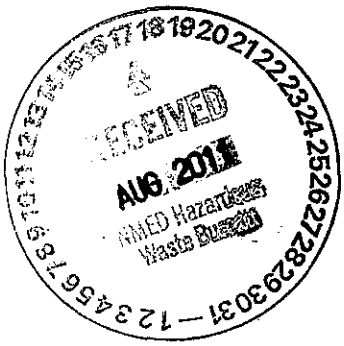
ERID-205237

Los Alamos
NATIONAL LABORATORY
EST. 1943
Environmental Programs
P.O. Box 1663, MS M991
Los Alamos, New Mexico 87545
(505) 606-2337/FAX (505) 665-1812



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

Date: AUG 17 2011
Refer To: EP2011-0272

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

Subject: Transmittal of Request for a Modification to the March 2005 Compliance Order on Consent

Dear Mr. Kieling:

The U.S. Department of Energy (DOE) and Los Alamos National Security (LANS), LLC, are requesting the New Mexico Environment Department's (NMED's) review and approval of a proposed modification of the March 2005 Compliance Order on Consent (Consent Order). This modification request, which is submitted in accordance with Section III.J.1 of the Consent Order, proposes language changes to Sections IV.A, IV.B, and XI.D that provide an alternative to watershed-based interim and long-term groundwater monitoring. The need for a more flexible approach to periodic monitoring reports was discussed during several meetings with NMED on the upcoming annual revision to the Interim Facility-Wide Groundwater Monitoring Plan. DOE/LANS agreed to draft a proposed modification to the Consent Order that would allow for area-specific groundwater monitoring plans in place of watershed-based monitoring plans, where they would more accurately reflect local hydrogeology. Monitoring locations not included within one of the new specific monitoring groups would be assigned to the general surveillance monitoring group.

Section III.J states that all modifications of the Consent Order must be in writing and signed by all parties and all modifications are subject to the same procedural rights that would apply to those modifications if made under the Laboratory's Hazardous Waste Permit. These procedural rights are described in 40 Code of Federal Regulations (CFR) 270.42 (20.4.1.900 New Mexico Administrative Code). After discussions with your staff, DOE/LANS is submitting this request as a Class 1* because the Consent Order requires NMED approval before the new approach is implemented. In addition to this modification request, a Class 1* modification requires the following two steps before the modification is implemented:

- Approval by the Secretary, and
- DOE/LANS to send a written notice to all persons on the NMED Hazardous Waste Bureau–(HWB-) maintained Los Alamos National Laboratory facility mailing list, and appropriate

units of state, local, and tribal governments. This notice will be sent within 90 calendar days after the Secretary approves the modification.

This Consent Order modification request package includes this transmittal letter, the Consent Order modification request, and pages of the revised portions of the Consent Order. The hard copy of revised pages is provided in red-line strike-out format along with the MS Word files used to create the hard copy.

Upon NMED's approval of the proposed language, DOE/LANS will send a notification of the modification to the NMED-HWB–maintained LANS facility mailing list.

If you have any questions, please contact Kate Lynnes at (505) 665-3019 (klynnes@lanl.gov) or David Rhodes at (505) 665-5325 (david.rhodes@nnsa.doe.gov).

Sincerely,

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

Sincerely,

George J. Rael, Assistant Manager
Environmental Projects Office
Los Alamos Site Office

MG/GR/TG/KL:sm

Enclosures: Two hard copies with electronic files:
(1) Consent Order Modification Request (LA-UR-11-4670)
(2) Pages of the revised portions of the Consent Order (LA-UR-11-4670)
(3) Redline-strikeout version of the tracked changes in the Consent Order

Cy: (w/enc.)
David Rhodes, DOE-LASO, MS A316
Tori George, EP-REG, MS M991
RPF, MS M707 (electronic copy)
Public Reading Room, MS M992 (hard copy)

Cy: (Letter and CD and/or DVD)
Laurie King, EPA Region 6, Dallas, TX
Steve Yanicak, NMED-DOE-OB, MS M894
William Alexander, EP-BPS, MS M992

Cy: (w/o enc.)
Tom Skibitski, NMED-OB, Santa Fe, NM (date-stamped letter emailed)
Annette Russell, DOE-LASO (date-stamped letter emailed)
Tori George, EP-REG, MS M991 (date-stamped letter emailed)
Dave McInroy, EP-CAP, MS M992 (date-stamped letter emailed)
Michael J. Graham, ADEP, MS M991 (date-stamped letter emailed)

Introduction

This submittal has been prepared by the U.S. Department of Energy (DOE) and Los Alamos National Security (LANS), LLC, to request a modification to the March 2005 Compliance Order on Consent (Consent Order). Section III.J states that all modifications of the Consent Order must be in writing and signed by all parties and all modifications are subject to the same procedural rights that would apply to those modifications if made under the Los Alamos National Laboratory's (the Laboratory's) Hazardous Waste Permit. These procedural rights are described in 40 Code of Federal Regulations (CFR) 270.42 (20.4.1.900 New Mexico Administraive Code). This modification is consistent with the Class 1 permit modification examples in Appendix I to 40 CFR 270.42. After consultation with the New Mexico Environment Department (NMED), this modification has been prepared as a "Class 1*", which requires prior NMED approval because the Consent Order does not allow for self-implemented modifications.

The Consent Order modification proposes language changes to Sections IV.A, *Facility Investigation - General Requirements*; IV.B, *Facility Investigation – Canyon Watershed Investigations*; and XI.D that provide an alternative to watershed-based interim and long-term groundwater monitoring. This modification was developed after several meetings with NMED regarding the 2011 Interim Facility Groundwater Monitoring Plan (IFGMP).

Background

The facility investigation requirements in Section IV are divided into canyon watershed investigations and technical area (TA) investigations. The primary focus of the canyon watershed investigations was to define the fate and transport of contaminants from the point of origin to each watershed drainage system and, if necessary, to the regional aquifer and to the Rio Grande. The monitoring conducted under the IFGMP is designed to enhance the general 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. Monitoring within current Laboratory boundaries takes place in seven major watershed groupings: Los Alamos Canyon/Pueblo Canyon, Sandia Canyon, Mortandad Canyon, Pajarito Canyon, Water Canyon/Cañon de Valle, Ancho/Chaquehui/Frijoles Canyons, and White Rock Canyon/Rio Grande.

Permit Modification Summary

In the past six years since the signing of the Consent Order, the data have shown that many of the "watershed" monitoring wells discussed in the annual IFGMPs should be assigned to area-specific monitoring groups related to project areas that may be located in more than one watershed. Area-specific monitoring groups are proposed for TA-54 in Pajarito and Mortandad

Canyons; TA-21, primarily in Los Alamos Canyon; Material Disposal Area (MDA) AB, primarily in Ancho Canyon; MDA C, primarily in Pajarito Canyon; the chromium investigation area in Sandia and Mortandad Canyons; and the TA-16 260 Outfall in Water Canyon/Cañon de Valle. Locations not included within one of these six area-specific monitoring groups will be assigned to the general surveillance monitoring group.

The proposed changes to Section IV.A add site-specific groundwater monitoring plan language, which may used in place of all or part of one or more watershed monitoring plans. The key change is the addition of language in Sections IV.A.3.b, *Groundwater Monitoring Plan*, IV.A.3.e.ii, *Intermediate Wells*, and IV.A.3.e.iii, *Regional Wells,* that allows DOE/LANS to request site-specific modifications to the "boundaries of the monitoring area."

The proposed changes in Section IV.B, *Canyon Watershed Investigations,* are primarily in the groundwater monitoring sections for each canyon watershed. The additional language links back to the boundary change language in Section IV and applies to the long-term monitoring plans.

IV. FACILITY INVESTIGATION

IV.A GENERAL REQUIREMENTS

This Section (IV.A) provides general requirements for the investigation of contamination at the Facility. The requirements of this Section (IV.A) shall apply to the canyon watershed and site-specific investigations under Section IV.B and the TA investigations under Section IV.C.

IV.A.1 Background

Prior to the issuance of this Consent Order, the Respondents began investigations to evaluate for the presence of contamination at the Facility and performed corrective measures pursuant to the Facility's Hazardous Waste Permit. The results of previous investigation work are to be incorporated into the investigations conducted under this Consent Order. However, additional investigation is necessary to fully characterize the nature, extent, fate, and transport of contaminants that have been released to the environment, including air, soil, sediment, surface water, and groundwater, to determine the need for and scope of corrective action.

The Respondents have established a groundwater-monitoring network for the purpose of hydrogeologic characterization and groundwater quality sampling. The current Facility monitoring network includes municipal supply wells, test wells, monitoring wells, and springs. Implementation of the groundwater monitoring requirements of this Consent Order will fulfill the groundwater monitoring requirements of the Hazardous Waste Regulations, 20.4.1.500 NMAC (incorporating 40 C.F.R. Part 264, Subpart F). Pursuant to the Facility's Hazardous Waste Permit, the Respondents have prepared and are implementing a Hydrogeologic Workplan, dated May 1998, to characterize the hydrogeologic system beneath the Facility. The requirements of this Consent Order replace the requirements of the Hydrogeologic Workplan. Based on the results of groundwater investigations conducted in accordance with this Consent Order or other information, the Department may require modification of the number and location of piezometers and wells to be installed as part of this Consent Order.

IV.A.2 General Facility Information

The Respondents shall submit to the Department the following information. These submittals are one-time submittals, unless new information becomes available. In that case, the affected submittals shall be updated and resubmitted annually:

1. Facility-wide topographic map;

2. Facility-wide geologic maps, surface geology, and structure contour maps;

3. Maps and tables indicating the surveyed coordinates and locations of all existing springs, wells, and surface water gaging stations;

4. Fault and high-fracture density zone maps;

5. Maps presenting the discharge points of seeps and springs, with tables indicating estimated flow, associated stratigraphic units, and discharge point elevations;

6. Alluvial groundwater maps depicting known saturated aquifer thickness and extent and suspected extent of contamination;

7. Perched-intermediate groundwater maps presenting aquifer thickness and flow direction data, and known and suspected vertical and lateral extents of contamination;

8. Regional groundwater maps depicting measured groundwater elevations and known flow direction(s);

9. The Facility's existing Hydrogeologic Atlas, including water-level contour map of regional aquifer and known radii-of-effects from pumping of municipal supply wells;

10. Diagrams using representative data showing groundwater flow regimes as indicated by water chemistry (e.g., Stiff, Piper diagrams) for all groundwater zones; and

11. Periodic water level data presented graphically and in tabular format.

The information shall be submitted to the Department, in hardcopy and CD-ROM, beginning 30 days after the effective date of this Consent Order, and no later than March 31 of each subsequent calendar year.

IV.A.3 Groundwater Investigation

The Respondents shall conduct investigations of groundwater in accordance with Department-approved work plans to fully characterize the nature, vertical and lateral extent, fate, and transport of groundwater contamination originating from the Facility to determine the need for, and scope of, corrective action. The investigation shall include an evaluation of the physical, biological and chemical factors influencing the transport of contaminants in groundwater. The Respondents shall implement the groundwater investigation requirements in accordance with the schedule set forth in Section XII of this Consent Order. All data shall be collected according to EPA and industry accepted methods and procedures, and in accordance with Section IX of this Consent Order.

IV.A.3.a Objectives

The Respondents shall implement the groundwater investigations, including all sampling and analysis, to determine the following:

1. nature and extent of contamination; historical and current releases of contaminants to groundwater;

2. fate and transport, including boundary conditions, of releases of contaminants within groundwater;

3. the depth to groundwater, groundwater elevations, water table elevations, and potentiometric surface distributions;

4. groundwater flow directions and velocities;

5. migration of groundwater across hydrostratigraphic boundaries;

6. site-specific, where applicable, watershed and regional water balance information for evaluating contaminant fate and transport including:

   - recharge and discharge locations, rates, and volumes,
   - evapotranspiration data,
   - stream-flow data;

7. water supply well pumping influences, including data for wells not owned by the Respondents, if available;

8. saturated and unsaturated hydraulic-conductivity ($K_{x,y,z}$), porosity, effective porosity, permeability, transmissivity, particle-size, storage coefficients, and estimated fracture/secondary porosity for each hydrostratigraphic unit from core and geophysical logging of boreholes;

9. contaminant concentrations from soil, rock, sediment, and vapor sample analyses and absorption coefficients (K_ds) for each hydrostratigraphic unit; and

10. changes in groundwater chemistry and the causes.

In selecting sites for new wells, the Respondents shall consider paleotopography, fracture density and orientation, source areas, contaminant characteristics, geologic structures, groundwater flow direction, and the occurrences of groundwater. All existing and newly installed wells and piezometers shall be surveyed in accordance with the requirements described in Sections IX.B and X of this Consent Order.

IV.A.3.b Groundwater Monitoring Plan

Within ninety (90) days after the effective date of this Consent Order, the Respondents shall submit to the Department for review and written approval an Interim Facility-Wide Groundwater Monitoring Plan (Interim Plan). The Interim Plan, approved pursuant to the procedures in Section III.M of this Consent Order, shall provide for all groundwater and spring monitoring necessary to fulfill the requirements of this Consent Order. The Interim Plan shall state the proposed locations and frequency of groundwater sampling, the proposed parameters for analysis, and the proposed

methods for sampling and analysis. The sampling schedule in Table XII-5 shall be used to develop the Interim Plan. Results of previous groundwater monitoring at the Facility may be used as guidance for development of the Interim Plan. All groundwater monitoring and sampling implemented pursuant to this Consent Order shall begin after, and in accordance with, an Interim Plan that has been approved by the Department pursuant to Section III.M. The Interim Plan shall comply with the investigation methods and procedures set forth in Section IX of this Consent Order. The plan shall be prepared in accordance with Section XI.B of this Consent Order. Submittal of the initial eight watershed-specific periodic monitoring reports may be staggered over the first year of groundwater monitoring conducted under this Consent Order. This may be accomplished by submitting two watershed-specific periodic monitoring reports for different watersheds to the Department per quarter starting 180 days after the Department's approval of the initial Interim Plan.

The Respondents shall revise and update the Interim Plan annually to propose changes to the monitoring plan (e.g., to include newly installed monitoring wells; to remove wells not providing good quality data, if approved by the Department; to propose replacing one or more watershed monitoring plans with site-specific monitoring plans; and to make any other appropriate changes). The Respondents shall submit the revised and updated plan to the Department for approval ninety (90) days after each anniversary of the effective date of this Consent Order.

After completing the installation of all additional monitoring wells in a canyon watershed or specific site as described in Section IV.B of this Consent Order, the Respondents shall submit to the Department for review and written approval a ~~watershed-specific~~ long-term groundwater monitoring plan for each watershed or specific area. Upon Department approval of a long-term monitoring plan for a specific watershed or area, the requirements of the long-term monitoring plan shall apply and shall supersede the ~~requirements of the watershed-specific section of the~~ Interim Plan.

IV.A.3.c Geophysical Investigations

The Respondents shall conduct geophysical and geochemical investigations in accordance with work plans approved under or incorporated into this section (IV) and with Section IX of this Consent Order. Pursuant to those approved work plans, the Respondents shall collect core and open-hole geophysical measurements from each boring to meet the purposes of this Consent Order as stated in Section III.A. Cased hole geophysical logging may be approved by the Department on a site-specific basis, but is not preferred because of the limited logging tool suite and reduced resolution of currently available geophysical equipment.

IV.A.3.d Background Investigation

The Respondents shall determine the background concentrations for naturally occurring metals and general chemistry parameters in alluvial, intermediate , and regional groundwater. Within 180 days after the effective date of this Consent Order, the Respondents shall submit to the Department for review and written approval a Groundwater Background Investigation Report to determine Facility background concentrations for naturally occurring metals in groundwater at or near the Facility. The background investigation report shall state the background concentration for each metal and the

general chemistry parameters, and state the bases for selecting each such concentration. The investigation report shall be prepared in accordance with Section XI.C of this Consent Order.

IV.A.3.e Monitoring Wells and Piezometers

The Respondents shall comply with the requirements of this section (IV.A.3.e) for the installation of all alluvial monitoring wells, piezometers, intermediate zone monitoring wells, and regional monitoring wells.

All well construction and installation shall be conducted in accordance with Sections IX and X of this Consent Order, and according to the schedule set forth in Section XII of this Consent Order. All monitoring and sampling shall be conducted in accordance with Section IX of this Consent Order, and according to the schedule set forth in Section XII of this Consent Order.

The Department shall approve in writing all drilling locations, monitoring well and piezometer construction and installation details, sampling depths, and abandonment activities prior to the start of the activities.

IV.A.3.e.i Alluvial Wells and Piezometers

The Respondents shall submit work plans for construction of alluvial wells and piezometers that meet the following requirements, subject to the procedures in Section III.M of this Consent Order.

1. The alluvial well borings shall be advanced to minimum depths of five ft below the alluvium-bedrock interface.

2. Samples of alluvial sediments and underlying bedrock shall be collected for hydraulic and soil property testing and for analysis to determine the presence of contaminants at depths or intervals approved by the Department and in accordance with the methods described in Section IX.B of this Consent Order.

3. Alluvial wells and piezometers shall be constructed and developed in accordance with Section X of this Consent Order. Wells and piezometers that are abandoned shall be abandoned in accordance with the procedures for abandonment in Section X.D of this Consent Order.

4. Samples shall be obtained from each boring between the ground surface and one ft below the ground surface (0.0-1.0 ft interval), at five-ft intervals, at the alluvium-bedrock contact, and at the maximum depth of each boring in accordance with the methods described in Section IX.B of this Consent Order.

5. Field screening and chemical analyses of collected samples shall be conducted in accordance with Section IX of this Consent Order.

6. Selected soil, rock, and sediment samples collected during drilling activities shall be submitted to an analytical laboratory for the required analyses.

7. Site-specific or watershed-specific work plans shall be prepared in accordance with Sections IX and XI.B of this Consent Order. The Respondents may request site-specific modifications to the work plans, including the boundaries of the monitoring area, required analytical suite, based on known site or watershed histories and previous investigation results in the site-specific investigation or monitoring work plans submitted to the Department prior to the start of field activities.

8. Groundwater samples shall be submitted for the analyses required in this section (IV) and Section IX of this Consent Order.

9. Groundwater monitoring data and groundwater samples shall be collected from each well at the frequencies specified in and in accordance with the requirements of this section (IV) and Section IX of this Consent Order. In accordance with Section IV.B of this Consent Order, the Respondents shall submit to the Department for review and written approval a ~~watershed-specific~~ long-term groundwater monitoring plan for each watershed or specific area. Upon Department approval of the long-term monitoring plan for a specific watershed or area, the requirements of the long-term monitoring plan shall apply and shall supersede ~~the requirements of the watershed-specific section of~~ the Interim Plan.

Piezometers should be used only for the purpose of determining the extent of saturation and hydraulic gradients. Piezometers should not be used to characterize or monitor the extent of contamination. The Department may approve the use of other methods to determine the extent of subsurface saturation.

IV.A.3.e.ii Intermediate Wells

The Respondents shall submit work plans for construction of intermediate wells that meet the following requirements, subject to the procedures in Section III.M of this Consent Order.

1. As appropriate, based on site-specific conditions, geophysical measurements and soil, rock, vapor, and groundwater samples shall be collected from each boring prior to well construction in accordance with Section IX of this Consent Order.

2. After completion of the borings, the Respondents shall submit a monitoring well design plan to the Department for approval prior to construction of the intermediate zone wells. The Respondents shall not leave any borehole open or cased with drill casing for longer than five (5) days.

3. The Department may impose specific conditions for well construction, require borings to be extended to the regional aquifer, or require the drilling of additional borings that intersect intermediate perched saturated zones or the regional aquifer based on investigation results.

4. Field screening and sample collection of soil, rock, vapor, and groundwater samples shall be conducted in accordance with Section IX of this Consent Order.

5. Selected soil, rock, and sediment samples shall be submitted to an analytical laboratory for the required analyses.

6. Site-specific or watershed-specific work plans shall be prepared in accordance with Section XI of this Consent Order. Site-specific modifications to the boundaries of the monitoring area, the required analytical suite and sampling frequency based on known site or watershed histories and previous investigation results may be requested by the Respondents in site-specific investigation or monitoring work plans submitted to the Department prior to the start of field activities.

7. Groundwater samples shall be submitted for the analyses required in Section IV.B below and Section IX of this Consent Order.

8. Groundwater monitoring data and groundwater samples shall be collected from each well at the frequencies specified in and in accordance with the requirements of this section (IV) and Section IX of this Consent Order. In accordance with Section IV.B of this Consent Order, the Respondents shall submit to the Department for review and written approval a ~~watershed-specific long~~-term groundwater monitoring plan for each watershed or specific area. Upon Department approval of the long-term monitoring plan for a specific watershed or area, the requirements of the long-term monitoring plan shall apply and shall supersede ~~the requirements of the watershed-specific section of~~ the Interim Plan.

IV.A.3.e.iii Regional Wells

The Respondents shall submit work plans for construction of regional aquifer wells that meet the following requirements, subject to the procedures in Section III.M of this Consent Order.

1. The proposed locations, depths and details of drilling, sampling, and well construction shall be described in work plans prepared in accordance with Sections IX and XI.B of this Consent Order or other document approved by the Department prior to well installation.

2. After completion of the borings, a monitoring well design plan shall be submitted to the Department for written approval prior to construction of the regional aquifer wells. No borehole shall be left open or cased with drill casing for longer than five (5) days.

3. Geophysical measurements and soil, rock, vapor, and groundwater samples shall be collected from the borings prior to well construction in accordance with Section IX of this Consent Order.

4. Where appropriate, the borings shall be monitored for the presence of vapor-phase contaminants prior to well construction.

5. Based on the results of subsurface vapor monitoring, the Department may require that the Respondents construct the wells to accommodate subsurface vapor monitoring in addition to groundwater monitoring and sampling.

6. Field screening and sample collection of soil, rock, vapor, and groundwater samples shall be conducted in accordance with Section IX of this Consent Order.

7. Selected soil, rock, and sediment samples shall be submitted to an analytical laboratory for the required analyses.

8. Site- or watershed-specific work plans shall be prepared in accordance with Sections IX and XI.B of this Consent Order. The Respondents may request site-specific modifications to the boundaries of the monitoring area and/or the required analytical suite in the site-specific investigation or monitoring work plans submitted to the Department, based on known site or watershed histories and previous investigation results, prior to the start of field activities.

9. Groundwater samples shall be submitted for the analyses required under Sections IV, V and VI of this Consent Order.

10. Groundwater monitoring data and groundwater samples shall be collected from each well at the frequencies specified in and in accordance with the requirements of this section (IV) and Section IX of this Consent Order. In accordance with Section IV.B of this Consent Order, the Respondents shall submit to the Department for review and written approval a ~~watershed-specific~~ long-term groundwater monitoring plan for each watershed or specific area. Upon Department approval of the long-term monitoring plan ~~for a specific watershed~~, the requirements of the long-term monitoring plan shall apply and shall supersede the requirements of ~~the watershed-specific section of~~ the Interim Plan.

IV.A.3.e.iv Well Completion

The Respondents shall submit to the Department a well completion summary fact sheet within 30 days of completion of each regional aquifer well. Installation of all wells shall be considered complete when the well casing has been installed to its final position and the casing rim can be measured relative to the ground surface. Well development must be completed within 30 days of the completion of well installation. The 120-day clock for well completion report submittal for regional aquifer wells will begin 30 days after well completion, as defined above. The details of all drilling and well construction for alluvial and intermediate depth wells shall be included in the site- or canyon-specific investigation reports. Investigation reports that document the results of the site-specific investigations shall be prepared in accordance with the format described in Section XI.C of this Consent Order and the schedule set forth in Section XII of this Consent Order.

IV.A.3.f Springs

The Respondents shall submit work plans for monitoring of springs that meet the following requirements, subject to the procedures in Section III.M of this Consent Order.

1. Springs used to monitor groundwater shall be sampled as close to the source as possible and shall be sampled at the same locations during each sampling event. If field conditions change, the spring shall be sampled as close to the original location as possible, and the

Respondents shall notify the Department in the periodic monitoring report that the sampling location has changed.

2. The sampling point for each spring shall be located in accordance with the survey methods described in Section IX.B of this Consent Order or by other survey methods approved by the Department.

3. Spring water flow rates shall be measured, if feasible. In addition, the seep or spring effluent pH, specific conductance, dissolved oxygen, temperature, and oxidation-reduction potential shall be measured at the sample location during each sampling event. The Respondents shall measure field water quality parameters to determine the stability of the groundwater chemistry prior to sample collection and shall follow the procedures outlined in Section IX of this Consent Order.

4. Spring samples shall be submitted to an analytical laboratory for analyses of the general chemistry, organic, and inorganic constituents listed below. The Respondents may request modification of the required analytical suite and monitoring frequency in the site-specific, canyon-specific, and Facility-wide work plans based on specific conditions and information acquired during previous investigation and monitoring activities. The Department shall approve all modifications to the monitoring and sampling methods and analytical suite prior to sample collection. General chemistry parameters shall include nitrate, nitrite, ammonia, total kjeldahl nitrogen (TKN), phosphate, sulfate, carbonate and bicarbonate, and other site-specific, watershed-specific, or groundwater zone-specific parameters listed in Section IX.B.2.i as specified in the ~~watershed-specific~~ long-term groundwater monitoring work plan. Samples shall be collected for organic analyses that include VOCs, semivolatile organics (SVOCs), explosive compounds and their degradation products, PCBs, and dioxins/furans listed in 40 C.F.R. Part 264, Appendix IX, or analyses otherwise approved by the Department. Inorganic analyses shall include TAL metals, silicon, lithium, molybdenum, cyanide, and perchlorate, or analyses otherwise approved by the Department in writing. The Department also may require testing for additional analytes not listed above.

The Respondents shall submit periodic monitoring reports to the Department in accordance with Section IV.A.6.

IV.A.3.g Notification

By the fifteenth day of each month, the Respondents shall review the analytical data from all groundwater monitoring conducted under this Consent Order that was received during the previous month, and shall record the date of such review; provided, however, that if the fifteenth day of a month is a non-business day, then the review shall be conducted by the next business day. The Respondents shall notify the Department orally within one business day after review of the analytical data if such data show detection of a contaminant in a well screen interval or spring at a concentration that exceeds either the WQCC water quality standard or the federal maximum contaminant level if that contaminant has not previously exceeded such water quality standard or maximum contaminant level in such well screen interval or spring.

The Respondents shall notify the Department in writing within fifteen days after review of the analytical data if the data show any of the following:

1. Detection of a contaminant that is an organic compound in a spring or screened interval of a well if that contaminant has not previously been detected in the spring or screened interval.

2. Detection of a contaminant that is a metal or other inorganic compound at a concentration above the background level in a spring or screened interval of a well if that contaminant has not previously exceeded the background level in the spring or screened interval.

3. Detection of a contaminant in a spring or screened interval of a well at a concentration that exceeds either one-half the New Mexico water quality standard or one-half the federal maximum contaminant level, or if there is no such standard for the contaminant, one-half the EPA Region VI Human Health Medium-Specific Screening Level for tap water, if that contaminant has not previously exceeded one-half such standard or screening level in the spring or screened interval.

4. Detection of perchlorate in a spring or screened interval of a well at a concentration of 2 µg/L or greater if perchlorate at such concentration has not previously been detected in the spring or screened interval.

5. Detection of a contaminant that is a metal or other inorganic compound in a spring or screened interval of a well at a concentration that exceeds two times the background level for the third consecutive sampling of the spring or screened interval.

6. Detection of a contaminant in a spring or screened interval of a well at a concentration that exceeds either one-half the New Mexico water quality standard or one-half the federal maximum contaminant level, and that has increased for the third consecutive sampling of that spring or screened interval.

The written notification shall be submitted to the Department in a letter report that includes in table format, at a minimum, the date or dates of the sampling event, an identification of the well or spring, the location of the well or spring, the depth of the screened interval of the well or zone sampled, a list of the analytical data that triggered the reporting requirement, any known issues with sample quality, and the specific category for which the data is reported under this Section (IV.A.3.g). The Respondents may submit a proposal for further sampling or investigation, or the Department may require further sampling or investigation.

The Respondents shall develop and maintain an e-mail notification list to notify members of the public concerning groundwater analytical data reported under this Section (IV.A.3.g). The Respondents shall provide a link on the LANL/Environment Home Page <currently http://www.lanl.gov/environment> whereby members of the public may submit a request to be placed on this list. Within five working days of submittal to the Department of the written notification under this Section (IV.A.3.g), the Respondents shall post a notice on the LANL/Environment website and shall notify those on the e-mail notification list.

Previous data to be evaluated under this Section (IV.A.3.g) to determine whether specified levels have been exceeded, or to determine trends in data for three consecutive samples, shall include only data acquired after June 14, 2007. For the purpose of the notice requirements of this Section (IV.A.3.g), the background level of a contaminant shall be the most recent Department-approved 95 percent upper tolerance limit for the background for that contaminant set forth in the *Groundwater Background Investigation Report* prepared under Section IV.A.3.d of this Consent Order once approved by the Department, including any approved revisions, as it may be revised or replaced with another document.

IV.A.4 Sediment Investigation

The Respondents shall conduct investigations to fully characterize the nature, extent, fate, and transport of contaminants in sediments in the canyons located within and downgradient of the Facility to determine the need for, and scope of, corrective action. The Respondents shall conduct the sediment investigations in accordance with approved work plans that meet the general requirements of this section (IV.A.4) and the specific requirements of Sections IV.B and IV.C subject to the procedures in Section III.M of this Consent Order. All monitoring and sampling shall be conducted in accordance with the investigation methods and procedures set forth in Section IX of this Consent Order. The Respondents shall implement the sediment investigation requirements set forth in the Department-approved work plans in accordance with the schedule set forth in Section XII.

The Respondents shall submit work plans for investigation of sediments that meet the following requirements, subject to the procedures in Section III.M of this Consent Order.

1. All types and sources of contaminants that were historically discharged or released to each canyon watershed shall be identified.

2. Identify the areas of sediment accumulation in each canyon from the western boundary of the Facility to the Rio Grande. Identify areas of sediment accumulation from the head to the mouth of those canyons that head within the Facility boundaries.

3. Identify reaches, as defined in this Consent Order, within each canyon based on the information collected to fulfill the requirements of Paragraph 2 above. Each reach shall be selected and investigated in accordance with Chapter 5 of the Facility's Core Document for Canyons Investigations, April 1997, approved by the Department on March 17, 1998.

4. Conduct geomorphic characterization, as defined in Chapter 5 of the Facility's Core Document for Canyons Investigations, of each reach and evaluate for the presence of contaminants within each reach.

5. Collect sediment samples from the surveyed locations for field screening and laboratory analysis as required by the Department. Sample collection shall focus on locations where contamination is detected at levels greater than established background levels and on geomorphic units where contamination is likely to accumulate.

IV.A.5 Firing Sites

IV.A.5.a General

The Respondents shall conduct the investigation and, as appropriate, implement corrective action at firing sites and surrounding areas of the Facility in accordance with this Consent Order.

The Respondents have prepared a map entitled "Los Alamos National Laboratory Firing Sites" dated October 2003, depicting active Facility firing sites and surrounding areas; this map is part of the Administrative Record for this Consent Order. The map depicts the "Fenced Area" (larger green area) and the "Testing Hazard Zone" (smaller blue-gray area) associated with active Facility firing sites. The map, as it may be revised from time to time, is incorporated herein by reference.

DOE may revise the geographic scope and location of the designated Testing Hazard Zones if necessary to support DOE's operations. If that occurs, or if any other changed circumstances or other information becomes available such that the map does not accurately depict the Fenced Area or the Testing Hazard Zone, or that uses incompatible with the range activities are occurring within the Testing Hazard Zone, the Respondents shall revise the map and submit to the Department the revised map with explanatory information, that explains and justifies the revision, within thirty (30) days. The revised version of the map shall be incorporated herein by reference and substituted for the earlier version.

IV.A.5.b Testing Hazard Zones

The Respondents shall investigate and, if appropriate, conduct corrective action for all SWMUs and AOCs identified in Table IV-1 (i.e. sites within Testing Hazard Zones to undergo corrective action under this Consent Order) located within the Testing Hazard Zone according to the schedule contained in Section XII. However, such investigation and corrective action shall be scheduled and conducted to avoid unreasonable interference with Testing Hazard Zone operations as described below.

Except as provided in the next paragraph, the Respondents may defer investigation and corrective action for any SWMU or AOC located within a Testing Hazard Zone and identified in Table IV-2 (sites within Testing Hazard Zones to be deferred), and need not include such SWMU or AOC in the relevant Aggregate Area investigation work plan. The deferral may continue until such time as the firing site that has been used to delineate the relevant Testing Hazard Zone is closed, or it is inactive and DOE has determined it is not reasonably likely to be reactivated. If requested, in writing, by the Department, DOE shall make such a determination within 60 days of receipt of the written request. If DOE decides not to make a determination, DOE shall provide the Department with a written justification for its decision. DOE's decision about the use of a firing site shall be based entirely on operation of the firing range, and shall not be subject to dispute resolution under this Consent Order. At such time as the site is closed, or it is inactive and DOE has determined it is not reasonably likely to be reactivated, the Respondents shall submit to the Department for approval an investigation work plan for the relevant Testing Hazard Zone in accordance with the Aggregate Area investigation work

plan, or on a schedule determined by the Department if the aggregate area work plan has already been submitted.

The Respondents may not defer investigation or corrective action for any SWMU or AOC if the Department finds that conditions resulting from such SWMU or AOC may present an immediate threat to human health or the environment. If the Department finds that the above condition is occurring, the Respondents shall mitigate such condition through Interim Measures (see Section VII.B) or through site-specific controls approved in advance by the Department.

When any firing site that has been used to delineate, in whole or in part, a Testing Hazard Zone is closed, or becomes inactive and DOE has determined that it is not reasonably likely to be reactivated, the Respondents shall, within thirty (30) days, submit to the Department a revised map.

IV.A.5.c Fenced Area

The Respondents shall investigate and, if appropriate, conduct corrective action for all SWMUs and AOCs located outside the Testing Hazard Zone but within the Fenced Area, without any deferral. However, such investigation and corrective action shall be scheduled and conducted to avoid unreasonable interference with Testing Hazard Zone operations as described below.

IV.A.5.d Interference With Firing Site Operations

All investigation and corrective action activities conducted within the Testing Hazard Zones and within the Fenced Area shall be scheduled and conducted to avoid unreasonable interference with Testing Hazard Zone operations. In the event that the Respondents determine that scheduled investigation or corrective action activities may unreasonably interfere with Testing Hazard Zone operations, the Respondents shall, as far in advance as is practicable, submit to the Department for approval a written request for an adjustment to the schedule, including a description of the basis for the adjustment. In assessing such request, the Department will consider the information provided by the Respondents, including safety risks to personnel, and schedules for testing and developing munitions.

Table IV-1

Non-Deferred Sites Within Testing Hazard Zones

Non-Deferred Site Identification	Brief Description
06-005	Firing site pit
06-007(a)	Material disposal area F
06-007(b)	Material disposal area F
06-007(c)	Material disposal area F
06-007(d)	Material disposal area F
06-007(e)	Material disposal area F
06-008	Underground storage tank
07-001(a)	Firing site
07-001(b)	Firing site
11-005(a)	Septic system
11-005(b)	Septic system
11-005(c)	Outfall
11-006(a)	Sump
11-006(b)	Tank and/or associated equipment
11-006(c)	Tank and/or associated equipment
11-006(d)	Tank and/or associated equipment
11-011(a)	Industrial or sanitary wastewater treatment
11-011(b)	Industrial or sanitary wastewater treatment
11-011(d)	Industrial or sanitary wastewater treatment
C-11-002	Footprint of former laboratory
C-12-001	Footprint of former building
C-12-002	Footprint of former building
C-12-003	Footprint of former building
C-12-004	Footprint of former building
14-001(g)	Firing site-Open Burn/Open Detonation (active)
14-002(c)	Building
14-002(f)	Footprint of former junction box shelter
14-003	Open burning ground
14-005	Open burn site (active)
14-006	Tank and/or associated equipment
14-007	Septic system
14-009	Surface disposal site
14-010	Sump
C-14-001	Footprint of former building
C-14-003	Footprint of former building
C-14-004	Footprint of former building

Non-Deferred Site Identification	Brief Description
C-14-005	Footprint of former building
C-14-006	Footprint of former building
C-14-007	Footprint of former building
C-14-008	Footprint of former building
C-14-009	Footprint of former building
15-001	Surface disposal
15-004(f)	Firing site E-F
15-004(h)	Firing site H
15-005(c)	Container storage area (R-41)
15-007(b)	Material disposal area Z
15-007(c)	Firing site shaft
15-007(d)	Firing site shaft
15-008(a)	Surface disposal at E/F Site
15-008(b)	Surface disposal
15-008(c)	Surface disposal
15-008(g)	Surface disposal
15-009(b)	Septic system
15-009(c)	Septic tank
15-009(e)	Septic system
15-009(g)	Septic tank (active)
15-009(h)	Septic tank
15-009(i)	Septic tank
15-010(c)	Drain line
15-014(l)	Outfall (active)
C-15-001	Surface disposal
C-15-004	Transformers
C-15-011	Former site of underground tank
C-15-013	Underground fuel tank
18-001(a)	Lagoon
27-002	Firing sites
27-003	Bazooka impact area
36-001	Material disposal area AA
36-002	Sump
36-003(a)	Septic system
36-003(b)	Septic system
36-004(c)	Firing site-open detonation (active)
36-005	Surface disposal site
36-006	Surface disposal site
36-008	Surface disposal site

Non-Deferred Site Identification	Brief Description
C-36-003	Storm drainages
37-001	Septic system
39-001(b)	Material disposal area Y
39-002(b)	Storage area
39-002(c)	Storage area
39-002(d)	Storage area
39-002(f)	Storage area
39-004(c)	Firing site 39-6 (active)-OD RCRA Unit
39-004(d)	Firing site 39-57 (active)-OD RCRA Unit
39-007(a)	Storage area
39-007(d)	Storage area
39-008	Former building footprint (soil contamination)
39-010	Excavated soil dump
40-001(b)	Septic system
40-001(c)	Septic system
40-003(a)	Scrap burn site/open detonation (completed RCRA closure)
40-003(b)	Burning area (completed RCRA closure)
40-004	Operational release
40-005	Sump
40-009	Landfill
40-010	Surface disposal site
49-001(a)	Material disposal area AB
49-001(b)	Material disposal area AB
49-001(c)	Material disposal area AB
49-001(d)	Material disposal area AB
49-001(e)	Material disposal area AB
49-001(g)	Material disposal area AB
49-002	Underground chamber
49-003	Leach field and small shot area
49-005(a)	Landfill
49-006	Sump
49-008(d)	Firing sites and underground chamber

Table IV-2

Deferred Sites In Testing Hazard Zones

Deferred Site Identification	Brief Description	Deferred Site Identification	Brief Description
06-003(a)	Firing site	15-006(a)	Firing site
06-003(h)	Firing site	15-006(b)	Firing site
C-06-019	Footprint of former	15-006(c)	Firing site
07-001(c)	Firing site	15-006(d)	Firing site
07-001(d)	Firing site	15-008(f)	Firing site
11-001(a)	Firing site	36-004(a)	Firing site
11-001(b)	Firing site	36-004(b)	Firing site
11-002	Burn site	36-004(d)	Firing site
11-003(b)	Air gun	36-004(e)	Firing site
11-004(a)	Firing site	39-004(a)	Firing site
11-004(b)	Firing site	39-004(b)	Firing site
11-004(c)	Firing site	39-004(e)	Firing site
11-004(d)	Firing site	40-006(a)	Firing site
11-004(e)	Firing site	40-006(b)	Firing site
11-004(f)	Firing site	40-006(c)	Firing site
11-009	Material disposal area S	49-008(a)	Soil contamination
11-012(c)	Footprint of former building	49-008(b)	Soil contamination (Area 6)
11-012(d)	Footprint of former building	49-008(c)	Soil contamination
C-11-001	Footprint of former laboratory		
14-001(f)	Firing site		
14-002(a)	Firing site		
14-002(d)	Firing site		
14-002(e)	Firing site		
14-002(b)	Firing site		
15-003	Firing site		
15-004(a)	Firing site		
15-004(g)	Firing site		

IV.A.6 Reporting

The Respondents shall submit to the Department periodic monitoring reports including the results of the groundwater, surface water, and springs monitoring and sampling over the previous reporting period. The reports shall be prepared in accordance with Section XI.D of this Consent Order. The reports shall be submitted within 120 days after completion of the watershed-specific or site specific periodic monitoring fieldwork and in accordance with the schedule set forth in the approved monitoring plans.

IV.B CANYON WATERSHED INVESTIGATIONS

The general investigation requirements in the work plan for each canyon watershed shall include an assessment of the nature and extent of historical and current releases of contaminants from SWMUs, AOCs and other sites through investigation of:

1. canyon alluvial sediments,

2. surface water monitoring and sampling, and

3. groundwater monitoring and sampling.

The Canyon Watersheds are subdivided into watershed aggregates. The Watersheds and associated Watershed Aggregates are listed below.

WATERSHED	WATERSHED AGGREGATE
Los Alamos/Pueblo Canyon	Upper Los Alamos Canyon Middle Los Alamos Canyon DP Site Lower Los Alamos Canyon Pueblo Canyon Bayo Canyon Guaje/ Barrancas/Rendija Canyons
Sandia	Upper Sandia Canyon Lower Sandia Canyon
Mortandad	Upper Mortandad Canyon Middle Mortandad/Ten Site Canyon Lower Mortandad/Cedro Canyon Upper Cañada del Buey Middle Cañada del Buey

	Lower Mortandad/Cañada del Buey
Water Canyon/Cañon de Valle	Cañon de Valle S-Site Upper Water Canyon Lower Water/Indio Canyon Potrillo/Fence Canyon
Pajarito	Starmer/Upper Pajarito Canyon Twomile Canyon Threemile Canyon Lower Pajarito Canyon
Ancho	North Ancho Canyon South Ancho Canyon
Chaquehui	Chaquehui Canyon
Frijoles	Frijoles Canyon TA-57 (Fenton Hill)

The general investigation activities required for each canyon watershed shall primarily focus on fate and transport of contaminants from the point of origin to each canyon watershed drainage system and, if necessary, to the regional aquifer and to the Rio Grande. Canyon watershed investigations shall be conducted in accordance with this Consent Order and the canyon-specific investigation work plans approved by the Department. The source areas located on mesa tops shall be addressed in separate investigations in this section (IV), where appropriate. The Respondents shall conduct investigations of canyons pursuant to approved investigation work plans prepared in accordance with Section III.M of this Consent Order.

The Respondents shall continue to conduct an investigation of contaminants that may have been discharged or released into each canyon watershed during historical operations at the Facility. The investigation shall include defining the known or suspected source of contaminants, and reviewing existing data and other information acquired during previous investigations. The Respondents shall review available information regarding SWMUs and AOCs and other possible sources of discharges or releases of contaminants, including historical use of all existing and demolished TA buildings and other structures; pits, shafts, trenches, landfills, and surface impoundments; wastewater treatment, conveyance, and disposal systems; and subsurface utility corridors. The Respondents shall also review all investigation borings, excavations, sampling events, and other sources of information on contamination. The Respondents shall submit to the Department a historical investigation report for each canyon watershed, which shall be included as a separate submittal in conjunction with the canyon investigation work plan. If the Department determines that an investigation work plan is not required for a canyon watershed, the Respondents shall not be required to submit a historical investigation report. The report shall contain the following historical information:

1. A list of all past or present SWMUs, AOCs, and other sites in or bordering the canyon

watershed that may have contributed contaminants to the canyon drainages.

2. A list of all discharge locations that may have contributed contaminants to the canyon drainages.

3. A description of the location, operational history, and present status of each such SWMU, AOC, and other site listed under Paragraph 1 and each discharge location listed under Paragraph 2. The Respondents shall depict all such locations in one or more figures.

4. A description of the known disposal history of each SWMU, AOC, and other site listed under Paragraph 1 and each discharge location listed under Paragraph 2. This description shall include all known and suspected material disposed, contaminants discharged or released; the volume of each discharge or release, if known; the flow rate of each discharge or release, if known; and the contaminants present in each discharge or release, if known. The Respondents shall report whether the disposal history of any SWMU, AOC, or other unit is unknown or incomplete and the source of the information.

5. A description of each previous investigation of the sources, extent, or characteristics of contamination in each canyon watershed, regardless of whether or not such investigation was completed.

6. A summary of any results and conclusions of each previous investigation described in Paragraph 5, including the known or suspected dates of waste disposal, discharge, or release, and the circumstances related to the discharge or release of contamination.

7. A description of the location, construction details, history, and present status of each investigation well, boring, and excavation in each canyon watershed. The Respondents shall depict all such locations in one or more figures and may reference existing documents for this information. The results of historical aquifer characterization, surface water study, and all sampling events shall be included, if available. A site map encompassing the watershed and pertinent regional investigation locations shall be included in the summary.

8. A description of the sample collection methods and the types of field and laboratory analyses performed on each medium during the previous investigations.

9. Tables summarizing the data collected during investigation activities for each investigation well, boring, and excavation. The results shall present only analyte detections and data quality exceptions reported by the analytical laboratory that may mask analyte detections.

10. A summary of data quality exceptions and interpretations of all compromised data reported under paragraph #9.

11. A summary of all contradictory investigation results and the rationale for acceptance or rejection of selected investigation results.

12. A list of general chemistry and metal background concentrations, including references to the documents that provide the methods for establishing the background values.

13. A table summarizing the field and laboratory analytical results obtained from the four most recent groundwater monitoring and sampling events. The results shall include groundwater monitoring and sampling conducted in each canyon watershed. A site plan presenting the locations of all wells and piezometers shall be included with the summary.

14. A table summarizing the field and laboratory analytical results obtained from the four most recent surface water monitoring and sampling events. The results shall include surface water monitoring and sampling conducted in each canyon watershed. A site plan presenting the locations of all surface-water monitoring and sampling stations shall be included with the summary.

15. A table summarizing the known hydraulic properties, including groundwater flow direction and velocity estimates, of the alluvial, intermediate, and regional aquifers based on testing results obtained at locations within each canyon watershed, if available. Groundwater flow directions and elevations may be presented on a map. Existing documents may be referenced for this information in lieu of inclusion in the historical investigation reports, providing that specific document titles and page numbers are cited.

The summaries shall include references to historical documents within the summary text citing the document title, page number, and table or figure number. The full reference citations shall be presented as a separate section in each summary document using the standard United States Geological Survey (USGS) format for reference citations. The Respondents shall provide complete data and information to the extent it is available, and shall identify the need for any additional data at each unit. The Department will evaluate the information and request changes as necessary. The Respondents shall submit new or updated information to the Department as soon as it becomes available.

IV.B.1 Los Alamos/Pueblo Canyons Watershed

IV.B.1.a Background

The Los Alamos/Pueblo Canyons watershed encompasses roughly 57 square miles and is located at the north end of the Facility. The watershed contains numerous springs as well as perennial and ephemeral streams and alluvial groundwater systems. Portions of Los Alamos Townsite, Los Alamos County, Santa Fe County, and Pueblo of San Ildefonso tribal lands are located within the Los Alamos/Pueblo Canyons watershed. Facility operations have discharged treated and untreated effluent into the watershed from the 1940s to the present. Runoff from SWMUs and AOCs at former and current TAs-0, 1, 2, 3, 21, 41, 43, 53, 62, 72, 73 and 74 have contributed to contaminant releases within the canyon systems. Metals, perchlorate, nitrates, hydrocarbons, other contaminants, and radionuclides, which are not addressed under this Consent Order, have been detected in the Los Alamos/Pueblo Canyons watershed groundwater.

This section (IV.B.1) of the Consent Order addresses the specific requirements for the investigation of Los Alamos and Pueblo Canyons and selected tributaries, including Acid and DP Canyons. The Los Alamos/Pueblo Canyons watershed also includes Bayo, Guaje, Rendija, and Barrancas Canyons (collectively known as the North Canyons). The characterization and monitoring requirements for these canyons are included in Section IV.B.6 of this Consent Order. Regional aquifer wells in the Los Alamos/Pueblo Canyons watershed shall be installed according to the schedule listed in Section XII of this Consent Order. DP Canyon joins Los Alamos Canyon east of TA-21 at the east end of the Los Alamos Townsite. TAs-2, 41, and 43 are located within the Los Alamos Canyon flood plain in the vicinity of the Los Alamos Townsite. TAs-21, 73, and former TA-1, are located on the mesa, from west to east, north of Los Alamos Canyon. TAs-62, 61, 53, and 72 are located from west to east along the mesa (South Mesa) south of Los Alamos Canyon.

Pueblo Canyon is located on the north side of the Los Alamos Townsite and extends from the Jemez Mountains to its confluence with Los Alamos Canyon approximately 4.5 miles east of the Los Alamos Townsite at the intersection of State Road 502 and State Road 4. TAs-72, 73 and former TAs-1 and 45 are located from west to east along the mesa south of Pueblo Canyon. Acid Canyon joins Pueblo Canyon from the south opposite former TA-45. Facility TAs are not present on the north side of the Canyon.

Facility activities have been conducted in the vicinity of the Los Alamos Townsite and the Los Alamos/Pueblo Canyons watershed since the establishment of the Facility in the 1940s. Historical Facility operations resulted in releases of contaminants to Los Alamos and Pueblo Canyons and their tributaries. The documented discharges and releases were primarily in the form of contaminated wastewater generated during research and manufacturing operations on the surrounding mesas in the vicinity of the Los Alamos Townsite. In addition, discharges and releases of contaminants were documented in Los Alamos Canyon resulting from operations conducted at TAs-2 and 41. Releases also originate from debris generated during TA-1 demolition activities and deposited on hillsides located above Los Alamos Canyon, opposite the Townsite.

Facility operations that affected Pueblo Canyon include the release of contaminants to Pueblo Canyon via Acid Canyon from former TAs-1 and 45. Historical activities at TAs-21 and 53 and former TAs-1, 2, and 41 released contaminants into Los Alamos Canyon and its tributary side canyons (DP Canyon and the undesignated canyon located east of TA-53). Historical Facility operations released both hazardous constituents and radionuclides, which are not addressed under this Consent Order.

A work plan for the investigation of Los Alamos and Pueblo Canyons was approved by the Department in 1997. An addendum to the Los Alamos and Pueblo Canyons investigation work plan was submitted to and approved by the Department in 2002. In accordance with the approved investigation work plan and addendum, the Respondents have conducted investigations of contamination in Los Alamos and Pueblo Canyons and have prepared interim reports describing the results of these investigations. Informational copies of these reports were submitted to the Department in 1998 and 1999. These reports were not submitted to the Department for review or approval. Additional investigations have been conducted by the Respondents. A report on these investigations was submitted to the Department on April 30, 2004. In 2002, Respondents conducted

an Interim Action in the South Fork of Acid Canyon (a tributary of Pueblo Canyon) in accordance with an Interim Action Plan approved by the Department in 2002.

IV.B.1.b Los Alamos/Pueblo Canyons Investigation

IV.B.1.b.i Los Alamos/Pueblo Canyons Investigation Work Plan

The Respondents have submitted to the Department the Work Plan for Los Alamos and Pueblo Canyons, dated November 1995, and the addendum to the Work Plan, dated February 2002. The work plan and addendum were approved by the Department in June 1997 and May 2002, respectively. The Los Alamos and Pueblo Canyons Work Plan and addendum are incorporated herein by reference and made an enforceable part of this Consent Order. The Respondents state that they have completed implementation of the approved Work Plan and Work Plan addendum for Los Alamos and Pueblo Canyons. The Respondents shall report the results of sediment, biota, surface water and alluvial groundwater investigations to the Department for approval in the Los Alamos/Pueblo Canyons Investigation Report in accordance with the schedule in Section XII of this Consent Order. If, after review of the Investigation Report, the Department determines that the investigation is inadequate to fully characterize Los Alamos and Pueblo Canyons to determine the need for and scope of further corrective action, the Department will require the Respondents to submit a supplemental work plan. The supplemental work plan shall be prepared in accordance with Sections IX and XI.B of this Consent Order. If deemed necessary, the supplemental work plan shall address additional investigations of the sources of contamination and the nature and extent of contamination in sediments, surface water, and groundwater in Los Alamos and Pueblo Canyons.

The Respondents submitted a Groundwater Work Plan in December 2003, addressing the groundwater requirements listed below. The Respondents shall implement the requirements of the work plan approved by the Department pursuant to the procedures in Section III.M of this Consent Order. The Respondents shall submit an investigation report summarizing the results of the groundwater investigation in the format described in Section XI.C of this Consent Order.

IV.B.1.b.ii Los Alamos Canyon Intermediate Groundwater Well Installation

The Respondents submitted to the Department for review and written approval a Groundwater Work Plan in December 2003 that addresses the following intermediate groundwater well requirements. The Respondents shall implement the work requirements of the work plan approved by the Department pursuant to the procedures in Section III.M of this Consent Order.

1. One intermediate monitoring well shall be installed between LAO-4.5 and LAO-6

Pursuant to a supplemental work plan, if required, the Respondents shall install additional wells required by the Department pursuant to this Consent Order.

Based on the results of groundwater monitoring and sampling, the Department may require a supplemental work plan requiring additional monitoring wells in Los Alamos Canyon.

IV.B.1.b.iii Los Alamos/Pueblo Canyons Regional Groundwater Well Installation

The Respondents have conducted groundwater work in Pueblo Canyon pursuant to the Los Alamos Canyon and Pueblo Canyon Work Plan and addendum, approved by the Department in 1997 and 2002, respectively, and the Hydrogeologic Work Plan, approved by the Department in 1998. Respondents state that, pursuant to these approved plans, regional wells R-2, R-4, and R-5 were constructed that fulfill the regional well construction requirements for Pueblo Canyon set forth by the Department. The Respondents submitted a Groundwater Work Plan to the Department for review and written approval in December 2003. The Respondents shall implement the work requirements of the work plan approved by the Department pursuant to the procedures in Section III.M of this Consent Order.

1. The Respondents shall construct two monitoring wells associated with Los Alamos Canyon intersecting the regional aquifer as described in Section IV.A.3.e. One well shall be located in Los Alamos Canyon north of the undesignated canyon located east of TA-53. The other well shall be placed in a location suitable for obtaining background regional aquifer data.

2. Two wells intersecting the regional aquifer shall be located in Pueblo Canyon or on the mesa top east of Acid Canyon, in accordance with the Department-approved groundwater investigation work plan.

3. One well intersecting the regional aquifer shall be located immediately north of TA-73, in accordance with the Department-approved groundwater investigation work plan.

4. Pursuant to a supplemental work plan, if required, the Respondents shall install any other wells required by the Department pursuant to this Consent Order.

5. The Respondents shall investigate for the presence of intermediate perched groundwater during the drilling of the regional monitoring wells described in this section (IV.B.1.b.iii). The Respondents shall construct the regional wells to have the capability to monitor and sample intermediate perched groundwater, if present.

The Respondents shall submit an investigation report summarizing the results of the regional groundwater investigation in the format described in Section XI.C of this Consent Order.

IV.B.1.b.iv Los Alamos/Pueblo Canyons Groundwater Monitoring

The Respondents shall monitor and sample wells containing alluvial, intermediate, and regional groundwater in accordance with the Interim Plan approved by the Department under Section IV.A.3.b of this Consent Order that meets the requirements listed below, subject to the procedures of Section III.M of this Consent Order. Based on the results of the investigation reported pursuant to Section IV.B.1.b.iii, and after completing the installation of all additional monitoring wells in the Los Alamos/Pueblo Canyons watershed in accordance with the approved work plan, the Respondents shall submit to the Department for review and written approval a watershed-specific long-term groundwater monitoring plan for Los Alamos and Pueblo Canyons. If the Department has approved

alternative monitoring boundaries under Section IV.A.3.b, the Respondents shall submit to the Department for review and written approval a long-term groundwater monitoring plan for that specific area. Upon Department approval of the long-term monitoring plan ~~for the Los Alamos/Pueblo Canyons watershed~~, the requirements of the long-term monitoring plan shall apply and shall supersede the requirements of the Los Alamos and Pueblo Canyons watershed sections of the Interim Plan.

1. Groundwater samples for Los Alamos Canyon shall be collected from existing alluvial monitoring wells LAO-B, LAO-0.3, LAO-0.6, LAO-0.91, LAO-1.6(g), LAO-1.8, LLAO-1b, LLAO-3, LLAO-4, LLAO-5, LAO-1.2, LAO-2, LAO-3A, LAO-4.5C, LAO-5, LAO-6, LAO-6A, LAUZ-1, and LAUZ-2; New Mexico Highway Department wells MW-3, MW-5, MW-6, and MW-9, if accessible.

2. Alluvial groundwater samples for Los Alamos Canyon shall be submitted to a laboratory for analysis of general chemistry parameters as described in Section IX.B.2.i of this Consent Order, including PCBs, perchlorate, TAL metals, cyanide, molybdenum, tungsten, VOCs, SVOCs, and for any other analytes specified by the Department.

3. Groundwater samples shall be collected from alluvial monitoring wells PAO-1, PAO-2, PAO-3, PAO-4, and APCO-1, and from all newly installed alluvial wells in Pueblo Canyon.

4. Alluvial groundwater samples for Pueblo Canyon shall be submitted to a laboratory for analysis of general chemistry parameters as described in Section IX.B.2.i of this Consent Order, including perchlorate, TAL metals, cyanide, molybdenum, tungsten, and for other analytes specified by the Department.

5. Groundwater samples shall be collected from Los Alamos Canyon intermediate monitoring wells LADP-3, R-9i, LAOI(a)-1.1, and all wells installed in the future that intersect intermediate zone groundwater in Los Alamos Canyon.

6. Groundwater samples shall be collected from intermediate monitoring wells TW-1a, TW-2a, and POI-4 in Pueblo Canyon. TW-1a and TW-2a shall be plugged and abandoned according to the procedures in Section X.D of this Consent Order. Groundwater shall be monitored from TW-1a and TW-2a until the wells are properly abandoned.

7. Intermediate zone groundwater samples shall be submitted to a laboratory for analysis of general chemistry parameters as described in Section IX.B.2.i of this Consent Order, perchlorate, TAL metals, cyanide, molybdenum, tungsten, and for other analytes specified by the Department.

8. Groundwater samples shall be obtained from regional wells R-5, R-7, R-9, TW-3, and all regional wells installed in the future in Los Alamos Canyon. TW-3 shall be plugged and abandoned according to the procedures in Section X.D. Groundwater shall be monitored from TW-3 until the well is properly abandoned.

9. Groundwater samples shall be collected from Pueblo Canyon regional monitoring wells TW-1, TW-1a, TW-2, TW-2a, and TW-4. TW-1, TW-1a, TW-2, and TW-2a shall be plugged and abandoned according to the procedures described in Section X.D of this Consent Order. Groundwater shall be monitored from TW-1, TW-1a, TW-2, and TW-2a until the wells are properly abandoned.

10. Regional groundwater samples shall be submitted to a laboratory for analysis of general chemistry parameters as described in Section IX.B.2.i of this Consent Order, perchlorate, TAL metals, cyanide, molybdenum, tungsten, and for other analytes specified by the Department.

IV.B.1.b.v Los Alamos/Pueblo Canyons Investigation Report

The Respondents shall submit an investigation report to the Department for review and written approval that presents the results of the approved Los Alamos and Pueblo Canyon Work Plan and addendum, including field activities, summaries of the data collected, and recommendations and conclusions for Los Alamos Canyon. The investigation report shall also include the results of the Pueblo Canyon investigation. The combined Los Alamos and Pueblo Canyon investigation report shall not address intermediate and regional groundwater investigations and shall fulfill the requirements of this section and Section IV.B.1.b.iv. The investigation report shall be prepared in accordance with Section XI.C of this Consent Order and shall be submitted by the date specified in Section XII of this Consent Order.

The Respondents shall submit a well abandonment report for TW-1, TW-1a, TW-2, TW-2a, and TW-3 to the Department within thirty (30) days of completing the activity or as an appendix to the Los Alamos/Pueblo Canyon Investigation Report, if the well abandonment is performed in conjunction with field investigation activities.

Based on the results of the investigations conducted in the Los Alamos/Pueblo Canyon watershed, and after completing the installation of all additional monitoring wells in the Los Alamos/Pueblo Canyons watersheds as described in the approved work plan and in this section (IV.B), the Respondents shall submit to the Department for review and written approval watershed-specific long-term groundwater monitoring plans for Los Alamos and Pueblo Canyons. If the Department has approved alternative monitoring boundaries under Section IV.A.3.b, the Respondents shall submit to the Department for review and written approval a long-term groundwater monitoring plan for that specific area. Upon Department approval of the long-term monitoring plans ~~for the Los Alamos and Pueblo Canyon watersheds~~, the requirements of the long-term monitoring plan shall apply and shall supersede the requirements of the Los Alamos and Pueblo Canyon watersheds sections of the Interim Plan.

IV.B.2 Mortandad Canyon Watershed

IV.B.2.a Background

The Mortandad Canyon watershed is located in the central portion of the Facility and covers approximately ten square miles. Tribal lands of the Pueblo of San Ildefonso are directly adjacent to a

portion of the Facility's eastern boundary and encompass the eastern end of Mortandad Canyon. The Mortandad Canyon watershed contains several tributary canyons that have received contaminants released during Facility operations. The most prominent tributary canyons include Ten Site Canyon, "Pratt" Canyon, "Effluent" Canyon and Cañada del Buey. Although Cañada del Buey is located in the Mortandad Canyon watershed, its characterization is included in the "Work Plan for Sandia Canyon and Cañada del Buey" (LA UR-99-3610).

Current and former TAs located in the Mortandad Canyon watershed include TAs-3, 4, 5, 18, 35, 42, 46, 48, 50, 51, 52, 54, 55, and 59. The primary sources of contamination in this watershed include historic releases of contaminants from outfalls and spills at TA-35 and TA-50, including the Radioactive Liquid Waste Treatment facility at TA-50. RCRA constituents, including metals and VOCs, have historically been released into the canyons. Nitrates, perchlorate, molybdenum, manganese, and radionuclides, which are not addressed under this Consent Order, are some of the contaminants that have been detected in the Mortandad Canyon alluvial groundwater. In addition, nitrate, perchlorate, fluoride, and radionuclides, which are not addressed under this Consent Order, were detected in samples of intermediate zone groundwater during the drilling of regional aquifer well R-15 located east of the confluence of Mortandad and Ten Site Canyons. Perchlorate also was detected in core samples obtained from the vadose zone close to the top of the regional aquifer.

IV.B.2.b Mortandad Canyon Investigation

IV.B.2.b.i Mortandad Canyon Investigation Work Plan

The Respondents have submitted to the Department the Work Plan for Mortandad Canyon, dated September 1997. The Mortandad Canyon Work Plan was approved by the Department on December 12, 2002 and is incorporated herein by reference and made an enforceable part of this Consent Order. The Department determined that the scope of investigations specified in the Work Plan was inadequate to fully investigate Mortandad Canyon and issued a letter dated December 12, 2002, detailing the requirements for additional groundwater investigations. On August 30, 2003, the Respondents submitted to the Department for review and written approval a Groundwater Work Plan for Mortandad Canyon. This work plan was approved by the Department in February 2004. The Mortandad Canyon Work Plans address investigations of the sources of contamination, and the nature and extent of contamination in sediments, surface water, and groundwater in Mortandad Canyon. The Respondents shall implement the work requirements of the approved work plans.

IV.B.2.b.ii Mortandad Canyon Groundwater Monitoring

The Respondents shall monitor and sample Mortandad Canyon and Cañada del Buey wells containing alluvial, intermediate, and regional groundwater in accordance with the Interim Plan approved by the Department under Section IV.A.3.b, and that meets the requirements below subject to the procedures in Section III.M of this Consent Order. Based on the results of the investigations conducted in the Mortandad Canyon watershed, and after completing the installation of all additional monitoring wells in the Mortandad Canyon watershed as described in the approved work plans, the Respondents shall submit to the Department for review and written approval a watershed-specific long-term groundwater monitoring plan for Mortandad

Canyon and Cañada del Buey. If the Department has approved alternative monitoring boundaries under Section IV.A.3.b, the Respondents shall submit to the Department for review and written approval a long-term groundwater monitoring plan for that specific area. Upon Department approval of the long-term monitoring plan ~~for the Mortandad Canyon and Cañada del Buey watersheds~~, the requirements of the long-term monitoring plan shall apply and shall supersede the requirements of the Mortandad Canyon and Cañada del Buey watershed sections of the Interim Plan.

1. Groundwater samples shall be obtained from alluvial wells MCO-2, MCO-3, MCO-4B, MCO-5, MCO-6, MCO-6B, MCO-7, MCO-7.5, MT-4, TSWB-6, CDBO-1 through 9, and all alluvial wells installed in the future. Groundwater from MCO-2 and MCO-3 shall be monitored until the wells are properly plugged and abandoned. The MCO-2 and MCO-3 replacement wells shall be monitored once installed.

2. Groundwater samples shall be obtained from intermediate wells MCOBT-4.4 and all intermediate wells installed in the future.

3. Groundwater samples shall be obtained from regional wells R-15, TW-8, and all regional wells installed in the future. TW-8 shall be monitored until the well is properly plugged and abandoned. The TW-8 replacement well shall be monitored once installed.

4. Groundwater samples shall be collected from the alluvial, intermediate zone, and regional monitoring wells in Mortandad Canyon for submittal to a laboratory for analysis of general chemistry parameters as described in Section IX.B.2.i of this Consent Order, perchlorate, TAL metals, molybdenum, tungsten, cyanide, VOCs, SVOCs, and for other analytes specified by the Department.

IV.B.2.b.iii Mortandad Canyon Investigation Report

The Respondents shall submit to the Department for review and written approval an investigation report that presents the results of the field activities, summarizes the data collected, and presents the recommendations and conclusions for Mortandad Canyon. In addition, the Respondents shall submit to the Department for review and written approval an investigation report that presents the results of the field activities, summarizes the data collected, and presents the recommendations and conclusions for Cañada del Buey. The investigation reports for Mortandad Canyon and Cañada del Buey shall be prepared in accordance with Section XI.C of this Consent Order and shall be submitted by the dates specified in Section XII of this Consent Order.

Based on the results of the investigations conducted in the Mortandad Canyon watershed, and after completing the installation of all additional monitoring wells in the Mortandad Canyon watershed as described in accordance with the approved work plans, a Mortandad Canyon watershed-specific long-term groundwater monitoring plan, that includes Cañada del Buey, shall be submitted to the Department for review and written approval. If the Department has approved alternative monitoring boundaries under Section IV.A.3.b, the Respondents shall submit to the Department for review and written approval a long-term groundwater monitoring plan for that

specific area. Upon Department approval of the long-term monitoring plan ~~for the Mortandad Canyon watershed~~, the requirements of the long-term monitoring plans shall apply and shall supersede the requirements of the Mortandad Canyon watershed section of the Interim Plan.

IV.B.3 Water Canyon/Cañon de Valle Watershed

IV.B.3.a Background

The Water Canyon/Cañon de Valle watershed is located in the southern portion of the Facility and encompasses an area of approximately 19 square miles. Cañon de Valle, located on the western portion of the Pajarito Plateau, is the main tributary to Water Canyon. The heads of both canyon watersheds are located in the Sierra de Los Valles. The watershed supplies numerous springs, ephemeral and perennial surface water flow, and alluvial groundwater systems. Tributaries that may contribute contamination to Water Canyon include Indio, Fence, and Potrillo Canyons that join Water Canyon on the eastern side of the Facility. The TAs located within this watershed include TAs 9, 11, 14, 15, 16, 28, 36, 37, 39, 49, 67, 68, 70, and 71. This portion of the Facility has been used for weapons testing, explosives testing, and explosives production and has received effluent from outfalls containing explosive compounds, metals, and VOCs. Storm water runoff from firing sites, open burn/open detonation units, surface disposal sites, and other SWMUs and AOCs may have contributed to the contamination detected within the watershed. The contaminants detected in soil, rock, and sediment samples obtained from various locations within the watershed during previous investigations include barium and other RCRA metals, explosive compounds, VOCs, pesticides, and radionuclides, which are not addressed under this Consent Order. Contaminants detected in groundwater samples obtained from wells located within the watershed include barium, explosive compounds and their associated degradation products, and VOCs

IV.B.3.b Water Canyon/Cañon de Valle Investigation

IV.B.3.b.i Water Canyon/Cañon de Valle Investigation Work Plan

The Respondents shall submit to the Department for review and written approval a work plan for the investigation of contamination in Water Canyon and Cañon de Valle. The work plan shall meet the requirements of this section (IV.B.3.b), subject to the procedures in Section III.M of this Consent Order. The work plan shall incorporate proposed investigations in Potrillo and Fence Canyons and Ancho, Chaquehui, and Indio Canyons as described in Section IV.B.6.b.i of this Consent Order. The work plan shall be prepared in accordance with Sections IX and XI.B of this Consent Order, and shall be submitted by the date specified in Section XII of this Consent Order. The work plan shall address investigations of the sources of contamination, and the nature and extent of contamination in sediments, surface water, and groundwater in Water Canyon and Cañon de Valle.

IV.B.3.b.ii Water Canyon/Cañon de Valle Alluvial Groundwater Well Installation

Pursuant to Section IV.B.3.b.i and Section IV.A.3.e of this Consent Order, the Respondents shall submit to the Department for review and written approval a work plan for Water Canyon and Cañon de Valle that meets the following alluvial groundwater well requirements subject to the

procedures in Section III.M of this Consent Order. The Respondents shall implement the work requirements of the approved work plan.

1. The Beta Hole and all WCO wells shall be replaced with monitoring wells constructed in accordance with the requirements of Section X of this Consent Order. The Beta Hole and all existing WCO wells shall be abandoned after replacement in accordance with the requirements of Section X of this Consent Order.

2. Two alluvial aquifer wells shall be installed between well WCO-1 and the Water Canyon-Cañon de Valle confluence.

3. Three alluvial wells shall be installed at locations approved by the Department downstream from the active TA-16 operational areas in Cañon de Valle and its tributaries to assess extent of saturation in the alluvial aquifer system.

4. Three nested piezometers shall be installed at locations approved by the Department in the vicinity of the Burning Ground location.

5. Four nested piezometer sets shall be installed in the canyon alluvium located between SWSC Spring and monitoring well 16-2659.

6. Three nested and transected piezometer sets shall be installed to assess vertical and lateral groundwater flow directions in the middle portion of Water Cañon at a location where the canyon alluvium directly overlies the Cerro Toledo interval.

7. One alluvial aquifer well shall be installed in Water Canyon located between the mouths of Martin Spring Canyon and Cañon de Valle.

IV.B.3.b.iii Water Canyon/Cañon de Valle Regional Groundwater Well Installation

Pursuant to Section IV.B.3.b.i and Section III.M of this Consent Order, the Respondents shall submit a work plan to the Department for review and approval that meets the regional groundwater well requirements listed below. The Respondents shall implement the work requirements of the approved work plan.

1. Regional wells R-24, R-26, R-27, and R-29 shall be completed according to the schedule set forth in Section XII of this Consent Order, in the following locations:

    - R-24: North of Cañon de Valle, on the upthrown side of the Pajarito Fault
    - R-26: Upper Water Canyon, on the downthrown side of the Pajarito Fault
    - R-27: Water Canyon, at the confluence with Cañon de Valle
    - R-29: Lower Water Canyon, near the confluence with Potrillo Canyon.

2. The Respondents may prepare a plan to demonstrate to the Department that the water quality data from regional well R-25 are or will be valid and reliable. The plan shall be submitted to the Department within 90 days of the effective date of this Consent Order for Department

approval, subject to the procedures of Section III.M of this Consent Order. If the Department determines that R-25 does not or will not produce valid and reliable data, the Respondents shall properly abandon R-25 and replace it at a location approved by the Department.

IV.B.3.b.iv Water Canyon/Cañon de Valle Groundwater Monitoring

The Respondents shall monitor and sample wells containing alluvial, intermediate zone, and regional groundwater in accordance with the Interim Plan approved by the Department under Section IV.A.3.b, and, that meets the requirements below subject to the procedures in Section III.M. Such monitoring and sampling shall also be conducted in accordance with Section IX of this Consent Order. Based on the results of the investigation and after completing the installation of all additional monitoring wells in the Water Canyon/Cañon de Valle watersheds in accordance with this section (IV.B), subject to the procedures in Section III.M, the Respondents shall submit to the Department for review and written approval watershed-specific long-term groundwater monitoring plans for Water Canyon/Cañon de Valle. If the Department has approved alternative monitoring boundaries under Section IV.A.3.b, the Respondents shall submit to the Department for review and written approval a long-term groundwater monitoring plan for that specific area. Upon Department approval of the long-term monitoring plans ~~for the Water Canyon/Cañon de Valle watersheds~~, the requirements of the long-term monitoring plan shall apply and shall supersede the requirements of the Water Canyon/Cañon de Valle watersheds sections of the Interim Plan.

1. Groundwater samples shall be obtained from alluvial wells 16-2655, 16-2656, 16-2657, 16-2658, 16-2659, WCO-1, WCO-2, WCO-3, Beta Hole, and all alluvial wells installed in the future.

2. Groundwater samples shall be obtained from intermediate wells CdV-15-3, CdV-37-2, and all intermediate wells installed in the future.

3. Groundwater samples shall be obtained from regional wells CdV-15-3, CdV-37-2, and all regional wells installed in the future.

4. Groundwater samples shall be collected from the alluvial, intermediate, and regional monitoring wells in Water Canyon/Cañon de Valle for submittal to a laboratory for analysis of general chemistry parameters as described in Section IX.B.2.i of this Consent Order, perchlorate, TAL metals, ~~,~~ cyanide, molybdenum, tungsten, VOCs, SVOCs, explosive compounds, and for other analytes specified by the Department.

IV.B.3.b.v Water Canyon/Cañon de Valle Investigation Report

The Respondents shall submit to the Department for review and written approval an investigation report that presents the results of the field activities, summarizes the data collected, and recommendations and conclusions for Water Canyon/Cañon de Valle. The investigation report shall be prepared in accordance with Section XI.C of this Consent Order and shall be submitted by the date specified in Section XII of this Consent Order.

Based on the results of the investigations conducted in the Water Canyon/Cañon de Valle watershed and after completing the installation of all additional monitoring wells in the Water Canyon/Cañon de Valle watershed, a Water Canyon/Cañon de Valle watershed-specific long-term groundwater monitoring plan shall be submitted to the Department for review and written approval. If the Department has approved alternative monitoring boundaries under Section IV.A.3.b, the Respondents shall submit to the Department for review and written approval a long-term groundwater monitoring plan for that specific area.

IV.B.4 Pajarito Canyon Watershed

IV.B.4.a Background

The Pajarito Canyon watershed is located in the central portion of the Facility and is approximately 13 square miles in area. The head of the watershed is located in the Sierra de los Valles. Two major tributary canyons, Two Mile and Three Mile Canyons, intersect Pajarito Canyon on the Facility property. Facility-related contamination has been detected in water samples obtained from perennial and ephemeral streams, alluvial groundwater systems, and springs supplied by intermediate zone groundwater from the Bandelier Tuff. The TAs located within this watershed include TAs-3, 6, 7, 8, 9, 14, 15, 18, 22, 23, 27, 36, 40, 46, 50, 54, 55, 58, 59, 64, 65, 66, 67, and 69. The contaminant release history from approximately 379 SWMUs includes releases from outfalls, septic systems, spills, open detonations from firing sites, and MDAs.

IV.B.4.b Pajarito Canyon Investigation

IV.B.4.b.i Pajarito Canyon Investigation Work Plan

The Respondents have submitted to the Department the Work Plan for Pajarito Canyon, dated September 1998. The Work Plan for Pajarito Canyon is incorporated herein by reference and made an enforceable part of this Consent Order. The Respondents shall implement the work plan approved pursuant to the procedures in Section III.M of this Consent Order.

IV.B.4.b.ii Pajarito Canyon Alluvial Groundwater Well Installation

The Respondents shall install alluvial groundwater monitoring wells in Pajarito Canyon at the locations proposed in the work plan approved pursuant to the procedures in Section III.M of this Consent Order that meet the following requirements:

1. Proposed alluvial monitoring well 3MAO-2 shall be moved into reach TH1 East, located in the south fork of Three Mile Canyon, to investigate historic outfall discharges in the upper portion of the Three Mile Canyon sub-basin.

2. One alluvial monitoring well shall be installed in Two Mile Canyon upgradient from its confluence with Pajarito Canyon.

3. Well PCO-3 shall be redeveloped or, if required by the Department, replaced.

4. One alluvial monitoring well shall be installed in the vicinity of PCTH-5.

5. Four alluvial aquifer system piezometers, including one nested piezometer set, shall be installed in Pajarito Canyon above PCO-3, downstream from the drainages associated with TA-54.

IV.B.4.b.iii Pajarito Canyon Intermediate Groundwater Well Installation

The Respondents shall install intermediate groundwater wells in Pajarito Canyon at the locations in the approved work plan that meet both the requirements of Section IV.A.3.e of this Consent Order and the following requirements, subject to the procedures in Section III.M of this Consent Order. The Respondents shall implement the work requirements of the approved work plan.

1. Two nested piezometer sets shall be installed in the vicinity of well PCO-3 to assess the vertical gradients in the Guaje Pumice Bed and the Cerros del Rio Basalt.

2. One intermediate zone monitoring well shall be installed between the flood retention structure and proposed well PCAO-6.

3. Pursuant to the approved work plan, additional intermediate zone wells shall be installed, if required by the Department.

IV.B.4.b.iv Pajarito Canyon Regional Groundwater Well Installation

The Respondents shall install regional groundwater wells in Pajarito Canyon at the locations in the approved work plan that meet both the requirements of Section IV.A.3.e of this Consent Order and the following requirements, subject to the procedures in Section III.M of this Consent Order.

1. Regional aquifer wells R-17 and R-18 shall be installed in accordance with the schedule specified in Section XII of this Consent Order. R-17 shall be installed in Two Mile Canyon and R-18 shall be installed in Upper Pajarito Canyon.

2. Pursuant to the approved work plan, additional regional aquifer wells shall be installed, if required by the Department.

IV.B.4.b.v Pajarito Canyon Groundwater Monitoring

The Respondents shall monitor and sample all wells specified below containing alluvial, intermediate zone and regional groundwater in accordance with the Interim Plan approved by the Department under Section IV.A.3.b, and, that meets the requirements listed below subject to the procedures in Section III.M of this Consent Order. Such monitoring and sampling shall also be conducted in accordance with Section IX of this Consent Order. Based on the results of investigations and after completing the installation of all additional monitoring wells in the Pajarito Canyon watershed in accordance with this section (IV.B), subject to the procedures in Section III.M, the Respondents shall submit to the Department for review and written approval a watershed-specific long-term groundwater monitoring plan for Pajarito Canyon. If the Department has approved

alternative monitoring boundaries under Section IV.A.3.b, the Respondents shall submit to the Department for review and written approval a long-term groundwater monitoring plan for that specific area. Upon Department approval of the long-term monitoring plan ~~for the Pajarito Canyon watershed~~, the requirements of the long-term monitoring plan shall apply and shall supersede the requirements of the Pajarito Canyon watershed section of the Interim Plan.

1. Groundwater samples shall be obtained from alluvial wells BG-1, BG-4, 18-MW-5, 18-MW-7, 18-MW-8, 18-MW-9, 18-MW-10, 18-MW-11, 18-MW-12, 18-MW-16, 18-MW-17, 18-MW-18, PCO-1, PCO-2, PCO-3, and all alluvial wells installed in the future.

2. Groundwater samples shall be obtained from the intermediate zone of regional well R-19 and all intermediate zone wells installed in the future.

3. Groundwater samples shall be obtained from regional wells R-19, R-22, and all regional wells installed in the future.

4. Groundwater samples shall be collected from the alluvial, intermediate zone, and regional monitoring wells in Pajarito Canyon for submittal to a laboratory for analysis of general chemistry parameters as described in Section IX.B.2.i of this Consent Order, perchlorate, TAL metals, cyanide, VOCs, SVOCs, explosive compounds, and for other analytes specified by the Department.

IV.B.4.b.vi Pajarito Canyon Investigation Report

The Respondents shall submit to the Department for review and written approval an investigation report that presents the results of the field activities, summarizes the data collected, and the recommendations and conclusions for Pajarito Canyon. The investigation report shall be prepared in accordance with Section XI.C of this Consent Order and shall be submitted by the date specified in Section XII of this Consent Order.

Based on the results of the investigations conducted in the Pajarito Canyon watershed, and after completing the installation of all additional monitoring wells in the Pajarito Canyon watershed as described in Section IV.B, subject to the procedures in Section III.M of this Consent Order, the Respondents shall submit to the Department for review and written approval a watershed-specific long-term groundwater monitoring plan for Pajarito Canyon. If the Department has approved alternative monitoring boundaries under Section IV.A.3.b, the Respondents shall submit to the Department for review and written approval a long-term groundwater monitoring plan for that specific area. Upon Department approval of the long-term monitoring plan ~~for the Pajarito Canyon watershed~~, the requirements of the long-term monitoring plan shall apply and shall supersede the requirements of the Pajarito Canyon watershed sections of the Interim Plan.

IV.B.5 Sandia Canyon Watershed

IV.B.5.a Background

The Sandia Canyon watershed is approximately 5.5 square miles in area. The head of the canyon is located on the Pajarito Plateau at TA-3. Perennial stream flow and saturated alluvial aquifer conditions occur in the upper and middle portions of the canyon system because of sanitary wastewater and cooling tower discharges to the canyon from operating facilities. A wetland of approximately seven acres has developed as a result of the wastewater and cooling tower discharges in the upper portion of the canyon. PCBs have been detected in sediment samples obtained from the wetland area and mercury has been detected in surface water samples. The only known perennial spring in the watershed (Sandia Spring) is located in lower Sandia Canyon.

TAs located in the Sandia Canyon watershed include TAs 3, 20, 53, 60, 61, and 72 and include approximately 264 SWMUs and AOCs. The types of SWMUs and AOCs vary from industrial outfalls to open-detonation firing sites.

IV.B.5.b Sandia Canyon Investigation

IV.B.5.b.i Sandia Canyon Investigation Work Plan

The Respondents have submitted to the Department the Work Plan for Sandia Canyon and Cañada del Buey, dated September 1999. The Work Plan for Sandia Canyon and Cañada del Buey is incorporated herein by reference and made an enforceable part of this Consent Order. The Department issued a Request for Supplemental Information (RSI) on May 12, 2003. The Respondents submitted a response to the RSI to the Department for approval on August 27, 2003. The Respondents shall implement the work plan approved pursuant to the procedures in Section III.M of this Consent Order and any additional requirements in the approved response to the RSI, and will report the results of the investigation in the Sandia Canyon Investigation Report.

IV.B.5.b.ii Sandia Canyon Groundwater Well Installation

The Respondents shall install groundwater monitoring wells in Sandia Canyon at the locations proposed in the work plan and RSI Response approved pursuant to the procedures in Section III.M of this Consent Order, and that meet the requirements of Section IV.A.3.e of this Consent Order and the following requirements:

1. Four piezometers shall be installed in the vicinity of the alluvial aquifer monitoring wells listed in the work plan. The piezometers shall include a minimum of one nested piezometer set near well SCAO-1 and also one nested piezometer set in the vicinity of SCAO-3 if groundwater is determined to be present.

2. One intermediate aquifer well shall be installed in the vicinity of regional aquifer well R-12.

3. Regional aquifer well R-10 shall be installed in Upper Sandia Canyon and R-11 shall be installed in Middle Sandia Canyon (below the break in slope) and according to the schedule set forth in Section XII of this Consent Order.

4. Three monitoring wells shall be installed in Cañada del Buey upgradient of CDBO-6 to investigate the source of alluvial saturation. The borings shall be advanced to the depth of the vapor-phase notch (horizontal zone of weathering between units Qbt 1v and Qbt 1g of the Bandelier Tuff.

5. Four monitoring wells shall be installed between wells CDBO-6 and CDBO-7 to identify the boundaries of alluvial saturation.

IV.B.5.b.iii Sandia Canyon Groundwater Monitoring

The Respondents shall monitor and sample all wells specified below containing alluvial, intermediate zone and regional groundwater in accordance with the Interim Plan approved by the Department under Section IV.A.3.b, and that meets the requirements listed below, subject to the procedures of Section III.M of this Consent Order. Such monitoring and sampling shall also be conducted in accordance with Section IX of this Consent Order. Based on the results of the investigations and after completing the installation of all additional monitoring wells in the Sandia Canyon watershed as described in this section (IV.B), subject to the procedures in Section III.M of this Consent Order, the Respondents shall submit to the Department for review and written approval a watershed-specific long-term groundwater monitoring plan for Sandia Canyon. If the Department has approved alternative monitoring boundaries under Section IV.A.3.b, the Respondents shall submit to the Department for review and written approval a long-term groundwater monitoring plan for that specific area. Upon Department approval of the long-term monitoring plan ~~for the Sandia Canyon watershed~~, the requirements of the long-term monitoring plan shall apply and shall supersede the requirements of the Sandia Canyon watershed section of the Interim Plan.

1. Groundwater samples shall be obtained from wells SCO-1, SCO-2, R-12, and all wells installed in the future.

2. Groundwater samples shall be collected from all monitoring wells in Sandia Canyon for submittal to a laboratory for analysis of general chemistry parameters as described in Section IX.B.2.i of this Consent Order, perchlorate, TAL metals, cyanide, molybdenum, tungsten, VOCs, SVOCs, explosive compounds, and for other analytes specified by the Department. In addition, groundwater samples from the alluvial monitoring wells shall be analyzed for PCBs.

IV.B.5.b.iv Sandia Canyon Investigation Report

The Respondents shall submit to the Department for review and written approval an investigation report that presents the results of the field activities, summarizes the data collected, and recommendations and conclusions for Sandia Canyon. The investigation report shall be prepared in accordance with Section XI.C of this Consent Order and shall be submitted by the date specified in

Section XII of this Consent Order. Investigations conducted in Cañada del Buey shall be reported separately from the Sandia Canyon investigations pursuant to Section IV.B.2.b.iii of this Consent Order.

Based on the results of the investigations conducted in the Sandia Canyon watershed, and after completing the installation of all additional monitoring wells in the Sandia Canyon watershed as described in Section IV.B, subject to the procedures in Section III.M of this Consent Order, the Respondents shall submit to the Department for review and written approval a Sandia Canyon watershed-specific long-term groundwater monitoring plan. If the Department has approved alternative monitoring boundaries under Section IV.A.3.b, the Respondents shall submit to the Department for review and written approval a long-term groundwater monitoring plan for that specific area. Upon Department approval of the long-term monitoring plan ~~for the Sandia Canyon watershed~~, the requirements of the long-term monitoring plan shall apply and shall supersede the requirements of the Sandia Canyon watershed section of the Interim Plan.

IV.B.6 Other Canyons: Ancho, Chaquehui, Indio, Potrillo, Fence, and North Canyons (Bayo, Guaje, Barrancas, and Rendija)

IV.B.6.a Background

Ancho Canyon is located in the southern portion of the Facility and is approximately seven square miles in area. During monsoon summer rains, large floods have damaged roads and buildings within the floodplain. The Ancho Canyon watershed is located entirely within TAs 33, 39, 49, and 70. It contains approximately 33 SWMUs. Contaminants that have been detected in sediments, surface water, or shallow groundwater during previous investigations conducted in the watershed include mercury and other metals, explosive compounds, organic constituents, and radionuclides, which are not addressed under this Consent Order.

The Chaquehui Canyon watershed is located in the southeast portion of the Facility at TA-33. There are approximately 61 SWMUs and AOCs in the watershed that vary from inactive industrial outfalls to MDAs. Surface-water flow is ephemeral; however, two springs are present along the south-facing wall of the main-drainage. Contaminants above background levels have been detected in historical samples of sediments and surface water obtained in the canyon.

Indio Canyon, a south-entering sub-basin to Water Canyon, originates on Facility property and extends for about three miles to its confluence with Water Canyon. The drainage basin is located in TA-39. Contaminants above background levels have been detected in sediments and surface water samples obtained from the canyon.

Potrillo and Fence Canyons are part of the Water Canyon Watershed. The confluence of these two canyons is near State Road 4. TAs 15, 36, 68, and 71 are located within these canyons. There are approximately 53 SWMUs within the watershed. The SWMUs vary from inactive septic tanks to open-detonation firing sites. Contaminants above background levels have been detected in sediments and surface water samples obtained from the canyons.

Bayo, Guaje, Barrancas, and Rendija Canyons are part of the Los Alamos Canyon watershed. Rendija and Barrancas Canyons terminate at Guaje Canyon from the south. Guaje Canyon terminates at Los Alamos Canyon approximately one mile upstream of the Rio Grande. The only active TA in the canyons is TA-74, a portion of which is located in Bayo and Barrancas Canyons. There are approximately 18 SWMUs and AOCs in these drainages. These SWMUs and AOCs are primarily related to mortar impact areas, firing ranges, and golf course effluent discharges.

Surface-water flow in upper Guaje Canyon is perennial and extends for about three miles. In 1996, two shallow test holes were drilled approximately three miles east of the perennial flow between the Los Alamos and Guaje faults. Each borehole penetrated saturation from near ground surface to total depth (23 ft and 103 ft below ground surface, respectively). Regional aquifer water-supply wells in Guaje Canyon were first installed in the early 1950s. In recent years there have been additional replacement wells drilled. The depths to water at these wells vary depending on their location. Depth to water in the lower portion of the canyon tends to be shallow (100-200 ft and was artesian prior to early 1950s), while water levels in the upper portion near the Rendija Canyon confluence have water-table depths ranging from 400 to 500 ft bgs.

Surface-water flow in Rendija and Barrancas Canyons is ephemeral and normally flows only during the summer monsoon season

Contaminant sources are primarily associated with upper Rendija Canyon. The results of sampling conducted in these canyons have periodically detected metals, organics, and radionuclides, which are not addressed under this Consent Order.

IV.B.6.b Investigations for the Other Canyons

IV.B.6.b.i Investigation Work Plans for the Other Canyons

The Respondents shall submit to the Department for review and written approval, pursuant to the procedures in Section III.M of this Consent Order, a work plan for the investigation of contamination in Ancho, Chaquehui, and Indio Canyons that meets the requirements of this section (IV.B). The work plan shall be incorporated into the Water Canyon/Cañon de Valle work plan described in Section IV.B.3.b.i. The work plan shall be prepared in accordance with Sections IX and XI.B of this Consent Order, and shall be submitted by the date specified in Section XII of this Consent Order. The work plan shall address investigations of the sources of contamination, and the nature and extent of contamination in sediments, surface water, and groundwater in Ancho, Chaquehui, and Indio Canyons. Upon Department approval, the Respondents shall implement the work plan. Upon Department approval, the work plan shall be incorporated herein by reference and become an enforceable part of this Consent Order.

The Respondents shall submit to the Department for review and written approval, pursuant to the procedures in Section III.M of this Consent Order, a work plan for the investigation of contamination in Potrillo and Fence Canyons that meets the requirements of this section (IV.B.). The work plan shall be incorporated into the Water Canyon/Cañon de Valle work plan described in Section IV.B.3.b.i. The work plan shall be prepared in accordance with Sections IX and XI.B of this Consent

Order, and shall be submitted by the date specified in Section XII of this Consent Order. The work plan shall address investigations of the sources of contamination, and the nature and extent of contamination in sediments, surface water, and groundwater in Potrillo and Fence Canyons. Upon Department approval, the Respondents shall implement the work plan. Upon Department approval, the work plan shall be incorporated herein by reference and become an enforceable part of this Consent Order.

The Respondents have submitted to the Department the Work Plan for the North Canyons, dated September 2001. The North Canyons Work Plan is incorporated herein by reference and made an enforceable part of this Consent Order upon approval by the Department pursuant to the procedures in Section III.M of this Consent Order. The Respondents shall implement the approved work plan.

IV.B.6.b.ii Groundwater Well Installation for the Other Canyons

Pursuant to Section IV.B.6.b.i and procedures in Section III.M of this Consent Order, the Respondents shall submit to the Department for review and written approval a work plan that meets the requirements listed below.

1. One alluvial monitoring well shall be installed down gradient of MDA Y at TA-39.

IV.B.6.b.iii Groundwater Monitoring for the Other Canyons

The Respondents shall monitor and sample wells specified below containing alluvial, intermediate, and regional groundwater in accordance with the Interim Plan approved by the Department under Section IV.A.3.b, and that meets the requirements listed below, subject to the procedures in Section III.M of this Consent Order. Such monitoring and sampling shall also be conducted in accordance with Section IX of this Consent Order. Based on the results of the investigation and after completing the installation of all additional monitoring wells in the other canyons watersheds in accordance with this section (IV.B), subject to the procedures in Section III.M, the Respondents shall submit to the Department for review and written approval watershed-specific long-term groundwater monitoring plans for the other canyons. If the Department has approved alternative monitoring boundaries under Section IV.A.3.b, the Respondents shall submit to the Department for review and written approval a long-term groundwater monitoring plan for that specific area. Upon Department approval of the long-term monitoring plans ~~for the other canyons watersheds~~, the requirements of the long-term monitoring plans shall apply and shall supersede the requirements of the other canyons watersheds sections of the Interim Plan.

1. Groundwater samples shall be obtained from Ancho Canyon intermediate and regional monitoring wells DT-5a, DT-9, DT-10, R-31, and all monitoring wells installed in the future.

2. Groundwater samples shall be collected from the monitoring wells for submittal to a laboratory for analysis of general chemistry parameters as described in Section IX.B.2.i of this Consent Order, perchlorate, TAL metals, cyanide, VOCs, SVOCs, explosive compounds, and for other analytes specified by the Department.

IV.B.6.b.iv Investigation Reports for the Other Canyons

The Respondents shall submit to the Department for review and written approval an investigation report that presents the results of the field activities, summarizes the data collected, and the recommendations and conclusions for Ancho, Chaquehui, and Indio Canyons. The investigation report shall be prepared in accordance with Section XI.C of this Consent Order and shall be submitted by the date specified in Section XII of this Consent Order.

The Respondents shall submit to the Department for review and written approval an investigation report that presents the results of the field activities, summarizes the data collected, and the recommendations and conclusions for Potrillo and Fence Canyons. The investigation report shall be prepared in accordance with Section XI.C of this Consent Order and shall be submitted by the date specified in Section XII of this Consent Order.

The Respondents shall submit to the Department for review and written approval an investigation report that presents the results of the field activities, summarizes the data collected, and the recommendations and conclusions for the North Canyons. The investigation report shall be prepared in accordance with Section XI.C of this Consent Order and shall be submitted by the date specified in Section XII of this Consent Order.

Based on the results of the investigations conducted in the canyons described in this Section (IV.B.6.b.iv), and after completing the installation of all additional monitoring wells in the Other Canyon watersheds as described in Section IV.B, subject to the procedures in Section III.M of this Consent Order, the Respondents shall submit to the Department for review and written approval watershed-specific long-term groundwater monitoring plans for the other canyons. If the Department has approved alternative monitoring boundaries under Section IV.A.3.b, the Respondents shall submit to the Department for review and written approval a long-term groundwater monitoring plan for that specific area. The plans shall include the specifics for conducting long-term groundwater sampling in the subject canyon watersheds or specific areas, and shall replace the Interim Plans for monitoring ~~in those canyons~~. Upon Department approval of the long-term monitoring plans ~~for the other canyons watersheds~~, the requirements of the long-term monitoring plan shall apply and shall supersede the requirements of the other canyons watersheds sections of the Interim Plan. Potrillo and Fence Canyons shall be included in the Water Canyon/Cañon de Valle watershed-specific long-term groundwater monitoring work plan required in Section IV.B.3.b.v.

IV.C TECHNICAL AREA INVESTIGATIONS

IV.C.1 Technical Area 54

IV.C.1.a Background

TA-54 is located at the eastern end of Mesita del Buey on the east side of the Facility. Mesita del Buey trends southeast-northwest and is bounded to the south by Pajarito Canyon and to the north by Cañada del Buey. Hazardous wastes, and mixed wastes, as well as radioactive wastes, which are not addressed under this Consent Order, have been stored at TA-54 from the 1950s to the present. TA-54 includes four MDAs designated MDA G, H, J, and L; a waste characterization, container storage,

XI.C.14.b Boring/Test Pit Logs and Well Construction Diagrams

An appendix shall provide boring logs, test pit logs, or other excavation logs, and well construction details. In addition, a key to symbols and a soil or rock classification system shall be included in this appendix. Geophysical logs shall be provided in a separate section of this appendix.

XI.C.14.c Analytical Program

An appendix shall discuss the analytical methods, a summary of data quality objectives, and the data quality review procedures. A summary of data quality exceptions and their effect on the acceptability of the field and laboratory analytical data with regard to the investigation and the site status shall be included in this appendix along with references to the case narratives provided in the laboratory reports.

XI.C.14.d Analytical Reports

An appendix shall provide the contract laboratory final analytical data reports generated for the investigation. The reports shall include all chain-of-custody records and Level II QA/QC results provided by the laboratory. The final laboratory reports and data tables shall be provided electronically in a format approved by the Department. Paper copies (or electronically scanned in PDF format) of all chain-of-custody records shall be provided with the reports.

XI.C.14.e Other Appendices

Other appendices containing additional information shall be included as required by the Department or as otherwise appropriate.

XI.D PERIODIC MONITORING REPORT

The Respondents shall use the following guidance for preparing periodic monitoring reports. The reports shall present the reporting of periodic groundwater, surface water, vapor, and remediation system monitoring at the Facility. The following sections provide a general outline for monitoring reports, and also provide the minimum requirements for reporting for specific Facility sites, watersheds, and regional monitoring. All data collected during each monitoring and sampling event in the reporting period shall be included in the reports. In general, interpretation of data shall be presented only in the background, conclusions, and recommendations sections of the reports. The other text sections of the reports shall be reserved for presentation of facts and data without interpretation or qualifications.

XI.D.1 Title Page

The title page shall include the type of document; Facility name; TA designation; SWMU or AOC name, site, watershed, and any other unit name; and the submittal date. A signature block providing spaces for the name and title of the responsible DOE and University of California (or co-operator) representative shall be provided on the title page in accordance with 20.4.1.900 NMAC incorporating 40 C.F.R. 270.11(d)(1).

XI.D.2 Executive Summary (Abstract)

The executive summary or abstract shall provide a brief summary of the purpose, scope, and results of the monitoring conducted at the subject site during the reporting period. The watershed or other designated boundary description, SWMU, AOC and site name, location, and TA designation shall be included in the executive summary. In addition, this section shall include a brief summary of conclusions based on the monitoring data collected.

XI.D.3 Table of Contents

The table of contents shall list all text sections, subsections, tables, figures, and appendices or attachments included in the report. The corresponding page numbers for the titles of each section of the report shall be included in the table of contents.

XI.D.4 Introduction

The introduction section shall include the Facility name, TA designation, unit location, and unit status (e.g. closed, corrective action). General information on the site usage and status shall be included in this section. A brief description of the purpose of the monitoring, type of monitoring conducted, and the type of results presented in the report also shall be provided in this section.

XI.D.5 Scope of Activities

A section on the scope of activities shall briefly describe all activities performed during the monitoring event or reporting period including field data collection, analytical testing, remediation system monitoring, if applicable, and purge/decontamination water storage and disposal.

XI.D.6 Regulatory Criteria

A section on regulatory criteria shall provide information regarding applicable cleanup standards, risk-based screening levels and risk-based cleanup goals for the subject site. A separate table summarizing the applicable screening levels or standards or inclusion of the applicable cleanup standards or screening levels in the data tables can be substituted for this section. The appropriate cleanup or screening levels for each site shall be included, if site-specific levels have been established at separate sites. Risk-based evaluation procedures, if used to calculate cleanup or screening levels, must either be included as an attachment or referenced. The specific document and page numbers must be included for all referenced materials.

XI.D.7 Monitoring Results

A section shall provide a summary of the results of monitoring conducted at the site. This section shall include the dates and times that monitoring was conducted, the measured depths to groundwater, directions of groundwater flow, field air and water quality measurements, contaminant surveys, static pressures, field measurements, and a comparison to previous monitoring results. Field observations or conditions that may influence the results of monitoring shall be reported in this section. Tables summarizing vapor-monitoring parameters, groundwater elevations, depths to