans, and radionuclides at new wells • Metals, VOC, and HEXP analyses semiannually or annually for most other locations • Annual or semiannual analysis for general inorganics and biennial analysis for radionuclides, SVOCs, and perchlorate for most other locations not considered new wells • 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 all intermediate and regional wells	• Metals, VOC, SVOC, HEXP, radionuclide, low-level tritium, and general inorganics analyses for all samples • Biennial analyses for perchlorate in all wells	• 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	• Continuous field-parameters sampling at key base-flow locations • Annual monitoring at key alluvial monitoring wells and springs to capture unexpected near-surface conditions • Annual sampling of all intermediate and regional wells • Annual sampling at White Rock Canyon base-flow locations and springs	• Metals, radionuclide, general inorganics, and perchlorate 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 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 • Annual sampling for metals, VOCs, radionuclides, general inorganics, and perchlorate at White Rock Canyon 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. 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 describes approaches used for tracking the performance of deep monitoring wells at the Laboratory under the Interim Plan.

- 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)

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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	Low volume of water. Field parameters do not stabilize. Insufficient water to utilize dedicated Bennett sampling system.	Evaluate alternatives for sampling for prioritized analytical suite.
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 has requested this piezometer be replaced with a monitoring well (LANL 2012, 213573).	Bail dry, allow for recharge, and collect a prioritized analytical suite the same day. Submitted work plan on July 26, 2012. Terminate sampling in R-26 PZ-2 after replacement.
R-40 S1	TA-54	Limited water volume	Extremely low yield. Approximately 2 wk required to recover water levels after 1 CV purge.	Sample after purge of drop pipe (DP) volume + 1/3 CV. Sample for VOCs and tritium only.
Wells with Westbay No-Purge Sampling Systems				
R-5 (S1,S2,S3,S4)	TA-21	Westbay sampling system	No purge sampling	Sample annually until well has been reconfigured.
R-7 (S1,S2,S3)	TA-21	Westbay sampling system	S1 and S2 are dry; S3 is impacted by drilling products and not sampled.	Monitor water levels only until well has been reconfigured.
R-8 (S1, S2)	TA-21	Westbay sampling system	No purge sampling	Sample annually until well has been reconfigured.
R-9i (S1, S2)	TA-21	Westbay sampling system	No purge sampling	Sample annually until well has been reconfigured.
R-25 (S1, S2, S4, S5, S6, S7)	TA-16-260	Westbay sampling system	NMED considers R-25 not viable for groundwater monitoring for contaminant detection because of problems during drilling, well installation, and development (LANL 2012, 213573).	Sample annually until well has been plugged and abandoned.
R-19 (S2, S3, S4)	General Surveillance	Westbay sampling system	No purge sampling	Sample annually.
R-31 (S4, S5)	General Surveillance	Westbay sampling system	No purge sampling	Sample annually.

Table E-1.0-1 (continued)

Location	Monitoring Group	Watch List Rationale	Description of Condition	Action
Water-Quality				
R-61 S1	Cr Investigation	High iron and manganese	Samples show elevated concentrations of iron and manganese indicating reducing conditions in the vicinity of well screen.	In accordance with the drilling work plan submitted to NMED, • Redevelop well using chemical augmentation. • Following redevelopment, monitor the next two quarters of groundwater samples for the presence of iron-reducing bacteria, slime-producing bacteria, and sulfate-reducing bacteria using Biological Activity Reaction Tests (BART). • Track performance and propose additional action if appropriate.
R-61 S2	Cr Investigation	High iron and manganese	Samples show elevated concentrations of iron and manganese indicating reducing conditions in vicinity of well screen.	In accordance with the work plan submitted to NMED, • Redevelop well using chemical augmentation. • Following redevelopment, monitor the next two quarters of groundwater samples for the presence of iron-reducing bacteria, slime-producing bacteria, and sulfate-reducing bacteria using BART. • Track performance and propose additional action if appropriate.
R-25 S1 and S2	TA-16 260	Steel corrosion	Westbay screens impacted by corrosion.	• Exclude metals from sampling suite.
R-40 Si (formerly R-40i)	TA-54	Reducing conditions; high iron and manganese	Zone shows residual drilling products (sudsy water); iron, manganese, and TOC remain elevated.	• Sample for low-level tritium only.
R-40 S1	TA-54	High iron and manganese	Residual drilling effects are evident; the yield is extremely low.	Sample after purging DP + 1/3 CV. Sample for VOCs and tritium only.

Table E-1.0-1 (continued)

Location	Monitoring Group	Watch List Rationale	Description of Condition	Action
R-54 S1	TA-54	High iron and manganese; reducing conditions in vicinity of well screen.	Field parameters do not approach regional 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.	• Consider redevelopment (with possible chemical augmentation), based on results of BART testing, iron field data, and groundwater analytical results.
R-55i	TA-54	High iron and manganese	Iron and manganese concentrations remain high. Sulfate, nitrate, chloride, and magnesium are also high. DO values are low, but improve with extended purging. δ15N values heavier than background, suggesting the presence of microbial activity associated with degradation of residual organics.	• Consider redevelopment (with possible chemical augmentation), based on results of BART testing, iron field data, and groundwater analytical results.
R-64	TA-21	High turbidity during early purge; water is cloudy and effervescent	Turbidity was elevated during initial purging stage; declines to <10 nephelometric turbidity units after considerable purging. Water appears cloudy due to effervescence and/or presence of fine-grained suspended solids.	• Use x-ray diffraction (XRD) to characterize mineralogy of suspended solids • Consider redevelopment based on XRD results.

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 using the geospatial modeling software EarthVision, developed by Dynamic Graphics, Inc., in 2008. 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 (TA-21) 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. Only sampling locations in the 2012 Interim Plan are shown on the cross-sections.

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)

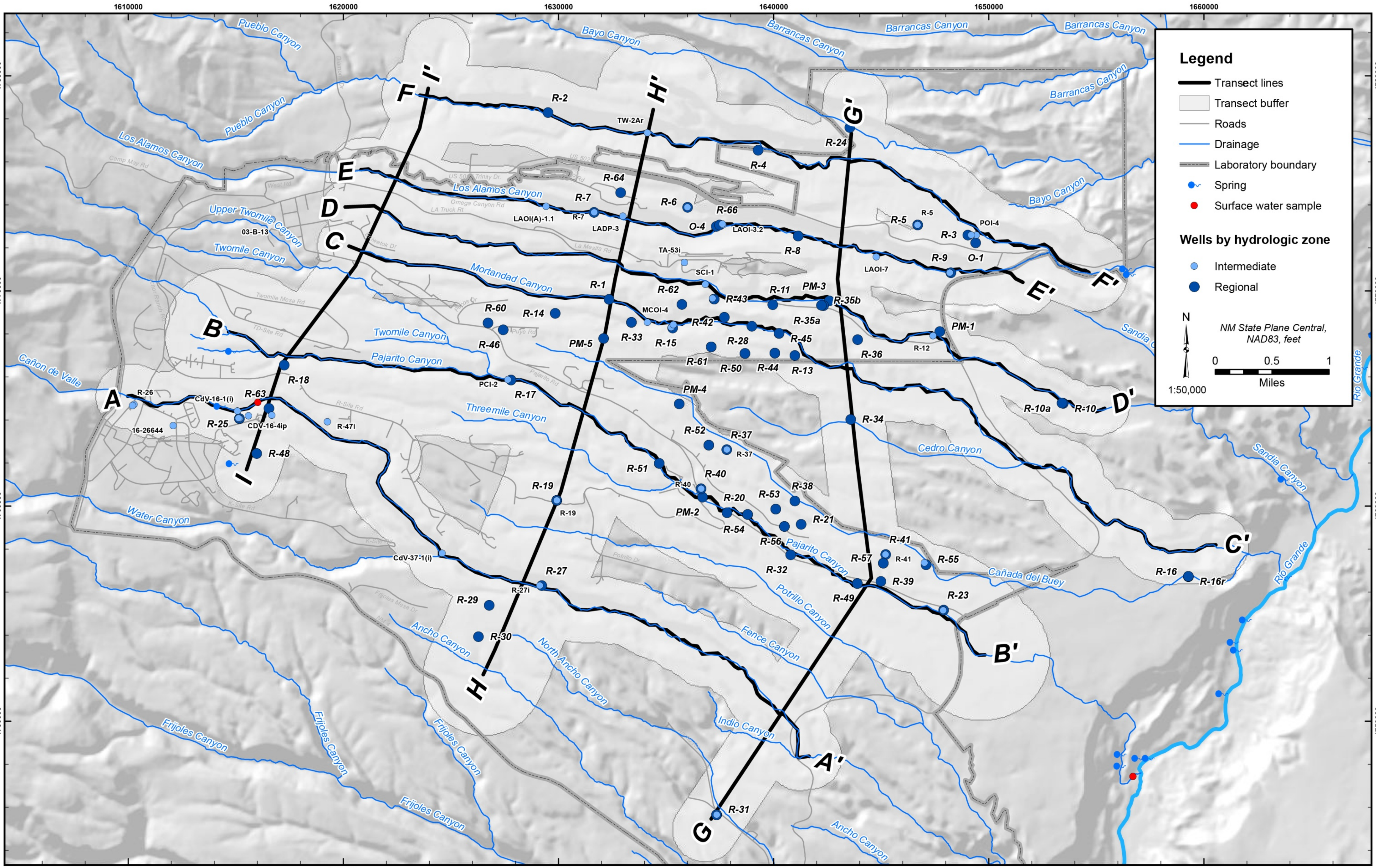
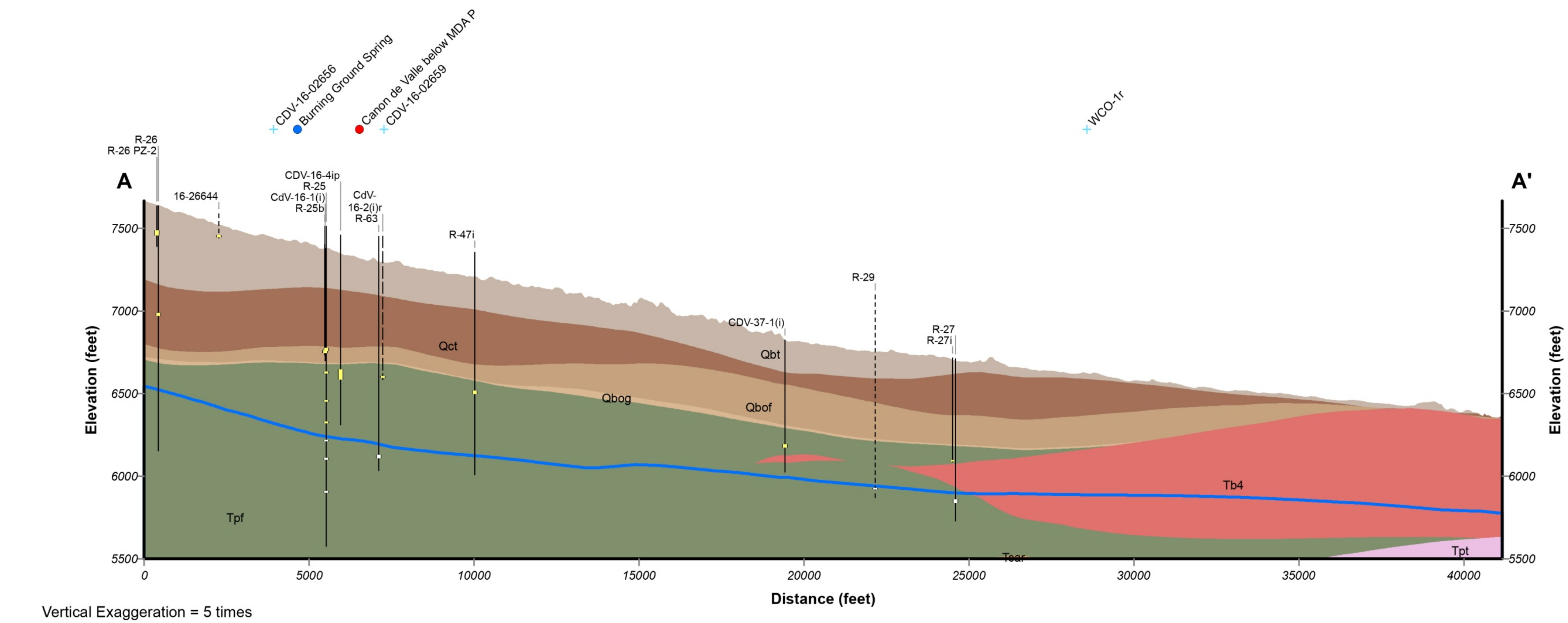


Figure F-1 Transect location map



Legend

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

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

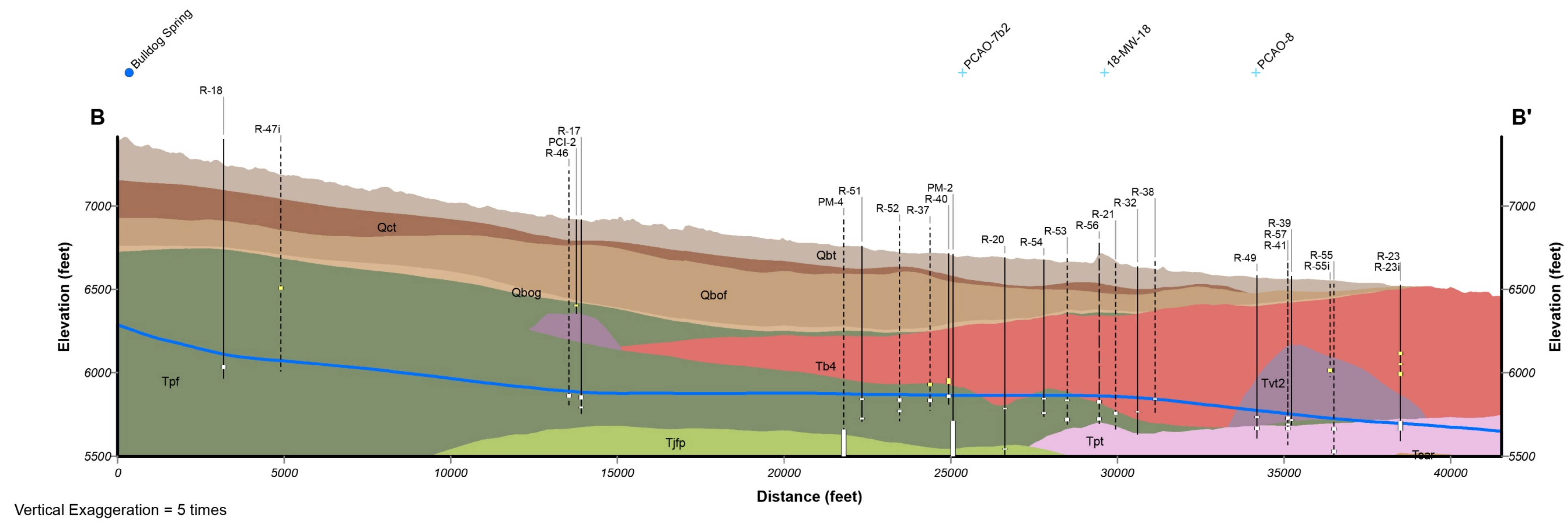
Alluvial System and Springs
- Well (Alluvial)
- Spring (Alluvial)
- Spring (Intermediate)
- Surface water sample
- Regional water table

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



Legend

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

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

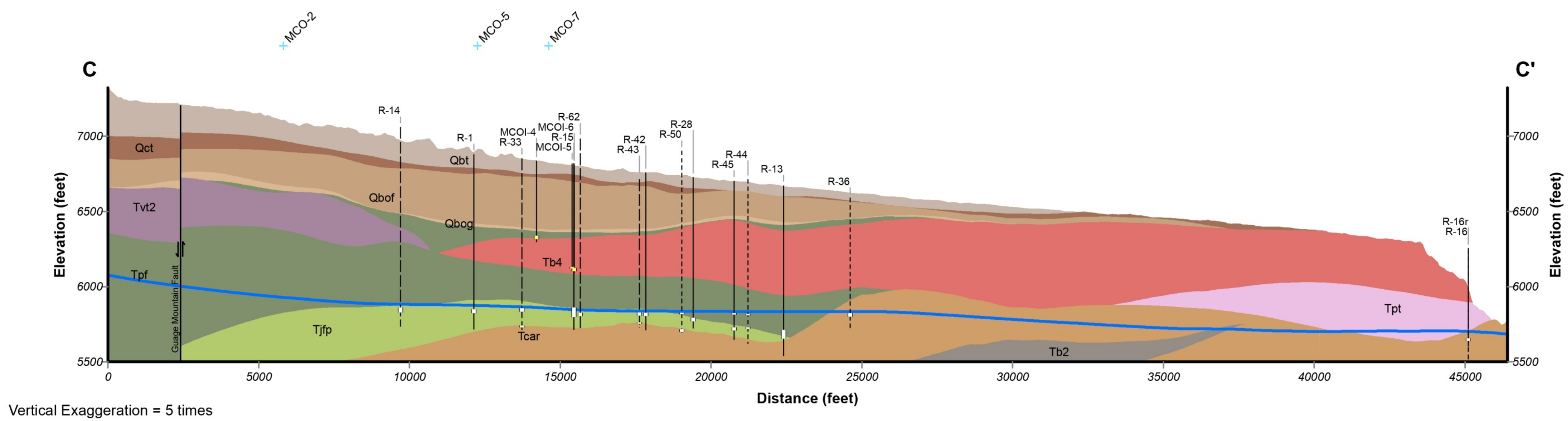
Alluvial System and Springs
- Well (Alluvial)
- Spring (Alluvial)
- Spring (Intermediate)
- Surface water sample
- Regional water table

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 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



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

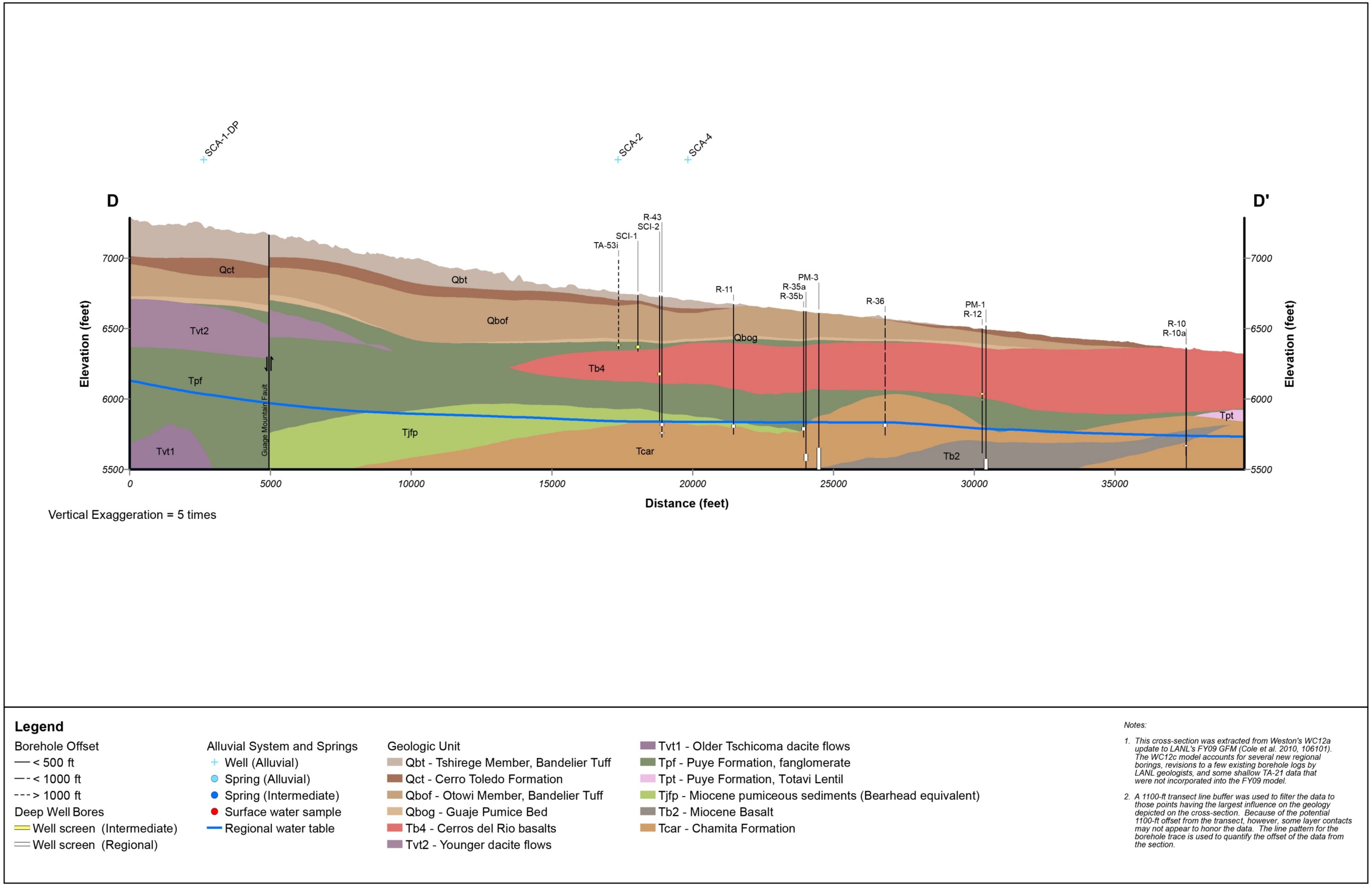
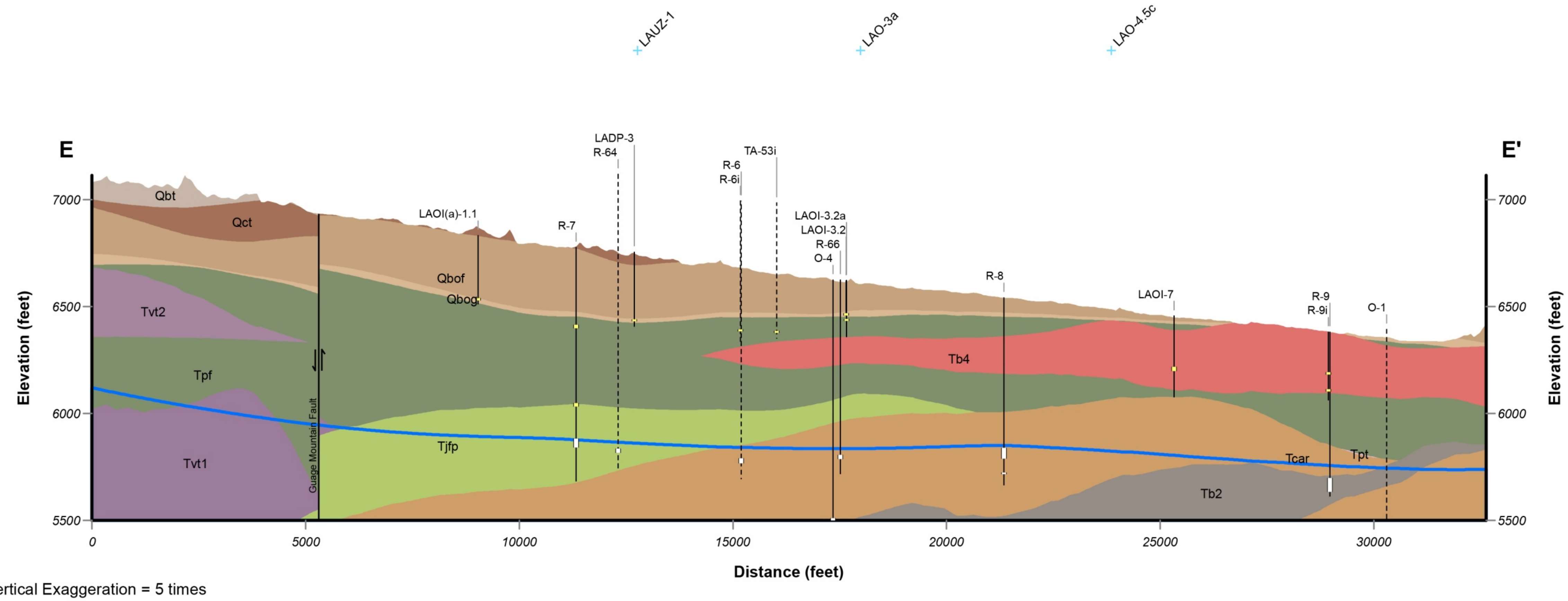


Figure F-5 Cross-section D–D′ Sandia Canyon



Legend

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

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

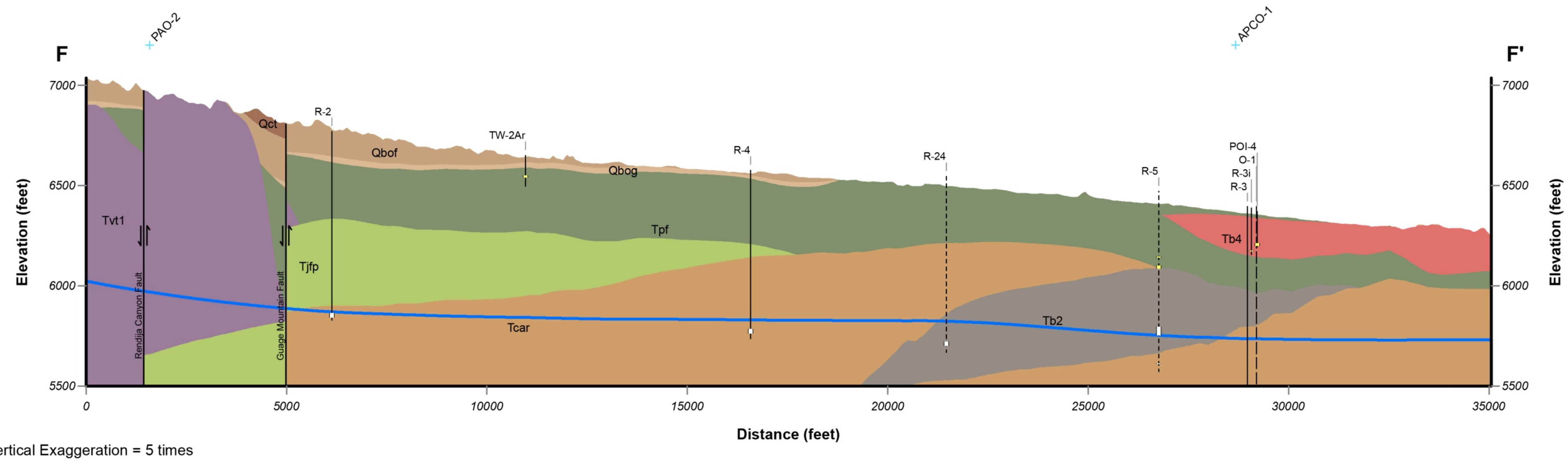
Alluvial System and Springs
- Well (Alluvial)
- Spring (Alluvial)
- Spring (Intermediate)
- Surface water sample
- Regional water table

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



Legend

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

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

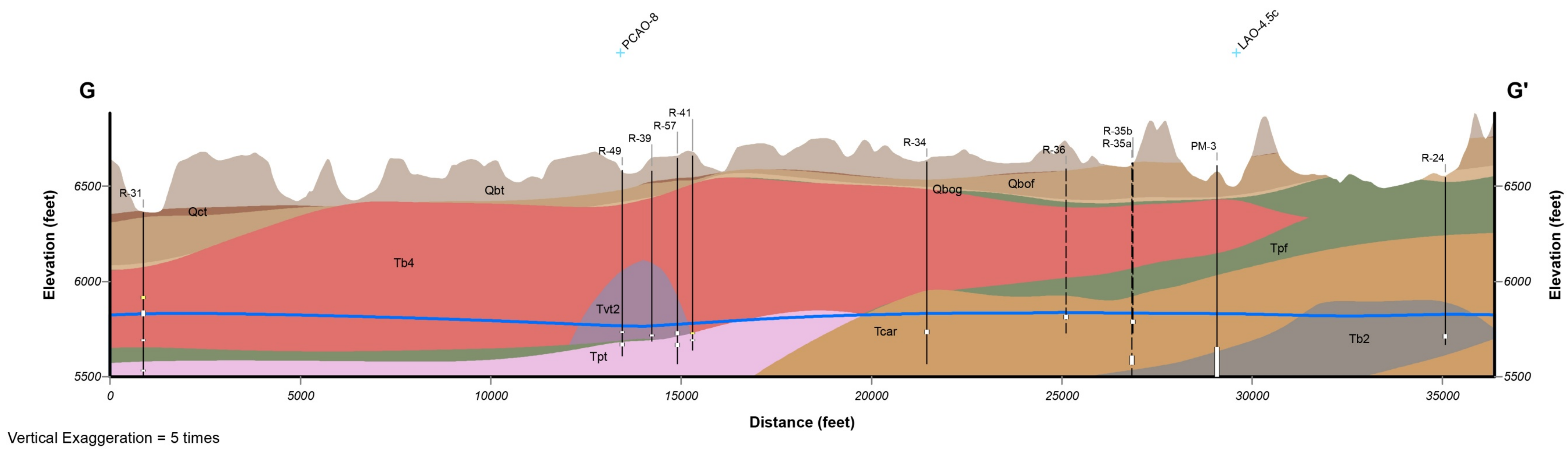
Alluvial System and Springs
- Well (Alluvial)
- Spring (Alluvial)
- Spring (Intermediate)
- Surface water sample
- Regional water table

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



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

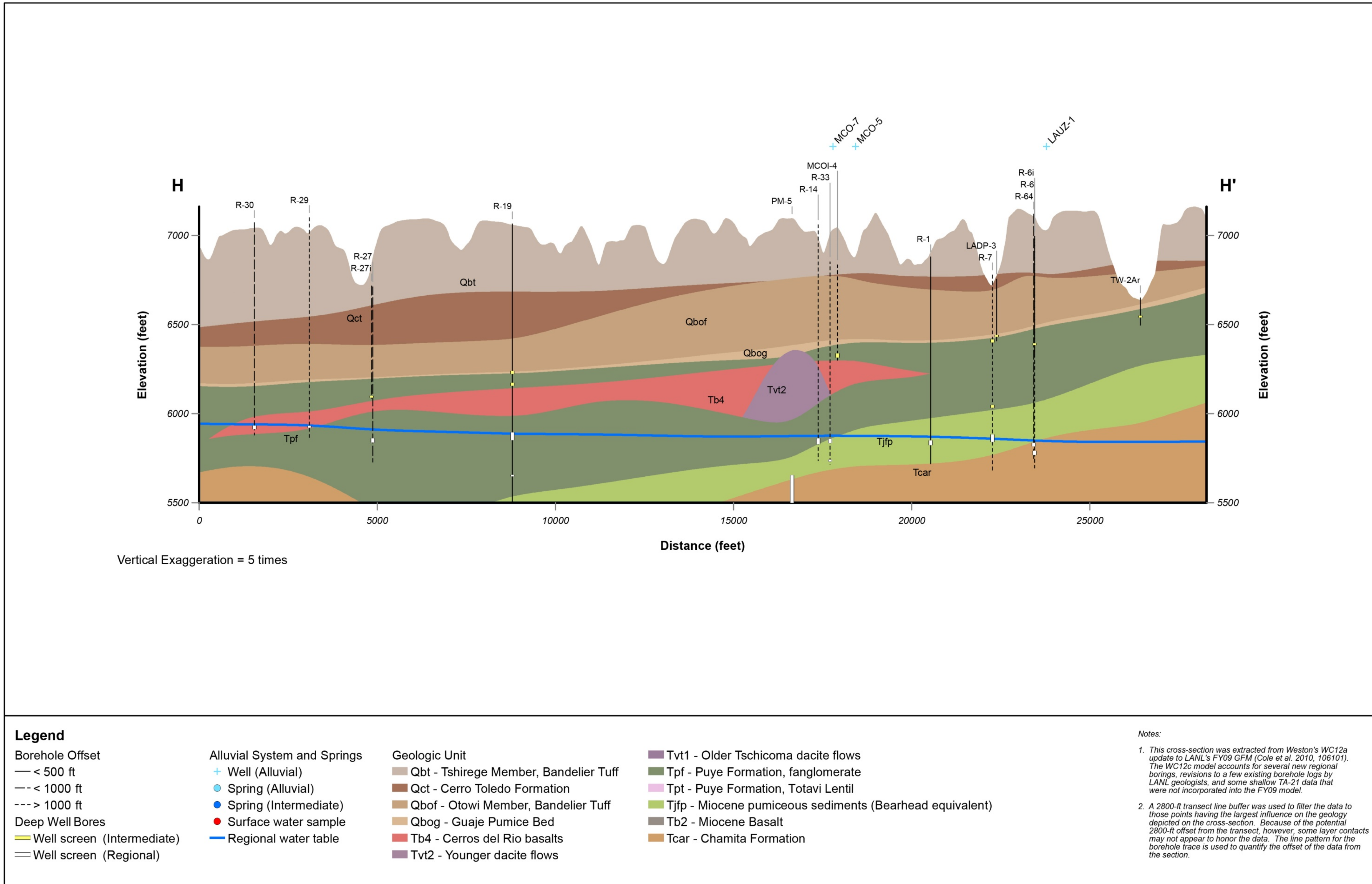
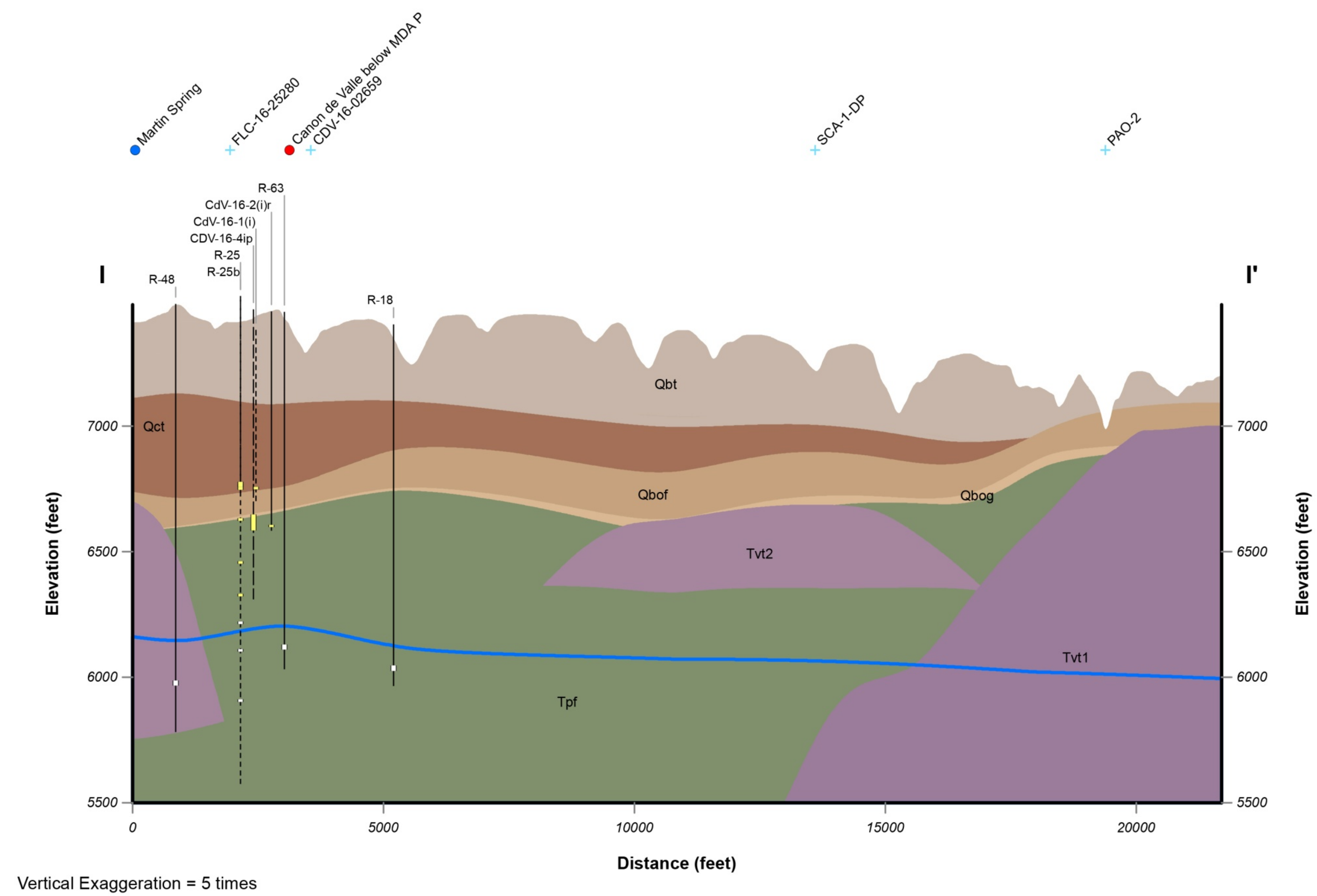


Figure F-9 Cross-section H–H' in the central part of the Laboratory (north-south)



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

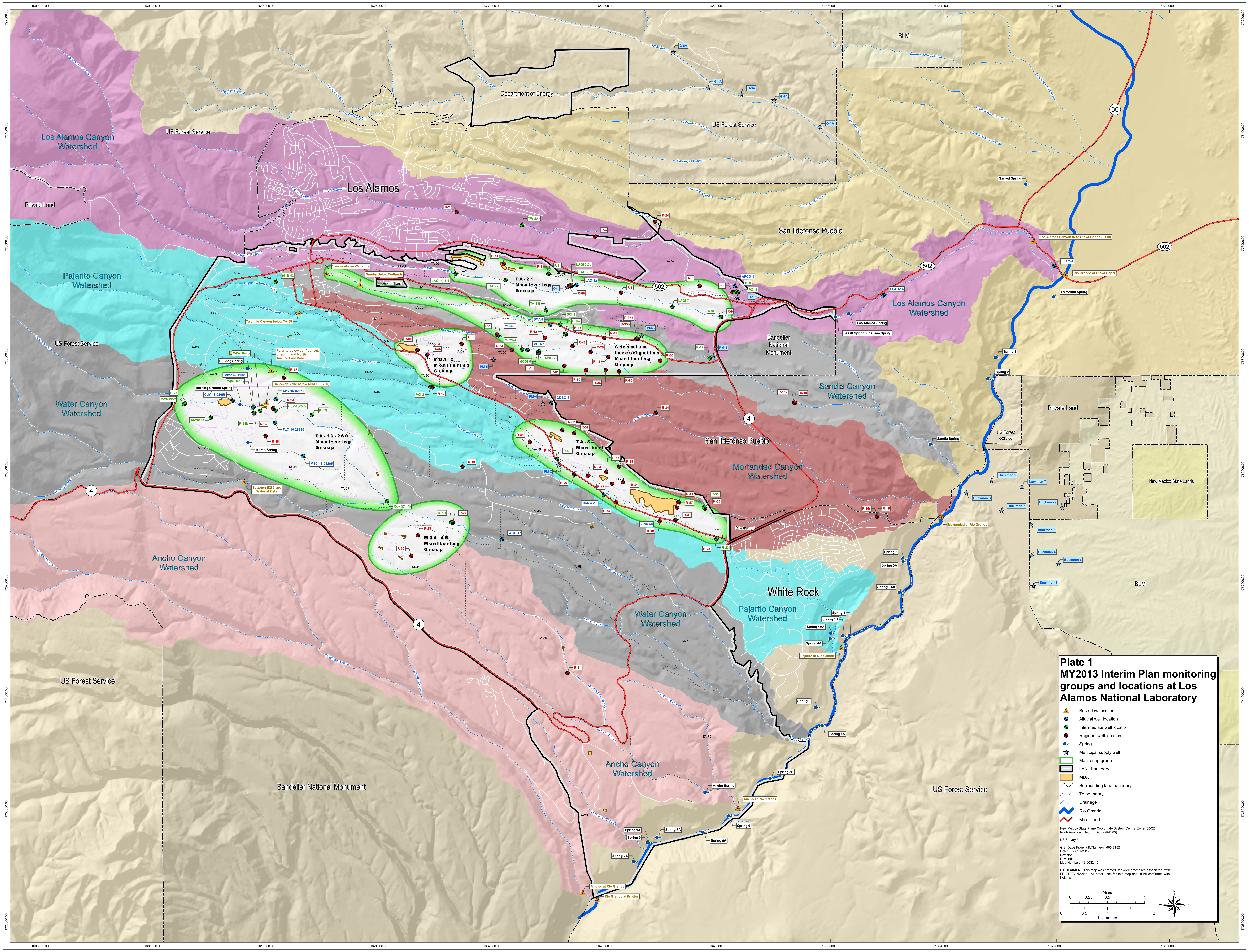
Plate 1
MY2013 Interim Plan monitoring groups and locations at Los Alamos National Laboratory
Base-flow location
Alluvial well location
Intermediate well location
Regional well location
Spring
Municipal supply well
Monitoring group
LANL boundary
MDA
Surrounding land boundary
TA boundary
Drainage
Rio Grande
Major road
New Mexico State Plane Coordinate System Central Zone (3002)
North American Datum, 1983 (NAD 83)
US Survey Ft
GIS: Dave Frank, dff@lanl.gov, 665-8182
Date: 06-April-2012
Revision:
Revised:
Map Number: 12-0032-12
DISCLAIMER: This map was created for work processes associated with EP-ET-ER division. All other uses for this map should be confirmed with LANL staff.
Miles
0
0.25
0.5
1
0
0.5
1
2
Kilometers
N
W
E
S
Los Alamos
White Rock
Department of Energy
US Forest Service
BLM
San Ildefonso Pueblo
Bandelier National Monument
Private Land
New Mexico State Lands
Los Alamos Canyon Watershed
Pajarito Canyon Watershed
Water Canyon Watershed
Sandia Canyon Watershed
Mortandad Canyon Watershed
Ancho Canyon Watershed
TA-21 Monitoring Group
Chromium Investigation Monitoring Group
MDA C Monitoring Group
TA-16-260 Monitoring Group
TA-54 Monitoring Group
MDA AB Monitoring Group