Permit RECEIVED ENTERED

DEC - 2

NMED
Hazardous Waste Bureau

NEW MEXICO
ENVIRONMENT DEPARTMENT

Harold Runnels Building
1190 South St. Francis Drive (87505)
P.O. Box 5469, Santa Fe, NM 87502-5469
Phone (505) 827-0187 Fax (505) 827-0160
www.nmenv.state.nm.us

SUSANA MARTINEZ
Governor
JOHN A. SANCHEZ
Lieutenant Governor

RYAN FLYNN
Cabinet Secretary
BUTCH TONGATE
Deputy Secretary

Certified Mail - Return Receipt Requested

November 24, 2014

Ms. Kimberly Davis-Lebak, Manager
U.S. DOE National Nuclear Security Administration
Los Alamos Site Office (NA-00-LA)
3747 West Jemez Road
Los Alamos, NM 87544

Ms. Alison Dories, Associate Director
Environment, Safety, Health and
Quality MS K491
Los Alamos National Security, LLC
P.O. Box 1663
Los Alamos, NM 87545

Re: Los Alamos National Laboratory, Minor, Individual Permit; SIC 9711; NPDES Compliance Evaluation Inspection; NM0030759; August 25-28, 2014 and September 12, 2014

Dear Ms. Davis-Lebak:

Enclosed please find a copy of the report and check list for the referenced inspection that the New Mexico Environment Department (NMED) conducted at your facility on behalf of the U.S. Environmental Protection Agency (USEPA). This inspection report will be sent to the USEPA in Dallas for their review. These inspections are used by USEPA to determine compliance with the National Pollutant Discharge Elimination System (NPDES) permitting program in accordance with requirements of the federal Clean Water Act.

Introduction, treatment scheme, and problems noted during this inspection are discussed in the "Further Explanations" section of the inspection report.

You are encouraged to review the inspection report, required to correct any problems noted during the inspection, and advised to modify your operational and/or administrative procedures, as appropriate. If you have comments on or concerns with the basis for the findings in the NMED inspection report, please contact us (see the address below) in writing within 30 days from the date of this letter. Further, you are encouraged to notify in writing both the USEPA and NMED regarding modifications and compliance schedules at the addresses below:

Racquel Douglas
US Environmental Protection Agency, Region VI
Enforcement Branch (6EN-WM)
1445 Ross Avenue
Dallas, Texas 75202-2733

Bruce Yurdin
New Mexico Environment Department
Surface Water Quality Bureau
Point Source Regulation Section
P.O. Box 5469
Santa Fe, New Mexico 87502

If you have any questions about this inspection report, please contact Sarah Holcomb at 505-827-2798 or at sarah.holcomb@state.nm.us.

37301

Sincerely,

Bruce J. Yurdin
Program Manager
Point Source Regulation Section
Surface Water Quality Bureau

cc: Racquel Douglas, USEPA (6EN-AS), mailed CD
Carol Peters-Wagnon, USEPA (6EN-WM), mailed CD
Everett Spencer, USEPA (6EN-WM), mailed CD
Brent Larsen, USEPA (6WQ-PP), mailed CD
Gladys Gooden-Jackson, USEPA (6EN), mailed CD
NMED District 2, Bob Italiano, mailed CD
John Kieling, Bureau Chief, NMED Hazardous Waste Bureau, mailed CD
Dave Cobrain, Program Manager, NMED Hazardous Waste Bureau, mailed CD
Don Carlson, NMED DOE Oversight Bureau, mailed CD
Courtney Perkins, NMED DOE Oversight Bureau
Michael Brandt, Associate Director, LANS LLC, mailed CD
David McInroy, LANS, LLC, mailed CD
Steve Veenis, LANS, LLC, mailed CD
David Rhodes, USDOE, mailed CD
Karen Armijo, USDOE, mailed CD
Gene Turner, USDOE, mailed CD
Tony Grieggs, LANS, LLC, mailed CD
Mike Saladen, LANS LLC, mailed CD
Terrill Lemke, LANS LLC, mailed CD

EPA

Form Approved
OMB No. 2040-0003
Approval Expires 7-31-85

NPDES Compliance Inspection Report

Section A: National Data System Coding

1	2	3	11	12	17	18	19	20
Transaction Code		NPDES		yr/mo/day		Inspec. Type	Inspector	Fac Type
N	5	NM0003075	9	140828	8	C	S	2

Remarks: INDIVIDUAL STORMWATER

67	69	70	71	72	73	74	75	80
Inspection Work Days		Facility Evaluation Rating	BI	QA	Reserved			
		2	N	N				

Section B: Facility Data

Name and Location of Facility Inspected *(For industrial users discharging to POTW, also include POTW name and NPDES permit number)*
Los Alamos National Laboratory (LANL), Los Alamos County, New Mexico. LANL is jointly operated by the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA), Los Alamos Site Office (LASO) and Los Alamos National Security, LLC (LANS).

Entry Time /Date
0900 hours / 8-25-2014

Permit Effective Date
11-1-2010

Exit Time/Date
1630 hours / 9-12-2014

Permit Expiration Date
3-31-2014

Name(s) of On-Site Representative(s)/Title(s)/Phone and Fax Number(s)
Kate Lynnes, LANS
Jeff Walterscheid, LANS
Armand Groffman, LANS
Thaddeus Kostrubala, LANS
Dave McInroy, LANS EP
Karen Armijo, EPO/CONTR-JGMS, NNSA/DOE
Joe English, LANS

Other Facility Data
SIC 9711, 9661, 9611

Name, Address of Responsible Official/Title/Phone and Fax Number
Ms. Kimberly Davis-Lebak, Manager
U.S. DOE National Nuclear Security Administration
Los Alamos Site Office (NA-00-LA)
3747 West Jemez Road
Los Alamos, NM 87544

Ms. Alison Dories, Associate Director
Environment, Safety, Health and Quality MS K491
Los Alamos National Security, LLC
P.O. Box 1663, Los Alamos, NM 87545

Contacted: Yes [ ] No [*]

Section C: Areas Evaluated During Inspection

(S = Satisfactory, M = Marginal, U = Unsatisfactory, N = Not Evaluated)

U	Permit	N	Flow Measurement	M	Operations & Maintenance	N	CSO/SSO
U	Records/Reports	U	Self-Monitoring Program	N	Sludge Handling/Disposal	N	Pollution Prevention
M	Facility Site Review	N	Compliance Schedules	N	Pretreatment	N	Multimedia
U	Effluent/Receiving Waters	M	Laboratory	U	Storm Water	N	Other:

Section D: Summary of Findings/Comments (Attach additional sheets if necessary)

1. **The NMED Inspectors arrived and conducted an entrance interview with LANS, LLC and U.S. DOE personnel on August 25, 2014 at the LANL Pueblo Complex at 9:00am. Introductions were made, credentials were presented and the purpose of the inspection was discussed. Pre-selected sites were arranged by LANS, LLC personnel into a site tour based on site access requirements and were visited over the course of the next three and a half days. Two sites could not be accessed due to scheduling during this first week; consequently a second site visit was arranged to visit two additional sites on September 12, 2014. An exit interview was conducted with both LANS, LLC and U.S. DOE personnel on August 28, 2014 at the LANL Pueblo Complex in which preliminary findings of the inspection were discussed.**
2. **Please see the report for further information.**

Name(s) and Signature(s) of Inspector(s)	Agency/Office/Telephone/Fax	Date
Sarah Holcomb Sarah Holcomb	505-827-2798	November 24, 2014
Signature of Management QA Reviewer	**Agency/Office/Phone and Fax Numbers**	**Date**
Bruce Yurdin	505-827-2795	11/24/2014

EPA Form 3560-3 (Rev. 9-94) Previous editions are obsolete.

LOS ALAMOS NATIONAL LABORATORY – INDIVIDUAL STORMWATER PERMIT	PERMIT NO. NM0030759

SECTION A - PERMIT VERIFICATION

PERMIT SATISFACTORILY ADDRESSES OBSERVATIONS ☐ S ☐ M ☒ U ☐ NA (*FURTHER EXPLANATION ATTACHED YES*)
DETAILS: **Permit is administratively continued. Site monitoring areas do not appear to be representative of discharges from these Sites.**

1. CORRECT NAME AND MAILING ADDRESS OF PERMITTEE	☒ Y ☐ N ☐ NA
2. NOTIFICATION GIVEN TO EPA/STATE OF NEW DIFFERENT OR INCREASED DISCHARGES	☐ Y ☒ N ☐ NA
3. NUMBER AND LOCATION OF DISCHARGE POINTS AS DESCRIBED IN PERMIT	☒ Y ☐ N ☐ NA
4. ALL DISCHARGES ARE PERMITTED	☐ Y ☒ N ☐ NA

SECTION B - RECORDKEEPING AND REPORTING EVALUATION

RECORDS AND REPORTS MAINTAINED AS REQUIRED BY PERMIT. ☐ S ☐ M ☒ U ☐ NA (*FURTHER EXPLANATION ATTACHED YES*)
DETAILS:

1. ANALYTICAL RESULTS CONSISTENT WITH DATA REPORTED ON DMRs.	☒Y ☐ N ☐ NA
2. SAMPLING AND ANALYSES DATA ADEQUATE AND INCLUDE.	☒S ☐ M ☐ U ☐ NA
a) DATES, TIME(S) AND LOCATION(S) OF SAMPLING	☒ Y ☐ N ☐ NA
b) NAME OF INDIVIDUAL PERFORMING SAMPLING	☒ Y ☐ N ☐ NA
c) ANALYTICAL METHODS AND TECHNIQUES.	☒ Y ☐ N ☐ NA
d) RESULTS OF ANALYSES AND CALIBRATIONS.	☒ Y ☐ N ☐ NA
e) DATES AND TIMES OF ANALYSES.	☒ Y ☐ N ☐ NA
f) NAME OF PERSON(S) PERFORMING ANALYSES.	☒ Y ☐ N ☐ NA
3. LABORATORY EQUIPMENT CALIBRATION AND MAINTENANCE RECORDS ADEQUATE.	☒ S ☐ M ☐ U ☐ NA
4. PLANT RECORDS INCLUDE SCHEDULES, DATES OF EQUIPMENT MAINTENANCE AND REPAIR.	☒ S ☐ M ☐ U ☐ NA
5. EFFLUENT LOADINGS CALCULATED USING DAILY EFFLUENT FLOW AND DAILY ANALYTICAL DATA.	☐ Y ☐ N ☒ NA

SECTION C - OPERATIONS AND MAINTENANCE

TREATMENT FACILITY PROPERLY OPERATED AND MAINTAINED. ☐ S ☒ M ☐ U ☐ NA *(FURTHER EXPLANATION ATTACHED YES)*
DETAILS:

1. TREATMENT UNITS PROPERLY OPERATED.	☒ S ☐ M ☐ U ☐ NA
2. TREATMENT UNITS PROPERLY MAINTAINED.	☒ S ☐ M ☐U ☐ NA
3. STANDBY POWER OR OTHER EQUIVALENT PROVIDED.	☐ S ☐ M ☐ U ☒ NA
4. ADEQUATE ALARM SYSTEM FOR POWER OR EQUIPMENT FAILURES AVAILABLE.	☐ S ☐ M ☐ U ☒ NA
5. ALL NEEDED TREATMENT UNITS IN SERVICE **Additional/Enhanced Control Measures needed for 78 SMAs.**	☐ S ☒ M ☐ U ☐ NA
6. ADEQUATE NUMBER OF QUALIFIED OPERATORS PROVIDED.	☐ S ☐ M ☐U ☒ NA
7. SPARE PARTS AND SUPPLIES INVENTORY MAINTAINED.	☒ S ☐ M ☐ U ☐ NA
8. OPERATION AND MAINTENANCE MANUAL AVAILABLE.	☒ Y ☐ N ☐ NA
STANDARD OPERATING PROCEDURES AND SCHEDULES ESTABLISHED.	☒ Y ☐ N ☐ NA
PROCEDURES FOR EMERGENCY TREATMENT CONTROL ESTABLISHED.	☐Y ☒ N ☐ NA

SECTION C - OPERATIONS AND MAINTENANCE (CONT'D)

9. HAVE BYPASSES/OVERFLOWS OCCURRED AT THE PLANT OR IN THE COLLECTION SYSTEM IN THE LAST YEAR? ☐ Y ☒ N ☐ NA
IF SO, HAS THE REGULATORY AGENCY BEEN NOTIFIED? ☐ Y ☐ N ☒ NA
HAS CORRECTIVE ACTION BEEN TAKEN TO PREVENT ADDITIONAL BYPASSES/OVERFLOWS? ☐ Y ☐ N ☒ NA

10. HAVE ANY HYDRAULIC OVERLOADS OCCURRED AT THE TREATMENT PLANT? ☐ Y ☐ N ☒ NA
IF SO, DID PERMIT VIOLATIONS OCCUR AS A RESULT? ☐ Y ☐ N ☒ NA

SECTION D - SELF-MONITORING

PERMITTEE SELF-MONITORING MEETS PERMIT REQUIREMENTS. ☐ S ☐ M ☒ U ☐ NA *(FURTHER EXPLANATION ATTACHED YES).*
DETAILS:

1. SAMPLES TAKEN AT SITE(S) SPECIFIED IN PERMIT. ☐ Y ☒ N ☐ NA

2. LOCATIONS ADEQUATE FOR REPRESENTATIVE SAMPLES. ☐ Y ☒ N ☐ NA

3. FLOW PROPORTIONED SAMPLES OBTAINED WHEN REQUIRED BY PERMIT. ☐ Y ☐ N ☒ NA

4. SAMPLING AND ANALYSES COMPLETED ON PARAMETERS SPECIFIED IN PERMIT. ☒ Y ☐ N ☐ NA

5. SAMPLING AND ANALYSES PERFORMED AT FREQUENCY SPECIFIED IN PERMIT. ☐ Y ☒ N ☐ NA

6. SAMPLE COLLECTION PROCEDURES ADEQUATE ☐ Y ☐ N ☐ NA

a) SAMPLES REFRIGERATED DURING COMPOSITING. ☐ Y ☐ N ☒ NA

b) PROPER PRESERVATION TECHNIQUES USED. ☐ Y ☐ N ☐ NA

c) CONTAINERS AND SAMPLE HOLDING TIMES CONFORM TO 40 CFR 136.3. ☐ Y ☐ N ☐ NA

7. IF MONITORING AND ANALYSES ARE PERFORMED MORE OFTEN THAN REQUIRED BY PERMIT, ARE THE RESULTS REPORTED IN PERMITTEE'S SELF-MONITORING REPORT? ☒ Y ☐ N ☐ NA

SECTION E - FLOW MEASUREMENT

PERMITTEE FLOW MEASUREMENT MEETS PERMIT REQUIREMENTS. ☐ S ☐ M ☐ U ☒ NA *(FURTHER EXPLANATION ATTACHED NO)*
DETAILS: However, events that trigger monitoring events (0.25 inches within 30 minutes) are recorded by LANS/DOE's rain gage system.

1. PRIMARY FLOW MEASUREMENT DEVICE PROPERLY INSTALLED AND MAINTAINED. ☐ Y ☐ N ☒ NA
TYPE OF DEVICE

2. FLOW MEASURED AT EACH OUTFALL AS REQUIRED. ☐ Y ☐ N ☒ NA

3. SECONDARY INSTRUMENTS (TOTALIZERS, RECORDERS, ETC.) PROPERLY OPERATED AND MAINTAINED. ☐ Y ☐ N ☒ NA

4. CALIBRATION FREQUENCY ADEQUATE. ☐ Y ☐ N ☒ NA
RECORDS MAINTAINED OF CALIBRATION PROCEDURES. ☐ Y ☐ N ☒ NA
CALIBRATION CHECKS DONE TO ASSURE CONTINUED COMPLIANCE. ☐ Y ☐ N ☒ NA

5. FLOW ENTERING DEVICE WELL DISTRIBUTED ACROSS THE CHANNEL AND FREE OF TURBULENCE. ☐ Y ☐ N ☒ NA

6. HEAD MEASURED AT PROPER LOCATION. ☐ Y ☐ N ☒ NA

7. FLOW MEASUREMENT EQUIPMENT ADEQUATE TO HANDLE EXPECTED RANGE OF FLOW RATES. ☐ Y ☐ N ☒ NA

SECTION F – LABORATORY

PERMITTEE LABORATORY PROCEDURES MEET PERMIT REQUIREMENTS. ☐ S ☒ M ☐ U ☐ NA *(FURTHER EXPLANATION ATTACHED YES)*
DETAILS:

1. EPA APPROVED ANALYTICAL PROCEDURES USED *(40 CFR 136.3 FOR LIQUIDS, 503.8(b) FOR SLUDGES)* ☐ Y ☒ N ☐ NA

SECTION F - LABORATORY (CONT'D)

2. IF ALTERNATIVE ANALYTICAL PROCEDURES ARE USED, PROPER APPROVAL HAS BEEN OBTAINED ☐ Y ☒ N ☐ NA

3. SATISFACTORY CALIBRATION AND MAINTENANCE OF INSTRUMENTS AND EQUIPMENT. ☒ S ☐ M ☐ U ☐ NA

4. QUALITY CONTROL PROCEDURES ADEQUATE. ☒ S ☐ M ☐ U ☐ NA

5. DUPLICATE SAMPLES ARE ANALYZED. 100 % OF THE TIME. ☒ Y ☐ N ☐ NA

6. SPIKED SAMPLES ARE ANALYZED. 100 % OF THE TIME. ☒ Y ☐ N ☐ NA

7. COMMERCIAL LABORATORY USED. ☒ Y ☐ N ☐ NA

LAB NAME GEL Laboratories

LAB ADDRESS 2040 Savage Rd., Charleston, SC 29407

PARAMETERS PERFORMED Metals, Cn, SVOCs

SECTION G - EFFLUENT/RECEIVING WATERS OBSERVATIONS. ☐ S ☐ M ☒ U ☐ NA *(FURTHER EXPLANATION ATTACHED YES).*

OUTFALL NO.	OIL SHEEN	GREASE	TURBIDITY	VISIBLE FOAM	FLOAT SOL.	COLOR	OTHER
Observed SMAs	No discharge	No discharge	No discharge	No discharge	No discharge	No discharge	No discharge

RECEIVING WATER OBSERVATIONS No flow was observed at the time of this inspection.

SECTION H - SLUDGE DISPOSAL

SLUDGE DISPOSAL MEETS PERMIT REQUIREMENTS. ☐ S ☐ M ☐ U ☒ NA *(FURTHER EXPLANATION ATTACHED NO).*
DETAILS:

1. SLUDGE MANAGEMENT ADEQUATE TO MAINTAIN EFFLUENT QUALITY. ☐ S ☐ M ☐ U ☐ NA

2. SLUDGE RECORDS MAINTAINED AS REQUIRED BY 40 CFR 503. ☐ S ☐ M ☐ U ☐ NA

3. FOR LAND APPLIED SLUDGE, TYPE OF LAND APPLIED TO: _____(e.g., FOREST, AGRICULTURAL, PUBLIC CONTACT SITE)

SECTION I - SAMPLING INSPECTION PROCEDURES *(FURTHER EXPLANATION ATTACHED).*

1. SAMPLES OBTAINED THIS INSPECTION. ☐ Y ☐ N ☒ NA

2. TYPE OF SAMPLE OBTAINED

GRAB _____ COMPOSITE SAMPLE ___ METHOD _____ FREQUENCY

3. SAMPLES PRESERVED. ☐ Y ☐ N ☐ NA

4. FLOW PROPORTIONED SAMPLES OBTAINED. ☐ Y ☐ N ☐ NA

5. SAMPLE OBTAINED FROM FACILITY'S SAMPLING DEVICE. ☐ Y ☐ N ☐ NA

6. SAMPLE REPRESENTATIVE OF VOLUME AND MATURE OF DISCHARGE. ☐ Y ☐ N ☐ NA

7. SAMPLE SPLIT WITH PERMITTEE. ☐ Y ☐ N ☐ NA

8. CHAIN-OF-CUSTODY PROCEDURES EMPLOYED. ☐ Y ☐ N ☐ NA

9. SAMPLES COLLECTED IN ACCORDANCE WITH PERMIT. ☐ Y ☐ N ☐ NA

Acronym Listing

ACR	Alternative Compliance Request
AOC	Area of Concern
ATAL	Average Target Action Level
BMP	Best Management Practice
CEI	Compliance Evaluation Inspection
COC	Certificate of Completion
CWA	Clean Water Act
DOE-OB	Department of Energy-Oversight Bureau
ECM	Enhanced Control Monitoring
EPA	Environmental Protection Agency
HE	High Explosives
HWB	Hazardous Waste Bureau
IP	Individual Permit
ISCO	automated stormwater sampler
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
LASO	Los Alamos Site Office
MDL	Minimum Detection Limit
MQL	Minimum Quantification Limit
MTAL	Maximum Target Action Level
NMAC	New Mexico Annotated Code
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
PCBs	Polychlorinated Biphenyls
RCRA	Resource Conservation and Recovery Act
SDPPP	Site Discharge Pollution Prevention Plan
SMA	Site Monitoring Area
SSL	Soil Screening Level
SWMU	Solid Waste Management Unit
SWQB	Surface Water Quality Bureau
TAL	Target Action Level
WQCC	Water Quality Control Commission

Los Alamos National Laboratory
Individual Stormwater NPDES Permit No. NM0030759
Compliance Evaluation Inspection
August 25-28 and September 12, 2014

Introduction

A Compliance Evaluation Inspection (CEI) was conducted at the Los Alamos National Laboratory (LANL) in Los Alamos County, New Mexico, starting August 25, 2014 thru August 28, 2014 with a follow up site visit on September 12, 2014 by Sarah Holcomb, accompanied by Bruce Yurdin and Daniel Valenta, of the New Mexico Environment Department (NMED), Surface Water Quality Bureau (SWQB), Point Source Regulation Section (PSRS). For storm water discharges, the facility is classified as a minor federal facility under the federal Clean Water Act (CWA), Section 402 National Pollutant Discharge Elimination System (NPDES) permit program. U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA), Los Alamos Site Office (LASO) and Los Alamos National Security, LLC (LANS) are jointly authorized to discharge storm water associated with historic industrial activities from specified solid waste management units (SWMUs) and areas of concern (AOCs) or Sites identified in Appendix A of NPDES permit number NM0030759.

Stormwater discharges are to tributaries or main channels of Mortendad Canyon, Canada del Buey, Los Alamos Canyon, DP Canyon, Sandia Canyon, Ten Site Canyon, Canyon de Valle, Water Canyon, Ancho Canyon, Bayo Canyon, Chaquehui Canyon, Fence Canyon, Pajarito Canyon, Two-Mile Canyon, Three-Mile Canyon, Potrillo Canyon, Pueblo Canyon and Rendija Canyon in Segments 20.6.4.97, 20.6.4.98, 20.6.4.126 and 20.6.4.128 NMAC (*State of New Mexico Standards for Interstate and Intrastate Surface Waters, 20.6.4 New Mexico Administrative Code(NMAC))* of the Rio Grande Basin.

Upon arrival at Technical Area (TA) 59 at approximately 0900 hours on August 25, 2014, the inspector made introductions, presented credentials and briefly discussed the purpose of the inspection during an entrance interview with representatives of LANS and USDOE. Personnel present represented LANS, LLC, U.S. DOE/NNSA/LASO, and NMED DOE Oversight Bureau (participating as observers). The inspectors, Mr. Jeff Walterscheid (LANS Monitoring Team Lead), Tadz Kostrubala (Planning and Reporting Team Lead), Joe English (LANS, LLC), and Kate Lynnes, and Katie Higgins (both of the Planning and Reporting Team), also of ENV-RCRA, toured selected site monitoring areas (SMAs) on August 25 through August 28, 2014. Karen Armijo, Environmental Projects Office, LASO, DOE, and Courtney Perkins and Don Carlson, NMED DOE Oversight Bureau were present during some field tours. An exit interview meeting with LANS and USDOE staff was conducted on August 28, 2014 at approximately 1550 hours. The inspectors left the facility at approximately 1630 hours on August 28, 2014. Additional findings resulting from records review were discussed with the Permittees on November 5, 2014.

In the follow up exit interview meeting, representatives from LANS, LLC and USDOE were present, including Steve Veenis, Kate Lynnes, Mike Saladen, Terrill Lemke, and Jeff Walterscheid (all from LANS, LLC), Karen Armijo of USDOE, as well as James Hogan, Bruce Yurdin and Sarah Holcomb of NMED SWQB. Prior to the meeting, LANS/DOE was provided a draft copy of the Executive Summary. The following items were specifically discussed:

- The use of the strategy stating that constituents were not present above 10% of residential soil screening values and therefore would not be present in stormwater in the permit reapplication materials.
- NMED stated as shown in the Executive Summary that the SDPPP should be one comprehensive document due to concerns about the deletion of relevant information from version to version. LANS staff stated that their interpretation of the permit was that annual SDPPP updates were only to concern events that had occurred during the previous year.
- LANS stated that the reason no corrective action had occurred at 2M-SMA-1.67 and PJ-SMA-16 was that while most of the baseline data showed no TAL exceedances, hold times were exceeded for the HE constituent required in the pollutant suites for those sites. The Permittees stated they are waiting for another sample at 2M-SMA-1.67 and have collected a second sample at PJ-SMA-16 that shows no TAL exceedance for HE.
- LANS staff indicated that small moves of sampler locations have been occurring as needed, and as documented in the annual reports. LANS staff also stated that large moves, which by their interpretation would require monitoring “new water”, were not made due to the requirement for a permit modification.
- Monitoring for gross alpha and the requirements to do adjustment monitoring and calculations for certain Sites was discussed.

- NMED discussed concerns regarding non-reporting of soil sampling data related to the affected area of the sites monitored under this permit, as well as concerns regarding the delay of implementation of corrective action/enhanced controls at sites that exhibited a TAL exceedance in baseline monitoring.

At LANS/DOE's request during the meeting, NMED provided the EPA contact information concerning adjusted gross alpha and exemptions under the Atomic Energy Act. Following the meeting, LANS/DOE provided information on two Sites that had not received enhanced controls after TAL exceedances were observed. NMED made the following revisions to the inspection report as a result of this meeting: corrected small typos and provided clarification on one issue in the Executive Summary.

The permit covers 405 Sites/Areas of Concern (AOCs)/Solid Waste Management Units (SWMUs) in 250 Site Monitoring Areas (SMAs). The permit describes how the SMAs were organized according to location of the SWMUs and the ability to monitor multiple Sites representatively.

The NMED performs a certain number of CEIs each year for the U.S. Environmental Protection Agency (USEPA), Region VI. The purpose of this inspection is to provide the USEPA with information to evaluate the Permittee's compliance with the NPDES permit. This inspection report is based on information provided by the Permittee's representatives, observations made by the NMED inspectors, and records and reports kept by the Permittee and NMED, including LANL on-line public involvement documents available at http://www.lanl.gov/environment/h2o/ip.shtml?1.

In 1992, EPA Region 6 issued a Notice of Non-Compliance to LANL to address violations of RCRA and disposal of mixed wastes. The EPA and LANL entered into negotiations to develop a Federal Facilities Compliance Agreement (FFCA) to address the concerns at the Laboratory. The agreement was finalized in 1995 and required LANL to collect various environmental data to assess the effectiveness of their Site Treatment Plan, required by the order. Solid Waste Management Units (SWMUs) created from the historic disposal of waste in the canyons on the Pajarito Plateau were previously regulated under the EPA's Multi Sector General Permit (MSGP) under Sector K for purposes of the Clean Water Act, but under negotiations related to the NMED Hazardous Waste Bureau's Consent Order (finalized in 2005), the US DOE and LANS, LLC were required to obtain coverage under an individual permit for the stormwater discharges from these SWMUs and AOCs to better manage and characterize the influence these wastes have on storm water discharges from the Lab. Under the Clean Water Act, discharges are regulated at "areas where industrial activity has taken place in the past and significant materials remain and are exposed to stormwater." (40 CFR Part 122.26(b)(14)) The Permittees have progressed through the first cycle of NPDES permitting. The current permit expired on March 31, 2014. The Permittees submitted their permit reapplication package to EPA and NMED on March 26, 2014. Normally, permit applications for renewals are required at least 180 days in advance of permit expiration; however, the Permittees received an extension from EPA.

Summary of Individual Permit Conditions

The Sites regulated under this permit are organized in a number of different ways. There are seven distinct watersheds on the Pajarito Plateau that are organized into five editions of the Site Discharge Pollution Prevention Plans (SDPPPs). Sites (specific SWMUs/AOCs) are organized into Site Monitoring Areas (SMAs). Depending on the characteristics of the site, a SWMU could potentially be included in more than one SMA – AOC 21-021 is a good example of this as it related to radioactive emissions from stacks and covered a large area. The SMAs are intended to group similar Sites for purposes of monitoring.

Sites were selected for inclusion in this permit from the total list of Sites in the NMED Hazardous Waste Bureau's RCRA Consent Order (issued in 2005) based on historical information and environmental data available at the time of the first permit application in 2008. The criteria for inclusion were as follows: (excerpted from the LANS/DOE Permit Reapplication, March 2014)

1. The SWMU/AOC is exposed to stormwater (e.g., not capped or subsurface)

2. The SWMU/AOC contains "significant industrial materials" (e.g., has contamination in place), and
3. The SWMU/AOC potentially impacts surface water.

Under USEPA's Individual Stormwater Permit for LANL, *Permittees are required to implement site-specific control measures (including best management practices) to address the non-numeric technology-based effluent limits contained in the Permit, followed by confirmation monitoring against New Mexico water-quality criteria equivalent target action levels to determine the effectiveness of the site-specific measures."*

Control measures include erosion and sedimentation controls; management of run-on and run-off; employee training; and other controls. Permittees' representatives indicate a desire to move toward green infrastructure approaches as they are able for some Sites. The permit lists the installed baseline control measures for each of the 250 permitted features or SMAs. The permit includes conditions for confirmation monitoring requirements and sampling locations (latitude and longitude). Monitoring at all SMAs includes radioactivity, cyanide and metals. Some SMAs and Sites have additional monitoring requirements for polychlorinated biphenyls (PCBs), high explosives (HE), semi-volatile compounds, and/or pesticides. This permit lists the applicable target action levels (TALs) for pollutants – maximum and average (MTAL and ATAL). The applicable TALs are not themselves effluent limitations, but are benchmarks to determine the effectiveness of control measures implemented to meet the non-numeric technology-based effluent limitations.

If any validated sample analytical result for a specific pollutant of concern at a particular SMA is greater than the applicable TAL (or applicable Minimum Quantification Level (MQL), whichever is greater), then corrective action (visual inspection, reevaluation of existing control measures, and initiation of corrective action as soon as practicable) is required. Confirmation samples are required following installation of corrective action enhanced controls. The permit includes conditions of completion of corrective action, alternative compliance, and deadlines for the 63 high priority Sites assigned in 33 SMAs. High priority Sites were identified based on PCB levels present at Sites. The rest are moderate priority Sites. Permittees must certify completion of corrective action for all high priority Sites within three (3) years and for all moderate priority Sites within five (5) years of the effective date of the permit, or such other time period pursuant to the permit.

The permit requires a Sites Discharge Pollution Prevention Plan (SDPPP) and includes conditions for documentation, identification of the SDPPP team, identification of the receiving waters and wetlands, summary of potential pollutant sources, description of control measures, schedules for control measures installation, monitoring and inspection procedures, signature requirements and other documentation. Conditions for inspection requirements (erosion inspection and reevaluation, post-storm inspection and reports) are also provided in the permit. Reporting requirements include compliance status reports, including discharge monitoring reports, with reporting periods from January 1st to December 31st, and annual reports. Other conditions include, but are not limited to, construction activity associated with Sites remediation; deletion of Sites; watershed protection approach; and public involvement (website, e-mail notification, and public meetings). The permit also provides requirements for 24-hour oral reporting, composite sampling, data averaging requirements and permit reopener conditions. Standard conditions for NPDES permits are also included in the permit.

Baseline Controls – Site Boundary and SMA Sampler Location and Corrective Action Status

Baseline controls were certified to be complete for each SMA at the time of this inspection. The SDPPP was prepared in five volumes based on watershed. Additional or "augmented" controls were installed for some Sites or SMAs. On-site representatives use the term "augmented" to indicate controls that were installed following installation of baseline controls, but not as a requirement of TAL exceedances and corrective action. The facility has approximately 175 Teledyne ISCO samplers and previously used single stage samplers but as of this inspection did not appear to be using them. LANS/DOE staff indicated that they have not made significant changes to the sampler locations since the previous inspection.

As of December 31, 2013, Sites status is as follows:

- Of the 250 SMAs, only 140 SMAs have been sampled (110 SMAs not sampled).
- TAL exceedances occurred at 131 of the 140 sampled SMAs. Pollutants exceeding TALs included adjusted gross alpha, Zinc, Aluminum, PCBs, Mercury, Copper, Selenium, Radium 226 + 228, Lead, weak acid dissociable Cyanide, Arsenic, Silver, and RDX.
- 78 SMAs were in need of enhanced control installation.
- 83 Sites have completed enhanced control monitoring. Of those 83 Sites, 19 Sites have reinitiated corrective action because of TAL exceedances.
- Baseline confirmation complete has been certified by LANS/DOE for 13 Sites (10 SMAs) with no TAL exceedances.
- Corrective action has been initiated at 245 Sites (129 SMAs). With the exception of 2M-SMA-1.67 and PJ-SMA-16.

According to the permit reapplication materials, certification of corrective action has been completed at 27 Sites (17 SMAs) as of December 31, 2013. Most of these (25) were submitted based on the receipt of a Certificate of Completion (CoC) under the RCRA Consent Order. The others were submitted based on elimination of exposure to pollutants (2 Sites). As of the writing of this inspection report, three alternative compliance requests have been submitted to EPA for S-SMA-0.25, S-SMA-2 and M-SMA-7.9. All three of these Sites were evaluated during this inspection and are discussed in detail in the permit verification section of this inspection report.

Appendix A gives a concise overview of the status of each Site, including corrective action status, receipt of a Certificate of Completion from the NMED Hazardous Waste Bureau, and notes on TAL exceedances for each Site.

Executive Summary:

Section A – Permit Verification – Unsatisfactory

- Of the 250 SMAs, only 140 SMAs have been sampled (110 SMAs not sampled).
- Baseline confirmation complete with no TAL exceedances has been certified by LANS/DOE for 13 Sites (10 SMAs). However, it appears that those Sites may not have been sampled representatively (refer to Section D).
- Three Alternative Compliance Requests – rationale included urban background pollution influencing results from these Sites. Soil sampling shows that stormwater monitoring done to date may not be representative of actual data from the Site (no run-on monitoring, entire affected area is not being monitored, etc.)
- LANS/DOE used metals, radioactive materials and PCB background reports published after the effective date of the permit and unapproved by EPA for this specific use to justify assertions that some Sites are not discharging Site-related pollution.
- Pollutants of concern discovered due to soil sampling have not been sampled in stormwater. Soil sampling largely occurred in 2009-2010 and has not influenced decision making under the NPDES permit.

Section B – Recordkeeping & Reporting – Unsatisfactory

- Some language was deleted from SDPPP revisions that would be useful in determining potential pollutants at a Site.
- Additional pollutant information included in the Permittees' reapplication materials should have been updated in the annual reports.
- Some pertinent Site features were left off of the Site maps (e.g., storm drain at LA-SMA-5.02, flow arrows on numerous maps, soil sampling data).
- Soil sampling should have influenced additional pollutant sampling in stormwater and the location of the SMA sampler.

Section C – Operation and Maintenance – Marginal

- The on-the-ground Site-specific BMPs that were observed during this inspection appeared to be well maintained and operational.
- 78 SMAs require enhanced control installation.
- 83 Sites have completed enhanced control monitoring. Of those 83 Sites, 19 Sites have reinitiated corrective action because of TAL exceedances.
- Corrective action has been initiated at 245 Sites (129 SMAs) with the exception of 2M-SMA-1.67 and PJ-SMA-16. However, it is unclear what "corrective action initiated" means – many Sites have not yet seen enhanced control installations. There appears to be a delay of implementation of corrective action after a baseline sample is collected that exhibits TAL exceedances.

Section D – Self Monitoring – Unsatisfactory

- Soil sampling data provided by LANS/DOE during the inspection for each Site showed that many pollutants detected in the soil were not being sampled in storm water. LANS/DOE staff did not update the SDPPPs to reflect new information gained through soil sampling. Additional data collected by NMED DOE Oversight Bureau also confirms this as well as the lack of representativeness of LANL sampling locations at certain Sites.
- For some Sites, individual Site monitoring is more appropriate to assess pollutants leaving the Site in storm water. Individual Site monitoring approaches are also needed when there is a large influence from run-on or current industrial sources (i.e. actively discharging outfalls.)
- Construction will trigger the need to restart monitoring requirements at S-SMA-2 and CDV-SMA-1.7.

- Some sampler locations were observed during the Site visits that inaccurately represent the Sites. In some cases, a small move would have fixed the issue, but LANS/DOE staff indicated that they interpreted this would require a major modification of the permit, and so elected not to make minor relocations. Most samplers did not reflect additional contaminated affected area identified by soil sampling.
- There are some issues with representativeness of TALs/MQLs as established in the permit, specifically for benzo(a)pyrene and hexachlorobenzene – MQLs are substantially above WQCC-established water quality standards.
- Only one analytical package for one SMA was reviewed under this inspection, but that sampling event illustrates issues with timely sample collection and the exceedance of holding times for metals and SVOCs. According to information provided at the exit interview meeting on November 5, it appears that hold time compliance has improved since 2011.
- Permittees have not been monitoring for adjusted gross alpha, but instead evaluated total gross alpha because of the cost/benefit analysis, which is included in this inspection report.

Section F – Laboratory – Marginal

- Permittees' contract lab is not using a 40 CFR Part 136 approved method for analysis of Ra-226.

Section G – Effluent/Receiving Waters – Unsatisfactory

- TAL exceedances occurred at 131 of the 140 sampled SMAs. Pollutants exceeding TALs included adjusted gross alpha, Zinc, Aluminum, PCBs, Mercury, Copper, Selenium, Radium 226 + 228, Lead, weak acid dissociable Cyanide, Arsenic, Silver, and RDX.
- Corrective action delay at some Sites results in pollution migration from the affected area closer to the affected waterbodies on the Pajarito Plateau.

Other Concerns

- LANS/DOE has turned off samplers at some Sites that have obtained a Certificate of Completion (CoCs) under the Consent Order, but still technically need to collect an Enhanced Monitoring Control confirmation sample. Many of the CoCs obtained from NMED Hazardous Waste Bureau indicate that the Permittees still need to continue monitoring for storm water pollutants.

Findings/Further Explanations

Note: The sections are arranged according to the format of the enclosed EPA Inspection Checklist (Form 3560-3), rather than being ranked in order of importance.

Section A – Permit Verification – Overall Rating of Unsatisfactory

Permit Requirements for Permit Verification

40 CFR Part 122.26(b)(12) states:

Significant materials includes, but is not limited to: raw materials; fuels; materials such as solvents, detergents and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under Section 101(14) of CERCLA; any chemical the facility is required to report pursuant to section 313 of title III of SARA; fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with storm water discharges.

40 CFR Part 122.26(b)(14) states:

Storm water discharge associated with industrial activity means the discharge from any conveyance that is used for collecting and conveying storm water and that is directly related to manufacturing, processing or raw materials storage areas at an industrial plant. The term does not include discharges from facilities or activities excluded from the NPDES program under this part 122. For the categories of industries identified in this section, the term includes, but is not limited to… areas where industrial activity has taken place in the past and significant materials remain and are exposed to storm water. For the purposes of this paragraph, material handling activities include storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, final product, by-product or waste product. The term excludes areas located on plant lands separate from the plant's industrial activities, such as office buildings and accompanying parking lots as long as the drainage from the excluded areas is not mixed with storm water drained from the above described areas. Industrial facilities (including industrial facilities that are federally, State, or municipally owned or operated that meet the description of the facilities listed in paragraphs (b)(14)(i) through (xi) of this section) include those facilities designated under the provisions of paragraph (a)(1)(v) of this section.

The permit states in Part I.D.2:

***Sampling Locations**: All samples taken for purposes of confirmation monitoring shall be taken in compliance with the monitoring requirements specified below at SMAs specified in Appendix A to the permit. Instead of monitoring at each individual Site, the Permittees may, when appropriate based on drainage patterns for the affected Sites, monitor two or more Sites in conjunction at an associated SMA, so long as the SMA and all associated Sites are identified in Appendix A to the Permit. SMA locations are based on reasonable site accessibility for sampling purposes and the Permittees' best judgment to ensure that samples taken at a particular point will be representative of discharges from Sites in the drainage area. The Permit may be modified, in accordance with the provisions of 40 C.F.R. § 122.62, to relocate a SMA based on a determination that the SMA is no longer representative of the drainage area for a Site or Sites, provided sufficient technical justification for the relocation is included with Permittees' request for permit modification. Permittees may move a sampler to make minor adjustments that arise due to changes in natural conditions, unexpected events or as otherwise necessary to ensure that the sample location is representative. Such changes can include minor updates in Site boundaries, changes in storm water drainage patterns, logistical or security adjustment. Any such movement of a sampler will be documented in the annual SDPPP, and be made available for public review. The Permittees shall provide that any permit modification request to EPA will be emailed to email list pursuant to Section I.7.b.*

The permit states in Part I.F.3 and 4:

3. ***Required Modifications:*** *The Permittees must keep documents and records with the SDPPP as necessary to reflect: (c) Any change of monitoring requirement or compliance status;*

4. ***SDPPP Updates:*** *The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.*

The permit states in Part I.A.2:

Management of Run-on and Runoff. *The Permittees must divert, infiltrate, reuse, contain or otherwise reduce storm water run-on/runoff in order, to minimize pollutants in discharges.*

EPA's Industrial Stormwater Monitoring and Sampling Guide (EPA 832-B-09-003) states:

There may be circumstances where benchmark values cannot be reasonably achieved because of local natural background concentrations (see 2008 MSGP Part 6.2.1.2). In such cases, EPA allows for benchmark exceedances. For example, high natural background levels of iron in soils or groundwater could cause exceedances of a benchmark value. This provision exempts facilities from further control measure evaluation and benchmark monitoring when natural background levels are solely responsible for the exceedance of a benchmark value.

To make this determination, natural background pollutant concentrations must be greater than the corresponding benchmark value, and there is no net facility contribution of the pollutant (i.e., average concentration detected in runoff from all monitored outfalls over four separate events minus the average natural concentration of the parameter for four separate events does not exceed zero).

For example, if the natural background concentration of TSS from an undisturbed watershed is 200 mg/L, an exemption from further benchmark monitoring / control measure evaluation is available if the average of your four benchmark samples is equal to or lower than 200 mg/L. There are additional requisites for claiming a natural background level exemption, including documentation. Details of these are contained in the 2008 MSGP in Part 6.2.1.2 and the Fact Sheet.

20.6.4.7.N.1 NMAC states:

Natural background *means that a portion of a pollutant load in a surface water resulting from non-anthropogenic sources. Natural background does not include impacts resulting from historic or existing human activities.*

40 CFR Part 122.41(j)(1) states:

Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

The permit states in Part I.F.1.d:

Summary of Potential Pollutant Sources*. The SDPPP must identify each Site at the facility where industrial materials or activities were previously exposed to storm water and from which allowable non-storm water discharges were released. The SDPPP must also identify the pollutants of concern associated with those activities.*

Findings for Permit Verification

When this permit was first drafted, LANS/DOE staff had collected some environmental data under the Federal Facilities Compliance Agreement (FFCA), as well as limited soil contaminant concentration data from RCRA investigation reports for some Sites. Over the past four years, significant data collection has occurred both for stormwater (CWA) and soil sampling (RCRA) purposes. Although there is not a method in the current permit to use soil sampling data for compliance with the NPDES permit

requirements, it can still be used to inform processes under the NPDES permit, such as the representativeness of SMA sampler locations and whether the use of the RCRA SWMU boundary as the affected area is valid, or if the approach under this permit needs to be shifted to an "affected area" approach. The 405 Sites under this permit present unique scenarios based on the activity that occurred there and confounding factors such as current urban/residential interfaces and current industrial uses of the Site. It follows that each Site may have specific issues that could need individual attention. The NPDES program does not regulate facilities based on RCRA SWMU boundaries, but instead focuses on industrial materials that are exposed to stormwater, as cited in 40 CFR Part 122.26(b)(14). Throughout the discussion below for permit verification, the narrative here details conditions at the Sites visited by the inspectors and will address Site specific issues through a discussion of what occurred at the Site according to LANS/DOE's records, stormwater data, soil sampling data and the inspectors' best professional judgment about the representativeness of monitoring at those locations.

The permit requires that the 405 Sites monitored under this permit are monitored representatively. The permit, as stated above in Part I.D.2, allowed that Sites which were similar in the capability to discharge significantly similar pollutants could be monitored under the Site Monitoring Area (SMA) approach, which resulted the grouping and sampling of 250 SMAs across the lab. However, the SMA approach does not appear to be representative at a number of locations across the lab, for various reasons as outlined below.

LANS/DOE staff indicated during this inspection that SWMU boundaries for a Site, as described in the 1990 SWMU Report, could not be changed. Because of the 2005 Consent Order requirements, LANS/DOE has soil sampling data for many (but not all) Sites around the Lab. The soil data as represented during this inspection is used to determine the extent of pollution under RCRA, and can be used in this case to inform "affected area" determinations to ensure that storm water sampling is representative.

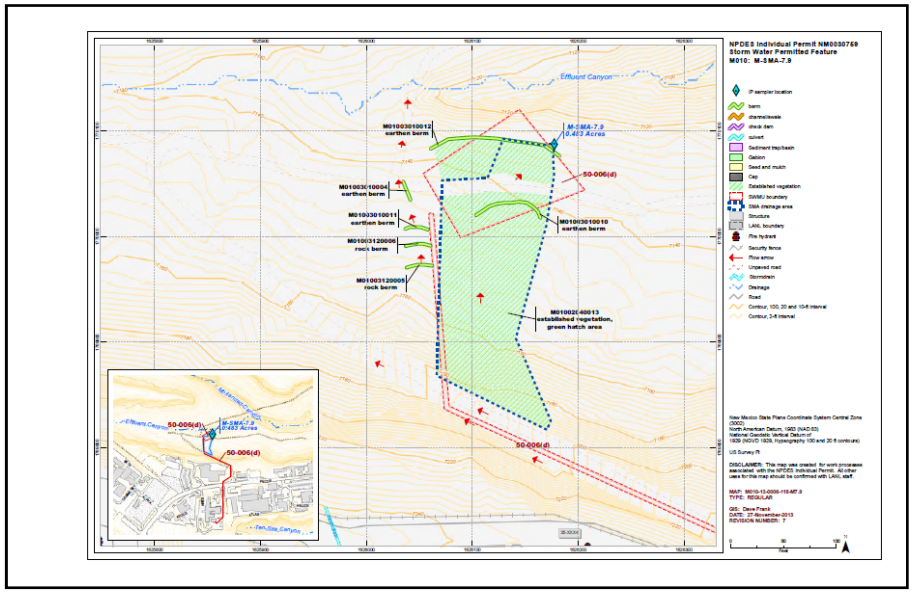
During this inspection, NMED visited 21 SMAs/48 Sites as listed below:

SMA Number	Site/SWMU Number	Watershed	Reason Visited
M-SMA-7.9	50-006(d)	Sandia/Mortendad	Alternative Compliance
S-SMA-0.25	03-013(a), 03-052(f)	Sandia/Mortendad	Alternative Compliance
S-SMA-2	03-012(b), 03-045(b), 03-045(c), 03-056(c)	Sandia/Mortendad	Alternative Compliance
S-SMA-3.53	03-014(b2)	Sandia/Mortendad	Major PCB Exceedance
ACID-SMA-1.05	00-030(g)	Los Alamos/Pueblo	< TALs
ACID-SMA-2	01-002(b)-00, 45-001, 45-002, 45-004	Los Alamos/Pueblo	Additional data shows exceedances
LA-SMA-5.02	01-003(e)	Los Alamos/Pueblo	Additional data shows exceedances
LA-SMA-3.1	01-001(e), 01-003(a)	Los Alamos/Pueblo	Additional data shows exceedances
LA-SMA-2.1	01-001(f)	Los Alamos/Pueblo	Major PCB Exceedance
LA-SMA-1.25	C-43-001	Los Alamos/Pueblo	Enhanced Control Monitoring (ECM) In Process
B-SMA-1	00-011(d)	Los Alamos/Pueblo	Additional data shows exceedances
S-SMA-2.01	03-052(b)	Sandia/Mortendad	Major PCB exceedance
Pratt-SMA-1.05	35-003(h), 35-003(p), 35-004(h), 35-009(d), 35-016(k), 35-016(m), 35-003(r), 35-016(l)	Sandia/Mortendad	Proposed Site deletion with TAL exceedances
CDB-SMA-1	46-003(c), 46-004(d2), 46-004(f), 46-004(t), 46-004(w), 46-008(g), 46-009(a), C-46-001	Sandia/Mortendad	Enhanced Control Monitoring (ECM) In Process

SMA Number	Site/SWMU Number	Watershed	Reason Visited
CDB-SMA-0.55	46-004(g), 46-004(m), 46-004(s), 46-006(f)	Sandia/Mortendad	CoC without Controls – proposed delete
PJ-SMA-20	54-017	Pajarito	Complete cover certification
CHQ-SMA-0.5	33-004(g), 33-007(c), 33-009	Ancho/Chaquehui	No sample collected
S-SMA-6	72-001	Sandia/Mortendad	Major PCB exceedances
S-SMA-3.72	53-001(b)	Sandia/Mortendad	Proposed monitoring deletion
CDV-SMA-1.7	16-019	Water/Canon de Valle	Possible additional sampling needed
DP-SMA-2.35	21-021	Los Alamos/Pueblo	Large SMA
There were three SMAs/4 Sites that were discussed but due to time constraints were not able to be visited in person during this inspection. These Sites are listed below:			
3M-SMA-2.6	36-008, C-36-003	Pajarito	No sample collected
LA-SMA-5.91/LA-SMA-6.38/LA-SMA-6.395	21-021	Los Alamos/Pueblo	Large SMA
R-SMA-2.3	00-011(e)	Los Alamos/Pueblo	Tentative delete

The following is a discussion of each of the Sites visited, in detail, to discuss sampling representativeness and other pertinent issues as related to permit verification.

M-SMA-7.9:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs
M-SMA-7.9	50-006(d)	Alpha & Ra	Cyanide	All	PCBs

The IP storm water sampler is currently located at the northeast end of SWMU 50-006(d). LANS/DOE soil sampling data collected under the Consent Order indicates that the affected area may be outside of the SWMU boundary. Soil samples taken to the north and northwest of the SWMU boundary indicate levels above NMED HWB-approved background levels for Nitrate, Perchlorate, Chromium, Copper, Mercury, Barium, Lead, and Selenium; various organics, and radionuclides.

Baseline samples were collected for this Site on September 13, 2013. Baseline samples exceeded TALs for gross alpha and PCBs, both of which are associated with activities conducted historically at this Site.

Soil Sampling Data as provided during this inspection is included as Appendix D.

An Alternative Compliance Request (ACR) was submitted by LANS/DOE for this SMA in April 2014. The permittees state that due to the sources of the pollutants and technical feasibility and practicality, they cannot confirm compliance at this Site. The rationale includes a discussion of urban background sources of PCBs and gross alpha.

There were no sampler inspection forms included with inspection documentation, so it appears that Permittees turned off the sampler due to the ACR. The permit language related to submission of an alternative compliance request does not allow the cessation of sampling.

Run-on monitoring was not conducted at this Site. The monitoring data presented in the ACR show TAL exceedances at 3.4 times the TAL for gross alpha and 3.4 times the TAL for PCBs. According to LANS/DOE, soil data show that both contaminants were associated with historical activities at this Site.

LANS/DOE includes a discussion in the ACR regarding urban background sources of PCBs. According to the EPA's Industrial Stormwater Monitoring and Sampling Guide (EPA 832-B-09-003), quoted above, it states that background can be determined for local natural background levels. The MSGP, for reference, states in Part 6.2.1.2 that "Natural background pollutants include those substances that are naturally occurring in soils or groundwater. Natural background pollutants do not include legacy pollutants

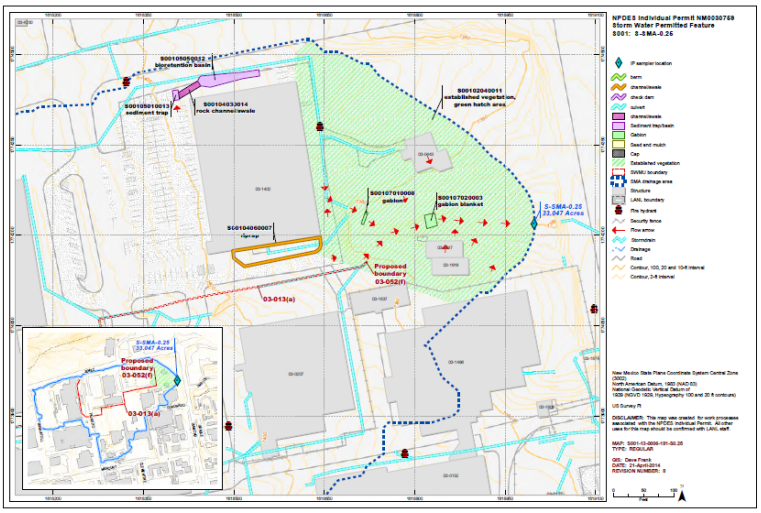
from earlier activity on your Site, or pollutants in run-on from neighboring sources that are not naturally occurring." PCBs are not naturally occurring pollutants.

LANS/DOE claims that gross alpha exceedances are associated with industrial materials used at this Site based on soils data gathered during Consent Order sampling. However, no adjustment calculation was conducted, so there is not currently a way to determine whether the discharge exceeds the adjusted gross alpha TAL. As cited in 20.6.4.7.A (5), adjusted gross alpha is defined as *the total radioactivity due to alpha particle emission as inferred from measurements on a dry sample, including radium-226, but excluding radon-222 and uranium. Also excluded are source, special nuclear and by-product material as defined by the Atomic Energy Act of 1954*.

While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in stormwater during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil, because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

benzo(b)fluoranthene	barium	nitrate	anthracene	benzo(a)anthracene
indeno(1,2,3-cd)pyrene	benzo(g,h,i)perylene	benzo(k)fluoranthene	chrysene	fluoranthene
	pyrene	toluene	tritium	strontium-90

S-SMA-0.25:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	Others
S-SMA-0.25	03-013(a)	Alpha & Ra	Cyanide	All	PCBs	SVC
	03-052(f)	Alpha & Ra	Cyanide	All	PCBs	

Baseline samples were collected at this Site on 7-28-2011 and 8-15-2011. Two samples were obtained. Exceedances were for copper, zinc, gross alpha, and PCBs. Enhanced controls were certified at this Site on 6-26-14. A sample was retrieved from this Site on 7-23-14 – no data for this sample was included with the inspection documentation.

There two SWMUs at this Site. SWMU 03-013(a) was a former storm drain that served floor drains in a maintenance shop. SWMU 03-052(f) is a former NPDES outfall that received floor drains in the maintenance shop. Common materials that were handled in the maintenance shop and discharged through these drains were Stoddard solvent, dry acid and caustics. Oils, beryllium machining, cooling water for welding torches, and a diesel spill were also included in historical activities here.

The IP stormwater sampler is currently located at the east end of the SMA. The current map included with the permit reapplication materials shows SWMU 03-052(f) as a point at the end of the stormwater/facility pipe. LANS/DOE soil sampling data collected under the Consent Order indicates that the affected area may be outside of the SWMU boundary as indicated in the application. Included with the inspection materials are soil maps (part of the Upper Sandia Canyon Aggregate Area Supplemental Investigation Report) that indicate soil contamination above NMED HWB-approved background levels for copper, cyanide, lead, zinc, chromium, perchlorate, barium, and assorted organics. Radionuclides were not evaluated in soil.

Soil sampling results are included in Appendix D.

An alternative compliance request (ACR) was submitted by LANS/DOE for this SMA in April 2013. The Permittees state that due to the sources of the pollutants and technical feasibility & practicality, they cannot confirm compliance at this Site. The rationale includes a discussion of urban sources of copper and zinc. Run-on monitoring was conducted within the SMA, above the SWMUs.

1. The monitoring data presented in the ACR shows a slight contribution to the copper load leaving the SMA. The same is true for zinc.
2. The monitoring shows a contribution from the Site for PCBs. Monitoring at S-ROM-0.25 (upstream of the SWMUs) showed concentrations of 0.00112 ug/L, and data at the SMA monitoring location showed a concentration of 0.0502 ug/L.

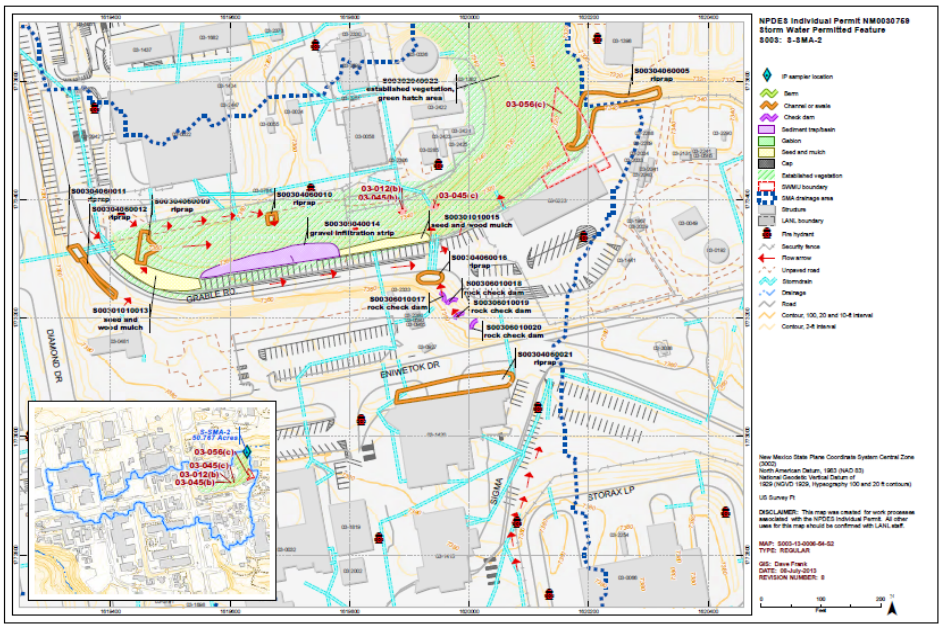
3. In the 1990s, the operational section of the environmental compliance group at LANL went through the metallurgy building and confirmed that floor drains were sealed and were no longer contributing to 03-013(a). Storm water should be the only current discharge through these drains. No remediation has been taken due to residual contamination that could be inside the storm drain pipe.
4. Currently, monitoring for SMA compliance at this Site is also being conducted in the channel, and includes contributions from parking lots on the northeast side of the parking structure. The location of the sampler must be adjusted to give more representative data of the SWMUs within this SMA.

While the permit did provide some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water under this term of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

bis(2-ethylhexyl)phthalate	dibenzo(a,h)anthracene	fluorene	Toluene	benzo(a)anthracene
benzo(b)fluoranthene	barium	acenaphthene	anthracene	fluoranthene
indeno(1,2,3-cd)pyrene	benzo(g,h,i)perylene	benzo(k)fluoranthene	chrysene	strontium-90
tritium	pyrene			

There are other compounds detected in soil that do not have a specific water quality standard but could present toxicity issues.

S-SMA-2:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs
S-SMA-2	03-012(b)	Alpha & Ra	Cyanide	All	PCBs
	03-045(b)	Alpha & Ra	Cyanide	All	PCBs
	03-045(c)	Alpha & Ra	Cyanide	All	PCBs
	03-056(c)	Alpha & Ra	Cyanide	All	PCBs

Baseline samples were collected at this SMA on 7-28-2011 and 8-13-2011. Exceedances were for copper, zinc, gross alpha, and PCBs. Enhanced controls were certified at this Site on 7-8-13. No sampler inspections for 2014 were included with the inspection documentation, so it appears that the sampler for the Site is off due to the alternative compliance request submitted on 4-30-2014.

SWMU 03-012(b) is soil contamination from cooling tower effluent. SWMU 03-045(b) is the currently permitted Outfall 001 under NM0028355 from the TA-46 SWSC and SERF that also contain occasional cooling tower effluent. SWMU 03-045(c) is the currently permitted outfall (03A027) under NM0028355. SWMU 03-056(c) is a historic transformer storage area that did contain PCB-containing dielectric fluid spills.

There were TAL exceedances after baseline control measure installation for copper, zinc, gross alpha and PCBs. After enhanced control measures were installed, there were exceedances for copper, zinc and PCBs. The IP sampler also collects effluent from Outfall 001, Outfall 027, and both MSGP outfalls from the power plant.

LANS/DOE claims that copper and zinc are not associated with the Sites based on soil data from RCRA consent order investigations. PCBs are also alleged not to have been associated with discharges from the outfalls in their historical operations based on soil data.

The sampler for this SMA is located in the receiving waterbody at the northeast end of the SMA watershed and collects runoff from approximately 50 acres. The SWMU boundary changed slightly for 03-056(c) between the soil sampling conducted under

the Consent Order in 2010 and the current map included with the permit reapplication materials provided by the Permittees earlier this year. The new map shows the SWMU boundary extending out into the drainage. Currently, the SWMUs in this SMA are indicated as points at the end of an outfall (other than 03-056(c)), rather than the soil contamination that is likely along the bottom of the canyon.

Monitoring results (TAL exceedances) as well as MSGP information is compared in the table below:

Constituent	Concentration	Sample Event Date	Sampling Purpose/Associated Permit
Copper	5.8 ug/L	7-28-11	Baseline/IP
Copper	8.3 ug/L	8-13-11	Baseline/IP
Copper	4.43 ug/L	7-11-13	Enhanced Control Monitoring
Copper	5.08 ug/L	8-1-13	Enhanced Control Monitoring
Copper	36.4 ug/L	5-8-12	MSGP
Copper	181 ug/L	5-8-12	MSGP
Zinc	62.6 ug/L	7-28-11	Baseline/IP
Zinc	43.4 ug/L (avg)	8-13-11	Baseline/IP
Zinc	44.2 ug/L	8-1-13	Enhanced Control Monitoring
Zinc	54 ug/L	7-11-13	Enhanced Control Monitoring
Gross alpha	29 pCi/L	7-28-11	Baseline/IP
Gross alpha	10.6 pCi/L (avg)	8-13-11	Baseline/IP
PCB	140 ng/L	7-28-11	Baseline/IP
PCB	190 ng/L	8-13-11	Baseline/IP
PCB	49 ng/L	8-1-13	Enhanced Control Monitoring
PCB	220 ng/L	7-11-13	Enhanced Control Monitoring

- MSGP runoff from current industrial activities could be influencing IP sampler results. There are two co-located MSGP sampling locations, one above all the SWMUs located at the southwest corner of the power plant Site. The second MSGP sampler is at a location near the northeastern corner of the Site, which drains down toward the IP sampler.
- Sampler is located in a waterbody.

The SMA approach is not appropriate for the IP Sites where the MSGP facilities' discharge clearly influences the stormwater collection at the current IP sampler locations.

Run-on from non-Site related sources/background: This permit does not allow for the use of background data to qualify storm water sampling results from SMAs/Sites except when a Site has entered alternative compliance. However, LANS/DOE uses soil data and background storm water data in their SDPPPs from their metals (LA-UR-13-22841) and PCB background (LA-UR-12-1081) reports in order to justify that a pollutant is not Site related prior to submitting an alternative compliance request. No crosswalk, analysis or other method has been used for between soil and water data to establish that certain levels of pollutants in the soil will or will not transfer to stormwater. Also, no paired upstream/downstream Site specific samples have been taken at these Sites to show that the Site does or does not cause or contribute to a water quality impairment. The metals and PCB reports used Sites scattered around the lab to be "representative" of all Sites. However, due to hardness changes in stormwater around the lab, one background value for a hardness dependent metal is not representative of all discharges from a stormwater-regulated Site. Hardness dependent values must be determined per event for each Site.

LANS/DOE installed and certified enhanced controls at this Site in July 2013. Completion of corrective action was certified on November 29, 2012 for SWMU 03-056(c) due to the receipt of a CoC with controls (requiring the monitoring of stormwater under this permit) from the NMED Hazardous Waste Bureau.

An ACR was submitted by LANS/DOE for this SMA in April 2013. The permittees state that due to the sources of the pollutants and technical feasibility and practicality, they cannot confirm compliance at this Site. The rationale includes a discussion of urban sources of copper and zinc. Run-on monitoring was conducted within the SMA, above the SWMUs.

The monitoring data presented in the ACR show a decrease in pollutant concentration for copper and zinc. However, EPA should be aware that this particular SMA presents some dilution factors. The active outfalls under LANS/DOE's Outfall Permit (NM0028355) for Outfall 001 and Outfall 03A027 discharge in this reach. The sampler is located in the channel and according to LANS staff is programmed to only take samples during storm events. LANS/DOE also claim urban background as a source, but this particular argument is based on their urban background study, which bases conditions at the lab on a few representative Sites. Since copper and zinc are hardness dependent metals, and hardness can vary widely across the lab, Site-specific run-on and runoff monitoring will be more representative to draw conclusions about what the Site is actually contributing to the metals load leaving the Site.

The monitoring data presented in the ACR show an increase of PCBs leaving the SMA. Again, there are actively discharging outfalls in this reach that could contribute to the PCB load leaving the SMA. Outfall 001 does have a PCB limit, while 03A027 does not. Run-on monitoring (geomean between the two monitoring locations) for PCBs show a concentration of 0.015 ug/L, while samples taken at the SMA monitoring location show a concentration of 0.14-0.19 ug/L.

During this inspection, LANS/DOE was completing construction at SWMU 03-056(c). The construction concerned installation of a piping system with associated inlet structure/pavement and velocity dissipation to bypass the potential contamination at this Site. Inspectors noted that sampling for the permit required that the initial suite of pollutants must be restarted due to the construction at the Site.

Additionally, the SMA sampler location is also influenced by two MSGP discharge locations from the power plant. Complete data sets were not obtained during this inspection for the MSGP Sites but it is possible that some copper and zinc could also be coming from the MSGP outfalls and influencing results at the SMA sampler.

Included with the inspection materials are soil maps (part of the Upper Sandia Canyon Aggregate Area Supplemental Investigation Report) that indicate soil contamination above NMED HWB-approved background levels for (inorganics) copper, lead, mercury, silver, zinc, magnesium, chromium, and assorted organics. Radionuclides were not evaluated in soil.

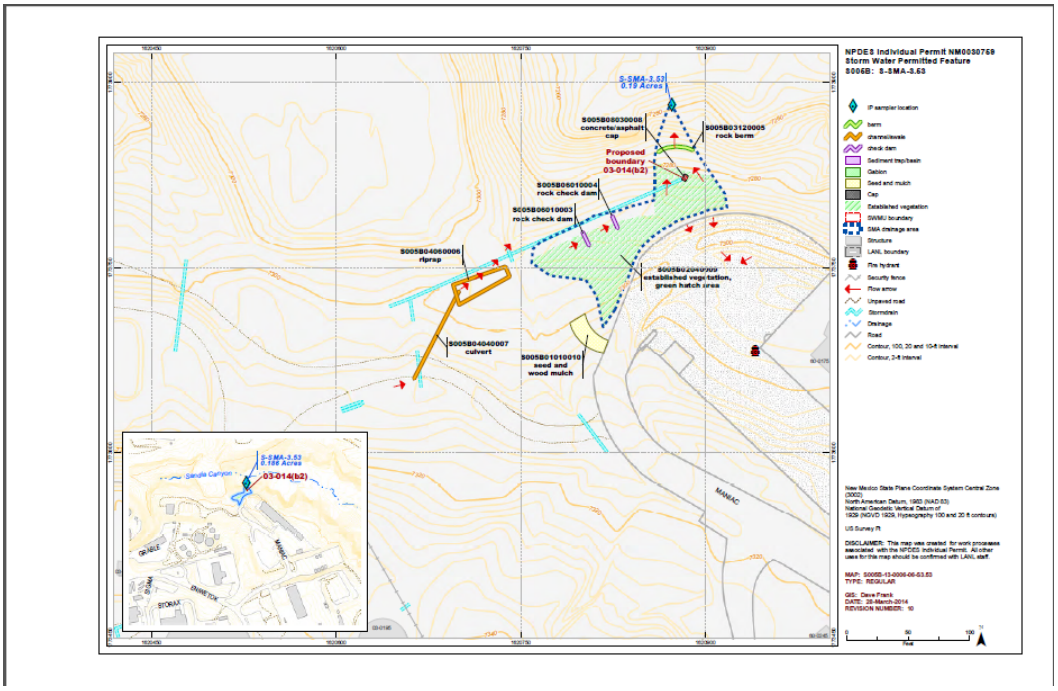
While the permit did provide some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water under this term of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

benzo(b)fluoranthene	benzo(g,h,i)perylene	acenaphthene	fluorene	benzo(a)anthracene
indeno(1,2,3-cd)pyrene	pyrene	benzo(k)fluoranthene	anthracene	fluoranthene

chrysene	fluorene	toluene		

There are other compounds detected in soil that do not have a specific water quality standard but could present toxicity issues.

S-SMA-3.53:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	Others
S-SMA-3.53	03-014(b2)	Alpha & Ra	Cyanide	All	PCBs	SVC

SWMU 03-014(b2) is the previous outfall for the former TA-03 WWTP (SSS01S). During its coverage under the NPDES permit, according to documents included with the permit reapplication materials, radionuclides were the only exceedances of the permit limits.

Baseline monitoring was completed at this Site on 8-4-2011. Exceedances were for aluminum, copper, gross alpha, and PCBs. Enhanced controls were certified at this Site on 5-2-13. An enhanced control monitoring sample was collected from this Site on 7-10-14. Monitoring results show exceedances for gross alpha, PCBs and copper. According to the sampler reactivation form, the sampler is still on to collect a second confirmation sample.

The IP stormwater sampler is currently located north of the SWMU boundary indicated in the permit reapplication materials, and collects approximately 0.19 acres of runoff. The current (proposed) SWMU boundary is shown as a point at the end of a former outfall. The SWMU boundary indicated in the Consent Order soil sampling map from 2010 is depicted as a large circle. Enhanced controls were installed and certified at this Site in May 2013.

Stormwater TAL exceedances at this Site were for gross alpha (4.17 times the TAL), PCBs (1097 times the TAL), copper (2.23 times the TAL) and aluminum (1.99 times the TAL).

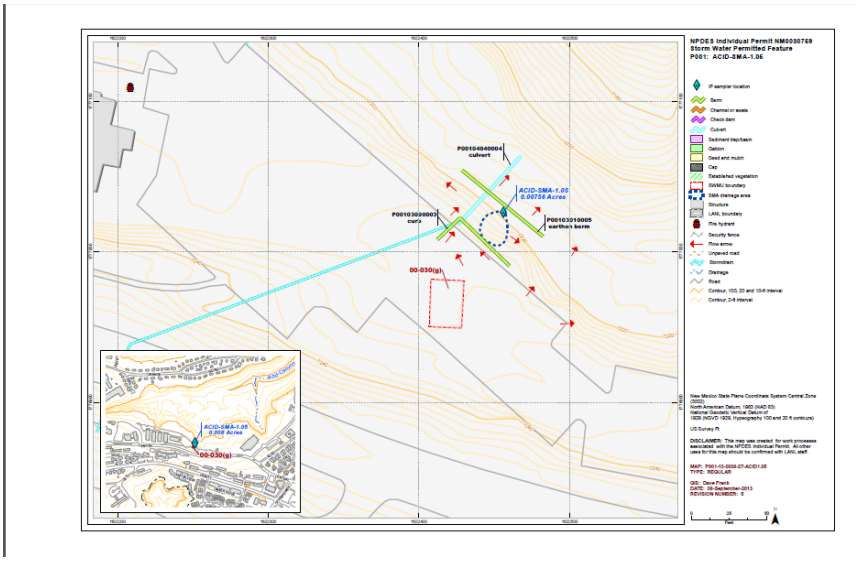
Data for a sample for enhanced control monitoring had just been received at the time of this inspection and indicated TAL exceedances for gross alpha (2.29 times the TAL), copper (1.7 times the TAL) and PCBs (155.8 times the TAL).

Soil sampling data are included in Appendix A. These data indicate soil levels above NMED HWB-approved background levels for perchlorate, cyanide and zinc, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, fluoranthene, and pyrene. There are other compounds detected in soil that do not have a specific water quality standard but could present toxicity issues.

While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

chrysene	fluoranthene	benzo(a)anthracene	pyrene	benzo(b)fluoranthene

ACID-SMA-1.05:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	Others
ACID-SMA-1.05	00-030(g)	Alpha & Ra	Cyanide	All	PCBs	PEST

SWMU 00-030(g) is a former septic system and outfall that conveyed wastes from the former TA-01 facilities.

A baseline sample was collected in 8-21-2011 and appeared to be under TALs for the Site. No second sample was collected within the 18 month sampling window. No sampler was present at this Site at the time of the inspection.

The IP stormwater sampler is currently located north of the SWMU boundary. The SWMU was an old septic system and outfall, which was removed in 1993. The septic tank location has been paved over with a parking lot, which was constructed sometime after 2001. Factoring in RCRA soil data, it appears that the current sampler location is not representative of the affected area of the Site. It appears that contamination traveled farther downstream from the outfall location and this is not reflected in the stormwater sampling data that has been collected to date.

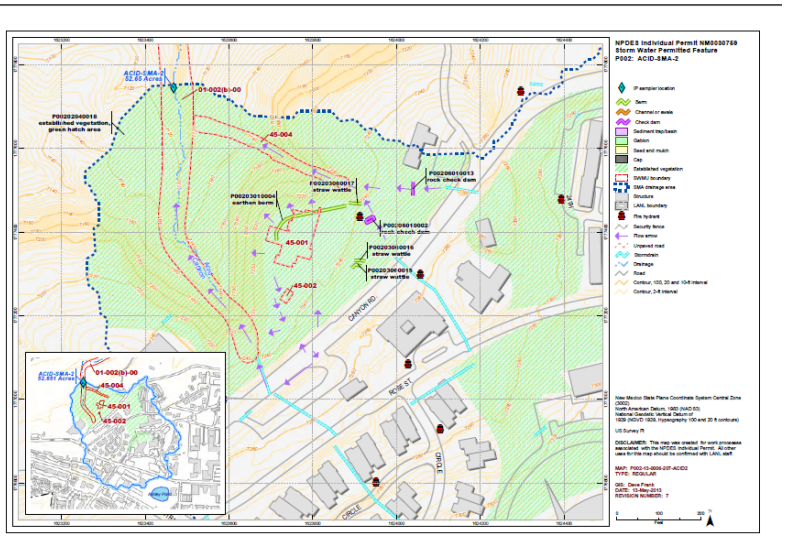
According to soil data from the 2001 RFI Report for 00-030(g), soil data collected was above NMED HWB-approved background levels for lead, chromium (total), copper, nickel, and selenium; downstream of the septic tank and outfall location, soil screening levels were higher for chromium, lead, zinc, selenium, arsenic, mercury, antimony, cobalt, silver, thallium, barium, manganese, vanadium, beryllium, cadmium, and nickel. There were soil levels of radionuclides below the outfall location, as well, but they were constituents that LANS/DOE staff claims are exempted under the Atomic Energy Act (AEA) of 1954, such as americium-241 and plutonium-239. Organics noted in the soil data below the outfall are 4-4'-DDT, PCBs, chlordane, 4-4'-DDD, 4-4'-DDE, dieldrin, endosulfan, endrin aldehyde, and toxaphene.

The current sampler location does not appear to be representative of the affected area, therefore, the sampler should be relocated to reflect the affected area. While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the

pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

barium	manganese	beryllium	chlordane	DDT and derivatives
endosulfan	endrin	dieldrin	toxaphene	dioxin

ACID-SMA-2:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs
ACID-SMA-2	01-002(b)-00	Alpha & Ra	Cyanide	All	PCBs
	45-001	Alpha & Ra	Cyanide	All	PCBs
	45-002	Alpha & Ra	Cyanide	All	PCBs
	45-004	Alpha & Ra	Cyanide	All	PCBs

SWMU 45-001 was a former radionuclide WWTP at TA-45 and its two associated outfalls. SWMU 45-002 is the soil contamination associated with a former vehicle decontamination facility. SWMU 45-004 is a former sanitary sewer outfall which was transferred to Los Alamos County in 1967. SWMU 01-002(b)-00 is a former industrial waste line and outfall and its drainage into Acid Canyon.

One baseline sample was collected in August 2011 that exhibited TAL exceedances. Exceedances were for aluminum, gross alpha, and PCBs. Enhanced control measures have not been certified at this Site. No sampler inspections were conducted in 2014. No sampler was present at the time of this inspection. One of the Permittees' gaging stations was collocated with the SMA sampler location and the NMED inspector requested data from that station. Results from 2011 to 2014 in that dataset show exceedances of TALs for PCBs and aluminum. Not all TAL constituents were monitored at this station.

The current location of the IP stormwater sampler is the middle of 01-002(b)-00. The sampler currently captures approximately 52 acres of watershed runoff. The SWMU boundary continues perhaps a quarter mile past the sampler location. Some soil remediation occurred in 2001, but the soil data discussed below was taken after the remediation efforts. Baseline stormwater TAL exceedances at this Site were for gross alpha (2.7 times the TAL), aluminum (1.1 times the TAL), and PCBs (130 times the TAL).

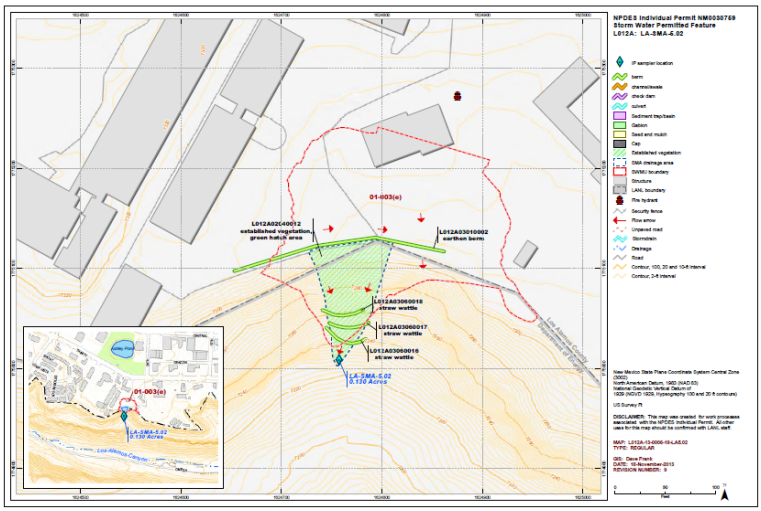
According to soil data from the 2005 Pueblo Canyon Aggregate Area Investigation Work Plan, soil data collected was above NMED HWB-approved background levels for cadmium, copper, lead, mercury, zinc, manganese, uranium, selenium, silver, chromium, cobalt, titanium, strontium-90, tritium, and acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, pyrene, toluene, PCBs, bis(2-ethylhexyl)phthalate, chlordane, and endrin, among a number of others. Soil data are included as Appendix D.

The current sampler location does not appear to be representative of the entire affected area, therefore, the sampler should be relocated to reflect the affected area. Run-on monitoring should be a consideration at this Site, as well as Site-specific monitoring

to address individual SWMUs. While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

manganese	trichlorobenzene	strontium-90	tritium	acenaphthene
anthracene	benzo(a)anthracene	fluorene	benzo(b)fluoranthene	benzo(g,h,i)perylene
chrysene	fluoranthene	benzene	indeno(1,2,3-cd)pyrene	pyrene
toluene	bis(2-ethylhexyl)phthalate	1,3-dichlorobenzene	endrin	dieldrin
heptachlor epoxide	chlorophenol	hexachloroethane	benzo(k)fluoranthene	chlorobenzene
chloronapthalene	1,2-dichlorobenzene	1,4-dichlorobenzene	dichlorophenol	barium
hexachlorobutadiene	hexachlorocyclopentadiene			

LA-SMA-5.02:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs
LA-SMA-5.02	01-003(e)	Alpha & Ra	Cyanide	All	PCBs

SWMU 01-003(e) is a former surface disposal area for demolition debris (e.g., utility boxes, piping, etc.) which was pushed over the hillside. Stormwater TAL exceedances at this Site were for copper (1.1 times the TAL), gross alpha (1.3 times the TAL) and PCBs (53 times the TAL).

Two baseline samples were collected at this Site in August 2011. Exceedances were for copper, gross alpha and PCBs. The sampler was not observed to be in place at the time of this inspection. No sampler inspections were included with documentation, which appears to mean that the sampler is shut off. This Site obtained a CoC from NMED HWB on 9-10-10 and it appears that the permittee interpreted that no further samples were required due to the CoC, although the CoC still requires stormwater monitoring under the IP.

The current location of the IP stormwater sampler is downgradient of the SWMU, 01-003(a). This was a former disposal area, where the materials were at some point pushed over the side of the hill into the canyon. The mesa top portion of the SWMU is currently covered under an asphalt parking lot. The sampler currently captures approximately 0.13 acres of watershed. There is a storm drain that captures parking lot runoff outside the SWMU boundary and could direct that runoff onto the SWMU.

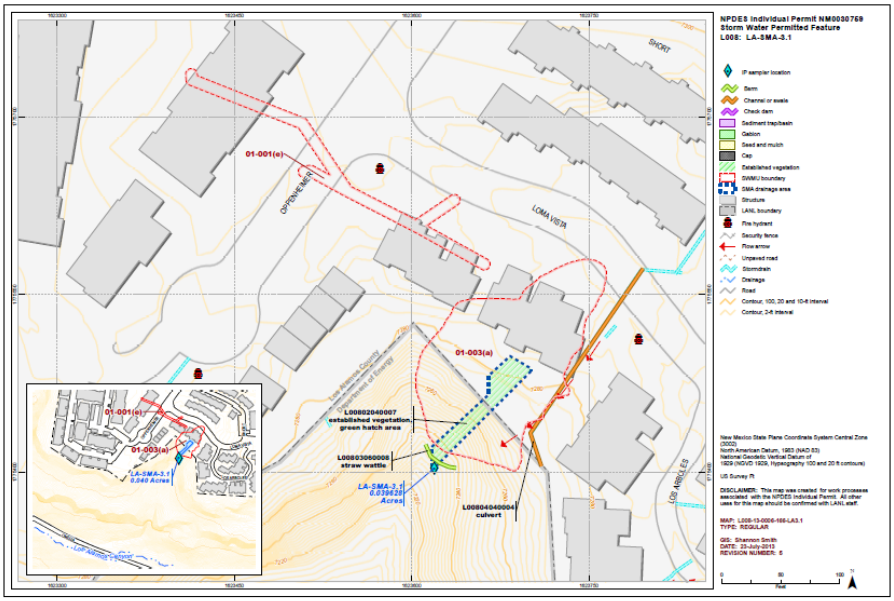
According to soil data from the 2010 Upper Los Alamos Canyon Aggregate Area Investigation Report, soil samples taken outside of and downslope of the IP sampler location indicate presence above NMED HWB-approved background levels for nitrate, lead, mercury, beryllium, perchlorate, selenium, nickel, tritium, and a number of organics. Soil data are included as Appendix D.

The current sampler location does not appear to be representative of the affected area, therefore the sampler should be relocated to reflect the affected area. While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures

during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

beryllium	methylene chloride	barium	tritium	acenaphthene
anthracene	benzo(a)anthracene	fluorene	benzo(b)fluoranthene	benzo(g,h,i)perylene
chrysene	fluoranthene	benzene	indeno(1,2,3-cd)pyrene	pyrene
toluene	bis(2-ethylhexyl)phthalate	benzo(k)fluoranthene		

LA-SMA-3.1:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs
LA-SMA-3.1	01-001(e)	Alpha & Ra	Cyanide	All	PCBs
	01-003(a)	Alpha & Ra	Cyanide	All	PCBs

SWMU 01-001(e) is a former septic tank, inlet and outlet, and outfall in former TA-01. SWMU 01-003(a) is a former landfill. This contained debris from the demolition of former TA-01 structures. Some soil was removed from this Site but more soil will be removed in 2014 according to information submitted with the permit reapplication materials.

This Site has not yet collected a sample. The sampler was present at the time of this inspection. Although the Site has received a CoC from NMED HWB, the sampler still appears to be on because sampler inspection forms were included with the documentation.

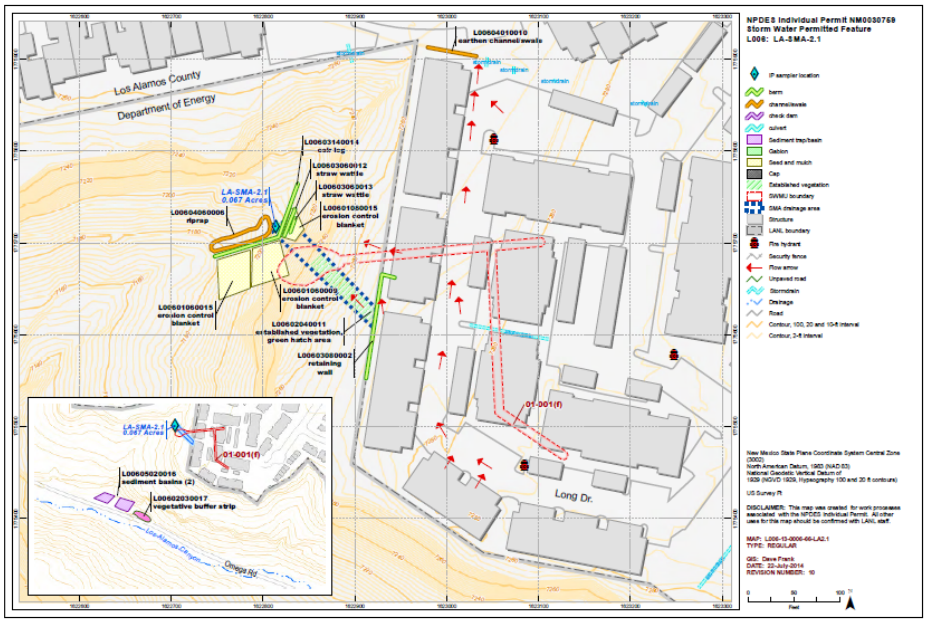
The current location of the IP stormwater sampler is essentially in the middle of SWMU 01-003(a). SWMU 01-001(e) is currently covered under asphalt and apartment complex buildings. Some of SWMU 01-003(a) is also under pavement and buildings, but approximately two-thirds is vegetated and is located on the slope below the apartment complex into LA Canyon. The IP sampler collects approximately 0.040 acres of watershed, but does not capture the entire SWMU. LANS/DOE has not collected a stormwater sample at this Site yet, however, the NMED DOE-OB has collected samples downstream of the LANS/DOE sampler and their data show TAL exceedances of PCBs (809 times the TAL). Data also indicates that partial samples were collected here by LANS/DOE but due to the requirement in the permit to only analyze samples when the volume was large enough to run all analyses, those volumes were not analyzed.

According to soil data from the 2010 Upper Los Alamos Canyon Aggregate Area Investigation Report, soil samples taken outside of and downslope of the IP sampler location indicate presence above NMED HWB-approved background levels for lead, mercury, perchlorate, chromium, nickel, copper, zinc, manganese, vanadium, barium, nitrate, tritium and a number of organics. Soil data are included as Appendix D.

The current sampler location does not appear to be representative of the affected area, therefore the sampler should be relocated. While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

manganese	benzo(a)anthracene	barium	tritium	acenaphthene
anthracene	fluoranthene	fluorene	benzo(b)fluoranthene	benzo(g,h,i)perylene
chrysene	bis(2-ethylhexyl)phthalate	perchlorate	indeno(1,2,3-cd)pyrene	pyrene
benzo(k)fluoranthene				

LA-SMA-2.1:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs
LA-SMA-2.1	01-001(f)	Alpha & Ra	Cyanide	All	PCBs

The current location of the IP stormwater sampler is just below SWMU 01-001(f). This SWMU was a former septic tank and outfall that served buildings where machining of uranium and foundry activities took place. Baseline monitoring exceedances were for copper (2.6 times the TAL), gross alpha (15 times the TAL) and PCBs (over 35,000 times the TAL). LANS/DOE personnel indicated that the SWMU boundary at this location likely was not drawn correctly (it appears a bit skewed). The mesa top portion of this SWMU has been covered by condominiums and parking lots. Further sampling in 2013 resulted in TAL exceedances of copper (2.6 times the TAL), gross alpha (8.3 times the TAL) and PCBs (33,000 times the TAL). This Site has been extensively remediated, including using a Vactor truck to "vacuum" the canyon twice – 2880 yd^3 of soil was removed during these efforts in 2009-2010.

The SMA sampler was present at the time of this inspection. No sampler inspections were present in the documentation, which leads the inspector to believe that the sampler is shut off. The documentation indicates that the Site is in planning for enhanced control measures.

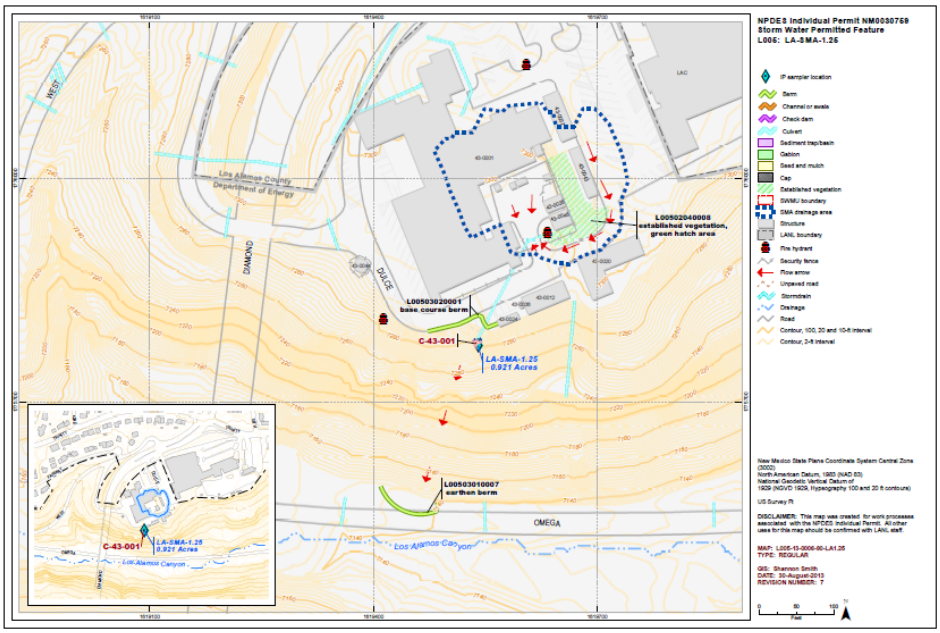
According to soil data from the Upper Los Alamos Canyon Aggregate Area Investigation Report (2010), soil samples taken outside of and downslope of the IP sampler location indicate presence above NMED HWB-approved background levels for lead, chromium, selenium, nickel, nitrate, tritium, and PCBs, and a number of other organics. Soil data are included as Appendix D.

The current sampler does not appear to be representative of the affected area, therefore the sampler should be relocated to reflect the affected area. While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of

concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

methylene chloride	benzo(a)anthracene	fluorene	benzo(b)fluoranthene	acenaphthene
anthracene	fluoranthene	chrysene	indeno(1,2,3-cd)pyrene	benzo(g,h,i)perylene
bis(2-ethylhexyl)phthalate	benzo(k)fluoranthene	pyrene		

LA-SMA-1.25:



Initial monitoring requirements under this permit were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals
LA-SMA-1.25	C-43-001	Alpha & Ra	Cyanide	All

SWMU C-43-001 is a storm drain outfall that collects runoff from the HRL building loading dock and could have potentially accepted overflows from a nearby sanitary lift station, although according to LANS/DOE documentation in the SDPPP, there was no documentation of such releases. This outfall could have also accepted non-sanitary cooling water. The Permittees state that according to the documentation available, it does not appear that the lift station was disconnected from the storm sewer line.

Two baseline samples were collected in July and August of 2011. Enhanced control measures were certified by the Permittees on August 30, 2012. Two more samples were collected in September and October of 2012. Exceedances were for copper and zinc. No sampler inspections were in the inspection documentation which leads the inspector to believe that sampler is shut off.

The current location of the IP stormwater sampler is just below the former outfall pipe at AOC C-43-001. This SWMU was a former storm drain that could have also accepted sanitary overflows from a lift station. Baseline sampling exceedances at this Site were for copper (7.7 times the TAL) and zinc (2.7 times the TAL). Enhanced controls were installed and the monitoring in 2012 showed TAL exceedances for copper (5.8 times the TAL) and zinc (2.6 times the TAL).

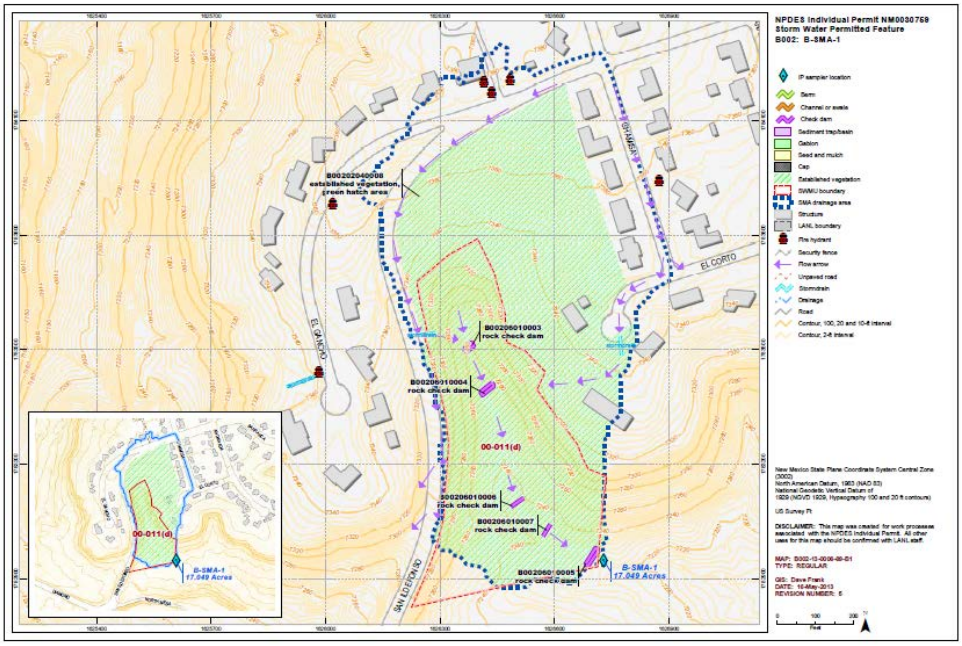
According to soil data from the Upper Los Alamos Canyon Aggregate Area Investigation Report (2010), soil samples taken outside of and downslope of the IP sampler location indicate presence above NMED HWB-approved background levels for copper, mercury, nitrate, zinc, chromium, cyanide, selenium, nickel, tritium, and many different organics. Soil data is included as Appendix D.

The current sampler does not appear to be representative of the affected area, therefore the sampler should be relocated. While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the

Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

anthracene	benzo(a)anthracene	pyrene	tritium	acenaphthene
chrysene	fluoranthene	fluorene	benzo(b)fluoranthene	benzo(g,h,i)perylene
benzo(k)fluoranthene	bis(2-ethylhexyl)phthalate	indeno(1,2,3-cd)pyrene		

B-SMA-1:



Initial monitoring requirements under this permit were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	High Explosive
B-SMA-1	00-011(d)	Alpha & Ra	Cyanide	All	HE

SWMU 00-011(d) is a former bazooka firing area. UXO/OEW were removed in 1992. A CoC with controls (the controls being for UXO) was received for this Site on 5-7-13.

One baseline sample was collected on 9-13-2013. The sampler was present at the time of this inspection. However, no sampler inspection forms were included with the documentation, leading the inspector to believe that the sampler is shut off due to the receipt of a CoC from NMED HWB.

The current location of the IP stormwater sampler is just below the SWMU boundary of 00-011(d). This SWMU was a former bazooka firing area which was operated from 1944-1948. UXO and OEW were removed from the Site in 1992. Baseline sampling exceedances at this Site were for gross alpha (8.4 times the TAL) and silver (2 times the TAL, reported at the MQL, which was 1 ug/L, but the permit required MQL is 0.5 ug/L). The NMED DOE-Oversight Bureau located their sampler at the old FFCA location slightly downstream of LANS/DOE's sampler location and also showed data exceeding TALs for Thallium (1.01 times with TAL).

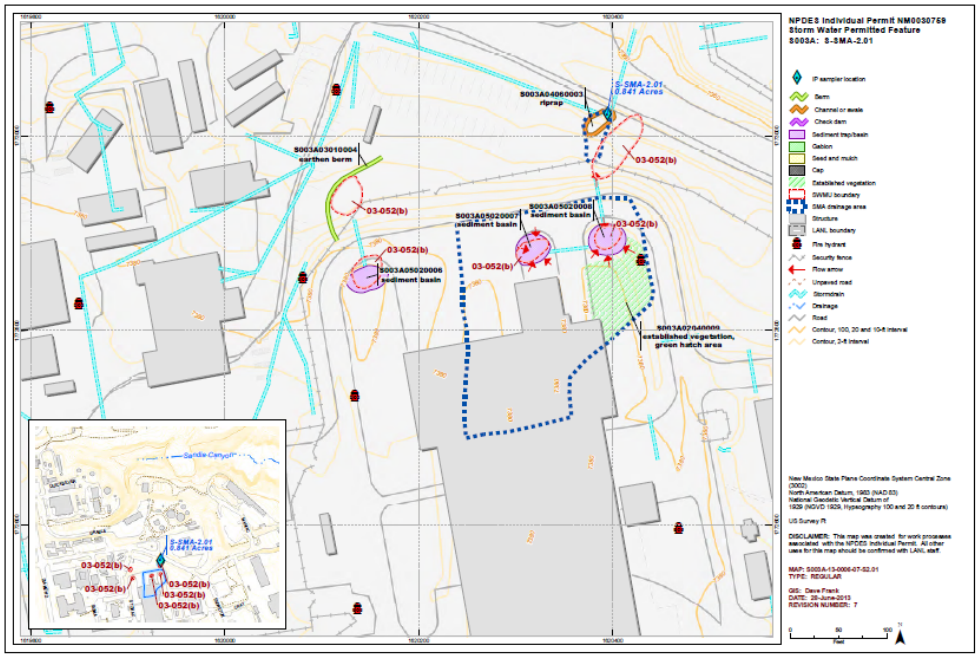
According to soil data collected during the Investigation Report for Guaje/Barrancas/Rendija Canyons (2007), soil samples taken within the SWMU boundary indicate presence above NMED HWB-approved background levels for barium, lead, selenium, perchlorate, manganese and cobalt. In this case, no soil sampling was done outside of the SWMU boundary. Soil data is included as Appendix D.

The current sampler may not be representative of the affected area (due to the data collected by NMED DOE-OB), therefore the sampler should be relocated. While the permit did provide some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm

water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. For the following constituents that were detected in soil, and according to the inspector's best professional judgment, because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water. While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water under this term of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

barium

S-SMA-2.01:



Initial monitoring requirements under this permit were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs
S-SMA-2.01	03-052(b)	Alpha & Ra	Cyanide	All	PCBs

AOC 03-052(b) is a storm drainage which was investigated with a container storage area and loading dock at the Sigma facility, building 03-66.

The current location of the IP stormwater sampler is just below a portion of the SWMU associated with this Site. This SWMU is defined as five stormwater catchment ponds, draining surface runoff around the Sigma building, including a materials storage area and loading dock. Baseline sampling exceedances at this Site were for copper (2.5 times the TAL), aluminum (1.4 times the TAL) and PCBs (540 times the TAL). Enhanced control measures were installed and certified in 2012. The Site has not sampled since the installation of enhanced controls.

This Site is also co-located with an industrial (current activity) MSGP Site. The MSGP sampler is located about 20 feet upstream of the IP sampler. The IP sampler only captures runoff from three of the five ponds/collection areas defined in the SWMU boundary. Documentation suggests that contaminants from an adjacent AOC (03-056(k) – not covered under this permit) may have been discharged into 03-052(b). Monitoring results from baseline monitoring, enhanced control monitoring and MSGP runoff are compared in the table below:

Constituent	Concentration	Sampling Event Date	Sampling Purpose/Associated Permit
Copper	10.7 ug/L	8-5-11	Baseline/IP
Copper	10.9 ug/L	9-7-11	Baseline/IP
PCB	380 ng/L	8-5-11	Baseline/IP
PCB	1900 ng/L	9-7-11	Baseline/IP

PCB	164 ng/L	9-13-13	Enhanced Control Monitoring
PCB	0.8 ug/L *	7-2-2013	MSGP

*Aroclor method was used for PCB analysis under the MSGP. This result is the addition of the 8 Aroclors added together for a "total" PCB result.

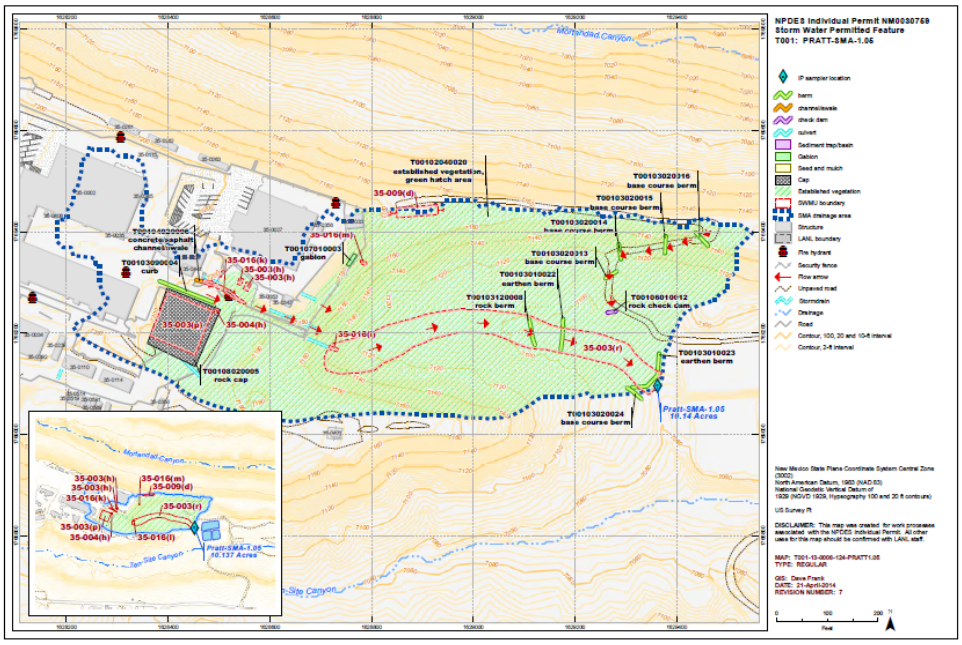
- MSGP sampler is located just upstream of the sampler for the IP.
- Neither the IP or the MSGP sampler capture runoff from the western section of the SWMU.

According to soil data collected during the Upper Sandia Canyon Aggregate Area Investigation Report (2010), soil samples taken outside of the SWMU boundary (and not currently in the watershed captured by the IP sampler) indicate presence above NMED HWB-approved background levels for barium, mercury, beryllium, manganese, cobalt, nickel, lead, aluminum, chromium, vanadium, copper, magnesium, and a number of organics, including PCBs and benzo(a)pyrene. Radionuclides were not assessed in soil at this location. Soil data are included as Appendix D.

The current sampler is not representative of the affected area, therefore the sampler should be relocated (or a second sampler installed) to reflect the affected area. While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

manganese	barium	beryllium	dioxin	acenaphthene
anthracene	benzo(a)anthracene	benzo(a)pyrene	benzo(b)fluoranthene	benzo(g,h,i)perylene
chrysene	fluoranthene	fluorene	indeno(1,2,3-cd)pyrene	pyrene
toluene	2,3,7,8-TCDD			

Pratt-SMA-1.05:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs
Pratt-SMA-1.05	35-003(h)	Alpha & Ra	Cyanide	All	PCBs
	35-003(p)	Alpha & Ra	Cyanide	All	PCBs
	35-004(h)	Alpha & Ra	Cyanide	All	PCBs
	35-009(d)	Alpha & Ra	Cyanide	All	PCBs
	35-016(k)	Alpha & Ra	Cyanide	All	PCBs
	35-016(m)	Alpha & Ra	Cyanide	All	PCBs
	35-003(r)	Alpha & Ra	Cyanide	All	PCBs
	35-016(l)	Alpha & Ra	Cyanide	All	PCBs

SWMU 35-003(h) is a former wastewater retention tank. SWMU 35-003(p) is a former air filter building that emitted radionuclide contaminated air, including strontium-90, and was removed in 1996. SWMU 35-004(h) is a former storage container area which housed hazardous wastes, oils, solvents and Freon. SWMU 35-009(d) is a former septic tank, 1800 ft^2 leach field that handled lab and sanitary wastes. The tank and manhole were filled with concrete. SWMU 35-016(k) is an inactive drainline and outfall formerly associated with outfall 04A116, which accepted cooling water from a gas laser building. SWMU 35-016(m) is an assortment of drains and outfalls associated with noncontact cooling water, however, the reactor and cooling tower were never built. SWMU 35-003(r) is a former outfall that accepted liquid sludge effluent from a tank farm. Radionuclides, mercury, PCBs and gross alpha are associated with this Site. SWMU 35-016(l) is storm drains which may have accepted past dielectric oil spills as well as a documented transformer oil leak.

Pratt-SMA-1.05 collected its baseline sample after the storm event of September 13, 2013. Erosion/BMP inspections were conducted on July 22 and August 14. Sampler inspections were present with the documentation, so the sampler appears to still be active. Enhanced control measures have not been installed or certified at this Site.

The current location of the IP stormwater sampler is downgradient of most of the Sites, and immediately below AOC 35-003(r). This grouping of SWMUs/AOCs is the former location of the TA-35 WWTP and outfall, and associated sludge drying beds, as well as a radioactive air filter building, former hazardous waste SAA, former septic tank and a metal blowdown line meant to serve cooling towers that were never installed, but currently collect stormwater from around the Site. Activities that discharged to these various SWMUs and AOCs handled materials including strontium-90 (beta emitter), hazardous oils, solvents and Freon, radioactive liquid waste, barium, and PAHs. Baseline monitoring exceedances at this Site were aluminum (1.3 times the TAL), mercury (1.2 times the TAL), silver (2 times the TAL), gross alpha (6.4 times the TAL) and PCBs (700 times the TAL). Cleanup activities including deactivation and decommissioning of some buildings and structures and some soil removal occurred in the 1980s and 1990s.

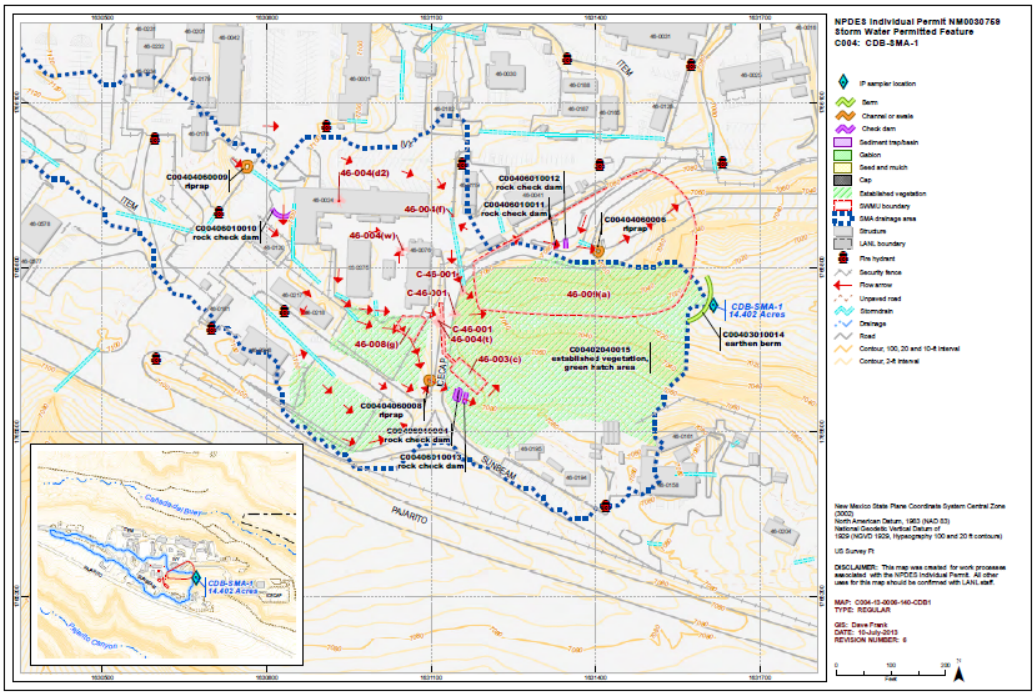
According to soil data collected under the Middle Mortendad/Ten Site Aggregate Investigation Report (2008), soil samples taken within the upper SMA drainage area indicate presence above NMED HWB-approved background levels for mercury, zinc, chromium, copper, nickel, silver, boron, fluoride, bromide, selenium, barium, copper, thallium, antimony, tritium, strontium-90, trichloroethylene/trichloroethene, acetone, bis(2-ethylhexyl)phthalate, PCBs, butanone, fluoranthene, methylene chloride, pyrene, and trichlorofluoromethane.

Samples taken further downstream within AOC 35-003(r) indicate presence above NMED HWB-approved background levels for (inorganics) mercury, zinc, selenium, nickel, cadmium, lithium, aluminum, copper, barium, chromium, (radionuclides) strontium-90, tritium, (organics) PCBs, bis(2-ethylhexyl)phthalate, dieldrin, chrysene, pyrene, fluoranthene, fluorene, indeno(1,2,3-cd)Pyrene, benzo(a)pyrene, among others. Soil data are included as Appendix D.

The current sampler may be representative of the affected area, however, a number of constituents are present in the soil that were not sampled for during this issuance of the Individual Permit. While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

barium	beryllium	strontium-90	tritium	acenaphthene
anthracene	benzo(a)anthracene	methylene chloride	benzo(b)fluoranthene	benzo(g,h,i)perylene
chrysene	fluoranthene	fluorene	indeno(1,2,3-cd)pyrene	pyrene

CDB-SMA-1:



Initial monitoring requirements for this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs
CDB-SMA-1	46-003(c)	Alpha & Ra	Cyanide	All	PCBs
	46-004(d2)	Alpha & Ra	Cyanide	All	PCBs
	46-004(f)	Alpha & Ra	Cyanide	All	PCBs
	46-004(t)	Alpha & Ra	Cyanide	All	PCBs
	46-004(w)	Alpha & Ra	Cyanide	All	PCBs
	46-008(g)	Alpha & Ra	Cyanide	All	PCBs
	46-009(a)	Alpha & Ra	Cyanide	All	PCBs
	C-46-001	Alpha & Ra	Cyanide	All	PCBs

The current location of the IP stormwater sampler is downgradient from the SMWUs/AOCs in this SMA, although part of SWMU 46-009(a) may not be captured by the sampler. These Sites are associated with septic systems, exhaust emissions, industrial drainlines, a former NPDES permitted outfall, a storage area, surface disposal area, and a one-time mercury spill area. Materials handled in these areas include fuel rod wastewater, acid sinks, laboratory waste, beryllium, beryllium oxide, floor drains, electrical labs, PCB oil, and mercury. Baseline monitoring exceedances at this Site included aluminum (1.5 times the TAL), copper (1.9 times the TAL), gross alpha (1 time the TAL) and PCBs (36 times the TAL). Enhanced monitoring controls were installed and certified in 2012. Enhanced monitoring exceedances included gross alpha (4.8 times the TAL) and PCBs (110 times the TAL).

Enhanced control measures were certified at this Site on July 30, 2012. According to documentation reviewed, enhanced control measure samples have not yet been collected. However, the inspector notes that sampler inspection forms included with this data package indicated that the earliest collected sample is 9-28-13. The inspector did not receive data from this event.

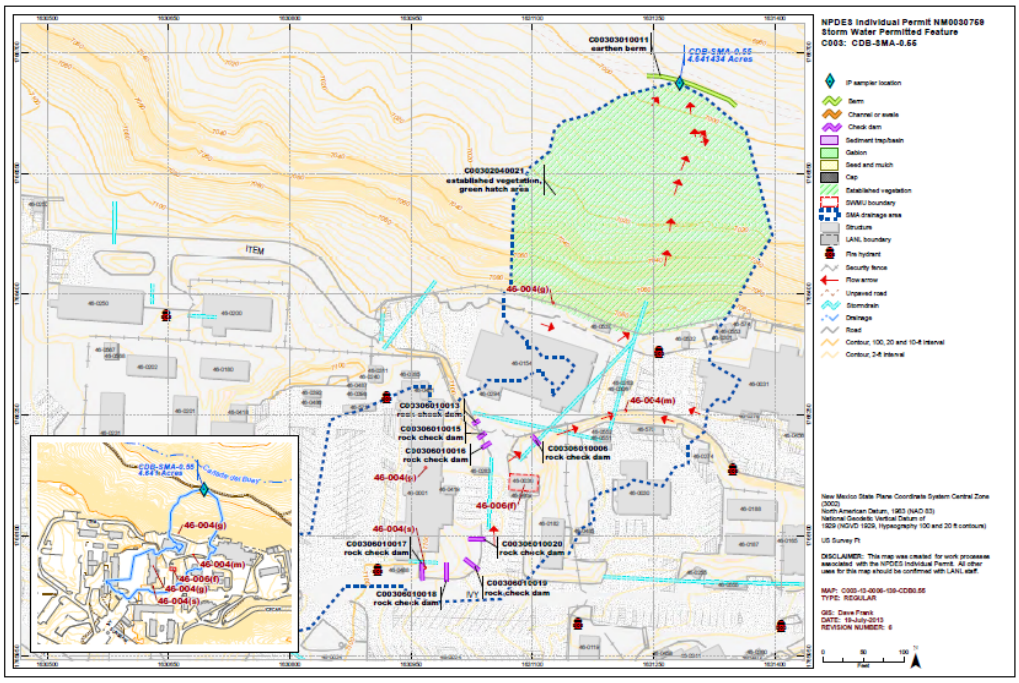
According to soil data collected during the Upper Canada del Buey Aggregate Area Investigation Report (2010), soil samples taken within and just outside the SMA indicate presence above NMED HWB-approved background levels for perchlorate, cadmium,

chromium, zinc, manganese, mercury, copper, aluminum, barium, cobalt, lead, magnesium, nickel, vanadium, and a number of organics. Soil data are included as part of Appendix D.

The current sampler location may be close to representative of the affected area, however, a number of constituents are present in the soil that were not sampled for during this permit term. While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

barium	manganese	acenaphthene	anthracene	benzo(a)anthracene
toluene	benzo(b)fluoranthene	benzo(g,h,i)perylene	chrysene	fluoranthene
fluorene	indeno(1,2,3-cd)pyrene	pyrene	methylene chloride	

CDB-SMA-0.55:



The initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	Others
CDB-SMA-0.55	46-004(e2)	Alpha & Ra	Cyanide	All	PCBs	SVC
	46-004(g)	Alpha & Ra	Cyanide	All	PCBs	SVC
	46-004(m)	Alpha & Ra	Cyanide	All	PCBs	SVC
	46-004(s)	Alpha & Ra	Cyanide	All	PCBs	SVC
	46-006(f)	Alpha & Ra	Cyanide	All	PCBs	SVC

The current location of the IP stormwater sampler is downgradient from this grouping of SWMUs. When reviewing different versions of LANS/DOE's SDPPPs, it appears that SWMU 46-004(e2) was deleted from later editions of the SDPPP and accompanying documentation. Since (e2) was an outfall related to floor drains in a robotics facility, NMED needs more information on why this Site was deleted from documentation related to the IP. These SWMUs were related to outfalls that handled uranium processes, machine shops, laboratories, industrial wastewater and a storage area where oils, metals, beryllium alloys, lead and mercury containing items were stored. Baseline monitoring exceedances at this Site were copper (3.8 times the TAL), silver (2 times the TAL), hexachlorobenzene (2.1 times the TAL), and PCBs (1.1 times the TAL).

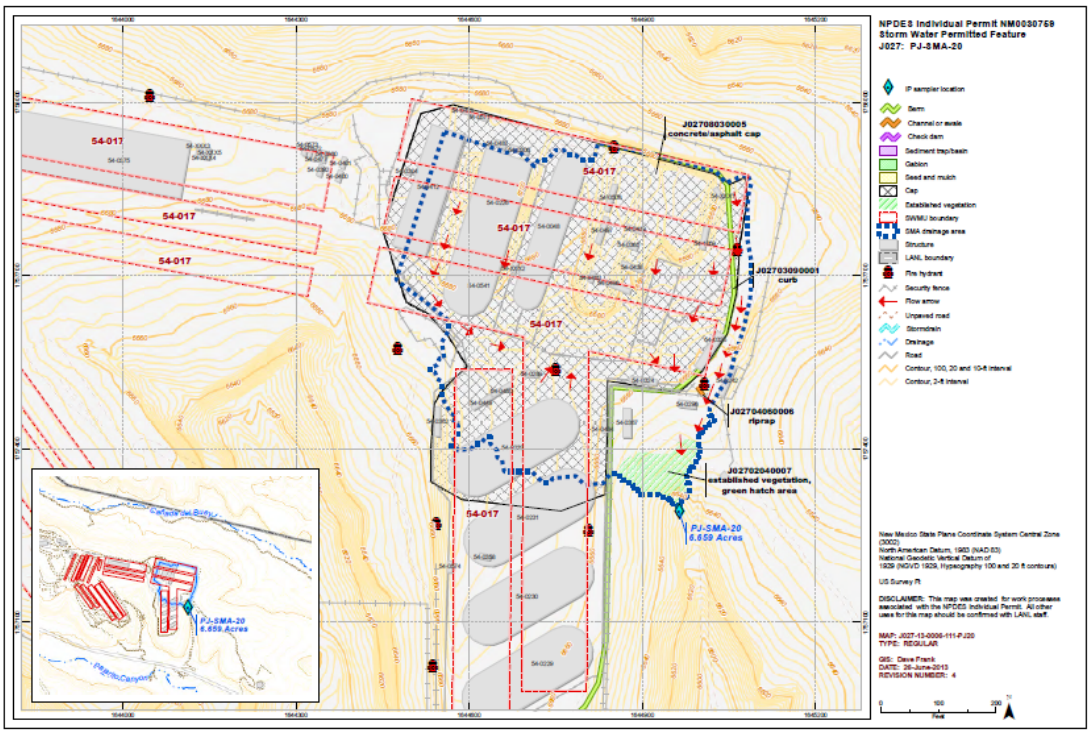
BMP inspections after rain events have been occurring as required, but there are no documented sampler inspections to indicate that the Lab is actively trying to collect a sample. The documentation indicates that corrective action is in planning but was initiated more than 30 days after the baseline sample was collected. New enhanced controls have not yet been installed.

According to soil data collected under the Upper Canada del Buey Aggregate Area Investigation Report (2010), soil samples taken within and outside the SMA indicate presence above background for (inorganics) cesium, perchlorate, lead, lithium, zinc, copper, cadmium, mercury, silver, selenium, thallium, beryllium, and a number of organics including PCBs. Soil data are included as part of Appendix D.

The current sampler location may not be representative of the affected area, and a number of constituents are present in the soils that were not sampled for during this permit term. While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

beryllium	benzene	perchlorate	benzo(k)fluoranthene	acenaphthene
anthracene	benzo(a)anthracene	bis(2-ethylhexyl)phthalate	benzo(b)fluoranthene	benzo(g,h,i)perylene
chrysene	fluoranthene	fluorene	indeno(1,2,3-cd)pyrene	pyrene
methylene chloride	xylenes	toluene	1,1,1-trichloroethane	

PJ-SMA-20:



Initial monitoring requirements for this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs
PJ-SMA-20	54-017	Alpha & Ra	Cyanide	All	PCBs

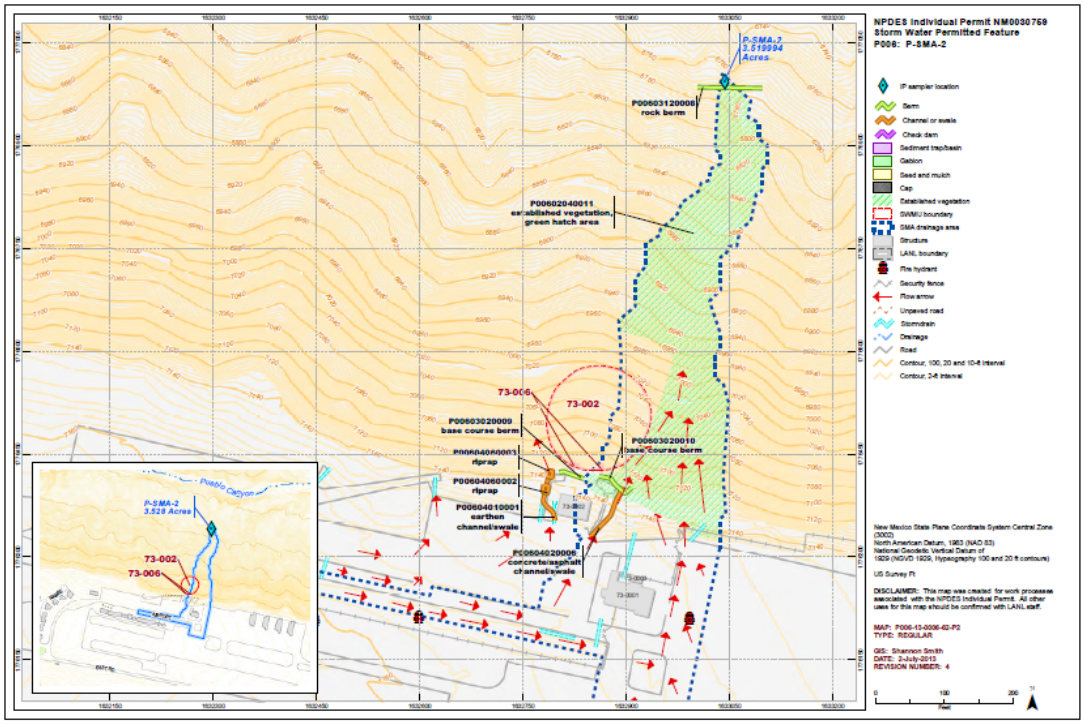
The SWMU for this Site is actually completely underground and is not exposed to stormwater. The baseline TAL exceedance for this Site is for copper (1.9 times the TAL).

A baseline sample was collected at this Site on July 29, 2011. Permittees certified complete cover on October 25, 2013. A sample was collected from this Site 5-28-14. Data showed exceedance for gross alpha. NMED has concerns about the MQLs in the permit for silver and cadmium. Both reported results were above TALs but at the defined MQL in the permit.

According to soil data collected as part of the MDA G Investigation Work Plan (2004), soil samples taken just outside the SWMU area indicate some presence for tritium, but this would not be captured by the current sampler location.

The current location of the IP stormwater sampler appears to be mostly representative of the Site, however, because soil data does indicate the presence of tritium along Pajarito Road in three locations, tritium monitoring should be added to the monitoring scheme in the future for this Site.

P-SMA-2:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	Others
P-SMA-2	73-002	Alpha & Ra	Cyanide	All	Dioxin
	73-006	Alpha & Ra	Cyanide	All	

The SWMUs associated with this SMA consist of a former incinerator where operations were ceased due to incomplete combustion and the associated drainlines from floor drains. The incinerator was used to burn classified documents, and after transfer to Los Alamos County, it was used to burn municipal trash. Incinerator operations were ceased in the 1970s. Stormwater data has not been collected for this Site yet.

The location of the IP sampler captures about half of the SWMU boundary designated as the push pile over the side of the cliff.

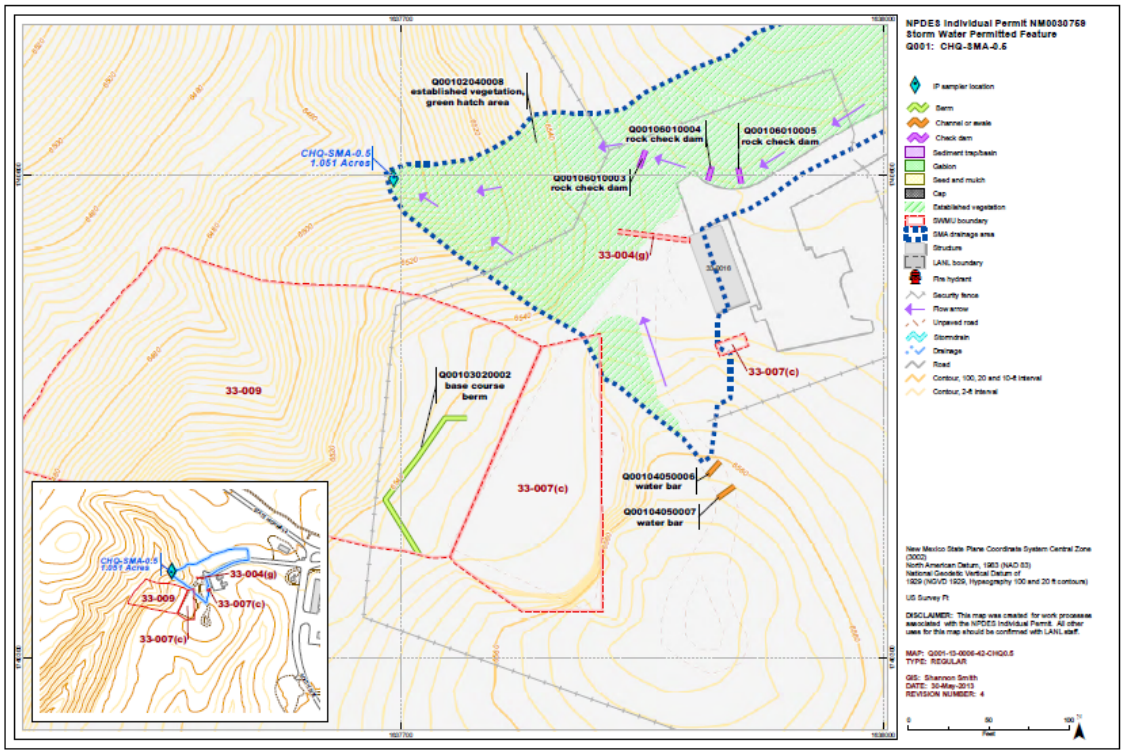
Soil data collected as part of the SWMU 73-002 and Consolidated Unit 73-002-99 Investigation Report (2007) indicate that there is presence above NMED HWB approved soil background levels for perchlorate, copper, mercury, zinc, barium, cadmium, lead, silver, thallium, vanadium, chromium, selenium, barium, magnesium, aluminum, arsenic, tritium, strontium-90, DDT and derivatives, and a number of other organics.

The current location of the IP stormwater sampler does not appear to be representative of the affected area at these Sites. While the permit did give TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part

I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

barium	chlordane	tritium	strontium-90	DDT and derivatives
beryllium	benzene	benzo(k)fluoranthene	dieldrin	acenaphthene
anthracene	benzo(a)anthracene	2,3,7,8-TCDD	benzo(b)fluoranthene	benzo(g,h,i)perylene
chrysene	fluoranthene	fluorene	indeno(1,2,3-cd)pyrene	pyrene
methylene chloride	bis(2-ethylhexyl)phthalate	xylenes	toluene	1,1,1-trichloroethane

CHQ-SMA-0.5:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive
CHQ-SMA-0.5	33-004(g)	Alpha & Ra	Cyanide	All		
	33-007(c)	Alpha & Ra	Cyanide	All		HE
	33-009	Alpha & Ra	Cyanide	All	PCBs	

The SWMUs associated with this SMA are a former outfall and drainline associated with a test gun building for initiator tests, abandoned firing Sites and a former surface disposal area, where some PCB contaminated transformers, metal wastes, light bulbs, tires and drums were stored. Materials of concern at SWMU 33-007(c) included beryllium, polonium-210, uranium, copper, lead, tungsten and stainless steel. There was a reported leak of radioactive material, and cleanup was documented as bulldozing contaminated surface soils from the shot area into the canyon below. During cleanup activities, 200 yd^3 of soil was removed from catcher boxes and the Site was stabilized. At 33-009, a former surface disposal area, contaminated soil and debris from firing activities was pushed into the canyon. After the Manhattan Project activities, this area was also used as a storage area for defective electrical capacitors for approximately five years. Materials were removed from the Site and disposed at MDA G, and included DU pieces, electrical capacitors, metal turnings, old tires and fluorescent light tubes. PCB-contaminated oil was measured from capacitors at 100 ppm. Baseline monitoring has not been completed for this Site. The IP sampler location will only capture runoff from the 33-004(g) SWMU and will not capture the 33-007(c) or 33-009 Sites.

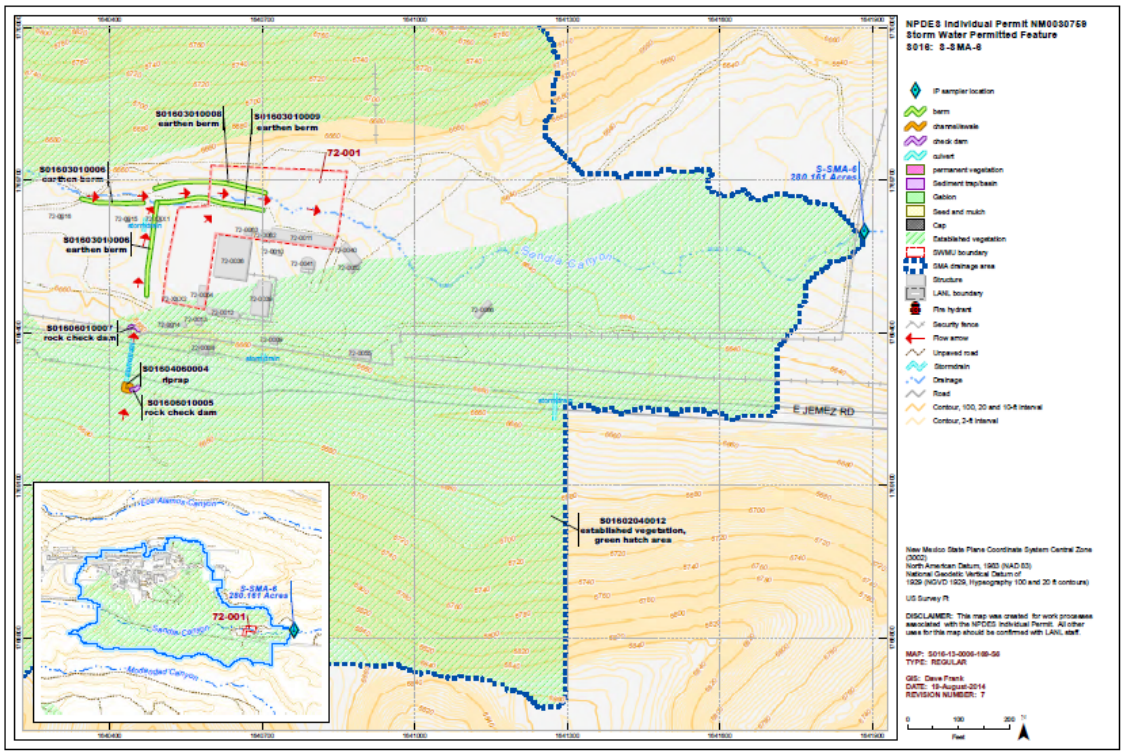
According to documentation submitted with this inspection, Permittees collected a baseline monitoring sample on 7-24-2014. No data has been submitted to EPA or NMED in association with this sampling event.

Only one sampler had been deployed for monitoring at this Site and has not collected a sample. However, this sampler is positioned such that it will only collect runoff from Sites 33-004(g) and a small portion of 33-007(c). The entire Site 33-009 and most of 33-007(c) are in another drainage not captured by the current sampler.

Consent Order investigations have not yet begun at this Site and consequently LANS/DOE does not have soil data to determine what they term to be significant industrial materials related to this Site.

The current location of the IP sampler is not representative of all of the affected area at these Sites and should be moved or a second sampler should be installed to capture runoff from the other two SWMUs.

S-SMA-6:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive
S-SMA-6	72-001	Alpha & Ra	Cyanide	All	PCBs	HE

The SWMU associated with this SMA was a historical firing range, which is also its current use. Baseline monitoring showed TAL exceedances for aluminum (2 times the TAL), copper (2 times the TAL), gross alpha (410 times the TAL), radium 226 & 228 (1.5 times the TAL), cyanide (1.8 times the TAL) and PCBs (7200 times the TAL).

Current sampling location is the old FFCA location. The differences between the FFCA investigation and the current sampling for this permit are markedly different due to the purpose of sampling under each effort. The FFCA sampling was a characterization effort to determine what kinds of contamination were coming off of the various SWMUs around the lab. Sampling under this permit is targeted at ensuring that discharges off of the specific SWMUs are not causing or contributing to exceedances of water quality standards. The current location of this sampler does not illustrate runoff from this SWMU but characterizes the diluted runoff from many Sites contributing to this canyon.

Samples have been obtained for the Site and there are exceedances of the ATALs for Cyanide, adjusted gross alpha, PCBs, Ra 226 + 228, and exceedances of the MTALs for Aluminum and Copper.

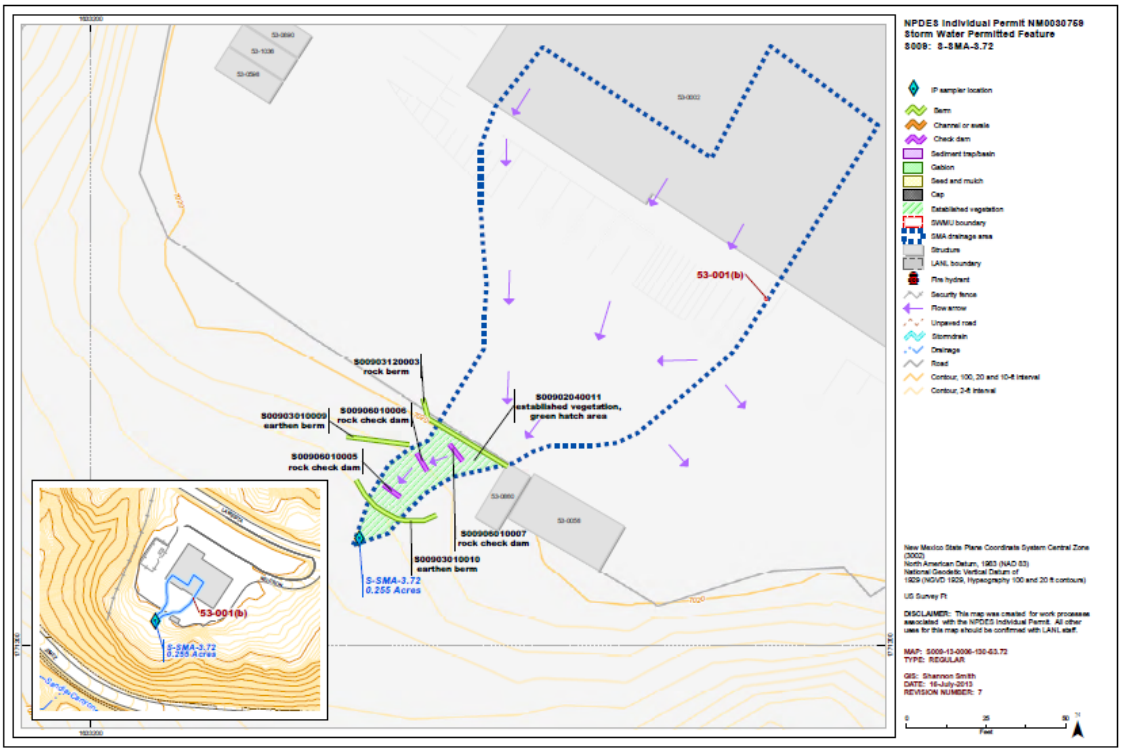
LANS/DOE submitted a permit modification request to EPA for this Site in October 2013 due to the conclusion that many of the required monitoring constituents are not considered to be Site-related. However, due to the sampler location, the data collected is not representative of the discharge from the Site because it collects stormwater from a large (approximately 280 acre) drainage. The claim that the pollutants are not Site related cannot be proven or disproven with the available water quality data.

Additionally, the Site was under construction, so LANS/DOE staff will need to restart sampling for the permit required constituents once construction is complete.

Soil sampling data available for this Site (for metals only) show that the only metal above background levels is selenium, downstream of the SWMU boundary.

The current sampler location is not representative of the affected area and should be moved closer to the affected area. In addition, depending on the new sampler location, run-on monitoring may also be helpful at this location to show that the Site is not causing or contributing to a violation of the TAL.

S-SMA-3.72:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs
S-SMA-3.72	53-001(b)	Alpha & Ra	Cyanide	All	PCBs

The SWMU associated with this Site was a former storage area where products and wastes associated with maintenance activities were stored, such as spent trichloroethene, Freon, solvents and acidic waste; some drums were marked with hazardous waste labels in what may have been a less than 90 day storage area that was removed in 1998.

No stormwater sample has been collected at this Site yet.

Most of the area associated with this SMA is covered by an asphalt parking lot. The SWMU is only defined as a point and is unlike other SWMUs that include a flow path. It is possible that the drainage through the parking lot will flow to the west and around the location of the current sampler.

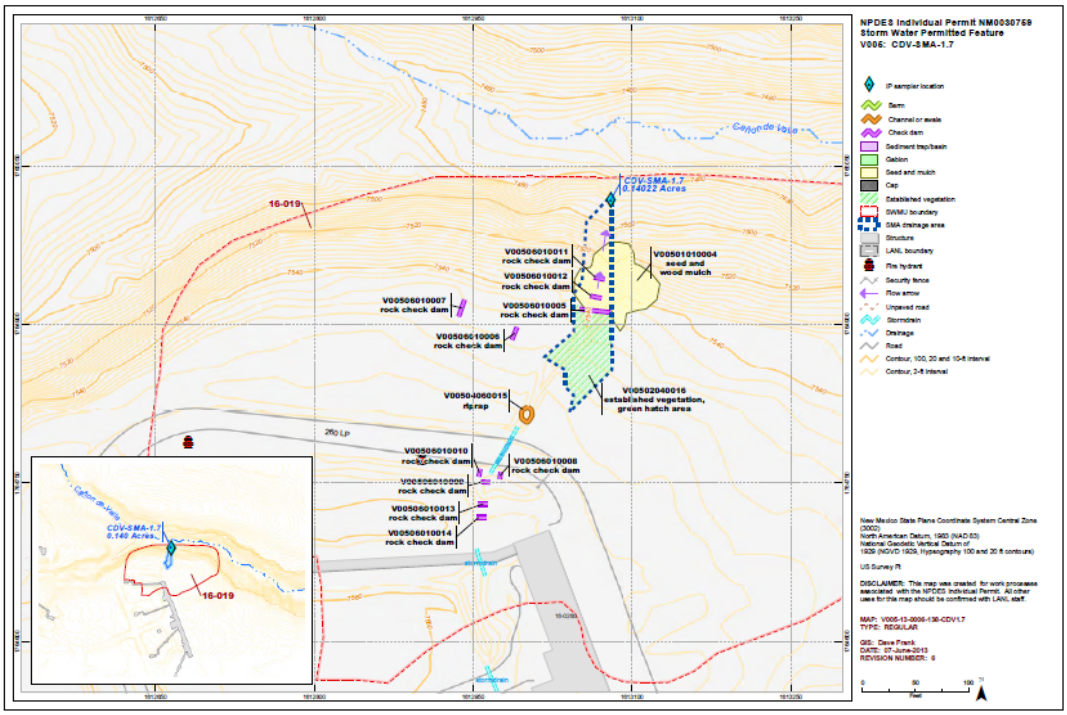
Soil data collected during the Lower Sandia Canyon Aggregate Area Investigation Report (2010) was taken outside of and downstream of the SWMU boundary. The data indicate the presence above NMED HWB-approved background levels of chromium, copper, lead, zinc, antimony, barium, silver, cadmium, PCBs and TPHs.

The current sampler location may not be representative of the discharge from the Site. While the permit did give TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the

permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

barium	TPHs

CDV-SMA-1.7:



Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals	High Explosive
CDV-SMA-1.7	16-019	Alpha & Ra	Cyanide	All	HE

The SWMU associated with this Site is part of MDA R, which consists of the original World War II S-Site Burning Ground and former waste disposal Site. This MDA was used specifically to burn HE wastes; at first, directly on the ground, and later in three adjacent shallow burning pits. Burning operations ceased in the 1950s and the 260 line buildings were built after filling in the burn pits with the materials comprising the associated berms. This Site burned underground for several weeks during and after the Cerro Grande fire in 2000.

Baseline stormwater TALs exceeded at this Site include gross alpha (2.46 times the TAL), cyanide (1.75 times the TAL), RDX (4.54 times the TAL) and copper (2.56 times the TAL). LANS claims that Cyanide and gross alpha are not associated with materials historically managed at the Site.

The current location of the sampler is in the middle of the SWMU. There are other channels leaving this Site that are not currently monitored.

Some of the SWMU is covered under asphalt parking lots.

Erosion that occurred during the September 2013 monsoonal storms created a new channel to the west of the current channel where sampling is occurring. At the time of this inspection, construction was occurring to install a bar ditch near the road to alleviate some of the erosive flows leaving the Site with associated velocity dissipation at the end of the bar ditch and a pipe to carry stormwater runoff around the SWMU area to avoid mobilizing soil and contaminants from this Site. The inspectors noted

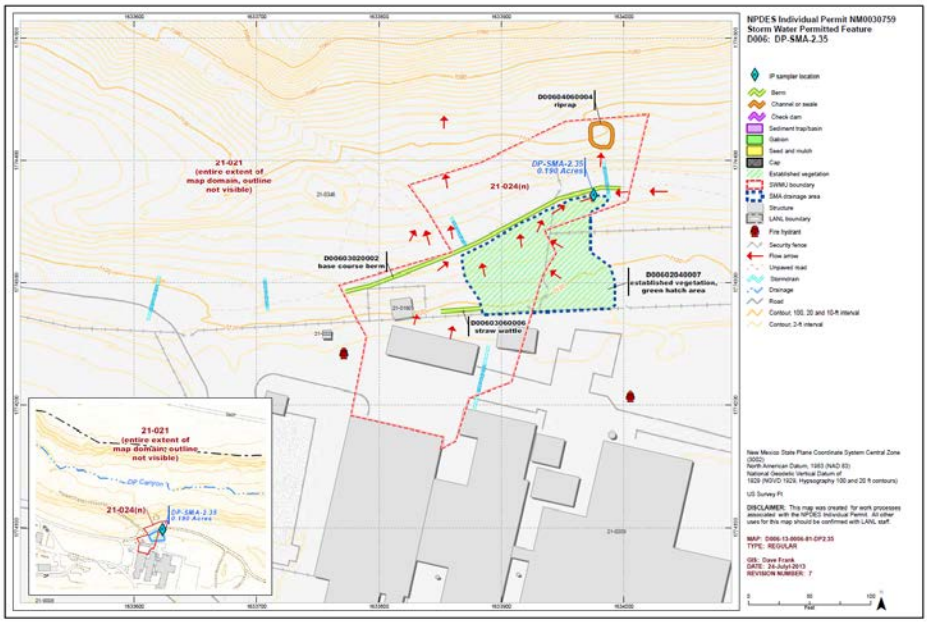
that sampling requirements would have to be re-started because the construction disturbance within the affected area of the Site.

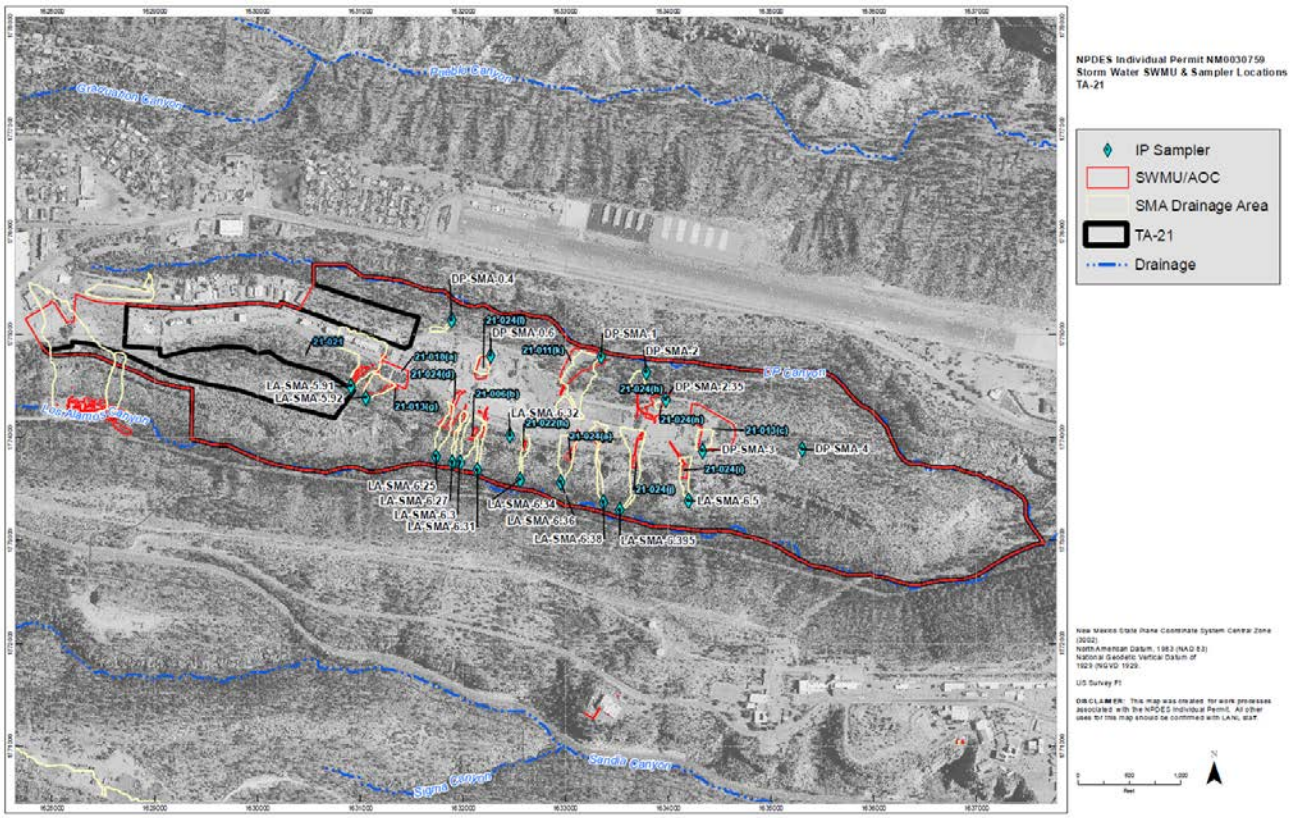
Soil data collected during the Canon de Valle Aggregate Area Investigation Report (2006) were taken outside of and downstream of the SWMU boundary. The data indicate the presence above NMED HWB-approved background levels of barium, cobalt, manganese, nickel, thallium, vanadium, silver, chromium, selenium, zinc, uranium, aluminum, arsenic, lead, copper, beryllium, boron, and nitrates, as well as toluenes, RDX, and a number of other organics. Soil data are included as part of Appendix D.

The current sampler location is not representative of the discharge from the Site. While the permit did give some TALs for some semi-volatile compounds and organics, it did not include other constituents that were detected in soil during Consent Order investigations. The following compounds were detected above NMED HWB-approved background levels according to Consent Order soil data, but were not sampled in storm water during this issuance of the Individual Permit. As cited above, the permit requires that LANS/DOE update their SDPPPs and update the pollutants of concern associated with these Sites during that process. LANS/DOE did not update for additional pollutants associated with Site activities. In accordance with Part I.F.1.d of the permit ("the SDPPP must also identify the pollutants of concern associated with those [industrial] activities."), Part I.F.3.b ("Findings of deficiencies in control measures during inspections or based on analytical monitoring results;") and Part I.F.4 ("The SDPPP shall be updated annually to fully incorporate all changes made during the previous year and to reflect any changes projected for the following year.") of the NPDES permit. For the following constituents that were detected in soil because NMED has water quality standards for the following pollutants, LANS/DOE should be sampling for these constituents in storm water:

barium	manganese	beryllium	toluenes	HMX
bis(2-ethylhexyl)phthalate	pyridine	phenanthrene	fluoranthene	pyrine

DP-SMA-2.35 (targeted SWMU 21-021, which covers many SMAs):





Discussion continued on the next page.

Initial monitoring requirements at this Site were:

SMA Number	Site Number	Radioactivity	Cyanide	Metals
DP-SMA-2.35	21-021	Alpha & Ra	Cyanide	All
	21-024(n)	Alpha & Ra	Cyanide	All

The SWMUs associated with this Site are described as follows: SWMU 21-024(n) was a corrugated metal pipe and associated outfall from a building that was previously a warehouse, a laboratory and a furnace, which was a heating unit for DP East. The SWMU also includes three additional drainlines from the facility. In 1988, reconnaissance sampling (one sample) results were above detection limits for zinc, plutonium 239/240, tritium, and oil and grease. Petroleum products were also cited as being likely because of the presence of the furnace.

SWMU 21-021 is associated with air stack releases of plutonium, strontium and possible chemical constituents at TA-21, which is cited in LANS/DOE's SDPPP as an area of 300,000 m^2. This TA is noted within 17 SMAs and as such, has not been effectively monitored for stormwater quality. The samplers that are located within the SMAs that also include Site 21-021 are targeted to sample the other Sites within those respective SMAs, according to LANS staff. Admittedly this is a difficult Site from which to obtain representative samples.

LANS documents that during the 1992 RFI, 155 shallow soil samples (<3 feet in depth) were taken from a 40-m x 40-m grid across the entire TA. For RCRA purposes, LANS/DOE does not plan to submit a CoC request for this Site until all other Site investigations are complete within TA-21.

There have been radiological detections at samplers whose area encompasses part of 21-021 = DP-SMA-3, DP-SMA-2.35, DP-SMA-0.3, LA-SMA-6.395, LA-SMA-5.92, and LA-SMA-5.91.

CoCs have been obtained for some Sites within the SMAs that also include 21-021.

Additional Pollutants for Monitoring

The following sections of this report are included for clarification and as a means of discussing current and future permit requirements.

Included in this report is the document, Appendix B, from LANS/DOE's permit reapplication materials. LANS/DOE presented information in the revised version of this document identifying additional pollutants that they added to the proposed monitoring requirements for the new permit. This list differs from the discussion above of the Sites that were visited during this inspection. In their initial evaluation, the Permittees rely on Site histories to determine what contaminants are and are not Site-related. This report identifies additional pollutants that should be added for consideration in the new permit.

Another consideration for the new permit is how Sites are characterized and how "associated" or "Site-related" pollutants are identified. Oftentimes, LANS/DOE's documentation, specifically in the SDPPPs, cites soil sampling and Site histories, and uses that documentation to show their conclusions that a pollutant either is or is not Site related. As seen in sampling results, there are pollutants leaving a Site that LANS/DOE has stated are not "Site-related" but still show the potential to either cause or contribute to water quality exceedances. Conversely, there are Sites that were granted clean closure under RCRA prior to the consent order that may not have needed coverage under the current permit. EPA should consider a mechanism to evaluate pollution above water quality standards when it is not Site related, and investigate a potential new Site that could then be added to the permit for monitoring and cleanup.

Use of Certificates of Completion for Clean Water Act Purposes

The term "Certificate of Completion" (CoC) is a DOE/LANL-specific term (not found in RCRA) which was developed during the negotiation process of the Consent Order. The term is not specifically defined in the Consent Order. This term is used to indicate that the Permittees, under their RCRA permit, have completed administrative tasks required under that enforcement action. A CoC can be issued either with or without controls. Controls can be physical (i.e., specific BMPs must be in place) or they can be administrative controls (i.e., industrial use of the Site, continued stormwater monitoring under the NPDES Stormwater Individual Permit). The language below from the Consent Order relates to work required under the RCRA process and does not include assessments of water quality by the Permittees.

From the Consent Order (VII.E.6.b), available at http://www.nmenv.state.nm.us/HWB/documents/LANL_10-29-2012_Consent_Order_-_MODIFIED_10-29-2012.pdf :

The Respondents may request a Certificate of Completion for any SWMU or AOC. With such request, Respondents shall submit an appropriate report (e.g., investigation report, corrective measures implementation report or other report prepared under this Consent Order) documenting completion of all work required at the SWMU or AOC. Upon receipt of an appropriate report and request for a Certificate of Completion, the Department will determine whether the requirements of this Consent Order for corrective action for the SWMU or AOC have been satisfied. The Department may conduct an inspection of the SWMU or AOC or request additional information from the Respondents to make this determination. If the Department determines that the requirements have not been satisfied for the SWMU or AOC, it will notify the Respondents in writing of the actions that are necessary to correct the deficiencies. The Respondents shall implement such actions in accordance with the notification. If the Department determines that the requirements of this Consent Order have been satisfied for the SWMU or AOC, it will issue to the Respondents a written Certificate of Completion, which shall state that Corrective Action is Complete with Controls or that Corrective Action is Complete without Controls.

The NMED Hazardous Waste Bureau does not evaluate compliance with WQCC-approved water quality standards when a CoC is issued, but as shown in Appendix F, will typically issue a CoC with controls to mandate continued stormwater monitoring under the IP. This is For a Site to be removed from the Permittees' RCRA permit under a Class III Modification, NMED Hazardous Waste Bureau would require a formal letter from the NMED Surface Water Quality Bureau stating that stormwater monitoring has met the applicable requirements of 20.6.4 NMAC.

As detailed through this inspection report, the use of CoCs (as the permit language is currently written) could in fact impede the process of assessment of compliance with water quality standards. EPA does state in the response to comments when the permit was issued that effectiveness of installed BMPs will be demonstrated through confirmation monitoring.

Background Concentrations of Pollutants

The Permittees have drafted two background reports, titled *Background Metals Concentrations and Radioactivity in Storm Water on the Pajarito Plateau, Northern New* Mexico (LA-UR-13-22841, April 2013) and *Polychlorinated Biphenyls in Precipitation and Stormwater within the Upper Rio Grande Watershed* (LA-UR-12-1081, May 2012). The Permittees have used the information in these reports to justify that Sites are not causing or contributing to water quality exceedances.

In the Permit's Response to Comments (February 9, 2009), EPA discusses the requirement to address run-on concentrations of pollutants to a Site, and also allows the Permittees to request No Further Action on a Site if the permit TAL exceedances are attributable solely to natural background levels in Part VI.C.2 (Comment 15). However, EPA notes that "In order to use this provision, the discharger must (1) *document and obtain EPA approval of the supporting rationale for establishing background* (emphasis added); demonstrate that the values above target level are attributable solely to natural background pollutant levels; (2) have results that show pollutant levels are less than or equal to the concentration of that pollutant in the natural background; and (3) notify EPA that values above target action levels are attributable solely to natural background pollutant levels." NMED does not have documentation that EPA has approved the use of these background reports.

Section B – Recordkeeping and Reporting Evaluation – Overall Rating of Unsatisfactory

Permit Requirements for Recordkeeping and Reporting

The permit states in Part I.F.1(b) & (d):

*(b) **Site Description.** The facility's SDPPP must include historical activities at each Site, precipitation information, general location map, and Site maps.*

*(d) **Summary of Potential Pollutant Sources.** The SDPPP must identify each Site at the facility where industrial materials or activities were previously exposed to storm water and from which allowable non-storm water discharges were released. The SDPPP must also identify the pollutants of concern associated with those activities.*

The permit states in Part I.F.5: *SDPPP Availability:*

…In accordance with Section I.7 of this permit, a copy of the SDPPP will also be made available on a public website.

The permit states in Part I.7: *Public Involvement*

(a) Website: Within six (6) months after the effective date of the permit, the Permittees shall establish a public website where information on that Permit, including the SDPPP, Annual Reports, Inspection Reports, DMRs, transmittal correspondence between Permittees and EPA, and other relevant data and documents, will be made available.

The permit states in Part I.F.1.d: *Summary of Potential Pollutant Sources.*

The SDPPP must identify each Site at the facility where industrial materials or activities were previously exposed to storm water and from which allowable non-storm water discharges were released. The SDPPP must also identify the pollutants of concern associated with those activities.

The permit states in Part I.J: Water Quality Based Effluent Limits

Permittees must control discharges from all Sites as necessary to ensure that such discharges will not cause or contribute to a violation of applicable water quality standards.

The Permit states in Part I.H.2: Annual Reports

The Permittees shall submit an annual status report. This report shall include the following:

(a) For each SMA (or Site), a summary of the Site-specific compliance status during the report period;
(b) SMA and associated Outfall and Site(S) numbers/identifications;
(c) Monitoring results available during the reporting period;
(d) Identification of pollutants which exceed applicable MTAL or ATAL; …
(i) Highlights of any change of compliance status from the Annual Report.

Findings for Recordkeeping and Reporting

The Permittees did continue to hold their semi-annual public meetings and additionally held meetings with interested parties to discuss current activities at Sites around the facility.

Site Discharge Pollution Prevention Plans (SDPPPs):

The 2012 updated version of the Permittees' SDPPP was missing from the LANS/DOE website. The 2011 and 2013 updates were available.

At certain Sites, LANS/DOE personnel identified pollutants that were Site related that should be on the monitoring list. This list is included as Attachment C and is obtained from the Permittees' permit reapplication package. This information should have been identified by the Permittees in the annual SDPPP updates and Annual Reports as the Permittees were aware of the additional pollutants of concern. This additional information should have resulted in revisions to Site sampling under the Permit.

When reviewing SDPPP language for a Site from update to update, it was noted that in some cases, language describing the former activity at the Site was changed or deleted. Site descriptions are one of the ways that LANS/DOE, the public and regulatory agencies characterize a Site and the potential pollutants that could be generated. Keeping the pertinent information in the SDPPPs from year to year is important. However, if the plan is to revise Site histories, this is why all versions of the SDPPPs should be available on the website.

An example of this occurring is at DP-SMA-2.35. The 2011 SDPPP stated the following:

SWMU 21-024(n) is a drain-line that exits Building 21-155 and discharges into DP Canyon. Building 21-155 has been a warehouse and a laboratory and contains a furnace. The furnace is believed to be a heating unit for DP East. The drain system consists of corrugated metal pipe that exits a concrete bulkhead and discharges onto a gravel road adjacent to MDA U [SWMU 21-017(a)-99]. The effluent flows north to the ditch paralleling the north perimeter road. From there, it flows east to a culvert that passes under the north perimeter road and into DP Canyon. One sample was collected directly under the opening in the ten inch drain pipe as part of the 1988 reconnaissance sampling. The analytical results indicate zinc, plutonium-239/-240 and tritium concentrations were above BVs/FVs. Oil and grease concentrations were reported above detection limits. Petroleum products are also potential contaminants because of the furnace in Building 21-155.

The 2013 SDPPP gave the description as:

SWMU 21-024(n) originally consisted of a CMP (corrugated metal pipe) that exited building 21-155 and an outfall on the north edge of DP Canyon. Building 21-155 was constructed in 1949 and housed a warehouse and laboratory. Three additional drainlines

originating from building 21-155 (or next to building 21-155) that followed a parallel path to, and west of, the SWMU 21-024(n) drainline were found in engineering drawings and during Site visits in the early 1990s and were subsequently added to SWMU 21-024(n). Each of the parallel drainlines discharged to the same hillside as the SWMU 21-024(n) outfall. Discharges from each drainline flowed downslope to a ditch on the south side of the TA-21 perimeter road. From the ditch, the path of the effluent flowed to one of two culverts (one to the east and one to the west) that crossed under the perimeter road and emptied onto the ground surface that sloped toward DP Canyon. All four drainlines were removed in 2007.

The information omitted in the 2013 version was all of the historical activity information that would inform potential pollutant observations. Again, this is critical information that can be used by all involved parties to assess the Sites.

While the Site maps contained in the SDPPPs were generally useful and detailed, there were a few instances where clarifications were needed. The direction of flow was not clear in some cases, and some Site features were not included that would be useful. For example, at LA-SMA-5.02, the associated SWMU was a surface disposal area where materials were also pushed over the side of the canyon. The materials were mostly construction debris from demolition activities of the former TA-01 buildings, in addition to utility boxes, piping, and miscellaneous construction debris. Aside from the SWMU area not being completely captured by the SMA sampler, there is a storm drain inlet in the parking lot at the upper end of the SWMU, which directs storm water over the eastern side of the SWMU boundary. The eastern side, outside the drainage area of the sampler, does contain soil concentrations for various metals (nickel, lead, mercury, zinc, beryllium) as well as PCBs, PAHs, and other chemicals. The influence of the storm drain is likely transporting these pollutants further down into the LA Canyon drainage and is not being treated or mitigated by the installation of BMPs or remediation activities. Additionally, because the area where this is occurring is outside the drainage area of the sampler, those pollutants are not being characterized in runoff.

Updates to SDPPPs are required annually by the permit. There was construction activity at two SMAs that were visited during this inspection. No information was included in the 2013 SDPPP update on construction related activities at Sites (specifically S-SMA-2 and CDV-SMA-1.7) and the requirements in Part I.E.5.a of the permit to restart sampling at those two SMAs. Construction began at S-SMA-2 approximately a month prior to this inspection, and construction at CDV-SMA-1.7 began shortly before the inspection as well.

For the Sites detailed in Section A of this narrative, soil sampling under the Consent Order typically occurred for many Sites in the 2009-2010 time frame. As LANS/DOE obtained these soil sampling results, updates should have been made to the SDPPPs for each of these Sites to indicate that other potential pollutants could be discharged off of the Sites. This requirement is made in the Permit in Part I.F in the Summary of Potential Pollutant Sources, which did not appear to be updated with the new soils information, and is also required to be reported to EPA and NMED in the Annual Report required by Part I.H.2.

Soils data are an example of information that is important and must be reported timely to the regulatory agencies. This would then result in important decisions on protection of water quality standards, and human health and the environment. Because of this lack of information, it is likely that these additional pollutants (metals, PAHs, and radionuclides) have been discharged into the environment without appropriate monitoring and remediation.

Silver and cadmium are inconsistently reported. Permittee representatives indicate that the contract lab they work with cannot analyze at the required MQL of 0.5 ug/L for silver. However, at some Sites, silver is reported above the TAL at the reported contract lab's reporting limit of 1.0 ug/L (such as at Pratt-SMA-1.05), but at other Sites, such as CDB-SMA-1, silver is reported below the MQL at 0.2 ug/L. The Permittees state that:

Detected results are reported to the value of the Method Detection Limit (MDL). Non-detected results are reported to the value of the Practical Quantitation Limit (PQL), also referred to as the Low Standard. Concentrations of analytes are detected if observed between the value for the MDL and PQL and are qualified as estimated with "J". LANL is incompliance when the MQL falls between the MDL and PQL because the contracted analytical laboratories are using EPA-approved analytical methods with the same or more sensitive detectable level (DL) than MQL.

Dissolved silver and cadmium analyses have been performed using ICP-MS analytical method EPA 200.8. All analyses conducted for the Individual Permit have been reported with a MDL for cadmium of 0.11 ug/L and for silver of 0.2 ug/L (see table below). These MDL values are lower than IP MQL values for these same metals. LANL is compliant with the requirement that analytical methods with the same or more sensitive detectable level (DL) than the MQL shall be used.

Analyte	*Analytical Method*	*Contract Lab MDL (ug/L)*	*Contract Lab Low Standard (ug/L)*	*IP MQL (ug/L) IP Part 1.C*	*IP MTAL (ug/L) IP Part 1.C*
Cadmium, Dissolved	*EPA:200.8*	*0.11*	*1.0 (on pages 167 and 426 of 790 in 11-3196.pdf)*	*1.0*	*0.6*
Silver, Dissolved	*EPA:200.8*	*0.2*	*1.0 (on pages 167 and 426 of 790 in 11-3196.pdf)*	*0.5*	*0.4*

The IP MQL is not reported in analytical results provided by the contracted laboratories. The lowest standard analyzed by contracted analytical laboratories for both dissolved cadmium and dissolved silver are 1.0 ug/L since the initiation of the Individual Permit. Any sample concentration that falls between the value of the MDL and Low Standard is reported as detected and the actual concentration of the analyte is reported. Instead of reporting values below the MQL as "0" or "ND", LANL's contracted analytical laboratories have been instructed to report the actual estimated concentration of each analyte when the concentration is between the MDL and Low Standard.

The Laboratory requested that the contracted laboratories change their reporting convention for results not-detected above the value of the MDL in order to be consistent with Department of Defense and Department of Energy Consolidated Quality Systems Manual for Environmental Laboratories (available at https://doecap.oro.doe.gov/EDS_Public/default.aspx). This was changed over the winter and spring of 2011/2012. In 2011, non-detected results were reported at the value of the MDL. Since 2012, non-detected results have been reported at the value of the lowest standard analyzed. This reporting convention causes the admittedly confusing situation where detected results can be reported with lower concentrations than non-detected results.

Cadmium is reported at the MQL value, which is also not protective of NMWQCC water quality standards and is not reported as a TAL exceedance. The language in the permit allows the Permittees to use the less sensitive limit between the EPA-established MQL or the ATAL/MTAL in the permit.

Analyte	*Std Value*	*MQL*	*MTAL value*	*Reported Value*	*EPA Method 200.8 MDL*	*EPA Method 200.9 MDL*
silver*	0.5 ug/L	0.5 ug/L	0.4 ug/L	1.0 ug/L	0.005 ug/L	0.5 ug/L
cadmium*	1.0 ug/L	1.0 ug/L	0.6 ug/L	1.0 ug/L	0.01 ug/L	0.05 ug/L

* Hardness dependent.

In Permittees' documentation, charts show the "std value", which is defined as "the TAL value as listed in the Permit." This is not accurate. The Permittees' terminology should reflect that they are using the MQL value, not the TAL value as established in the permit.

Section C – Operations and Maintenance – Overall Rating of Marginal

Permit Requirements for Operations and Maintenance:

The permit requires in Part I.E.1, Confirmation Results above Target Action Levels:

If, following installation of baseline control measures, any validated sample analytical result for a specific pollutant of concern at a particular SMA is greater than the applicable MTAL (or applicable MQL, whichever is greater) or the average of all applicable sampling results Is greater than the applicable ATAL (or applicable MQL, whichever is greater), the Permittees shall conduct visual

inspections for all Sites within the SMA drainage area, reevaluate the existing control measures, and initiate corrective action as soon as practicable. Such corrective action may entail the design and installation of enhanced (additional, expanded or better tailored) control measures reasonably expected to achieve compliance with target action levels identified in the Permit for all Sites within the SMA drainage area. If this type of corrective action is selected, at least two confirmation samples shall be collected (one confirmation sample shall be collected during each of at least two (2) separate measureable storm events occurring at least fifteen (15) days apart) following installation of any enhanced control.

Findings for Operations and Maintenance:

The on-the-ground Site-specific BMPs that were observed during this inspection appeared to be well maintained and operational. These BMPs ranged from berms and check dams to established vegetation.

As noted in Appendix A (overview of Sites) there are 78 SMAs that showed an exceedance of TALs in baseline monitoring, but are listed as needing corrective action. These Sites have been in need of corrective action anywhere from October of 2011 to November of 2013. Sites that need corrective action are required by the Permit as detailed above to be addressed "as soon as practicable." Although there is no specific timeframe for compliance with this requirement, it does not appear that delaying corrective action for three years is compliant with the requirement to implement corrective action as soon as practicable.

For example, it appears that M-SMA-4 collected a baseline sample in December of 2010. TAL exceedances were for gross alpha, radium 226+228, PCBs and copper. As listed in the permit reapplication materials submitted to EPA and NMED in March 2014, the corrective action response listed is that corrective action is initiated. No more information is given as to the meaning of "initiated", whether that is planning or whether controls have been implemented on the ground. The Site description given in the latest SDPPP update is that for the five SWMUs/AOCs associated with this SMA, three have obtained CoCs from the NMED Hazardous Waste Bureau, and two are awaiting corrective action. The documentation also states that no exposure certification is being considered for one of the remaining SWMUs in 2014. No additional samples since the baseline samples collected in December of 2010 have been collected at this Site.

Appendix H of this inspection report is a table showing the corrective action status of Sites as of December 2013.

Section D – Self-Monitoring – Overall Rating of Unsatisfactory

Permit Requirements for Self-Monitoring

The permit states in Part I.D.2: *Sampling Locations:*

All samples taken for purposes of confirmation monitoring shall be taken in compliance with the monitoring requirements specified below at SMAs specified in Appendix A to the permit. Instead of monitoring at each individual Site, the Permittees may, when appropriate based on drainage patterns for the affected Sites, monitor two or more Sites in conjunction at an associated SMA… SMA locations are based on reasonable site accessibility for sampling purposes and the Permittees' best judgment to ensure that samples taken at a particular point will be representative of discharges from Sites in the drainage area… Permittees may move a sampler to make minor adjustments that arise due to changes in natural conditions, unexpected events or as otherwise necessary to ensure that the sample location is representative. Such changes can include minor updates in Site boundaries, changes in storm water drainage patterns, logistical or security adjustment. Any such movement of a sampler will be documented in the annual SDPPP, and be made available for public review.

The permit states in Part I.E.5(c):

…if a Site for which monitoring has ceased, later exhibits evidence of a discharge of contaminated runoff, or conditions that could lead to a discharge of contaminated runoff, …or if monitoring data (from the facility, State or local agency), shows an exceedance of applicable target action levels, the Permittees shall initiate appropriate actions to correct the problems within

thirty (30) days of being made aware of such information. After completion of any required corrective actions, at least two confirmation samples shall be taken.

The permit states in Part I.E. and Part I.E.2:

I.E: As specifically described below, if confirmation monitoring shows target action levels are not being met at a particular Site, Permittees must take corrective action through installation of measures reasonable expected to: (i) meet applicable target action levels at that Site; (ii) achieve total retention of storm water discharges from the Site; (iii) totally eliminate exposure of pollutants to stormwater at the Site; or through (iv) a demonstration that the Site has achieved RCRA "corrective action complete without controls/corrective action complete without controls/corrective action complete with controls" status or a Certificate of Completion under NMED's Consent Order.

I.E.2: Permittees must certify to EPA, pursuant to 40 C.F.R. Section 122.22(b), completion of corrective action at all Sites within the deadlines established under Section E.4 below. Except as provided in subsection E.3 below, "Completion of Corrective Action" under this Permit shall mean:

(a) Analytical results from confirmation sampling show pollutant concentrations for all pollutants of concern at the Site to be at or below applicable target action levels; or

(b) Control measures that totally retain and prevent the discharge of storm water have been installed at the Site; or

(c) Control measures that totally eliminate exposure of pollutants to stormwater have been installed at the Site; or

(d) The Site has achieved RCRA "corrective action complete without controls/corrective action complete with controls" status or a Certificate of Completion under NMED's Consent Order.

The permit also states in Part I.D and Part I.D.1(a) & (b):

The permittees shall monitor storm water discharges from Sites at specified sampling points known at Site Monitoring Areas (SMAs) against applicable target action levels. The Permittees shall perform confirmation monitoring as detailed below following installation in accordance with Permittees' SDPPP of each site-specific control measures, including any enhanced or additional control measure installed as corrective action. Pollutants of concern to be monitored are specified in Appendix B.

Initial monitoring requirements and frequency of sampling for each pollutant of concern following installation and implementation of baseline control measures vary on a site-by-site basis as specified below:

(a) For Sites at which baseline control measure to address the non-numeric effluent limits in Part I.A of the permit have already been installed and implemented prior to the effective date of this permit, the Permittees shall collect two or more confirmation samples. One (1) confirmation sample shall be collected during each of at least two (2) separate measureable storm events occurring at least fifteen (15) days apart and within one (1) year after the effective date of this Permit at associated SMAs.

(b) For Sites at which baseline controls to address the non-numeric effluent limits in Part I.A of the Permit are installed with six (6) months of the effective date of this permit, the Permittees shall collect two or more confirmation samples. One (1) confirmation sample shall be collected during each of at least two (2) separate measureable storm events occurring at least fifteen (15) days apart and within eighteen (18) months after the effective dates of this Permit at associated SMAs.

Additionally, the permit requires in Part I.E.1(a):

If, following installation of baseline control measures, any validated sample analytical result for a specific pollutant of concern at a particular SMA is greater than the applicable MTAL (or applicable MQL, whichever is greater) or the average of all applicable sampling results is greater than the applicable ATAL (or applicable MQL, whichever is greater), the Permittees shall conduct visual inspections for all Sites within the SMA drainage area, reevaluate the existing control measures, and initiate corrective action as soon as practicable. Such corrective action may entail the design and installation of enhanced (additional, expanded or better tailored) control measures reasonably expected to achieve compliance with target action levels identified in the Permit for all Sites within the SMA drainage area. If this type of corrective action is selected, at least two confirmation samples shall be collected

during each of at least two (2) separate measurable storm events occurring at least fifteen (15) days apart following installation of any enhanced control. If either validated confirmation sample result for any specific pollutant of concern exceeds applicable target action levels, the Permittees shall conduct visual inspections for all Sites within the SMA drainage area, reevaluate the existing control measures, and initiate further measures to achieve completion of corrective action under Sections E.2 or 3 as soon as possible.

The permit states in Part I.E.5.f: Monitoring Location Change

If the location of any SMA for any Site or Sites has been changed, confirmation samples must be analyzed for all pollutants of concern for that Site or Sites, as listed in Appendix B of the Permit.

Findings for Self-Monitoring

No Sample Collected:

There are approximately 110 SMAs for which no sample has been collected. The current permit requires that a sample is analyzed when there is enough volume to complete all required analyses, and if it has been 15 days since the prior rain event. In many cases, the BMPs installed at a Site (including large berms and/or retention basins) do not allow flow to pass to the sampler location.

Soil Sampling and Lack of Updates to SDPPP and Sampling Requirements:
The permit states, as cited above, in Part I.E.5.c, that if there is evidence that a Site exhibits conditions that could lead to a discharge of contaminated runoff, the Permittees are required to initiate corrective action within 30 days of receiving notice of those conditions. As noted earlier in this report, the Permittees have conducted extensive soil sampling in accordance with their RCRA permit and this information informs the affected area of the Sites covered under this Clean Water Act permit. Much of the soil sampling was conducted for Investigation Reports in 2009-2010. It appears that the soil sampling results should have informed the Permittees' decisions on what the affected areas of these Sites were, and the Permittees should have taken action within 30 days to correct sampler locations and ensure the representativeness of those SMA locations.

The permit states in Part I.E.5.f that when an SMA sampler location changes, regardless of whether it is a major or a minor change, that the Permittees must collect confirmation samples for all pollutants of concern at the Site. According to the permittees' annual reports for 2012 and 2013, the following SMAs had minor changes in the associated SMA location. No confirmation sampling of the Sites listed below appears to have occurred.

2012 Annual Report:

Table 7-1
Minor Sampler Location Adjustments

SMA	New Station Name
2M-SMA-1.45	2M-SMA-1.45 at SS123220
2M-SMA-2	2M-SMA-2 at SS123221
A-SMA-2.7	A-SMA-2.7 at SS120211
DP-SMA-3	DP-SMA-3 at SS121907
LA-SMA-0.85	LA-SMA-0.85 at SS121043
LA-SMA-1	LA-SMA-1 at SS121044
M-SMA-1	M-SMA-1 at SS121238
M-SMA-10.01	M-SMA-10.01 at SS121235
M-SMA-7.9	M-SMA-7.9 at SS121237
PT-SMA-1	PT-SMA-1 at SS124815
PT-SMA-2.01	PT-SMA-2.01 at SS124816
S-SMA-1.1	S-SMA-1.1 at SS121634
W-SMA-14.1	W-SMA-14.1 at SS123937
W-SMA-8.71	W-SMA-8.71 at SS123938

2013 Annual Report

Table 7-1
Minor Sampler Location Adjustments

SMA	New Station Name	Watershed
LA-SMA-1.25	LA-SMA-1.25 at SS131045	Los Alamos and Pueblo
LA-SMA-5.2	LA-SMA-5.2 at SS131046	Los Alamos and Pueblo
P-SMA-2.2	P-SMA-2.2 at SS130804	Los Alamos and Pueblo
PJ-SMA-10	PJ-SMA-10 at SS132340	Pajarito
PJ-SMA-13.7	PJ-SMA-13.7 at SS132339	Pajarito
STRM-SMA-1.5	STRM-SMA-1.5 at SS133007	Pajarito
CDV-SMA-1.4	CDV-SMA-1.4 at SS130425	Water and Cañon de Valle
CDV-SMA-4	CDV-SMA-4 at SS130424	Water and Cañon de Valle
CDV-SMA-6.02	CDV-SMA-6.02 at SS130423	Water and Cañon de Valle
PT-SMA-1.7	PT-SMA-1.7 at SS134817	Water and Cañon de Valle
W-SMA-1	W-SMA-1 at SS133939	Water and Cañon de Valle
W-SMA-6	W-SMA-6 at SS133940	Water and Cañon de Valle

For enhanced control monitoring, the permit states that two confirmation samples must be collected if enhanced control measures are installed as part of a corrective action remedy. There is no time frame established in the permit to obtain these two samples. The permit does state at Part I.E.5.d that if in any situation where two confirmation samples are required and only one can be obtained, then compliance will be judged on the single sample, but again, there is no time frame established in Part I.E.1.a.

During the inspection, NMED noted that some sampler locations – specifically the inlet and actuator to the sampler – were in such a location that some storm flows would not be sampled. For example, at CDB-SMA-0.55, there was a channel evidenced by erosion that routed flow around the sampler inlet (please see Appendix E for the photos showing this situation). Permittees' representatives indicated that they felt they were unable to move the sampler inlet location (at this and other Sites) because it would require a modification to the permit. However, as the permit states in Part I.D.2 above, minor changes are allowed with notification to EPA that they are occurring, and followed by documentation in the SDPPP. Additionally, the Permittees document in the 2013 Annual Report that minor changes occurred at sampling locations (12 SMAs) and minor changes to Site boundaries did occur at 81 Sites.

Additional Sampling Information:

Additional sampling data available through the Intellus database was collected by the NMED DOE Oversight Bureau. DOE-OB monitored at a few locations that were slightly downstream of LANS/DOE's SMA locations (please see Appendix C for maps showing NMED DOE-OB's sampling locations in relation to LANS/DOE's sampling locations) and did obtain some data that indicated that the contamination had moved past (down slope from) the location of the SWMU boundary. These Sites are discussed below:

SMA	***Site Number***	***CoC with or without Controls***	***LANS/DOE Sampling/TAL Exceedances; None means no sampling has occurred (Ratio exceedances to TAL)***	***Notes***
B-SMA-1	00-011(d)	CoC with Controls (5-7-13) – NMED HWB indicates that stormwater sampling under the IP is still required.	Gross alpha (8.4); used MQL for Ag of 1.0 ug/L	DOE-OB sampled below LANS/DOE's sampler: exceedance at old FFCA location of Thallium (1.01) on 6-19-13.
LA-SMA-3.1	01-001(e), 01-003(a)	CoC with Controls (Sept 2010) - NMED HWB indicates that stormwater sampling under the IP is still required.	None (LANS/DOE has collected partial samples here).	DOE-OB has samples from five events. Exceedances: PCBs (809). Partial samples have been collected here.
LA-SMA-5.02	01-003(e)	CoC with Controls (9-10-10) - NMED HWB indicates that stormwater sampling under the IP is still required.	Copper (1.14), PCBs (94.26)	LANS/DOE certified corrective action complete at this Site on November 29, 2012. DOE-OB sampling also showed an exceedance of PCBs (2 of 3

ACID-SMA-2	45-001, 45-002, 45-004, 01-002(b)-00	CoC without Controls (2-2013)	Al (1.05), Gross alpha (2.7), PCBs (128.44)	samples). DOE-OB sampling shows exceedances for Al, Thallium, Zn, Hg, PCBs

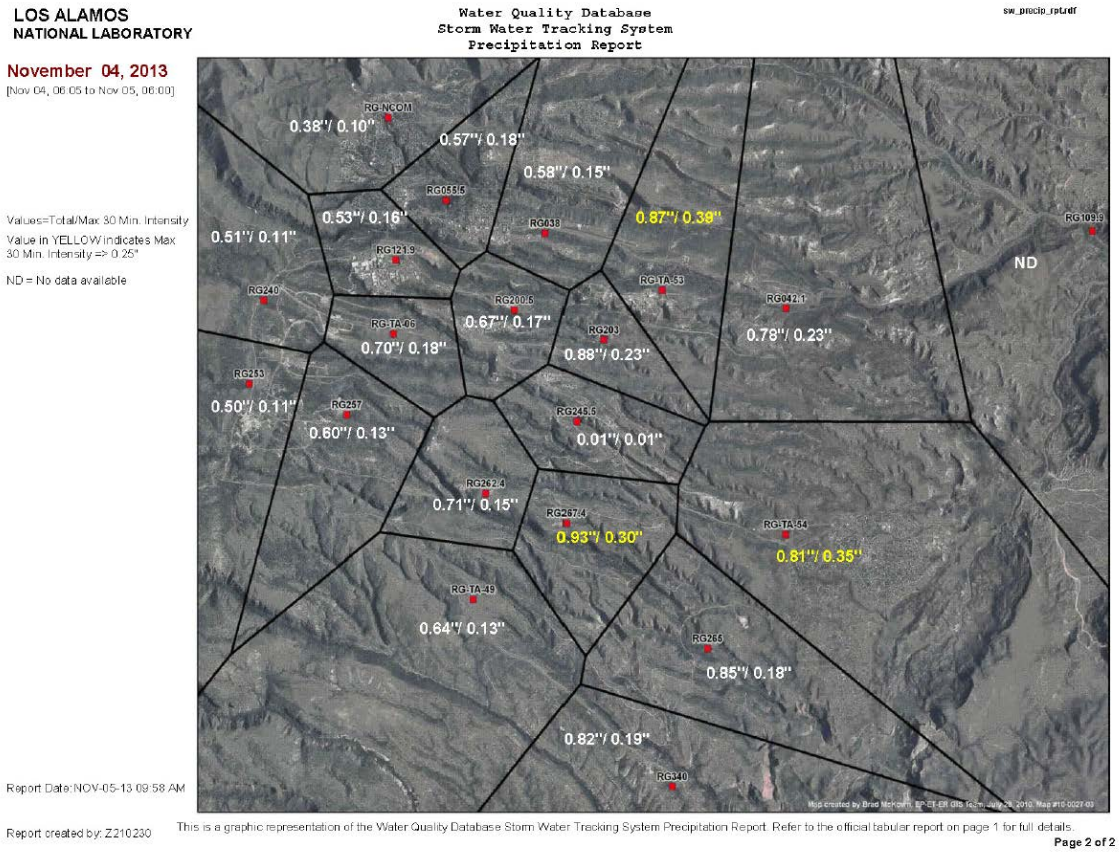
For these four Sites, the NMED DOE-OB samplers appear to be more representative of the runoff from the Sites and affected area when taking available soil sampling data into account. The differences between the TAL exceedances indicate that the Permittees must reevaluate the representativeness of their current sampling location and should use all available information to inform that assessment.

Sample Processing Lab – Temperature:

During the previous NMED inspection in 2012, one of the monitoring-related findings was that thermometer calibration in the sample storage refrigerators was not occurring. During this inspection, it was confirmed that thermometers were being properly calibrated against a NIST-certified thermometer. LANS/DOE staff also indicated that the refrigerators were in need of replacement and were working on securing new refrigerators.

Structure of Gaging Network to Respond to Rain Events:

LANS/DOE's procedure for stormwater sample collection is dependent on an extensive rain gauge monitoring network. The Lab is separated into polygons (shown in the photo, below), each of which contains a gaging station.



The gauging stations are equipped with telemetry. When a rain event occurs that triggers the required measurable storm event (0.25 inches within 30 minutes), a post-storm inspection is conducted, and the sampler is checked at that time for sample volume. According to Permittees', the LANS staff conducting the inspections typically respond within 3 days of the triggering rain event. When an appropriate sample volume is collected, which is enough sample volume to run all of the required analyses, LANS staff then collects and brings the sample to the sample processing lab at the Pueblo Complex. When only an insufficient volume is collected for all analytes, no analysis is done.

Dissolved Metals and Sample Retrieval Procedures:

Monitoring requirements under the permit mandate assessment of Sites for dissolved metals concentrations in accordance with the TALs designated in the permit. The approved method for dissolved metals analysis in 40 CFR Part 136.3 that LANS/DOE utilizes is EPA Method 200.8. The method states that "for the determination of dissolved elements, the sample must be filtered through a 0.45µm pore diameter membrane filter at the time of collection or as soon thereafter as practically possible." In footnote 7 in Table II of 40 CFR Part 136.3, EPA notes "For dissolved metals, filter grab samples within 15 minutes of collection and before adding preservatives." LANS/DOE staff indicated that because there is approximately three days' time before field staff retrieves a sample after a triggering event, in-line filtering on ISCO collection devices was attempted. However, according to LANS/DOE staff, the filter clogged. As a result, samples are now collected and returned to the sample processing lab where they are then filtered and preserved, and sent offsite to the contract laboratory for analysis. With the delay in filtration of the sample, dissolved and suspended forms of the metals could change, therefore resulting in an inaccurate portrayal of that storm event's impact on the Site. At one Site, S-SMA-3.53, LANS staff did not retrieve the sample collected in August 2011 for eight days, at which time it was cooled and preserved. NMED SWQB does recognize that due to the large number of SMAs monitored under this permit, getting samples filtered and processed within 15 minutes is extremely unlikely, however, eight days is excessive. Excessive delays in analysis call the quality of the data into question.

Information provided at the final exit interview on November 5, 2014 indicated that sampling hold time exceedances had improved since 2011. The table provided to NMED is provided here for reference:

Year	SMA	Sample Date	Prep Date	Analysis Holding Time (Days)	Required Analysis Holding Time (Days)	Exceeds (Y/N)	Appendix Table	Notes
2011	R-SMA-1.95	8/19/2011	*	*	7	Y	C-5	
	LA-SMA-1.25	8/28/2011	*	*	14	Y	C-5	
	LA-SMA-10.12	9/1/2011	*	*	14	Y	C-5	
	S-SMA-0.25	7/28/2011	*	*	7	Y	C-5	
	S-SMA-1.1	9/14/2011	*	*	14	Y	C-5	
	S-SMA-3.53	8/4/2011	*	*	7	Y	C-5	
	S-SMA-3.6	8/13/2011	*	*	7	Y	C-5	
	S-SMA-6	8/19/2011	*	*	7/14	Y	C-5	
	CDB-SMA-0.25	9/1/2011	*	*	7	Y	C-5	
	M-SMA-1	8/19/2011	*	*	14	Y	C-5	
	M-SMA-10.3	8/19/2011	*	*	14	Y	C-5	
	M-SMA-4	8/19/2011	*	*	14	Y	C-5	
	2M-SMA-1.67	9/15/2011	*	*	7	Y	C-5	
	2M-SMA-2	9/4/2011	*	*	14	Y	C-5	
	2M-SMA-2.2	9/4/2011	*	*	14	Y	C-5	
	PJ-SMA-16	7/30/2011	*	*	7	Y	C-5	
	PJ-SMA-3.05	8/19/2011	*	*	14	Y	C-5	
	STRM-SMA-4.2	9/9/2011	*	*	14	Y	C-5	
	STRM-SMA5.05	8/21/2011	*	*	14	Y	C-5	
	CDV-SMA-2.41	8/21/2011	*	*	14	Y	C-5	

	CDV-SMA-2.5	9/1/2011	*	*	7	Y	C-5	
	CDV-SMA-3	8/21/2011	*	*	7	Y	C-5	
	CDV-SMA-6.02	8/13/2011	*	*	7	Y	C-5	
	PT-SMA-0.5	9/1/2011	*	*	7	Y	C-5	
	PT-SMA-1	9/1/2011	*	*	7	Y	C-5	
	PT-SMA-2.01	8/18/2011	*	*	7	Y	C-5	
	W-SMA-1	9/9/2011	*	*	14	Y	C-5	
	W-SMA-1.5	9/9/2011	*	*	14	Y	C-5	
	W-SMA-10	8/21/2011	*	*	14	Y	C-5	
	W-SMA-14.1	7/25/2011	*	*	7	Y	C-5	
	W-SMA-14.1	8/18/2011	*	*	7	Y	C-5	
	W-SMA-2.05	8/21/2011	*	*	14	Y	C-5	
	W-SMA-9.9	8/21/2011	*	*	14	Y	C-5	
	A-SMA-2.7	9/4/2011	*	*	7	Y	C-5	
	CHQ-SMA-1.02	8/21/2011	*	*	14	Y	C-5	
2012	W-SMA-5	7/3/2012	7/12/2012	9	7	Y	B-6	LANL entered Stage III Fire Restrictions on 7/3, field work placed on hold until site assessments could be completed. Sample collected on 7/10, shipped from LANL with 24 hr delivery on 7/11, lab extraction on 7/12. **Corrective action initiated.**
2013	M-SMA-10	6/30/2013	7/15/2013	15	14	Y	B-5	Sample shipped from LANL with 24 hr delivery on Wed 7/10. Lab failed to extract within required time. **Corrective action initiated.**
	3M-SMA-0.4	7/12/2013	7/23/2013	11	7	Y	B-6	Sample shipped from LANL with 24 hr delivery on Th 7/18. Lab failed to extract within required time. **Corrective action initiated.**
	S-SMA-3.6	7/2/2013	7/11/2013	9	7	Y	B-6	4th of July holiday + weekend. Sample shipped from LANL with 24 hr delivery on Tue 7/9. **Corrective action initiated.**
	CDV-SMA-1.2	9/12/2013	9/20/2013	8	7	Y	B-6	Due to heavy rains and flooding all field work was stopped 9/13 through 9/17 until safety assessments could be completed. Sample collected from field on 9/18 and shipped from LANL with 24 hr delivery on 9/19.

	S-SMA-3.95	9/13/2013	9/26/2013	13	7	Y	B-6	Due to heavy rains and flooding all field work was stopped 9/13 through 9/17 until safety assessments could be completed. Sample collected from field on 9/19 and shipped from LANL with 24 hr delivery on 9/19. Lab delayed extraction. **Corrective action initiated.**
	W-SMA-8	9/12/2013	9/26/2013	14	7	Y	B-6	Due to heavy rains and flooding all field work was stopped 9/13 through 9/17 until safety assessments could be completed. Sample collected from field on 9/18 and shipped from LANL with 24 hr delivery on 9/19. Lab delayed extraction. **Enhanced controls installed.**
	W-SMA-8.7	9/12/2013	9/20/2013	8	7	Y	B-6	Due to heavy rains and flooding all field work was stopped 9/13 through 9/17 until safety assessments could be completed. Sample collected from field on 9/18 and shipped from LANL with 24 hr delivery on 9/19. **Corrective action sampling.**
2014	T-SMA-6.8	7/31/2014	8/14/2014	17	14	Y	NA	Collected from field on 8/12, shipped to lab on 8/13. **Corrective action initiated.**
	S-SMA-0.25	7/15/2014	7/23/2013	8	7	Y	NA	Corrective action complete, characterization sample
	S-SMA-0.25	8/22/2014	9/9/2014	18	7	Y	NA	Corrective action complete, characterization sample

*not in Annual table

No Further Monitoring After Receipt of CoC

There are multiple Sites under the permit that, following the installation of enhanced controls, have been certified as Corrective Action Complete. These Sites have not collected confirmatory storm water samples, but rather have obtained a Certificate of Completion under NMED Hazardous Waste Bureau's Consent Order. In discussions with LANS/DOE staff at the time of this inspection, it appears that an interpretation has been made by the Permittees that when a Site does receive a CoC from NMED's Hazardous Waste Bureau, that corrective action is complete and that no more sampling needs to occur. However, NMED does not believe the permit intended to reflect that stormwater sampling could be terminated once a certificate of completion document was obtained.

When a baseline monitoring sample at a Site exceeds TALs, the permit specifically requires that enhanced controls meant to better address the conditions at the Site, and samples to confirm that those controls are working are collected. However, the Sites/SMAs listed below have been documented by the Permittees as having achieved Corrective Action Complete under this permit due to the receipt of a CoC from the NMED Hazardous Waste Bureau. The permit also requires that corrective action in response to a TAL exceedance is initiated within 30 days. There was no documentation available to show that this was achieved. As shown for the Sites in the table below, corrective action was not initiated within the 30 day deadline.

LANS/DOE has not provided any further documentation at the Sites that have obtained a Certificate of Completion to illustrate that the soil concentrations of pollutants at the Site are protective of water quality standards.

Additionally, many of the CoCs obtained for these Sites were issued as a Certificate of Completion WITH controls. These CoCs specifically require LANS/DOE to continue monitoring stormwater under the Individual Permit as a control under the RCRA process (indicated in the table below as "*"):

SMA Number	*Site Number*	*Date Baseline Sample Collected*	*Date Corrective Action Initiated*	*Date of Completion of Corrective Action*	*Date of CoC*	*Sampling Status*	*TAL Exceedances*	*Sampler On/Off*[‡]
R-SMA-0.5	C-00-020	8-3-2012	9-12-2012	11-29-12	5-16-12	No ECM	gross α	Off
ACID-SMA-2	45-001, 45-002, 45-004	8-19-2011	11-3-2011	3-7-13	2-22-13	No ECM	PCB, gross α, Al	Off
P-SMA-0.3	0-018(b)	7-25-2013	9-5-2013	9-16-13	1-14-11	No ECM	gross α, Hg, Se, Ra 226+228	Off
LA-SMA-1.1	43-001(b2)	8-19-2011	10-11-2011	11-29-12	9-10-10*	No ECM	gross α	Off
LA-SMA-2.3	01-001(b)	8-21-2011	5-1-2012	11-29-12	9-10-10*	No ECM	gross α	Off
LA-SMA-5.02	01-003(e)	8-19-2011	10-25-2011	11-29-12	9-10-10*	No ECM	PCB, Cu	Off
LA-SMA-5.33	32-004	8-21-2011	4-30-2012	3-7-13	12-28-12*	No ECM	gross α	Off
LA-SMA-5.91	21-023(c)	9-7-2011	10-31-2011	11-29-12	6-3-11*	No ECM	gross α	Off
S-SMA-2	03-056(c)	8-13-2011	10-20-2011	11-29-12	2-28-11*	No ECM	PCB, Zn, Cu	Off
S-SMA-4.1	53-014	9-1-2011	11-2-2011	8-20-13	7-31-13	No ECM	PCB	Off
CDB-SMA-1	C-46-001	9-7-2011	4-30-2012	11-29-12	7-13-12	No ECM	gross α, PCB, Cu, Al	On
M-SMA-4	48-007(a), 48-007(d), 48-010	8-19-2011	10-31-2011	11-29-12	9-7-10*	No ECM	gross α, Ra 226+228, Cu	Off
M-SMA-10.3	35-014(e2), 35-016(i)	8-19-2011	10-24-2011	10-30-13	9-27-13*	No ECM	PCB, Zn, Al, Cu	Off
T-SMA-1	50-009	8-15-2011	10-21-2011	10-31-13	Complete Cover cert	No ECM	PCB, Zn, Cu	On
PJ-SMA-20	54-017	7-29-2011	5-1-2012	10-25-13	Complete Cover cert	No ECM	Cu, Al	Off
CDV-SMA-1.4	16-030(c)	9-10-2012	10-18-2012	11-29-12	1-23-08	No ECM	Cn, Ag	On
A-SMA-2.7	39-002(c)	9-4-2011	10-27-2011	11-29-12	4-6-10	No ECM	gross α, Cu	On

[‡] Please see Appendix I for LANS/DOE's explanation of sampler rationale and confirmation of which samplers are active/inactive.

Because of the written requirement under the Certificate of Completion to continue monitoring in accordance with the NPDES permit, a decision to discontinue monitoring appears to also create an issue with the CoC under the Consent Order.

Gross Alpha

LANS/DOE's assessment of the TAL in the permit for adjusted gross alpha has been to monitor for gross alpha due to the cost of the additional monitoring for Radium 226+228 and Uranium. Permittee representatives also state that the adjustment would not

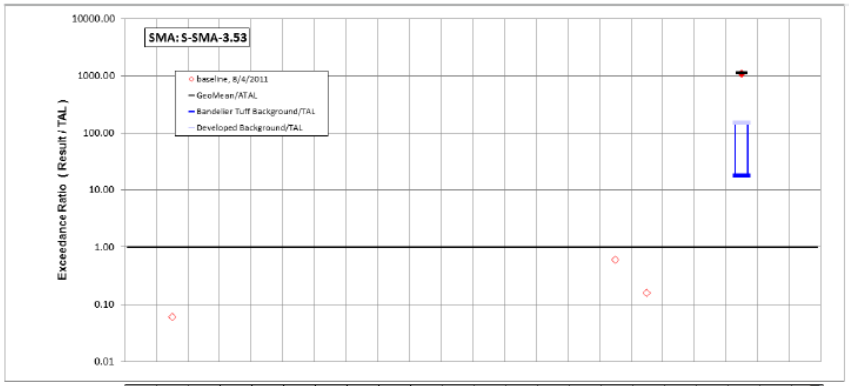
make a significant difference in the value of adjusted gross alpha. Appendix G is the Permittees' report on why this adjustment is unnecessary to determine compliance with this permit.

Analytical Information

A complete analytical information package was reviewed for S-SMA-3.53. This packet included information on sampling/preservation procedures, sample processing at the Permittees' sample processing facility in Los Alamos, and information from the contract analytical laboratory. This narrative will also include a discussion of the Permittees' analytical validation program, which is employed before data is uploaded into the publicly accessible Intellus database. According to the permit, the original monitoring requirements for this Site are:

Table-1000.8.2.1 Historical Industrial Areas within the Permitted Feature

Site	Description	Physical Configuration	Drainage Configuration	Pollutants of Concern			
				Inorg	Org	Rad	Other
03-014(b2)	Outfall associated with former WWTP	Co-located, Overlapping	Individual	•	•	•	PCBs SVC



	Aldrin	Benzo(a)pyrene	BHC[gamma-]	Chlordane (alpha&gamma)	Chlordane[alpha-]	Chlordane[gamma-]	DDD[4,4'-]	DDE[4,4'-]	DDT[4,4'-]	Dieldrin	Endosulfan I	Endosulfan II	Endrin	Heptachlor	Heptachlor Epoxide	Hexachlorobenzene	Pentachlorophenol	ROX	Tetrachlorodibenzo dioxin[2,3,7,8-]	Total PCB	Toxaphene (Technical Grade)	Trinitrotoluene [2,4,6-]
std used in ratio calculations	-	ATAL	-	-	-	-	-	-	-	-	-	-	-	-	-	ATAL	MTAL	-	-	ATAL	-	-
std value	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	5	19	-	-	6E-04	-	-
unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
8/4/2011 result	-	*0.3*	-	-	-	-	-	-	-	-	-	-	-	-	-	*3*	*3*	-	-	**0.702**	-	-
result / TAL	-	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	*0.6*	*0.16*	-	-	**1100**	-	-

Bold font indicates result>TAL; italic font indicates undetected results; "-" is used if no analytical results were available.

Figure 72-3 Organic analytical results summary plot for S-SMA-3.53

Sampling results included with the 2013 SDPPP indicate that sampling information was completed for the required TALs, as noted above. The stormwater sample was collected on August 4, 2011 at 3:12pm. The sample was retrieved by LANS staff on August 12, 2011 at 12:30pm. The sample was received by GEL Laboratories on August 16, 2011. This delay in collection of the sample results in a missed hold time for extraction of the SVOC analytes. Additionally, this means that the sample was not filtered for dissolved metals until at least 8 days later.

No processing/laboratory information was received for PCB analysis at this Site. Collection and retrieval information were available, but the documentation failed to give details as to the type of bottle cap used to hold the PCB sample. 40 CFR Part 136.3

requires that PCBs are collected in a glass container with a fluoropolymer lined cap. The sample was collected in a 1 L glass bottle and was cooled accordingly.

Results for benzo(a)pyrene and hexachlorobenzene are significantly above the ATAL listed in the permit. The documentation in the SDPPP indicates that the "std value" used to determine compliance in these cases was 5 ug/L. LANS/DOE explains in the SDPPP introduction that the "std value" is the TAL value as listed in the permit.

This characterization is not entirely correct, as the ATAL is much lower. The value substituted in this case is the MQL listed by EPA. This information is summarized in the table below.

Analyte	*Std Value*	*MQL*	*ATAL value*	*Reported Value*	*EPA Method 625 MDL*	*EPA Method 610 MDL*
benzo(a)pyrene	5 ug/L	5 ug/L	0.18 ug/L	0.3 ug/L	2.5 ug/L	0.0023 ug/L
hexachlorobenzene	5 ug/L	5 ug/L	0.0029 ug/L	3 ug/L	1.9 ug/L	0.05 ug/L

Permit language at Part I.C allows the permittees to use the higher of the MQL or the MTAL or ATAL for assessment of benchmarks. EPA established a list of MQLs in the permit, but these MQLs are not protective of NM WQCC water quality standards. As seen in the discussion above, pollutants are being discharged from the Sites in excess of the water quality standards, and therefore could be causing or contributing to a violation of those standards. In addition, there are methods approved under 40 CFR Part 136 that do have more sensitive MDLs as listed in the table above.

EPA recently finalized the Sufficiently Sensitive Rule, which is effective September 18, 2014. This rule requires that any analysis done in accordance with an NPDES permit must be EPA-approved and capable of detecting and measuring the pollutants at, or below, the applicable water quality criteria or permit limits. To do this, EPA modified existing regulations applying to permit applications, compliance monitoring and analytical methods. These changes are contained in 40 CFR Part 136 and 40 CFR Chapter I, Subchapters N and O.

Section F – Laboratory – Overall Rating of Marginal

Permit Requirements for Laboratory

The permit requires in Part III.C.5.a:

Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit or approved by the Regional Administrator.

Findings for Laboratory

DOE/LANS uses GEL Laboratories out of South Carolina to perform their analytical analyses on their behalf. From the review of the data package provided as part of this inspection, it appears that GEL has adequate QA/QC procedures. All QC fell within appropriate recovery ranges.

For Radium-226, GEL is using EPA Method 904.0, which is not a 40 CFR Part 136 approved method. GEL is using EPA Method 903.1 for analysis of Radium-228. EPA Method 903.1 does also allow for analysis of Radium-226. It is unclear why the Permittees decided to use a separate method for analysis of Radium-226 that is not approved for NPDES analyses.

LANL also runs its own data verification program. The data verification program ensures that the data received by LANS/DOE from the contract lab meets the Permittees' needs.

Section G – Effluent/Receiving Waters – Overall Rating of Unsatisfactory

Permit Requirements for Effluent/Receiving Waters

The permit requires in Part I.J: Water Quality Based Effluent Limits

Permittees must control discharges from all Sites as necessary to ensure that such discharges will not cause or contribute to a violation of applicable water quality standards.

Findings for Effluent/Receiving Waters:

Baseline monitoring for Sites show that there were many exceedances of applicable TALs. Because corrective action was and continues to be delayed on many Sites, these issues are not resolved. Additionally, the interpretation by the Permittees that the receipt of a CoC immediately results in the need for no further monitoring of the Site results in the delay of needed controls at these Sites. Pollutants could then continue to be carried downstream.

Additional Concerns:

The Permittees use their laboratory-wide meteorological gauging system to determine when a significant rain event has occurred (0.25 inches within 30 minutes) and then use that data to determine when an erosion/BMP inspection is required. However, when LANS staff conducts these inspections, there is no documentation that staff are checking on the samplers associated with the SMA. Separate sampler inspections are conducted. It appears that it would be a much more efficient use of the Lab's resources to also check on the sampler while present for other purposes.

Decision-making to Turn Samplers On or Off

The only instance where the permit clearly allows the Permittees to turn off a sampler would be in the 15 day period after collection of a compliance sample.

The Permittees state in internal documents that they will remove a sampler from a SMA if they have received a CoC from NMED Hazardous Waste Bureau for all Sites within a SMA. If that SMA still has not collected confirmation samples after installed enhanced controls, for example, then there is no surface water confirmation that discharges from the Site are meeting TALs.

For example, the Permittees collected one sample at ACID-SMA-2 on August 19, 2011. There have been no additional samples collected here and there was no sampler present at the time of this inspection. The Permittees did not provide sufficient justification (e.g., dates of sampler removal versus potential subsequent sampling events) for only one sampling event to occur at this SMA. This also occurred at other Sites, such as ACID-SMA-1.05.

List of Appendices:

Appendix A:	NMED Spreadsheet showing status of each Site as of December 2013
Appendix B:	Additional pollutants from permit reapplication materials
Appendix C:	Maps comparing LANS sampling locations at SMAs to NMED DOE-OB locations
Appendix D:	Soil data maps for all Sites visited during this inspection
Appendix E:	Photodocumentation – photos taken by LANS staff and additional notes provided by NMED SWQB
Appendix F:	Example Certificate of Completion with Controls letter issued by NMED Hazardous Waste Bureau
Appendix G:	LANS/DOE Report on Gross Alpha
Appendix H:	Corrective action status of Sites under this permit
Appendix I:	LANS follow-up documentation of sampler shut-off rationale

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[1][2]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
R001	R-SMA-0.5	16-Dec-10	3-Aug-12	12-Sep-12	**C-00-020**	MPS	CACompD[a]	29-Nov-12	[b]	29-Nov-12	5-16-12	α
R002	R-SMA-1	16-May-11	19-Aug-11	13-Oct-11	**C-00-041**	MPS	CAI[c]	In Planning	—	—		α, Zn, Al
R003	R-SMA-1.95	16-Dec-10	19-Aug-11	1-May-12	**00-015**	MPS	CAI	In Planning	—	—		α
R004	R-SMA-2.05	1-Dec-10	In Process	—	**00-011(c)**	MPS	—	—	—	—	5-16-12	
R005	R-SMA-2.3	1-Dec-10	14-Jun-13	<TAL	**00-011(e)**	MPS	—	—	—	—	5-7-13	<TALs?
R006	R-SMA-2.5	16-Dec-10	In Process	—	**00-011(a)**	MPS	—	—	—	—	5-7-13	
B001	B-SMA-0.5	16-Dec-10	13-Sep-13	30-Oct-13	**10-001(a)**	MPS	CAI	In Planning	—	—		α
					10-001(b)	MPS	CAI	In Planning	—	—		α
					10-001(c)	MPS	CAI	In Planning	—	—		α
					10-001(d)	MPS	CAI	In Planning	—	—		α
					10-004(a)	MPS	CAI	In Planning	—	—		α
					10-004(b)	MPS	CAI	In Planning	—	—		α
					10-008	MPS	CAI	In Planning	—	—		α
					10-009	MPS	CAI	In Planning	—	—		α
B002	B-SMA-1	16-Dec-10	13-Sep-13	22-Oct-13	**00-011(d)**	MPS	CAI	In Planning	—	—	5-7-13	α
P001	ACID-SMA-1.05	1-Dec-10	21-Aug-11	<TAL	**00-030(g)**	MPS	—	—	—	—		<TALs?
P002	ACID-SMA-2	1-Dec-10	19-Aug-11	3-Nov-11	**01-002(b)-00**	MPS	CAI	In Planning	—			PCB, α, Al,
					45-001	MPS	CACompD	7-Mar-13	—	7-Mar-13	2-22-13	PCB, α, Al
					45-002	MPS	CACompD	7-Mar-13	—	7-Mar-13	2-22-13	PCB, α, Al

[1] Yellow highlighting indicates LANS/DOE proposed the site for deletion from the permit in their permit reapplication materials.
[2] Sites in **BLUE** indicate LANS/DOE's submission of an alternative compliance request to EPA; Sites in **RED** indicate SWMU/AOC does not appear to be adequately sampled.
[3] LANS/DOE has proposed the site to be moved to moderate priority; change is indicated by **RED** text. NMED SWQB is not able to evaluate the impact of changing priorities on the renewal permit at this time.
[4] Legend for these acronyms located at the end of this chart.
[5] LANS/DOE application indicates that sites with a CoC or Investigation Report (IR) do not require coverage under the permit, regardless of the status of monitoring and TAL results. **Green** = CoC with Controls, **Orange** = CoC without Controls, **Black** = Investigation Report (IR)
[6] **Purple** = ATAL exceedances, **Blue** = MTAL exceedances

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					45-004	MPS	CACompD	7-Mar-13	—	7-Mar-13	2-22-13	PCB, α, Al
P002A	ACID-SMA-2.01	16-Dec-10	In Process	—	00-030(f)	MPS	—	—	—	—		
P003	ACID-SMA-2.1	1-Dec-10	3-Aug-12	7-Sep-12	01-002(b)-00	MPS	CAI	In Planning	—	—		PCB, α, Hg, Cu,
P004	P-SMA-0.3	16-Dec-10	25-Jul-13	5-Sep-13	00-018(b)	MPS	CACompD	16-Sep-13	—	16-Sep-13	1-14-11	α, Hg, Se, Ra 226 +Ra228,
P005	P-SMA-1	1-Dec-10	In Process	—	73-001(a)	HPS	—	—	—	—		
					73-004(d)	HPS	---	---	---	---		
P006	P-SMA-2	1-Dec-10	In Process	---	73-002	MPS	---	---	---	---	8-13-07	
					73-006	MPS	---	---	---	---	8-13-07	
P007	P-SMA-2.15	16-Dec-10	In Process	---	31-001	HPS	---	---	---	---		
P008	P-SMA-2.2	16-May-11	In Process	---	00-019	MPS	---	---	---	---		
P009	P-SMA-3.05	16-Dec-10	13-Sep-13	22-Oct-13	00-018(a)	MPS	CAI	In Planning	---	---		PCB, Al, Cu,
L001	LA-SMA-0.85	1-DEC-10	14-AUG-11	7-OCT-11	03-055(c)	MPS	CAM5	23-Oct-12	In Process	---		Zn, Cu, Al, Pb,
				24-Jun-13	03-055(c)	MPS	CAI2	In Planning	---	---		Zn, Cu, Al, Pb,
L002	LA-SMA-0.9	16-Dec-10	In Process	---	00-017	MPS	---	---	---	---		
					C-00-044	MPS	---	---	---	---		
L003	LA-SMA-1	16-Dec-10	19-Aug-11	30-Apr-12	00-017	MPS	CAM5	27-Nov-12	In Process	---		α, PCB, Al, Cu, Pb,
					C-00-044	MPS	CAM5	27-Nov-12	In Process	---		α, PCB, Al, Cu, Pb,
L004	LA-SMA-1.1	16-Dec-10	19-Aug-11	11-Oct-11	43-001(b2)	MPS	CACompD	29-Nov-12	---	29-Nov-12	9-10-10	α,
L005	LA-SMA-1.25	1-Dec-10	28-Aug-11	27-Oct-11	C-43-001	MPS	CAM5	30-Aug-12	In Process	---		Cu, Zn,
				15-Nov-12	C-43-001	MPS	CAI2	In Planning	---	---		Cu, Zn,
L006	LA-SMA-2.1	16-May-11	13-Sep-13	3-Nov-13	01-001(f)	HPS	CAI	In Planning	---	---		α, PCB, Cu,
L007	LA-SMA-2.3	16-Dec-10	21-Aug-11	1-May-12	01-001(b)	MPS	CACompD	29-Nov-12	---	29-Nov-12	9-10-10 IR 4-21-	α,

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
											10	
L008	LA-SMA-3.1	1-Dec-10	In Process	---	**01-001(e)**	**HPS**	---	---	---	---	**9-10-10**	
					01-003(a)	HPS	---	---	---	---		
L009	LA-SMA-3.9	16-Dec-10	In Process	---	**01-001(g)**	HPS	---	---	---	---		
					01-006(a)	MPS	---	---	---	---		
L010	LA-SMA-4.1	1-Dec-10	4-Sep-11	8-Nov-11	**01-003(b)**	MPS	CAI	In Planning	---	---		**α, PCB, Cu,**
					01-006(b)	MPS	CAI	In Planning	---	---		**α, PCB, Cu**
L011	LA-SMA-4.2	1-Dec-10	In Process	---	**01-001(c)**	MPS	---	---	---	---	**9-10-10**	
					01-006(c)	MPS	---	----	---	---		
					01-006(d)	MPS	---	---	---	---	**9-10-10**	
L012	LA-SMA-5.01	16-Dec-10	In Process	—	**01-001(d)**	**HPS**	—	—	—	—		
					01-006(h)	**HPS**	—	—	—	—		
L012A	LA-SMA-5.02	16-May-11	19-Aug-11	25-Oct-11	**01-003(e)**	**HPS**	CACompD	29-Nov-12	—	29-Nov-12	**9-10-10**	**PCB, Cu**
L013	LA-SMA-5.2	16-May-11	In Process	—	**01-003(d)**	MPS	—	—	—	—		
L015	LA-SMA-5.31	16-Dec-10	19-Aug-11	30-Apr-12	**41-002(c)**	MPS	CAM5	27-Jul-12	In Process	—		**α, Cu,**
L016	LA-SMA-5.33	16-Dec-10	21-Aug-11	30-Apr-12	**32-004**	MPS	CACompD	7-Mar-13	—	7-Mar-13	**12-28-12**	**α,**
L014	LA-SMA-5.35	1-Dec-10	7-Sep-11	27-Oct-11	**C-41-004**	MPS	CAM5	27-Nov-12	In Process	—		**α, Cu,**
L017	LA-SMA-5.361	28-Apr-11	In Process	—	**32-002(b1)** **32-002(b)**	MPS	—	—	—	—		
					32-002(b2) **32-002(b)**	MPS	—	—	—	—		
L017A	LA-SMA-5.362	28-Apr-11	In Process	—	**32-003**	MPS	—	—	—	—	**12-20-12**	
L018	LA-SMA-5.51	28-Apr-11	12-Jul-13	21-Aug-13	**02-003(a)**	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Hg,**
					02-003(e)	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Hg,**
					02-004(a)	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Hg,**

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					02-005	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Hg,**
					02-006(b)	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Hg,**
					02-006(c)	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Hg,**
					02-006(d)	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Hg,**
					02-006(e)	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Hg,**
					02-008(a)	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Hg,**
					02-009(b)	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Hg,**
					02-011(a)	HPS	CAI	In Planning	—	—		**α, Hg, PCB, Hg,**
L018	LA-SMA-5.51	28-Apr-11	12-Jul-13	21-Aug-13	**02-011(b)**	**HPS**	CAI	In Planning	—	—		**Hg, Hg, PCB, α**
					02-011(c)	**HPS**	CAI	In Planning	—	—		**Hg, Hg, PCB, α**
					02-011(d)	**HPS**	CAI	In Planning	—	—		**Hg, Hg, PCB, α**
L018A	LA-SMA-5.52	28-Apr-11	In Process	—	**02-003(b)**	**HPS**	—	—	—	—		
					02-007	**HPS**	—	—	—	—		
					02-008(c)	**HPS**	—	—	—	—		
L018B	LA-SMA-5.53	28-Apr-11	In Process	—	**02-009(a)**	**HPS**	—	—	—	—		
L018C	LA-SMA-5.54	28-Apr-11	13-Sep-13	3-Nov-13	**02-009(c)**	**HPS**	CAI	In Planning	—	—		**α, PCB,**
L019	LA-SMA-5.91	1-Dec-10	7-Sep-11	31-Oct-11	**21-009**	MPS	CAM5	8-Jul-13	In Process	—		**α,**
					21-021	MPS	CAM5	8-Jul-13	In Process	—		**α**
					21-023(c)	MPS	CACompD	29-Nov-12	—	29-Nov-12	**6-3-11**	**α**

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					21-027(d)	MPS	CAM5	8-Jul-13	In Process	—		α
L019A	LA-SMA-5.92	1-Dec-10	12-Jul-13	27-Aug-13	**21-013(b)**	MPS	CAI	In Planning	—	—	6-3-11	α, Hg, Hg, Cu,
					21-013(g)	MPS	CAI	In Planning	—	—	6-3-11	α, Hg, Hg, Cu,
					21-018(a)	MPS	CAI	In Planning	—	—	6-3-11	α, Hg, Hg, Cu,
					21-021	MPS	CAI	In Planning	—	—		α, Hg, Hg, Cu,
L020	LA-SMA-6.25	1-Dec-10	In Process	—	21-021	MPS	—	—	—	—		
					21-024(d)	MPS	—	—	—	—		
					21-027(c)	MPS	—	—	—	—		
L021	LA-SMA-6.27	1-Dec-10	In Process	—	21-021	MPS	—	—	—	—		
					21-027(c)	MPS	—	—	—	—		
L022	LA-SMA-6.3	16-Dec-10	In Process	—	**21-006(b)**	MPS	—	—	—	—		
L022A	LA-SMA-6.31	16-Dec-10	In Process	—	**21-027(a)**	MPS	—	—	—	—		
L023	LA-SMA-6.32	16-Dec-10	In Process	—	21-021	MPS	—	—	—	—		
L024	LA-SMA-6.34	16-Dec-10	In Process	—	21-021	MPS	—	—	—	—		
					21-022(h)	MPS	—	—	—	—		
L025	LA-SMA-6.36	16-Dec-10	In Process	—	21-021	MPS	—	—	—	—		
					21-024(a)	MPS	—	—	—	—		
L026	LA-SMA-6.38	16-Dec-10	In Process	—	21-021	MPS	—	—	—	—		
					21-024(c)	MPS	—	—	—	—		
L027	LA-SMA-6.395	16-Dec-10	13-Sep-13	25-Oct-13	21-021	MPS	CAI	In Planning	—	—		α,
					21-024(j)	MPS	CAI	In Planning	—	—		α
L028	LA-SMA-6.5	16-Dec-10	In Process	—	21-021	MPS	—	—	—	—		
					21-024(i)	HPS	—	—	—	—		
L029	LA-SMA-9	28-Apr-11	In Process	—	**26-001**	MPS	—	—	—	—		

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					26-002(a)	MPS	—	—	—	—		
					26-002(b)	MPS	—	—	—	—		
					26-003	MPS	—	—	—	—		
L030	LA-SMA-10.11	16-Dec-10	In Process	—	**53-002(a)**	MPS	—	—	—	—		
L030A	LA-SMA-10.12	16-May-11	1-Sep-11	1-May-12	**53-008**	MPS	CAM5	30-Nov-12	In Process	—		**α,**
D001	DP-SMA-0.3	28-Apr-11	19-Aug-11	1-May-12	**21-029**	MPS	CAM5	8-Jul-13	In Process	—		**α, Ra226+Ra228,**
				30-Oct-13	**21-029**	MPS	CAI2	In Planning	—	—		**α, Ra226+Ra228,**
D002	DP-SMA-0.4	16-Dec-10	13-Sep-13	26-Oct-13	**21-021**	MPS	CAI	In Planning	—	—		**Al, Cu,**
D003	DP-SMA-0.6	28-Apr-11	In Process	—	**21-021**	MPS	—	—	—	—		
					21-024(l)	MPS	—	—	—	—		
D004	DP-SMA-1	16-Dec-10	In Process	—	**21-011(k)**	MPS	—	—	—	—		
					21-021	MPS	—	—	—	—		
D005	DP-SMA-2	1-Dec-10	In Process	—	**21-021**	MPS	—	—	—	—		
					21-024(h)	MPS	—	—	—	—		
D006	DP-SMA-2.35	16-Dec-10	13-Sep-13	30-Oct-13	**21-021**	MPS	CAI	In Planning	—	—		**α,**
					21-024(n)	MPS	CAI	In Planning	—	—		**α**
D007	DP-SMA-3	11-Feb-11	29-Jul-11	1-May-12	**21-013(c)**	MPS	CAM5	30-Aug-12	In Process	—		**α,**
					21-021	MPS	CAM5	30-Aug-12	In Process	—		**α**
D008	DP-SMA-4	16-Dec-10	In Process	—	**21-021**	MPS	—	—	—	—		
S001	S-SMA-0.25	1-Dec-10	15-Aug-11	20-Oct-11	**03-013(a)**	**HPS**	AltCompR[g]	30-Apr-13	—	—		**α, PCB, Zn, Cu,**
					03-052(f)	HPS	AltCompR	30-Apr-13	—	—		**α, PCB, Zn, Cu**
S002	S-SMA-1.1	16-May-11	4-Sep-11	2-Nov-11	**03-029**	**HPS**	FM[h]	23-Sep-13	In Process	—		**PCB, Cu**

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
S003	S-SMA-2	1-Dec-10	13-Aug-11	20-Oct-11	03-012(b)	HPS	CAM3[i]	8-Jul-13	In Process	—		PCB, Zn, Cu
					03-045(b)	HPS	CAM3	8-Jul-13	In Process	—		PCB, Zn, Cu
					03-045(c)	HPS	CAM3	8-Jul-13	In Process	—		PCB, Zn, Cu
					03-056(c)	HPS	CACompD	29-Nov-12	—	29-Nov-12	2-28-11	PCB, Zn, Cu
				10-Sep-13	03-012(b)	HPS	CAI2	10-Sep-13	—	—		PCB, Zn, Cu
					03-045(b)	HPS	CAI2	10-Sep-13	—	—		PCB, Zn, Cu
					03-045(c)	HPS	CAI2	10-Sep-13	—	—		PCB, Zn, Cu
					03-056(c)	HPS	CACompD	29-Nov-12	—	29-Nov-12		PCB, Zn, Cu
				—	03-012(b)	HPS	FM	23-Sep-13	—	—		PCB, Zn, Cu
					03-045(b)	HPS	AltCompR	30-Apr-13	—	—		PCB, Zn, Cu
					03-045(c)	HPS	AltCompR	30-Apr-13	—	—		PCB, Zn, Cu
					03-056(c)	HPS	AltCompR	30-Apr-13	—	—		PCB, Zn, Cu
S003A	S-SMA-2.01	16-Dec-10	7-Sep-11	2-Nov-11	03-052(b)	HPS	CAM3	27-Nov-12	In Process	—		PCB, Cu
				—	03-052(b)	HPS	FM	23-Sep-13	In Process	—		PCB, Cu
S004	S-SMA-2.8	16-Dec-10	In Process	—	03-014(c2)	MPS	—	—	—	—		
S005	S-SMA-3.51	16-Dec-10	In Process	—	03-009(i)	HPS	—	—	—	—		
S005A	S-SMA-3.52	16-Dec-10	In Process	—	03-021	HPS	—	—	—	—		
S005B	S-SMA-3.53	16-Dec-10	4-Aug-11	30-Apr-12	03-014(b2)	HPS	CAM3	2-May-13	In Process	—		α, PCB, Cu, Al
				—	03-014(b2)	HPS	FM	23-Sep-13	In Process	—		α, PCB, Cu,

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
												Al
S006	S-SMA-3.6	1-Dec-10	13-Aug-11	20-Oct-11	**60-007(b)**	**HPS**	CAM3	27-Nov-12	In Process	—		PCB, Cu, Zn
				13-Aug-13	**60-007(b)**	HPS	CAI2	In Planning	—	—		PCB, Cu, Zn
S007	S-SMA-3.7	16-Dec-10	In Process	—	**53-012(e)**	MPS	—	—	—	—		
S008	S-SMA-3.71	16-Dec-10	In Process	—	53-001(a)	MPS	—	—	—	—		
S009	S-SMA-3.72	16-Dec-10	In Process	—	53-001(b)	MPS	—	—	—	—	7-31-13	
S010	S-SMA-3.95	16-May-11	13-Sep-13	25-Oct-13	20-002(a)	MPS	CAI	In Planning	—	—		α
S011	S-SMA-4.1	16-Dec-10	1-Sep-11	2-Nov-11	**53-014**	**HPS**	CACompD	20-Aug-13	—	20-Aug-13	7-31-13	PCB
S012	S-SMA-4.5	16-May-11	In Process	—	20-002(d)	MPS	—	—	—	—		
S013	S-SMA-5	16-May-11	In Process	—	20-002(c)	**HPS**	—	—	—	—		
S014	S-SMA-5.2	16-Dec-10	In Process	—	**20-003(c)**	MPS	—	—	—	—		
S015	S-SMA-5.5	16-May-11	In Process	—	20-005	MPS	—	—	—	—		
S016	S-SMA-6	16-May-11	19-Aug-11	2-Nov-11	**72-001**	**HPS**	CAI	In Planning	—	—		Cn, α, PCB, Ra226+Ra228, Al, Cu
C001	CDB-SMA-0.15	1-Dec-10	In Process	—	04-003(a)	MPS	—	—	—	—		
					04-004	MPS	—	—	—	—		
C002	CDB-SMA-0.25	1-Dec-10	1-Sep-11	2-Nov-11	**46-004(c2)**	MPS	CAM5	19-Jul-12	In Process	—		PCB, Cu, Al
					46-004(e2)	MPS	CAM5	19-Jul-12	In Process	—		PCB, Cu, Al
				22-Oct-13	**46-004(c2)**	MPS	CAI2	In Planning	—	—		PCB, Cu, Al
					46-004(e2)	MPS	CAI2	In Planning	—	—		PCB, Cu, Al
C003	CDB-SMA-0.55	12-Jan-11	13-Sep-13	25-Oct-13	**46-004(g)**	MPS	CAI	In Planning	—	—		Cu
					46-004(m)	MPS	CAI	In Planning	—	—	7-13-12	Cu
					46-004(s)	MPS	CAI	In Planning	—	—		Cu
					46-006(f)	MPS	CAI	In Planning	—	—		Cu
C004	CDB-SMA-1	12-Jan-11	7-Sep-11	30-Apr-12	**46-003(c)**	MPS	CAM5	30-Jul-12	In Process	—		α, PCB, Cu, Al

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					46-004(d2)	MPS	CAM5	30-Jul-12	In Process	—		α, PCB, Cu, Al
					46-004(f)	MPS	CAM5	30-Jul-12	In Process	—		α, PCB, Cu, Al
					46-004(t)	MPS	CAM5	30-Jul-12	In Process	—		α, PCB, Cu, Al
					46-004(w)	MPS	CAM5	30-Jul-12	In Process	—		α, PCB, Cu, Al
					46-008(g)	MPS	CAM5	30-Jul-12	In Process	—		α, PCB, Cu, Al
					46-009(a)	MPS	CAM5	30-Jul-12	In Process	—		α, PCB, Cu, Al
					C-46-001	MPS	CACompD	30-Jul-12	In Process	29-Nov-12	7-13-12	α, PCB, Cu, Al
C005	CDB-SMA-1.15	1-Dec-10	In Process	—	46-004(b)	MPS	—	—	—	—		
					46-004(y)	MPS	—	—	—	—		
					46-004(z)	MPS	—	—	—	—		
					46-006(d)	MPS	—	—	—	—		
C006	CDB-SMA-1.35	1-Dec-10	In Process	—	46-004(a2)	MPS	—	—	—	—		
					46-004(u)	MPS	—	—	—	—		
					46-004(v)	MPS	—	—	—	—		
					46-004(x)	MPS	—	—	—	—		
					46-006(d)	MPS	—	—	—	—		
					46-008(f)	MPS	—	—	—	—		
C007	CDB-SMA-1.54	1-Dec-10	In Process	—	46-004(h)	MPS	—	—	—	—		
					46-004(q)	MPS	—	—	—	—		
					46-006(d)	MPS	—	—	—	—		
C008	CDB-SMA-1.55	1-Dec-10	In Process	—	46-003(e)	MPS	—	—	—	—		

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
C009	CDB-SMA-1.65	1-Dec-10	In Process	—	**46-003(b)**	MPS	—	—	—	—		
C010	CDB-SMA-4	16-Dec-10	25-Jul-13	27-Aug-13	**54-017**	HPS	CAI	In Planning	—	—		**α, PCB, Cu**
					54-018	**HPS**	CAI	In Planning	—	—		**α, PCB, Cu**
					54-020	**HPS**	CAI	In Planning	—	—		**α, PCB, Cu**
M001	M-SMA-1	1-Dec-10	7-Sep-11	2-Nov-11	**03-050(a)**	MPS	CAM5	27-Nov-12	In Process	—		**α, PCB, Cu, Zn**
					03-054(e)	MPS	CAM5	27-Nov-12	In Process	—		**α, PCB, Cu, Zn**
				13-Aug-13	**03-050(a)**	MPS	CAI2	In Planning	—	—		**α, PCB, Cu, Zn**
					03-054(e)	MPS	CAI2	In Planning	—	—		**α, PCB, Cu, Zn**
M002	M-SMA-1.2	16-Dec-10	13-Sep-13	30-Oct-13	**03-049(a)**	MPS	CAI	In Planning	—	—		**As, Cu**
M002A	M-SMA-1.21	16-Dec-10	In Process	—	03-049(e)	MPS	—	—	—	—		
M002B	M-SMA-1.22	11-Feb-11	15-Sep-11	1-May-12	**03-045(h)**	MPS	CAM5	2-May-13	In Process	—		**Cu, Al**
M003	M-SMA-3	16-May-11	12-Jul-13	13-Aug-13	**48-001**	MPS	CAI	In Planning	—	—		**α, PCB**
					48-005	MPS	CAI	In Planning	—	—		**α, PCB**
					48-007(c)	MPS	CAI	In Planning	—	—		**α, PCB**
M004	M-SMA-3.1	16-Dec-10	In Process	—	**48-001**	MPS	—	—	—	—		
					48-007(b)	MPS	—	—	—	—		
M005	M-SMA-3.5	16-May-11	In Process	—	**48-001**	MPS	—	—	—	—		
					48-003	**HPS**	—	—	—	—		
M006	M-SMA-4	1-Dec-10	19-Aug-11	31-Oct-11	**48-001**	MPS	CAI	In Planning	—	—		**α, Ra226+Ra228, Cu, PCB**
					48-005	MPS	CAI	In Planning	—	—		**α, Ra226+Ra228, Cu, PCB**
					48-007(a)	MPS	CACompD	29-Nov-12	—	29-Nov-12	**9-7-10**	**α, Ra226+Ra2**

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[1,2]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
												28, Cu, PCB
					48-007(d)	MPS	CACompD	29-Nov-12	—	29-Nov-12	9-7-10	α, Ra226+Ra2 28, Cu, PCB
					48-010	MPS	CACompD	29-Nov-12	—	29-Nov-12	9-7-10	α, Ra226+Ra2 28, Cu, PCB
M007	M-SMA-5	16-May-11	In Process	—	42-001(a)	MPS	—	—	—	—		
					42-001(b)	MPS	—	—	—	—		
					42-001(c)	MPS	—	—	—	—		
					42-002(a)	MPS	—	—	—	—		
					42-002(b)	MPS	—	—	—	—		
M008	M-SMA-6	16-Dec-10	12-Oct-12	15-Nov-12	35-016(h)	MPS	CAI	In Planning	—	—		α, PCB, Cu
M009	M-SMA-7	16-Dec-10	7-Jul-12	22-Aug-12	35-016(g)	MPS	CAI	In Planning	—	—		α, Zn
M010	M-SMA-7.9	16-Dec-10	13-Sep-13	25-Oct-13	50-006(d)	HPS	CAI	In Planning	—	—		α, PCB
M011	M-SMA-9.1	11-Feb-11	In Process	—	35-016(f)	MPS	—	—	—	—	4-1-08	
M012	M-SMA-10	16-Dec-10	30-Jun-13	13-Aug-13	35-008	MPS	CAI	In Planning	—	—	4-1-08	α
					35-014(e)	MPS	CAI	In Planning	—	—	4-1-08	α
M012A	M-SMA-10.01	16-Dec-10	15-Sep-11	15-Nov-11	35-016(e)	MPS	CAM5	25-Sep-12	In Process	—	4-1-08	α, Cu
M013	M-SMA-10.3	16-May-11	19-Aug-11	24-Oct-11	35-014(e2)	HPS	CACompD	30-Oct-13	—	30-Oct-13	9-27-13	PCB, Zn, Al, Cu
					35-016(i)	HPS	CACompD	30-Oct-13	—	30-Oct-13	9-27-13	PCB, Zn, Al, Cu
M014	M-SMA-11.1	16-Dec-10	In Process	—	35-016(o)	MPS	—	—	—	—		
M015	M-SMA-12	28-Apr-11	In Process	—	35-016(p)	MPS	—	—	—	—	4-1-08	
M016	M-SMA-12.5	1-Dec-10	In Process	—	05-005(b)	MPS	—	—	—	—		
					05-006(c)	MPS	—	—	—	—		
M017	M-SMA-12.6	16-May-11	13-Sep-13	22-Oct-13	05-004	MPS	CAI	In Planning	—	—		α
M018	M-SMA-12.7	16-Dec-10	In Process	—	05-002	MPS	—	—	—	—	4-1-08	

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					05-005(a)	MPS	—	—	—	—	**4-1-08**	
					05-006(b)	MPS	—	—	—	—	**4-1-08**	
					05-006(e)	MPS	—	—	—	—	**4-1-08**	
M019	M-SMA-12.8	16-Dec-10	In Process	—	05-001(a)	MPS	—	—	—	—	**4-1-08**	
					05-002	MPS	—	—	—	—	**4-1-08**	
M020	M-SMA-12.9	16-Dec-10	In Process	—	**05-001(b)**	MPS	—	—	—	—	**4-1-08**	
					05-002	MPS	—	—	—	—	**4-1-08**	
M021	M-SMA-12.92	1-Dec-10	In Process	—	**00-001**	MPS	—	—	—	—		
M022	M-SMA-13	16-Dec-10	13-Sep-13	**<TAL**	**05-001(c)**	MPS	—	—	—	—	**4-1-08**	**<TALs?**
T001	Pratt-SMA-1.05	16-Dec-10	13-Sep-13	30-Oct-13	**35-003(h)**	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Al**
					35-003(p)	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Al**
					35-003(r)	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Al**
					35-004(h)	**HPS**	CAI	In Planning	—	—	**4-1-08**	**α, Hg, PCB, Al**
					35-009(d)	**HPS**	CAI	In Planning	—	—	**4-1-08**	**α, Hg, PCB, Al**
					35-016(k)	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Al**
					35-016(l)	**HPS**	CAI	In Planning	—	—	**4-1-08**	**α, Hg, PCB, Al**
					35-016(m)	**HPS**	CAI	In Planning	—	—	**4-1-08**	**α, Hg, PCB, Al**
T002	T-SMA-1	16-Dec-10	15-Aug-11	21-Oct-11	**50-006(a)**	**HPS**	CAI	In Planning	—	—		**PCB, Zn, Cu**
					50-009	**HPS**	CAI	In Planning	—	—		**PCB, Zn, Cu**
				—	**50-006(a)**	HPS	FM	23-Sep-13	—	—		**PCB, Zn,**

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
												Cu
				—	50-009	HPS	CACompC[j]	31-Oct-13	—	31-Oct-13		PCB, Zn, Cu
T003	T-SMA-2.5	16-Dec-10	In Process	—	35-014(g3)	MPS	—	—	—	—		
T004	T-SMA-2.85	16-Dec-10	12-Jul-13	21-Aug-13	35-014(g)	MPS	CAI	In Planning	—	—	**4-1-08**	α, Cu
					35-016(n)	MPS	CAI	In Planning	—	—	**4-1-08**	α, Cu
T005	T-SMA-3	16-Dec-10	10-Sep-12	19-Oct-12	35-016(b)	MPS	CAI	In Planning	—	—	**4-1-08**	α, Cu
T006	T-SMA-4	16-Dec-10	13-Sep-13	25-Oct-13	35-004(a)	MPS	CAI	In Planning	—	—	**4-1-08**	α, Hg, Hg, Cu
					35-009(a)	MPS	CAI	In Planning	—	—		α, Hg, Hg, Cu
					35-016(c)	MPS	CAI	In Planning	—	—		α, Hg, Hg, Cu
					35-016(d)	MPS	CAI	In Planning	—	—		α, Hg, Hg, Cu
T007	T-SMA-5	16-Dec-10	In Process	—	35-004(a)	MPS	—	—	—	—	**4-1-08**	
					35-009(a)	MPS	—	—	—	—		
					35-016(a)	MPS	—	—	—	—	**4-1-08**	
					35-016(q)	MPS	—	—	—	—	**4-1-08**	
T008	T-SMA-6.8	16-Dec-10	In Process	—	35-010(e)	MPS	—	—	—	—	**4-1-08**	
T009	T-SMA-7	16-Dec-10	In Process	—	04-003(b)	MPS	—	—	—	—	**4-1-08**	
T010	T-SMA-7.1	16-Dec-10	In Process	—	04-001	MPS	—	—	—	—	**4-1-08**	
					04-002	MPS	—	—	—	—	**4-1-08**	
E001	2M-SMA-1	1-Dec-10	20-Aug-11	18-Oct-11	03-010(a)	MPS	CAM5	20-Jul-12	In Process	—		Al
				19-Oct-12	03-010(a)	MPS	CAI2	In Planning	—	—		Al
E002	2M-SMA-1.42	12-Jan-11	15-Sep-11	10-Nov-11	06-001(a)	MPS	CAM5	27-Jun-12	In Process	—		α, Al
E003	2M-SMA-1.43	1-Dec-10	12-Jul-13	21-Aug-13	22-014(a)	MPS	CAI	In Planning	—	—		α, Al
					22-015(a)	MPS	CAI	In Planning	—	—		α, Al
E004	2M-SMA-1.44	12-Jan-11	21-Aug-11	30-Apr-12	06-001(b)	MPS	CAM5	27-Jun-12	In Process	—		α, Cu

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
E005	2M-SMA-1.45	12-Jan-11	7-Sep-11	1-May-12	**06-006**	MPS	CAM5	20-Aug-12	In Process	—		α
E006	2M-SMA-1.5	1-Dec-10	In Process	—	**22-014(b)**	MPS	—	—	—	—		
E007	2M-SMA-1.65	12-Jan-11	21-Aug-11	1-May-12	**40-005**	MPS	CAM5	19-Jul-12	In Process	—		α
E008	2M-SMA-1.67	28-Apr-11	15-Sep-11	—	06-003(h)	MPS	—	—	—	—		**<TALs?**
E009	2M-SMA-1.7	12-Jan-11	9-Sep-11	3-Nov-11	**03-055(a)**	MPS	CAM5	27-Jul-12	In Process	—		**Cu**
E010	2M-SMA-1.8	12-Jan-11	9-Sep-11	3-Nov-11	**03-001(k)**	MPS	CAI	In Planning	—	—		**Zn, Cu**
E011	2M-SMA-1.9	12-Jan-11	11-Jul-12	23-Aug-12	**03-003(a)**	MPS	CAI	In Planning	—	—		**Zn, Cu**
E012	2M-SMA-2	12-Jan-11	4-Sep-11	3-Nov-11	**03-050(d)**	MPS	CAM5	2-May-13	In Process	—		**PCB, Zn, Cu**
					03-054(b)	MPS	CAM5	2-May-13	In Process	—		**PCB**
				24-Sep-13	**03-050(d)**	MPS	CAI2	In Planning	—	—		**PCB**
					03-054(b)	MPS	CAI2	In Planning	—	—		
E013	2M-SMA-2.2	1-Dec-10	4-Sep-11	3-Nov-11	**03-003(k)**	MPS	CAI	In Planning	—	—		**α, Zn, Cu**
E014	2M-SMA-3	12-Jan-11	12-Jul-13	16-Aug-13	**07-001(a)**	MPS	CAI	In Planning	—	—		**Al, Cu**
					07-001(b)	MPS	CAI	In Planning	—	—		**Al, Cu**
					07-001(c)	MPS	CAI	In Planning	—	—		**Al, Cu**
					07-001(d)	MPS	CAI	In Planning	—	—		**Al, Cu**
E015	2M-SMA-2.5	12-Jan-11	9-Sep-12	**<TAL**	**40-001(c)**	MPS	—	—	—	—		**<TALs?**
H001	3M-SMA-0.2	1-Dec-10	In Process	—	15-010(b)	MPS	—	—	—	—		
H002	3M-SMA-0.4	12-Jan-11	12-Jul-13	27-Aug-13	**15-006(b)**	MPS	CAI	In Planning	—	—		**PCB**
H003	3M-SMA-0.5	12-Jan-11	In Process	—	**15-006(c)**	MPS	—	—	—	—		
					15-009(c)	MPS	—	—	—	—		
H004	3M-SMA-0.6	12-Jan-11	In Process	—	**15-008(b)**	MPS	—	—	—	—		
H005	3M-SMA-2.6	28-Apr-11	In Process	—	**36-008**	MPS	—	—	—	—		
					C-36-003	MPS	—	—	—	—		
H006	3M-SMA-4	12-Jan-11	In Process	—	**18-002(b)**	MPS	—	—	—	—		
					18-003(c)	MPS	—	—	—	—		

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					18-010(f)	MPS	—	—	—	—		
J001	PJ-SMA-1.05	1-Dec-10	13-Sep-13	3-Nov-13	**09-013**	MPS	CAI	In Planning	—	—		**PCB**
J002	PJ-SMA-2	1-Dec-10	In Process	—	09-009	MPS	—	—	—	—		
J003	PJ-SMA-3.05	11-Feb-11	19-Aug-11	30-Apr-12	**09-004(o)**	MPS	CAM5	18-Jul-12	In Process	—		**Cn, α, Cn**
J004	PJ-SMA-4.05	1-Dec-10	13-Sep-13	30-Oct-13	**09-004(g)**	MPS	CAI	In Planning	—	—		**α**
J005	PJ-SMA-5	1-Dec-10	12-Oct-12	15-Nov-12	**22-015(c)**	MPS	CAI	In Planning	—	—		**Cu**
J006	PJ-SMA-5.1	12-Jan-11	7-Sep-11	31-Oct-11	**22-010(b)**	MPS	CAM5	18-Jul-12	In Process	—		**α, Zn, Cu**
					22-016	MPS	CAM5	18-Jul-12	In Process	—		**α, Zn, Cu**
J007	PJ-SMA-6	1-Dec-10	In Process	—	**40-010**	MPS	—	—	—	—		
J008	PJ-SMA-7	1-Dec-10	In Process	—	40-006(c)	MPS	—	—	—	—		
J009	PJ-SMA-8	1-Dec-10	In Process	—	**40-006(b)**	MPS	—	—	—	—		
J010	PJ-SMA-9	1-Dec-10	In Process	—	**40-009**	MPS	—	—	—	—		
J012	PJ-SMA-10	12-Jan-11	In Process	—	40-006(a)	MPS	—	—	—	—		
J013	PJ-SMA-11	12-Jan-11	13-Sep-13	30-Oct-13	**40-003(a)**	MPS	CAI	In Planning	—	—		**α, Cu**
J014	PJ-SMA-11.1	12-Jan-11	13-Sep-13	30-Oct-13	**40-003(b)**	MPS	CAI	In Planning	—	—		**α, Al, Cu**
J015	PJ-SMA-13	28-Apr-11	In Process	—	**18-002(a)**	MPS	—	—	—	—		
J016	PJ-SMA-13.7	12-Jan-11	1-Sep-11	1-May-12	**18-010(b)**	MPS	CAM5	8-Jul-13	In Process	—		**α**
J017	PJ-SMA-14	28-Apr-11	In Process	—	**54-004**	MPS	—	—	—	—		
J018	PJ-SMA-14.2	1-Dec-10	In Process	—	18-012(b)	MPS	—	—	—	—		
J019	PJ-SMA-14.3	1-Dec-10	In Process	—	**18-003(e)**	MPS	—	—	—	—		
J020	PJ-SMA-14.4	28-Apr-11	In Process	—	18-010(d)	MPS	—	—	—	—		
J021	PJ-SMA-14.6	1-Dec-10	In Process	—	18-010(e)	MPS	—	—	—	—		
J022	PJ-SMA-14.8	12-Jan-11	18-Aug-11	**<TAL**	18-012(a)	MPS	—	—	—	—		**<TALs?**
J023	PJ-SMA-16	1-Dec-10	8-Aug-13	**<TAL**	27-002	MPS	—	—	—	—		**<TALs?**
J024	PJ-SMA-17	1-Dec-10	25-Jul-13	5-Sep-13	**54-018**	**HPS**	CAI	In Planning	—	—		**α, Cu**
J026	PJ-SMA-18	1-Dec-10	25-Jul-13	3-Sep-13	**54-014(d)**	MPS	CAI	In Planning	—	—		**α**
					54-017	HPS	CAI	In Planning	—	—		**α**
J025	PJ-SMA-19	1-Dec-10	8-Aug-13	12-Sep-13	**54-013(b)**	**HPS**	CAI	In Planning	—	—		**α, Hg, PCB, Hg, Al**

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					54-017	HPS	CAI	In Planning	—	—		
					54-020	HPS	CAI	In Planning	—	—		
J027	PJ-SMA-20	16-Dec-10	29-Jul-11	1-May-12	54-017	HPS	CACompC	25-Oct-13	—	25-Oct-13		Cu, Al
J028	STRM-SMA-1.05	1-Dec-10	26-Aug-11	17-Oct-11	08-009(f)	MPS	CAM5	2-May-13	In Process	—		Cu
				10-Sep-13	08-009(f)	MPS	CAI2	In Planning	—	—		Cu
J029	STRM-SMA-1.5	1-Dec-10	11-Jul-12	27-Aug-12	08-009(d)	MPS	CAM5	8-Jul-13	In Process	—		Cn, α, Hg, Ra226+Ra228, Cd, Ag, Cn
J030	STRM-SMA-4.2	1-Dec-10	9-Sep-11	10-Nov-11	09-008(b)	MPS	CAM5	21-Aug-12	In Process	—		Al
J031	STRM-SMA-5.05	1-Dec-10	21-Aug-11	31-Oct-11	09-013	MPS	CAM5	27-Jun-12	In Process	—		PCB, α, Al
V001	CDV-SMA-1.2	12-Jan-11	12-Sep-13	<TAL	16-017(b)-99	MPS	—	—	—	—	2-16-10	<TALs?
					16-029(k)	MPS	—	—	—	—	2-16-10	<TALs?
V002	CDV-SMA-1.3	12-Jan-11	13-Sep-13	25-Oct-13	16-017(a)-99	MPS	CAI	In Planning	—	—	2-16-10	α,
					16-026(m)	MPS	CAI	In Planning	—	—	2-16-10	α
V003	CDV-SMA-1.4	12-Jan-11	10-Sep-12	18-Oct-12	16-020	MPS	CAI	In Planning	—	—		Cn, Ag,
					16-026(l)	MPS	CAI	In Planning	—	—		Cn, Ag,
					16-028(c)	MPS	CAI	In Planning	—	—		Cn, Ag,
					16-030(c)	MPS	CACompD	29-Nov-12	—	29-Nov-12	1-23-08	Cn, Ag,
V004	CDV-SMA-1.45	12-Jan-11	21-Aug-11	30-Apr-12	16-026(i)	MPS	CAM5	18-Jul-12	In Process	—		α,
V005	CDV-SMA-1.7	12-Jan-11	13-Sep-13	25-Oct-13	16-019	MPS	CAI	In Planning	—	—		α, Cn, RDX, Cu,
V006	CDV-SMA-2	16-May-11	12-Jul-13	20-Aug-13	16-021(c)	MPS	CAI	In Planning	—	—		α,
V007	CDV-SMA-2.3	12-Jan-11	In Process	—	13-001	MPS	—	—	—	—		
					13-002	MPS	—	—	—	—		
					16-003(n)	MPS	—	—	—	—		

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					16-003(o)	MPS	—	—	—	—		
					16-029(h)	MPS	—	—	—	—		
					16-031(h)	MPS	—	—	—	—		
V008	CDV-SMA-2.41	12-Jan-11	21-Aug-11	1-May-12	**16-018**	MPS	CAI	In Planning	—	—		α, PCB,
V008A	CDV-SMA-2.42	12-Jan-11	12-Jul-13	26-Aug-13	**16-010(b)**[7]	MPS	CAI	In Planning	—	—		α, PCB, Cu,
V009	CDV-SMA-2.5	12-Jan-11	26-Jul-13	<TAL	**16-010(c)**	MPS	—	—	—	—		<TALs?
					16-010(d)	MPS	—	—	—	—		<TALs?
					16-028(a)	MPS	—	—	—	—		<TALs?
V009A	CDV-SMA-2.51	12-Jan-11	13-Sep-13	25-Oct-13	**16-010(i)**	MPS	CAI	In Planning	—	—		α,
V010	CDV-SMA-3	11-Feb-11	21-Aug-11	30-Apr-12	**14-009**	MPS	CAM5	18-Jul-12	In Process	—		α,
V011	CDV-SMA-4	11-Feb-11	In Process	—	**14-010**	MPS	—	—	—	—		
V012	CDV-SMA-6.01	11-Feb-11	In Process	—	**14-001(g)**	MPS	—	—	—	—		
					14-006	MPS	—	—	—	—		
V012A	CDV-SMA-6.02	11-Feb-11	1-Sep-11	31-Oct-11	**14-002(c)**	MPS	CAM5	18-Jul-12	In Process	—		α, Hg, Cu, Hg,
					14-002(d)[8]	MPS	CAM5	18-Jul-12	In Process	—		α, Hg, Cu, Hg,
					14-002(e)	MPS	CAM5	18-Jul-12	In Process	—		α, Hg, Cu, Hg,
V013	CDV-SMA-7	12-Jan-11	13-Sep-13	30-Oct-13	**15-008(d)**	MPS	CAI	In Planning	—	—		α, Se, Al,
V014	CDV-SMA-8	12-Jan-11	In Process	—	**15-011(c)**	MPS	—	—	—	—		
V015	CDV-SMA-8.5	12-Jan-11	In Process	—	**15-014(a)**	MPS	—	—	—	—		
V016	CDV-SMA-9.05	12-Jan-11	In Process	—	**15-007(b)**	MPS	—	—	—	—		
F001	F-SMA-2	12-Jan-11	15-Aug-11	1-May-12	**36-004(c)**	MPS	CAI	In Planning	—	—		α, Cu, Al,
I001	PT-SMA-0.5	28-Apr-11	1-Sep-11	1-May-12	**15-009(e)**	MPS	CAM5	27-Nov-12	In Process	—		α, Al, Cu,

[7] LANL states this site is no longer a SWMU – clean closed under RCRA permit.
[8] LANL indicates that sites 14-002(d) and 14-002(e) were misidentified as needing coverage under the IP.

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					C-15-004	MPS	CAM5	27-Nov-12	In Process	—		
I002	PT-SMA-1	28-Apr-11	1-Sep-11	30-Apr-12	15-004(f)	MPS	CAM5	3-Aug-12	In Process	—		α, Al, Cu, Zn
					15-008(a)	MPS	CAM5	3-Aug-12	In Process	—		α, Al, Cu, Zn
I003	PT-SMA-1.7	28-Apr-11	10-Sep-12	18-Oct-12	15-006(a)	MPS	CAI	In Planning	—	—		α,
I004	PT-SMA-2	28-Apr-11	In Process	—	15-008(f)	MPS	—	—	—	—		
					36-003(b)	MPS	—	—	—	—		
					36-004(e)	MPS	—	—	—	—		
I004A	PT-SMA-2.01	28-Apr-11	18-Aug-11	30-Apr-12	C-36-001	MPS	CAM5	3-Aug-12	In Process	—		α,
					C-36-006(e)	MPS	CAM5	3-Aug-12	In Process	—		α
I005	PT-SMA-3	1-Dec-10	In Process	—	36-004(a)	MPS	—	—	—	—		
					36-006	MPS	—	—	—	—		
I007	PT-SMA-4.2	1-Dec-10	In Process	—	36-004(d)	MPS	—	—	—	—		
W001	W-SMA-1	1-Dec-10	9-Sep-11	8-Nov-11	16-017(j)-99	MPS	CAM5	2-May-13	In Process	—		α, Al,
					16-026(c2)	MPS	CAM5	2-May-13	In Process	—		α, Al
					16-026(v)	MPS	CAM5	2-May-13	In Process	—		α, Al
W002	W-SMA-1.5	12-Jan-11	1-Sep-11	8-Nov-11	16-026(b2)	MPS	CAM5	25-Sep-12	In Process	—		α, Zn, Cu,
					16-028(d)	MPS	CAM5	25-Sep-12	In Process	—		α, Zn, Cu,
W003	W-SMA-2.05	12-Jan-11	21-Aug-11	1-May-12	16-028(e)	MPS	CAM5	25-Sep-12	In Process	—		Al,
W004	W-SMA-3.5	12-Jan-11	In Process	—	16-026(y)	MPS	—	—	—	—		
W005	W-SMA-4.1	12-Jan-11	In Process	—	16-003(a)	MPS	—	—	—	—		
W006	W-SMA-5	12-Jan-11	3-Jul-12	18-Sep-12	16-001(e)	MPS	CAI	In Planning	—	—		Cu,
					16-003(f)	MPS	CAI	In Planning	—	—		Cu
					16-026(b)	MPS	CAI	In Planning	—	—		Cu
					16-026(c)	MPS	CAI	In Planning	—	—		Cu
					16-026(d)	MPS	CAI	In Planning	—	—		Cu

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					16-026(e)	MPS	CAI	In Planning	—	—		**Cu**
W007	W-SMA-6	12-Jan-11	In Process	—	**11-001(c)**	MPS	—	—	—	—		
W008	W-SMA-7	12-Jan-11	In Process	—	**16-029(e)**[9] **16-026(h2)**	MPS	—	—	—	—		
W009	W-SMA-7.8	12-Jan-11	In Process	—	**16-031(a)**	MPS	—	—	—	—		
W010	W-SMA-7.9	12-Jan-11	In Process	—	**16-006(c)**	MPS	—	—	—	—		
W011	W-SMA-8	12-Jan-11	12-Sep-13	25-Oct-13	**16-016(g)**	MPS	CAI	In Planning	—	—		**Cu, Al,**
					16-028(b)	MPS	CAI	In Planning	—	—		**Cu, Al,**
W012	W-SMA-8.7	12-Jan-11	12-Sep-13	25-Oct-13	**13-001**[10]	MPS	CAI	In Planning	—	—		**Al,**
					13-002	MPS	CAI	In Planning	—	—		**Al**
					16-004(a)	MPS	CAI	In Planning	—	—		**Al**
					16-026(j2)	MPS	CAI	In Planning	—	—		**Al**
					16-029(h)	MPS	CAI	In Planning	—	—		**Al**
					16-035	MPS	CAI	In Planning	—	—		**Al**
W012A	W-SMA-8.71	12-Jan-11	21-Aug-11	1-May-12	**16-004(c)**	MPS	CAM5	27-Nov-12	In Process	—		**α, Hg, Hg, Cu, Zn,**
W013	W-SMA-9.05	12-Jan-11	13-Sep-13	**<TAL**	**16-030(g)**	MPS	—	—	—	—	January 2008	**<TALs?**
W014	W-SMA-9.5	1-Dec-10	In Process	—	**11-012(c)**	MPS	—	—	—	—		
W015	W-SMA-9.7	12-Jan-11	13-Sep-13	30-Oct-13	**11-011(a)**	MPS	CAI	In Planning	—	—		**Cu,**
					11-011(b)	MPS	CAI	In Planning	—	—		**Cu**
W016	W-SMA-9.8	12-Jan-11	In Process	—	**11-005(c)**	MPS	—	—	—	—		
W017	W-SMA-9.9	12-Jan-11	21-Aug-11	30-Apr-12	**11-006(b)**	MPS	CAM5	27-Jun-12	In Process	—		**α, Al,**
W018	W-SMA-10	12-Jan-11	21-Aug-11	1-May-12	**11-002**	MPS	CAM5	23-Aug-12	In Process	—		**α,**
					11-003(b)	MPS	CAM5	23-Aug-12	In Process	—		**α**

[9] LANL states the correct SWMU for monitoring is 16-029(e) and 16-026 (h2) should be removed. There is no site description for 16-026(h2).
[10] Some sites are documented as sampling while others did not in this SMA. Only one sampler is documented for this SMA.

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					11-005(a)	MPS	CAM5	23-Aug-12	In Process	—		α
					11-005(b)	MPS	CAM5	23-Aug-12	In Process	—		α
					11-006(c)	MPS	CAM5	23-Aug-12	In Process	—		α
					11-006(d)	MPS	CAM5	23-Aug-12	In Process	—		α
					11-011(d)	MPS	CAM5	23-Aug-12	In Process	—		α
W019	W-SMA-11.7	12-Jan-11	1-Sep-11	1-May-12	**49-008(c)**	MPS	CAM5	23-Oct-12	In Process	—		α, Al,
W020	W-SMA-12.05	12-Jan-11	In Process	—	**49-001(g)**	MPS	—	—	—	—		
W021	W-SMA-14.1	28-Apr-11	18-Aug-11	17-Oct-11	**15-004(h)**	MPS	CAM5	25-Sep-12	In Process	—		α, Zn, Cu,
					15-014(l)	MPS	CAM5	25-Sep-12	In Process	—		α, Zn, Cu,
W022	W-SMA-15.1	12-Jan-11	1-Sep-11	1-May-12	**49-005(a)**	MPS	CAM5	23-Oct-12	In Process	—		α,
A001	**A-SMA-1.1**	1-Dec-10	In Process	—	**39-004(a)**	MPS	—	—	—	—		
					39-004(d)	MPS	—	—	—	—		
A002	A-SMA-2	11-Feb-11	12-Sep-13	22-Oct-13	**39-004(b)**	MPS	CAI	In Planning	—	—		α, Al, Cu
					39-004(e)	MPS	CAI	In Planning	—	—		α, Al, Cu
A003	A-SMA-2.5	11-Feb-11	In Process	—	**39-010**	MPS	—	—	—	—		
A004	**A-SMA-2.7**	11-Feb-11	4-Sep-11	27-Oct-11	39-002(c)	MPS	CACompD	29-Nov-12	—	29-Nov-12	4-6-10	α, Cu
					39-008	MPS	CAM5	23-Aug-12	In Process	—		α
A005	A-SMA-2.8	11-Feb-11	In Process	—	39-001(b)	MPS	—	—	—	—	4-6-10	
A006	A-SMA-3	1-Dec-10	25-Jul-13	29-Aug-13	**39-002(b)**	MPS	CAI	In Planning	—	—		α, Hg, Se, PCB, Hg, Al, Cu
					39-004(c)	MPS	CAI	In Planning	—	—		α, Hg, Se, PCB, Hg, Al, Cu
A007	A-SMA-3.5	11-Feb-11	25-Jul-13	**<TAL**	39-006(a)	MPS	—	—	—	—		**<TALs?**
A008	A-SMA-4	11-Feb-11	In Process	—	**33-010(d)**	MPS	—	—	—	—		
A009	A-SMA-6	11-Feb-11	4-Aug-13	4-Sep-13	33-004(k)	MPS	CAI	In Planning	—	—		Cu
					33-007(a)	MPS	CAI	In Planning	—	—		Cu

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
					33-010(a)	MPS	CAI	In Planning	—	—		Cu
Q001	CHQ-SMA-0.5	11-Feb-11	In Process	—	**33-004(g)**	MPS	—	—	—	—		
					33-007(c)	MPS	—	—	—	—		
					33-009	MPS	—	—	—	—		
Q002	CHQ-SMA-1.01	11-Feb-11	In Process	—	33-002(d)	MPS	—	—	—	—		
Q002A	CHQ-SMA-1.02	11-Feb-11	21-Aug-11	1-May-12	33-004(h)	MPS	CAM5	24-Oct-12	In Process	—		PCB, Cu
					33-008(c)	MPS	CAM5	24-Oct-12	In Process	—		PCB, Cu
					33-011(d)	MPS	CAM5	24-Oct-12	In Process	—		PCB, Cu
					33-015	MPS	CAM5	24-Oct-12	In Process	—		PCB, Cu
				3-Nov-13	33-004(h)	MPS	CAI2	In Planning	—	—		PCB, Cu
					33-008(c)	MPS	CAI2	In Planning	—	—		PCB, Cu
					33-011(d)	MPS	CAI2	In Planning	—	—		PCB, Cu
					33-015	MPS	CAI2	In Planning	—	—		PCB, Cu
Q002B	CHQ-SMA-1.03	11-Feb-11	4-Jul-12	27-Aug-12	**33-008(c)**	MPS	CAI	In Planning	—	—		α, PCB, Cu
					33-012(a)	MPS	CAI	In Planning	—	—		α, PCB, Cu
					33-017	MPS	CAI	In Planning	—	—		α, PCB, Cu
					C-33-001	MPS	CAI	In Planning	—	—		α, PCB, Cu
					C-33-003	MPS	CAI	In Planning	—	—		α, PCB, Cu
Q003	CHQ-SMA-2	11-Feb-11	4-Jul-12	27-Aug-12	**33-004(d)**	MPS	CAI	In Planning	—	—		α, Al, Cu
					33-007(c)	MPS	CAI	In Planning	—	—		α, Al, Cu
					C-33-003	MPS	CAI	In Planning	—	—		α, Al, Cu
Q004	CHQ-SMA-3.05	11-Feb-11	10-Sep-13	23-Oct-13	33-010(f)	MPS	CAI	In Planning	—	—		α, PCB
Q005	CHQ-SMA-4	11-Feb-11	In Process	—	33-011(e)	MPS	—	—	—	—		
Q006	CHQ-SMA-4.1	11-Feb-11	13-Sep-13	22-Oct-13	33-016	MPS	CAI	In Planning	—	—		α
Q007	CHQ-SMA-4.5	11-Feb-11	25-Jul-13	5-Sep-13	**33-011(b)**	MPS	CAI	In Planning	—	—		α

Permitted Feature	SMA	Certify Baseline Controls	Completion of Baseline Monitoring	Initiation of Corrective Action	Site Number[12]	Priority[3]	Corrective Action Response[4]	Corrective Action Certification	Completion of Enhanced Control Monitoring	Completion of Corrective Action	HWB COC[5]	Notes related to TALs[6]
Q008	CHQ-SMA-5.05	1-Dec-10	In Process	—	**33-007(b)**	MPS	—	—	—	—		
Q009	CHQ-SMA-6	11-Feb-11	25-Jul-13	29-Aug-13	33-004(j)	MPS	CAI	In Planning	—	—		**α, Cu**
					33-006(a)	MPS	CAI	In Planning	—	—		**α, Cu**
					33-007(b)	MPS	CAI	In Planning	—	—		**α, Cu**
					33-010(c)	MPS	CAI	In Planning	—	—		**α, Cu**
					33-010(g)	MPS	CAI	In Planning	—	—		**α, Cu**
					33-010(h)	MPS	CAI	In Planning	—	—		**α, Cu**
					33-014	MPS	CAI	In Planning	—	—		**α, Cu**
Q010	CHQ-SMA-7.1	11-Feb-11	In Process	—	**33-010(g)**	MPS	—	—	—	—		

[a] CACompD = Corrective action is complete under the Permit with a certificate of completion under NMED's Consent Order.

[b] — = Corrective action has not been initiated.

[c] CAI = Corrective action is initiated after a TAL exceedance is observed during baseline monitoring.

[d] <TAL = All baseline confirmation monitoring results are less than TALs

[e] CAM5 = Monitoring following installation of enhanced control measures at SMAs associated with Moderate Priority Sites.

[f] CAI2 = Corrective action is re-initiated after a TAL exceedance is observed during monitoring following installation of enhanced control measures.

[g] AltCompR = Alternative compliance requested.

[h] FM =.Force majeure requested to extend the deadline for completion of corrective action.

[i] CAM3 = Monitoring following installation of enhanced control measures at SMAs associated with High Priority Sites.

[j] CACompC = Corrective action is complete under the Permit with a certification of no exposure.

APPENDIX B
SITE MONITORING REQUIREMENTS

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive	Others	Add
R-SMA-0.5	C-00-020	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
R-SMA-1	C-00-041	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
R-SMA-1.95	00-015	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
R-SMA-2.05	00-011(c)	Alpha & Ra	Cyanide	Metals		HE		
R-SMA-2.3	00-011(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
R-SMA-2.5	00-011(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
B-SMA-0.5	10-001(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
B-SMA-0.5	10-001(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
B-SMA-0.5	10-001(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
B-SMA-0.5	10-001(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
B-SMA-0.5	10-004(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
B-SMA-0.5	10-004(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
B-SMA-0.5	10-008	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
B-SMA-0.5	10-009	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
B-SMA-1	00-011(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
ACID-SMA-1.05	00-030(g)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~PEST~~	
ACID-SMA-2	01-002(b)-00	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
ACID-SMA-2	45-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
ACID-SMA-2	45-002	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
ACID-SMA-2	45-004	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
ACID-SMA-2.01	00-030(f)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
ACID-SMA-2.1	01-002(b)-00	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
P-SMA-0.3	00-018(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
P-SMA-1	73-001(a)	Alpha & Ra	Cyanide	Metals				
P-SMA-1	73-004(d)	Alpha & Ra	Cyanide	Metals				
P-SMA-2	73-002	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb	PCBs		~~Dioxin~~, SVC	PAHs, PCBs
P-SMA-2	73-006	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg			~~Dioxin~~, SVC	PAHs
P-SMA-2.15	31-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
P-SMA-2.2	00-019	Alpha & Ra	Cyanide	Metals	PCBs			
P-SMA-3.05	00-018(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs			
LA-SMA-0.85	03-055(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-0.9	00-017	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-0.9	C-00-044	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb	~~PCBs~~			
LA-SMA-1	00-017	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-1	C-00-044	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb	~~PCBs~~			
LA-SMA-1.1	43-001(b2)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-1.25	C-43-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-2.1	01-001(f)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs			
LA-SMA-2.3	01-001(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				

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APPENDIX B
SITE MONITORING REQUIREMENTS

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive	Others	Add
LA-SMA-3.1	01-001(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-3.1	01-003(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb	PCBs			
LA-SMA-3.9	01-001(g)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-3.9	01-006(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-4.1	01-003(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-4.1	01-006(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-4.2	01-001(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-4.2	01-006(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-4.2	01-006(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.01	01-001(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg, Pb	~~PCBs~~			
LA-SMA-5.01	01-006(h)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg, Pb	~~PCBs~~			
LA-SMA-5.02	01-003(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.2	01-003(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb, Sb				
LA-SMA-5.31	41-002(c)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu				
LA-SMA-5.33	32-004	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-5.35	C-41-004	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu				
LA-SMA-5.361	~~32-002(b1)~~ ~~32-002(b)~~	~~Alpha & Ra~~	~~Cyanide~~	~~Metals Hg, Pb~~				
LA-SMA-5.361	32-002(b2) ~~32-002(b)~~	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg, Pb				
LA-SMA-5.362	32-003	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs			
LA-SMA-5.51	02-003(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.51	02-003(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.51	02-004(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg	~~PCBs~~		SVC	PAHs
LA-SMA-5.51	02-005	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.51	02-006(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg	~~PCBs~~		SVC	PAHs
LA-SMA-5.51	02-006(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.51	02-006(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.51	02-006(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg	~~PCBs~~			
LA-SMA-5.51	02-008(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.51	02-009(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.51	02-011(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg	PCBs			
LA-SMA-5.51	02-011(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.51	02-011(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.51	02-011(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.52	02-003(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.52	02-007	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.52	02-008(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg	~~PCBs~~			
LA-SMA-5.53	02-009(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
LA-SMA-5.54	02-009(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			

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APPENDIX B
SITE MONITORING REQUIREMENTS

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive	Others	Add
LA-SMA-5.91	21-009	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-5.91	21-021	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-5.91	21-023(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-5.91	21-027(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-5.92	21-013(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-5.92	21-013(g)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-5.92	21-018(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-5.92	21-021	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu, Hg				
LA-SMA-6.25	21-021	Alpha & Ra	Cyanide	Metals				
LA-SMA-6.25	21-024(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Pb				
LA-SMA-6.25	21-027(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb				
LA-SMA-6.27	21-021	Alpha & Ra	Cyanide	Metals				
LA-SMA-6.27	21-027(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb				
LA-SMA-6.3	21-006(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~			~~SVC~~	
LA-SMA-6.31	21-027(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb			~~SVC~~	
LA-SMA-6.32	21-021	Alpha & Ra	Cyanide	Metals				
LA-SMA-6.34	21-021	Alpha & Ra	Cyanide	Metals				
LA-SMA-6.34	21-022(h)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Ag, Pb				
LA-SMA-6.36	21-021	Alpha & Ra	Cyanide	Metals				
LA-SMA-6.36	21-024(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-6.38	21-021	Alpha & Ra	Cyanide	Metals				
LA-SMA-6.38	21-024(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg	PCBs			PCBs
LA-SMA-6.395	21-021	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-6.395	21-024(j)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-6.5	21-021	Alpha & Ra	Cyanide	Metals	PCBs		SVC	
LA-SMA-6.5	21-024(i)	Alpha & Ra	Cyanide	Metals	PCBs		SVC	
LA-SMA-9	26-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-9	26-002(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-9	26-002(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-9	26-003	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-10.11	53-002(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
LA-SMA-10.12	53-008	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
DP-SMA-0.3	21-029	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~				
DP-SMA-0.4	21-021	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Al, Cu				
DP-SMA-0.6	21-021	Alpha & Ra	Cyanide	Metals				
DP-SMA-0.6	21-024(l)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb				
DP-SMA-1	21-011(k)	Alpha & Ra	Cyanide	Metals	PCBs			
DP-SMA-1	21-021	Alpha & Ra	Cyanide	Metals	PCBs			
DP-SMA-2	21-021	Alpha & Ra	Cyanide	Metals				

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APPENDIX B
SITE MONITORING REQUIREMENTS

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive	Others	Add
DP-SMA-2	21-024(h)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
DP-SMA-2.35	21-021	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~				
DP-SMA-2.35	21-024(n)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
DP-SMA-3	21-013(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
DP-SMA-3	21-021	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al, Cu				
DP-SMA-4	21-021	Alpha & Ra	Cyanide	Metals				
S-SMA-0.25	03-013(a)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu, Zn	~~PCBs~~		~~SVC~~	
S-SMA-0.25	03-052(f)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs			
S-SMA-1.1	03-029	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		SVC	PAHs
S-SMA-2	03-012(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
S-SMA-2	03-045(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
S-SMA-2	03-045(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
S-SMA-2	03-056(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs			
S-SMA-2.01	03-052(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
S-SMA-2.8	03-014(c2)	~~Alpha & Ra~~	Cyanide	~~Metals~~	PCBs		~~SVC~~	
S-SMA-3.51	03-009(i)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~SVC~~	
S-SMA-3.52	03-021	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb, Tl	~~PCBs~~		~~SVC~~	
S-SMA-3.53	03-014(b2)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~SVC~~	
S-SMA-3.6	60-007(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~	~~HE~~	SVC	PAHs
S-SMA-3.7	53-012(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs			
S-SMA-3.71	53-001(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs			
S-SMA-3.72	53-001(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb	PCBs			
S-SMA-3.95	20-002(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
S-SMA-4.1	53-014	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
S-SMA-4.5	20-002(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
S-SMA-5	20-002(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~	~~HE~~		
S-SMA-5.2	20-003(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~	~~HE~~	~~SVC~~	
S-SMA-5.5	20-005	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
S-SMA-6	72-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~	~~HE~~		
CDB-SMA-0.15	04-003(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
CDB-SMA-0.15	04-004	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
CDB-SMA-0.25	46-004(c2)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~SVC~~	
CDB-SMA-0.25	46-004(e2)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~SVC~~	
CDB-SMA-0.55	46-004(g)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~SVC~~	
CDB-SMA-0.55	46-004(m)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~SVC~~	
CDB-SMA-0.55	46-004(s)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu	~~PCBs~~		~~SVC~~	
CDB-SMA-0.55	46-006(f)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~SVC~~	
CDB-SMA-1	46-003(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
CDB-SMA-1	46-004(d2)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			

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APPENDIX B
SITE MONITORING REQUIREMENTS

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive	Others	Add
CDB-SMA-1	46-004(f)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
CDB-SMA-1	46-004(t)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
CDB-SMA-1	46-004(w)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
CDB-SMA-1	46-008(g)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs		SVC	PAHs
CDB-SMA-1	46-009(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
CDB-SMA-1	C-46-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
CDB-SMA-1.15	46-004(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		SVC	PAHs
CDB-SMA-1.15	46-004(y)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg	~~PCBs~~			
CDB-SMA-1.15	46-004(z)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb	~~PCBs~~			
CDB-SMA-1.15	46-006(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Hg	PCBs		SVC	PAHs
CDB-SMA-1.35	46-004(a2)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~PEST, SVC~~	
CDB-SMA-1.35	46-004(u)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~PEST, SVC~~	
CDB-SMA-1.35	46-004(v)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~PEST, SVC~~	
CDB-SMA-1.35	46-004(x)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~PEST, SVC~~	
CDB-SMA-1.35	46-006(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Hg	PCBs		~~PEST,~~ SVC	
CDB-SMA-1.35	46-008(f)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~PEST,~~ SVC	
CDB-SMA-1.54	46-004(h)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~PEST~~	
CDB-SMA-1.54	46-004(q)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg, Pb	PCBs		~~PEST~~	
CDB-SMA-1.54	46-006(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Hg	PCBs		~~PEST~~ SVC	PAHs
CDB-SMA-1.55	46-003(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Hg				
CDB-SMA-1.65	46-003(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
CDB-SMA-4	54-017	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~SVC~~	
CDB-SMA-4	54-018	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~SVC~~	
CDB-SMA-4	54-020	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		~~Dioxin, SVC~~	
M-SMA-1	03-050(a)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu, Zn	PCBs			
M-SMA-1	03-054(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-1.2	03-049(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu				
M-SMA-1.21	03-049(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb, Sb				
M-SMA-1.22	03-045(h)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
M-SMA-3	48-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-3	48-005	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-3	48-007(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-3.1	48-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-3.1	48-007(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-3.5	48-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-3.5	48-003	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-4	48-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-4	48-005	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-4	48-007(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			

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APPENDIX B
SITE MONITORING REQUIREMENTS

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive	Others	Add
M-SMA-4	48-007(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-4	48-010	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-5	42-001(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-5	42-001(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-5	42-001(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-5	42-002(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-5	42-002(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-6	35-016(h)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-7	35-016(g)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
M-SMA-7.9	50-006(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-9.1	35-016(f)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-10	35-008	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
M-SMA-10	35-014(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
M-SMA-10.01	35-016(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
M-SMA-10.3	35-014(e2)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs		SVC	PAHs
M-SMA-10.3	35-016(i)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		SVC	PAHs
M-SMA-11.1	35-016(o)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs			
M-SMA-12	35-016(p)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
M-SMA-12.5	05-005(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
M-SMA-12.5	05-006(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Pb		~~HE~~	~~SVC~~	
M-SMA-12.6	05-004	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
M-SMA-12.7	05-002	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Pb		~~HE~~	~~SVC~~	
M-SMA-12.7	05-005(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
M-SMA-12.7	05-006(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
M-SMA-12.7	05-006(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
M-SMA-12.8	05-001(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Pb		~~HE~~	~~SVC~~	
M-SMA-12.8	05-002	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Pb		~~HE~~	~~SVC~~	
M-SMA-12.9	05-001(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Pb		~~HE~~		
M-SMA-12.9	05-002	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Pb		~~HE~~		
M-SMA-12.92	00-001	Alpha & Ra	Cyanide	Metals				
M-SMA-13	05-001(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
Pratt-SMA-1.05	35-003(h)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
Pratt-SMA-1.05	35-003(p)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
Pratt-SMA-1.05	35-003(r)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
Pratt-SMA-1.05	35-004(h)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al, Hg	PCBs			
Pratt-SMA-1.05	35-009(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs			
Pratt-SMA-1.05	35-016(k)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		SVC	PAHs
Pratt-SMA-1.05	35-016(l)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		SVC	PAHs
Pratt-SMA-1.05	35-016(m)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			

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APPENDIX B
SITE MONITORING REQUIREMENTS

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive	Others	Add
T-SMA-1	50-006(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
T-SMA-1	50-009	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
T-SMA-2.5	35-014(g3)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
T-SMA-2.85	35-014(g)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
T-SMA-2.85	35-016(n)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
T-SMA-3	35-016(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
T-SMA-4	35-004(a)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu, Hg				
T-SMA-4	35-009(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
T-SMA-4	35-016(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
T-SMA-4	35-016(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~Hg				
T-SMA-5	35-004(a)	Alpha & Ra	Cyanide	Metals				
T-SMA-5	35-009(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
T-SMA-5	35-016(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
T-SMA-5	35-016(q)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
T-SMA-6.8	35-010(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
T-SMA-7	04-003(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
T-SMA-7.1	04-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
T-SMA-7.1	04-002	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
2M-SMA-1	03-010(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Al				
2M-SMA-1.42	06-001(a)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al				
2M-SMA-1.43	22-014(a)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al				
2M-SMA-1.43	22-015(a)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al				
2M-SMA-1.44	06-001(b)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu				
2M-SMA-1.45	06-006	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~				
2M-SMA-1.5	22-014(b)	Alpha & Ra	Cyanide	Metals		HE	SVC	
2M-SMA-1.65	40-005	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
2M-SMA-1.67	06-003(h)	Alpha & Ra	Cyanide	Metals		HE		
2M-SMA-1.7	03-055(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu				
2M-SMA-1.8	03-001(k)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Zn				
2M-SMA-1.9	03-003(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Zn				
2M-SMA-2	03-050(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Zn	PCBs			
2M-SMA-2	03-054(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~		SVC	PAHs
2M-SMA-2.2	03-003(k)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Zn	PCBs			
2M-SMA-3	07-001(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Al, Cu		~~HE~~		
2M-SMA-3	07-001(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Al, Cu		~~HE~~		
2M-SMA-3	07-001(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Al, Cu		~~HE~~		
2M-SMA-3	07-001(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Al, Cu		~~HE~~		
2M-SMA-2.5	40-001(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
3M-SMA-0.2	15-010(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				

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APPENDIX B
SITE MONITORING REQUIREMENTS

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive	Others	Add
3M-SMA-0.4	15-006(b)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
3M-SMA-0.5	15-006(c)	Alpha & Ra	Cyanide	Metals		HE		
3M-SMA-0.5	15-009(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
3M-SMA-0.6	15-008(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Pb, Sb				
3M-SMA-2.6	36-008	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Ag, Cu, Hg, Pb	PCBs	~~HE~~	~~SVC~~	PCBs
3M-SMA-2.6	C-36-003	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Ag, Cu, Pb	PCBs	~~HE~~	~~SVC~~	PCBs
3M-SMA-4	18-002(b)	Alpha & Ra	Cyanide	Metals		HE		
3M-SMA-4	18-003(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs			PCBs
3M-SMA-4	18-010(f)	Alpha & Ra	Cyanide	Metals				
PJ-SMA-1.05	09-013	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	PCBs			
PJ-SMA-2	09-009	Alpha & Ra	Cyanide	Metals				
PJ-SMA-3.05	09-004(o)	Alpha ~~& Ra~~	Cyanide	~~Metals~~		HE		HE
PJ-SMA-4.05	09-004(g)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~				
PJ-SMA-5	22-015(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu			~~SVC~~	
PJ-SMA-5.1	22-010(b)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu, Zn				
PJ-SMA-5.1	22-016	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu, Zn				
PJ-SMA-6	40-010	Alpha & Ra	Cyanide	Metals				
PJ-SMA-7	40-006(c)	Alpha & Ra	Cyanide	Metals		HE		
PJ-SMA-8	40-006(b)	Alpha & Ra	Cyanide	Metals		HE		
PJ-SMA-9	40-009	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~	~~SVC~~	
PJ-SMA-10	40-006(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~	~~SVC~~	
PJ-SMA-11	40-003(a)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu				
PJ-SMA-11.1	40-003(b)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al, Cu				
PJ-SMA-13	18-002(a)	Alpha & Ra	Cyanide	Metals		HE		
PJ-SMA-13.7	18-010(b)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~				
PJ-SMA-14	54-004	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
PJ-SMA-14.2	18-012(b)	Alpha & Ra	Cyanide	Metals				
PJ-SMA-14.3	18-003(e)	Alpha & Ra	Cyanide	Metals				
PJ-SMA-14.4	18-010(d)	Alpha & Ra	Cyanide	Metals				
PJ-SMA-14.6	18-010(e)	Alpha & Ra	Cyanide	Metals				
PJ-SMA-14.8	18-012(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
PJ-SMA-16	27-002	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
PJ-SMA-17	54-018	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
PJ-SMA-18	54-014(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
PJ-SMA-18	54-017	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
PJ-SMA-19	54-013(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
PJ-SMA-19	54-017	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
PJ-SMA-19	54-020	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
PJ-SMA-20	54-017	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			

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APPENDIX B
SITE MONITORING REQUIREMENTS

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive	Others	Add
STRM-SMA-1.05	08-009(f)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu				
STRM-SMA-1.5	08-009(d)	Alpha & Ra	Cyanide	~~Metals~~ Ag, Cd, Hg			~~SVC~~	
STRM-SMA-4.2	09-008(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Al				
STRM-SMA-5.05	09-013	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al	PCBs			
CDV-SMA-1.2	16-017(b)-99	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
CDV-SMA-1.2	16-029(k)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
CDV-SMA-1.3	16-017(a)-99	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
CDV-SMA-1.3	16-026(m)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~				
CDV-SMA-1.4	16-020	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Ag				
CDV-SMA-1.4	16-026(l)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
CDV-SMA-1.4	16-028(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
CDV-SMA-1.4	16-030(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Ag				
CDV-SMA-1.45	16-026(i)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
CDV-SMA-1.7	16-019	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu		HE		
CDV-SMA-2	16-021(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		HE	~~SVC~~	HE
CDV-SMA-2.3	13-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
CDV-SMA-2.3	13-002	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
CDV-SMA-2.3	16-003(n)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		HE		HE
CDV-SMA-2.3	16-003(o)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ As, Co, Cu, Pb, V		HE		HE
CDV-SMA-2.3	16-029(h)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
CDV-SMA-2.3	16-031(h)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
CDV-SMA-2.41	16-018	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
CDV-SMA-2.42	16-010(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
CDV-SMA-2.5	16-010(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
CDV-SMA-2.5	16-010(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
CDV-SMA-2.5	16-028(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
CDV-SMA-2.51	16-010(i)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
CDV-SMA-3	14-009	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
CDV-SMA-4	14-010	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb		~~HE~~		
CDV-SMA-6.01	14-001(g)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
CDV-SMA-6.01	14-006	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb		~~HE~~		
CDV-SMA-6.02	14-002(c)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
CDV-SMA-6.02	14-002(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
CDV-SMA-6.02	14-002(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
CDV-SMA-7	15-008(d)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al, Se				
CDV-SMA-8	15-011(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~			~~SVC~~	
CDV-SMA-8.5	15-014(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Ag				
CDV-SMA-9.05	15-007(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Pb			~~SVC~~	
F-SMA-2	36-004(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		

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APPENDIX B
SITE MONITORING REQUIREMENTS

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive	Others	Add
PT-SMA-0.5	15-009(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~	~~HE~~	~~SVC~~	
PT-SMA-0.5	C-15-004	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~	~~HE~~	~~SVC~~	
PT-SMA-1	15-004(f)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~	~~SVC~~	
PT-SMA-1	15-008(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~	~~SVC~~	
PT-SMA-1.7	15-006(a)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
PT-SMA-2	15-008(f)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
PT-SMA-2	36-003(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
PT-SMA-2	36-004(e)	Alpha & Ra	Cyanide	Metals		HE	SVC	
PT-SMA-2.01	C-36-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
PT-SMA-2.01	C-36-006(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~	~~SVC~~	
PT-SMA-3	36-004(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
PT-SMA-3	36-006	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Pb				
PT-SMA-4.2	36-004(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
W-SMA-1	16-017(j)-99	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al				
W-SMA-1	16-026(c2)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al				
W-SMA-1	16-026(v)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-1.5	16-026(b2)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu, Zn				
W-SMA-1.5	16-028(d)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu, Zn				
W-SMA-2.05	16-028(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-3.5	16-026(y)	Alpha & Ra	Cyanide	Metals				
W-SMA-4.1	16-003(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
W-SMA-5	16-001(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~			~~SVC~~	
W-SMA-5	16-003(f)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~			~~SVC~~	
W-SMA-5	16-026(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~			~~SVC~~	
W-SMA-5	16-026(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~			~~SVC~~	
W-SMA-5	16-026(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		HE	~~SVC~~	HE
W-SMA-5	16-026(e)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		HE	~~SVC~~	HE
W-SMA-6	11-001(c)	Alpha & Ra	Cyanide	Metals		HE		
W-SMA-7	16-029(e) ~~16-026(h2)~~	Alpha & Ra	Cyanide	Metals				
W-SMA-7.8	16-031(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Pb				
W-SMA-7.9	16-006(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~			~~SVC~~	
W-SMA-8	16-016(g)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Al, Cu			~~SVC~~	
W-SMA-8	16-028(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu			~~SVC~~	
W-SMA-8.7	13-001	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
W-SMA-8.7	13-002	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-8.7	16-004(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Al				
W-SMA-8.7	16-026(j2)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-8.7	16-029(h)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				

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APPENDIX B
SITE MONITORING REQUIREMENTS

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive	Others	Add
W-SMA-8.7	16-035	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-8.71	16-004(c)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu, Hg, Zn				
W-SMA-9.05	16-030(g)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
W-SMA-9.5	11-012(c)	Alpha & Ra	Cyanide	Metals				
W-SMA-9.7	11-011(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-9.7	11-011(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-9.8	11-005(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-9.9	11-006(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-10	11-002	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-10	11-003(b)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-10	11-005(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-10	11-005(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-10	11-006(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-10	11-006(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-10	11-011(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-11.7	49-008(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
W-SMA-12.05	49-001(g)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
W-SMA-14.1	15-004(h)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu, Zn		~~HE~~		
W-SMA-14.1	15-014(l)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu, Zn				
W-SMA-15.1	49-005(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
A-SMA-1.1	39-004(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Hg, Pb		HE		
A-SMA-1.1	39-004(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Hg, Pb		~~HE~~		
A-SMA-2	39-004(b)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~		
A-SMA-2	39-004(e)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~		
A-SMA-2.5	39-010	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu, Hg		HE		HE
A-SMA-2.7	39-002(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
A-SMA-2.7	39-008	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
A-SMA-2.8	39-001(b)	Alpha & Ra	Cyanide	Metals				
A-SMA-3	39-002(b)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al, Cu, Hg, Se	PCBs			
A-SMA-3	39-004(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~		
A-SMA-3.5	39-006(a)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
A-SMA-4	33-010(d)	Alpha & Ra	Cyanide	Metals		HE		
A-SMA-6	33-004(k)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu				
A-SMA-6	33-007(a)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~		
A-SMA-6	33-010(a)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu				
CHQ-SMA-0.5	33-004(g)	Alpha & Ra	Cyanide	Metals	PCBs			
CHQ-SMA-0.5	33-007(c)	Alpha & Ra	Cyanide	Metals	PCBs	HE		
CHQ-SMA-0.5	33-009	Alpha & Ra	Cyanide	Metals	PCBs			
CHQ-SMA-1.01	33-002(d)	Alpha & Ra	Cyanide	Metals	PCBs			

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APPENDIX B
SITE MONITORING REQUIREMENTS

SMA Number	Site Number	Radioactivity	Cyanide	Metals	PCBs	High Explosive	Others	Add
CHQ-SMA-1.02	33-004(h)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu	PCBs			
CHQ-SMA-1.02	33-008(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu	~~PCBs~~			
CHQ-SMA-1.02	33-011(d)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
CHQ-SMA-1.02	33-015	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu	PCBs			
CHQ-SMA-1.03	33-008(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu	~~PCBs~~			
CHQ-SMA-1.03	33-012(a)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu	PCBs			
CHQ-SMA-1.03	33-017	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu	PCBs			
CHQ-SMA-1.03	C-33-001	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu	PCBs			
CHQ-SMA-1.03	C-33-003	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
CHQ-SMA-2	33-004(d)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al, Cu	~~PCBs~~			
CHQ-SMA-2	33-007(c)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Al, Cu	~~PCBs~~	HE		HE
CHQ-SMA-2	C-33-003	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~			
CHQ-SMA-3.05	33-010(f)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~	PCBs		~~PEST~~	
CHQ-SMA-4	33-011(e)	Alpha & Ra	Cyanide	Metals	PCBs	HE		
CHQ-SMA-4.1	33-016	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~	~~PCBs~~	~~HE~~		
CHQ-SMA-4.5	33-011(b)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~				
CHQ-SMA-5.05	33-007(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~				
CHQ-SMA-6	33-004(j)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~		
CHQ-SMA-6	33-006(a)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~		
CHQ-SMA-6	33-007(b)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~		~~HE~~		
CHQ-SMA-6	33-010(c)	~~Alpha & Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~		
CHQ-SMA-6	33-010(g)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~		
CHQ-SMA-6	33-010(h)	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~		
CHQ-SMA-6	33-014	Alpha ~~& Ra~~	~~Cyanide~~	~~Metals~~ Cu		~~HE~~		
CHQ-SMA-7.1	33-010(g)	Alpha & Ra	Cyanide	Metals		HE		

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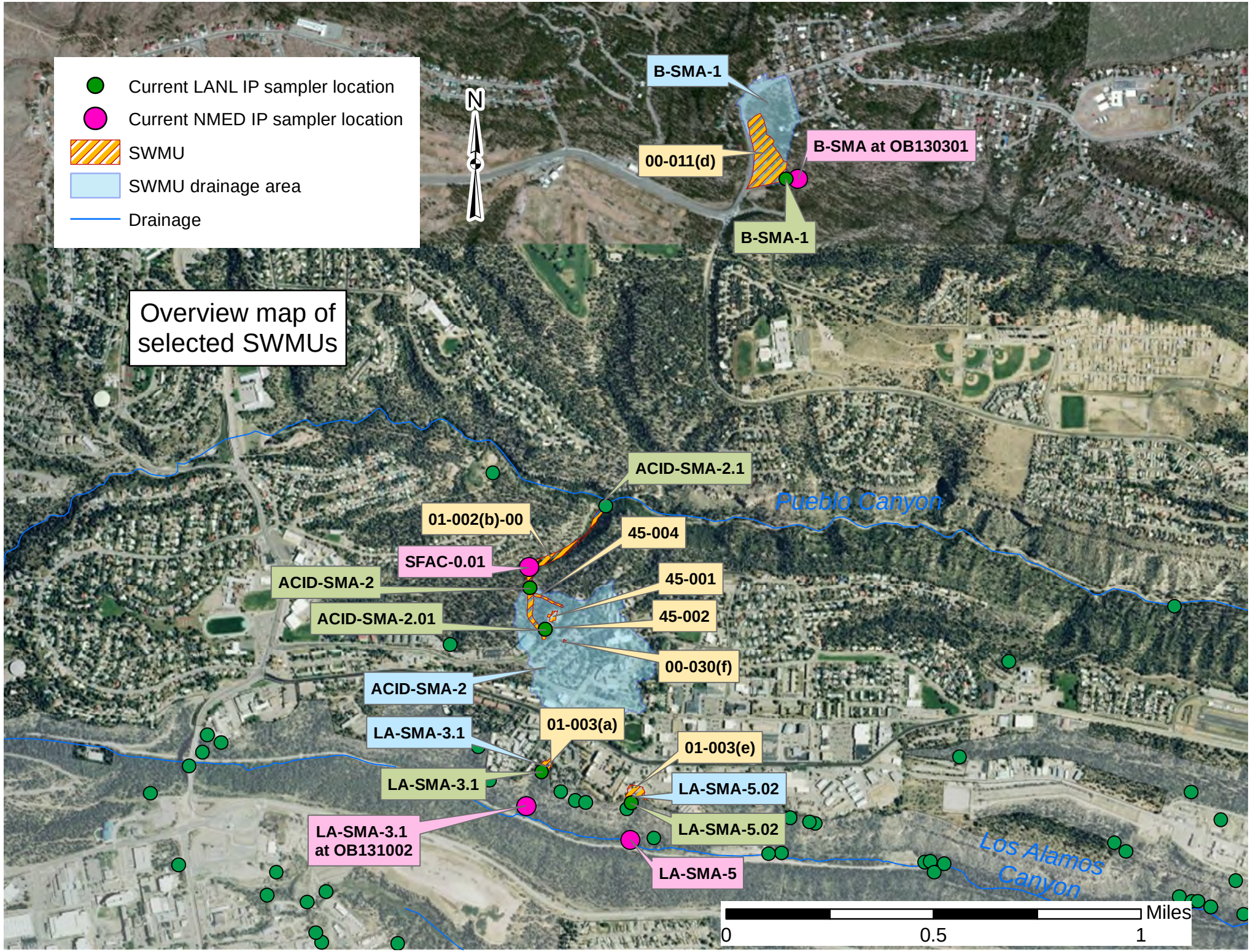
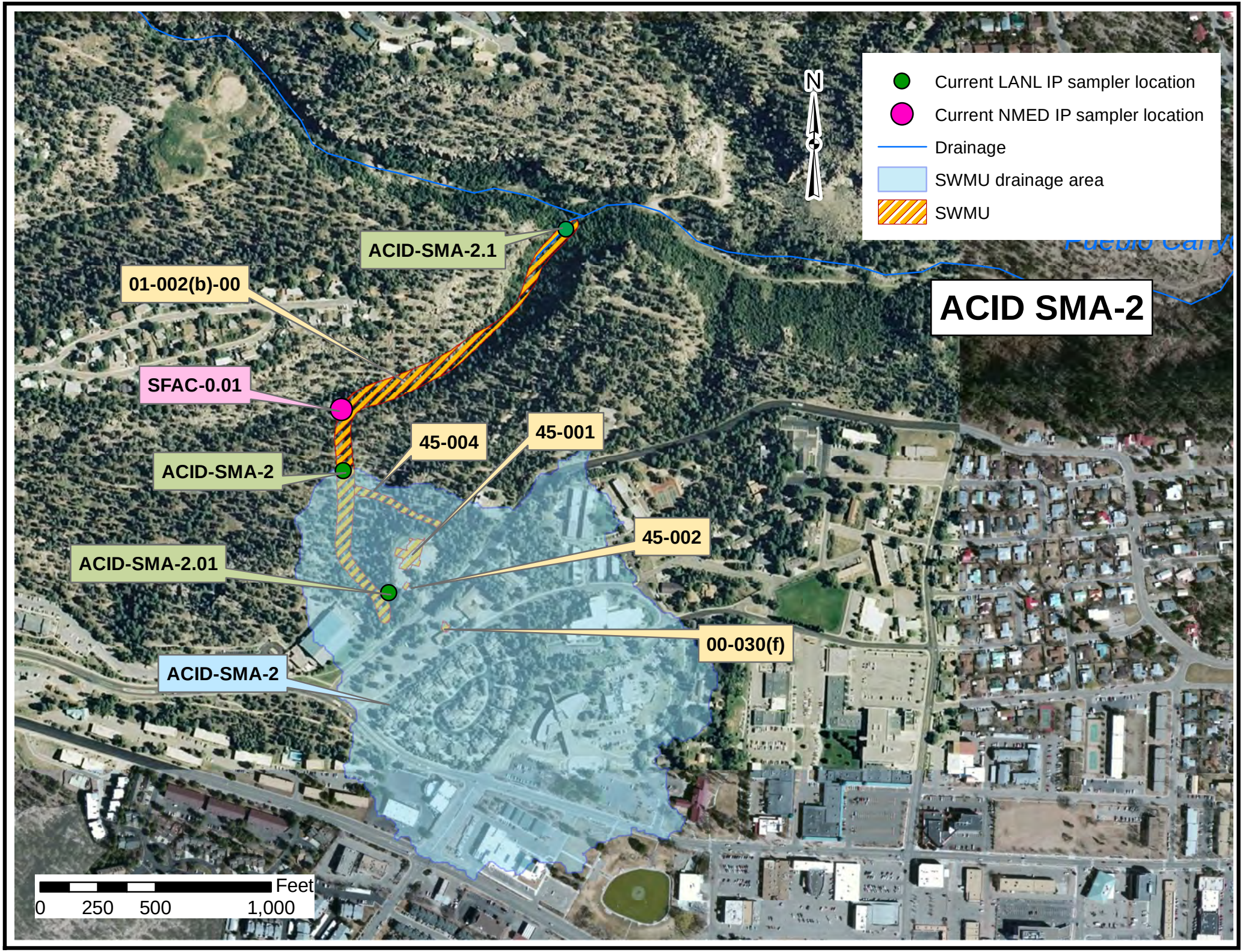
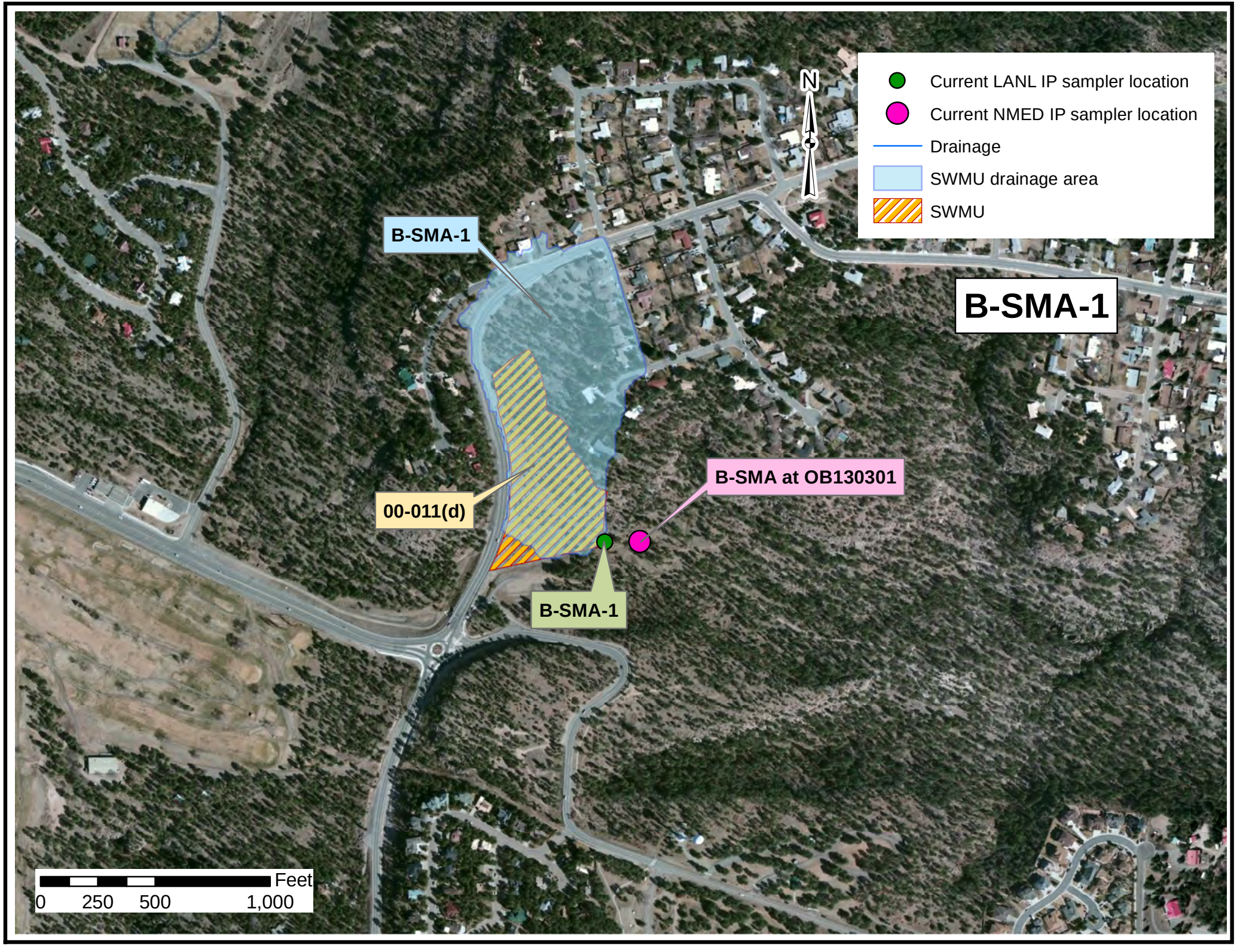
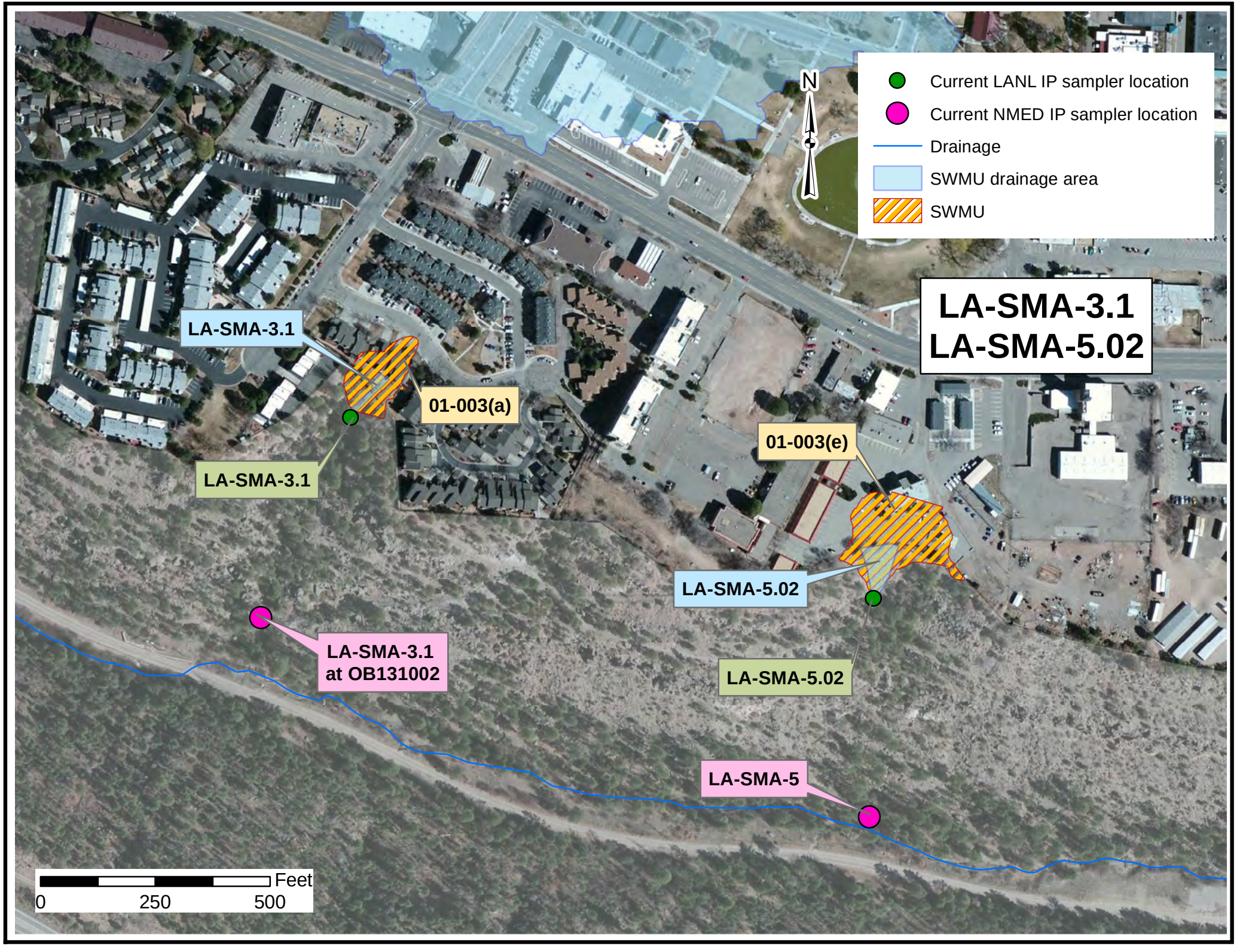

Current LANL IP sampler location
Current NMED IP sampler location
SWMU
SWMU drainage area
Drainage
N
Overview map of selected SWMUs
B-SMA-1
00-011(d)
B-SMA at OB130301
B-SMA-1
ACID-SMA-2.1
Pueblo Canyon
01-002(b)-00
45-004
SFAC-0.01
ACID-SMA-2
45-001
ACID-SMA-2.01
45-002
00-030(f)
ACID-SMA-2
LA-SMA-3.1
01-003(a)
01-003(e)
LA-SMA-3.1
LA-SMA-5.02
LA-SMA-3.1 at OB131002
LA-SMA-5.02
LA-SMA-5
Los Alamos Canyon
Miles
0
0.5
1


ACID SMA-2
N
Current LANL IP sampler location
Current NMED IP sampler location
Drainage
SWMU drainage area
SWMU
ACID-SMA-2.1
01-002(b)-00
SFAC-0.01
45-004
45-001
ACID-SMA-2
45-002
ACID-SMA-2.01
00-030(f)
ACID-SMA-2
Feet
0
250
500
1,000


N
Current LANL IP sampler location
Current NMED IP sampler location
Drainage
SWMU drainage area
SWMU
B-SMA-1
B-SMA-1
B-SMA at OB130301
00-011(d)
B-SMA-1
Feet
0
250
500
1,000


N
Current LANL IP sampler location
Current NMED IP sampler location
Drainage
SWMU drainage area
SWMU
LA-SMA-3.1
LA-SMA-5.02
LA-SMA-3.1
01-003(a)
LA-SMA-3.1
01-003(e)
LA-SMA-5.02
LA-SMA-3.1
at OB131002
LA-SMA-5.02
LA-SMA-5
Feet
0
250
500

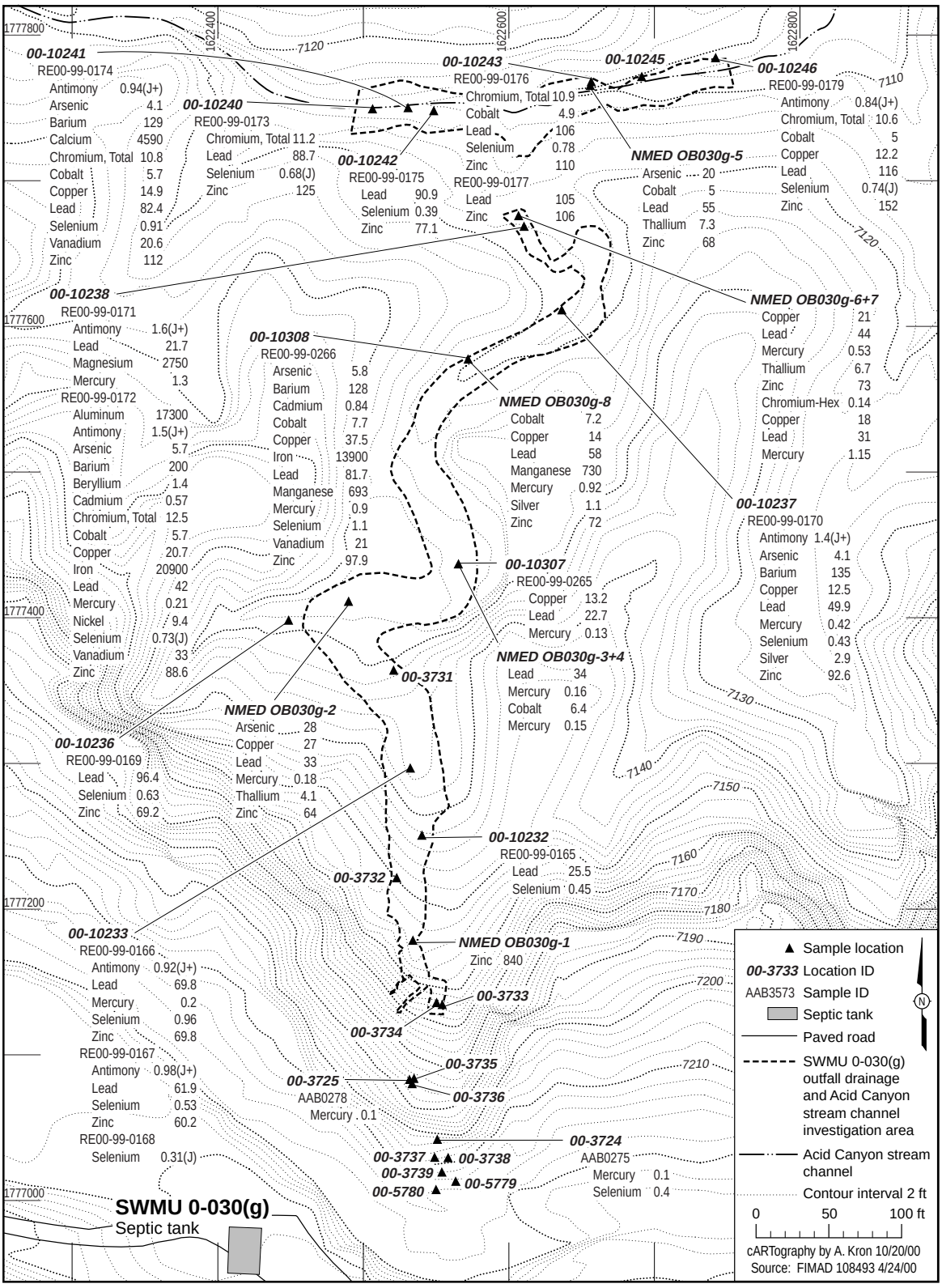


Figure 2.3-11. Locations with inorganic chemicals (mg/kg) at or above background values for the drainage and stream channels at SWMU 0-030(g)

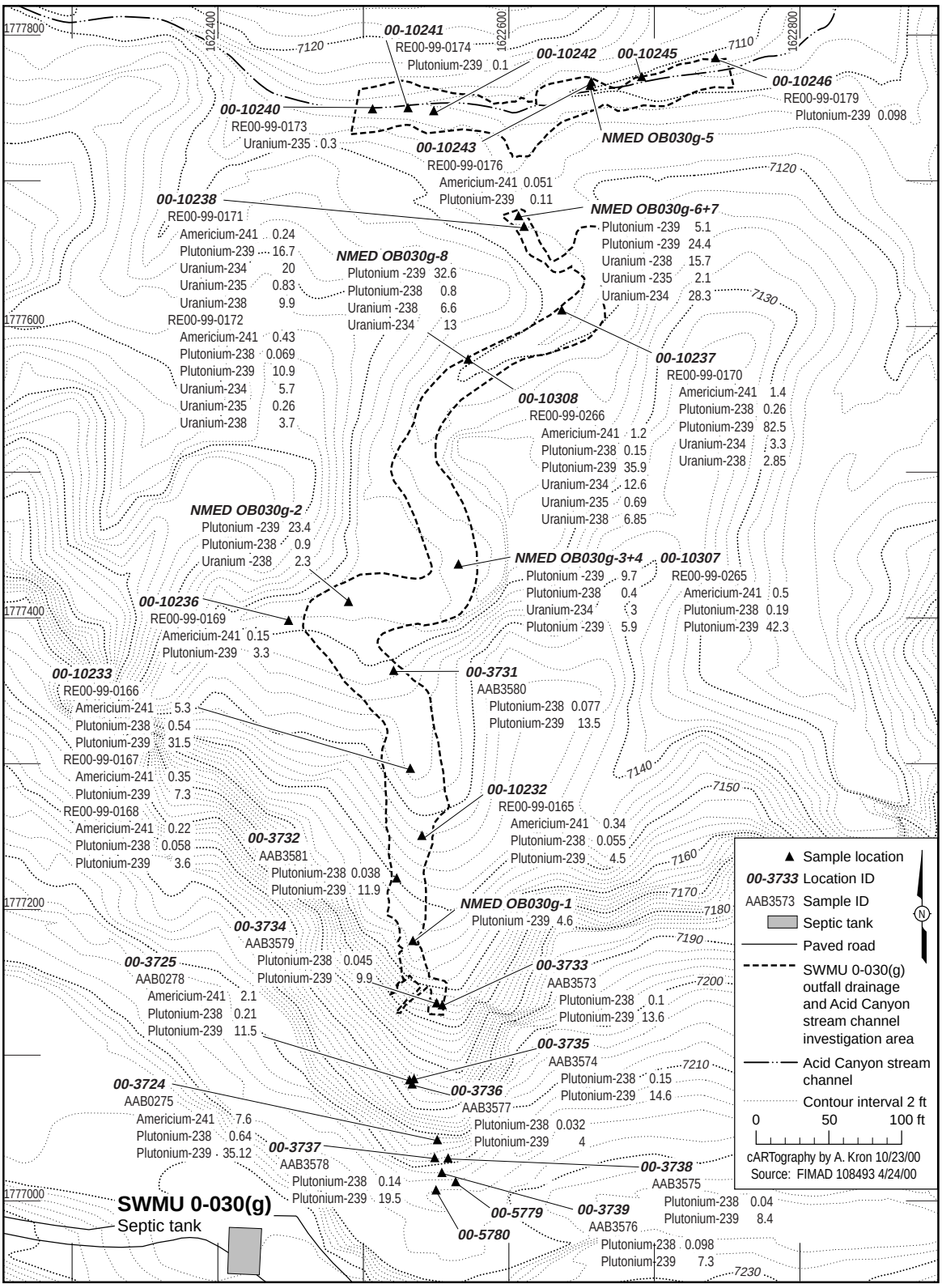


Figure 2.3-13. Locations with radionuclides (pCi/g) at or above background values/fallout concentrations for the drainage and stream channels at SWMU 0-030(g)

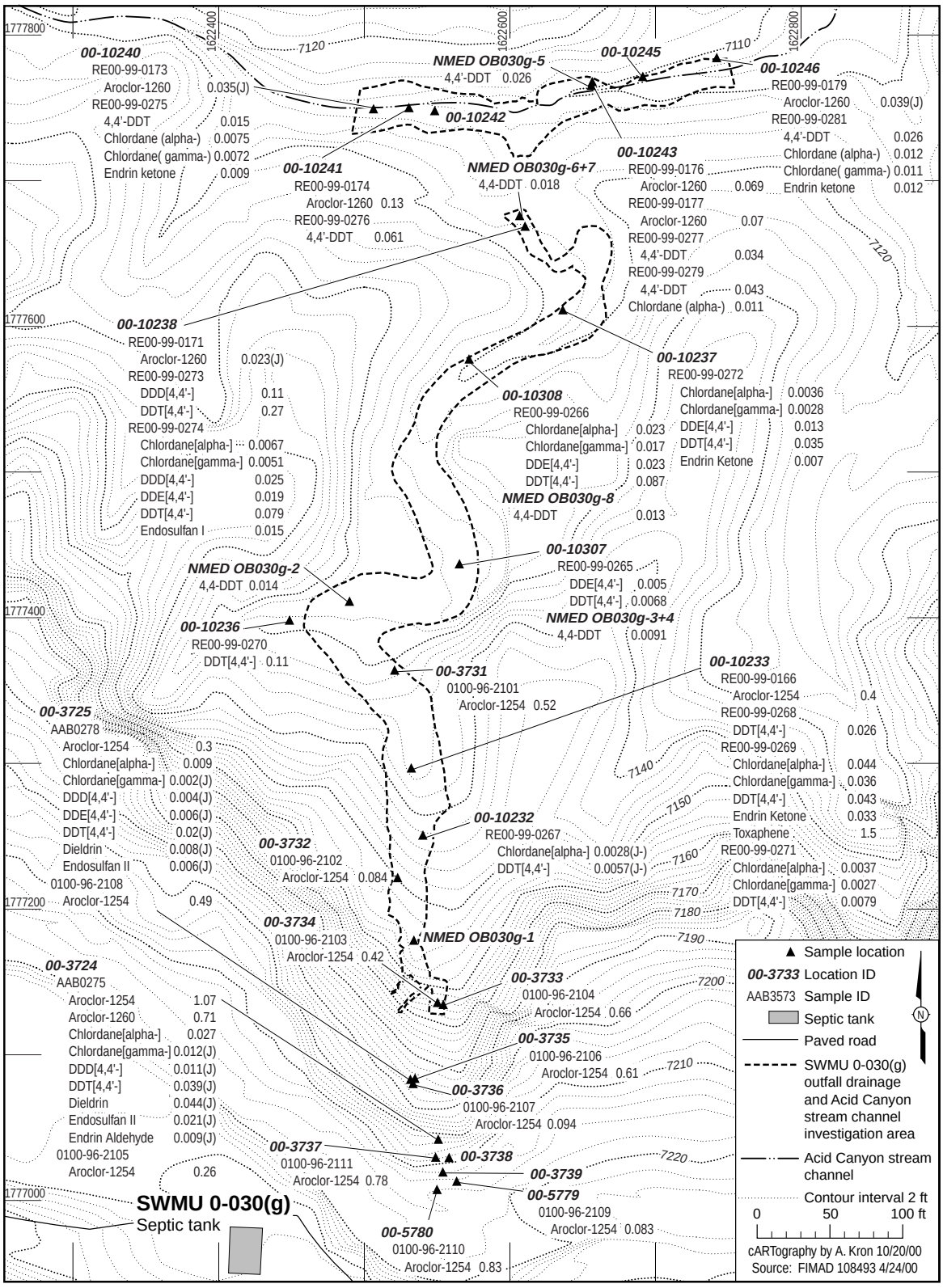


Figure 2.3-15. Locations with organic chemicals (mg/kg) detected in the drainage and stream channels at SWMU 0-030(g)

1623400 1623600 1623800 1624000

1777600 1777400 1777200 1777000

Consolidated Unit 45-001-00

SWMU 45-004

SWMU 01-002(b)-00

SWMU 45-001

AOC C-45-001

SWMU 45-002

SWMU 45-003

SWMU 01-001(a)-99

AOC 00-030(f)

Canyon Rd.

7160 7180 7200 7220 7240 7260 7280

PU-611753 0–2 ft
CAPU-10-13855 0–1 ft AH
Lead 25.7
Mercury 1.43
Silver 2.26
Zinc 62.4
CAPU-10-13856 1–1.5 ft Qbt 2
Barium 134
Chromium 10.2 (J)
Lead 33.6
Mercury 0.468
Silver 9.55
Zinc 81.4
CAPU-10-13857 1.5–2 ft Qbt 2
Barium 53.3
Lead 15.9
Mercury 0.391
Silver 2.33

45-01068 0–8 ft
RE45-06-66904 0–0.5 ft Soil
Mercury 0.108
Nitrate 1.71
Silver 1.45
Zinc 51.1
RE45-06-66905 1–1.5 ft Soil
Copper 22.1
Lead 38.6
Mercury 1.57
Nitrate 2.57
Silver 6.76
Zinc 88.3
RE45-06-66906 1.5–2 ft Soil
Copper 17.6
Lead 38.9
Mercury 0.902
Silver 10
Zinc 72
CAPU-10-12595 7–8 ft Qbt 2
Chromium 38.6 (J)
Manganese 685 (J+)
Zinc 79.4 (J+)

PU-611431 0–8 ft
CAPU-10-12591 4–5 ft Qbt 3
Mercury 0.236

45-01046 1.5–2 ft
RE45-06-68171 1.5–2 ft Qbt 3
Selenium 0.684 (J)

45-25463 0–2 ft
RE45-06-67360 0–0.5 ft Soil
Nitrate 4.71
Perchlorate 0.00403 (J-)
RE45-06-67361 1–1.5 ft Soil
Nitrate 1.34
Perchlorate 0.0072 (J-)
RE45-06-67362 1.5–2 ft Soil
Nitrate 1.23
Perchlorate 0.00948 (J-)

45-25462 0–2 ft
RE45-06-67355 0–0.5 ft Soil
Nitrate 2.1
RE45-06-67357 1.5–2 ft Soil
Perchlorate 0.000679 (J-)

45-01044 1.5–2 ft
RE45-06-68167 1.5–2 ft Soil
Lead 22.6

45-01045 1.5–2 ft
RE45-06-68169 1.5–2 ft Soil

45-01033 0–2 ft
RE45-06-66895 1–1.5 ft Soil
Nitrate 1.28
RE45-06-66896 1.5–2 ft Soil
Nitrate 0.917 (J)

45-01039 0–2 ft
RE45-06-66882 0–0.5 ft Soil
Nitrate 3.11
Perchlorate 0.000895 (J-)
RE45-06-66883 1–1.5 ft Soil
Nitrate 1.72
Perchlorate 0.00154 (J-)
RE45-06-66884 1.5–2 ft Qbt 3
Lead 16
Nitrate 1.41
Perchlorate 0.00612 (J-)

45-25460 0–2 ft
RE45-06-67345 0–0.5 ft Soil
Nitrate 2.04
RE45-06-67346 1–1.5 ft Soil
Nitrate 1.45
Perchlorate 0.000919 (J-)
RE45-06-67347 1.5–2 ft Soil
Nitrate 2.56
Perchlorate 0.00239 (J-)

45-01034 1.5–2 ft
RE45-06-68165 1.5–2 ft Soil
Calcium 6210

PU-611435 0.8–3.3 ft
CAPU-10-12606 0.8–1.3 ft Qbt 3
Barium 54 (J)
Lead 19.1
Manganese 1160
Perchlorate 0.00209 (J)
RE00-10-22624 2.3–3.3 ft Qbt 3
Beryllium 1.3
Lead 12.7
Manganese 651 (J-)
Nitrate 0.71

PU-611434 0–3.5 ft
CAPU-10-12604 0–1.5 ft Qbt 3
Lead 13.9
Nitrate 3.63
Perchlorate 0.00209 (J)
RE00-10-22623 2.5–3.5 ft Qbt 3
Beryllium 1.3
Lead 12.9
Manganese 619 (J-)
Nitrate 1.2
Zinc 68.7

PU-611436 0–2.8 ft
CAPU-10-12608 0–1.2 ft Qbt 3
Lead 13.4
Manganese 560
Nitrate 2.91
Perchlorate 0.00108 (J)
RE00-10-22625 1.8–2.8 ft Qbt 3
Manganese 510 (J-)
Nitrate 1.5

45-01028 0–49.5 ft
RE45-06-66874 0–0.5 ft Fill
Nitrate 1.15
RE45-06-66875 1–1.5 ft Fill
Nitrate 1.07 (J)
RE45-06-66876 21–21.5 ft Qbt 2
Nitrate 4.47
RE45-06-66877 29–29.5 ft Qbt 2
Nitrate 2.81
RE45-06-66878 39–39.5 ft Qbt 2
Beryllium 1.3
Nitrate 6.16
Perchlorate 0.000567 (J)
RE45-06-66879 49–49.5 ft Qbt 2
Nitrate 2.64

45-01029 0–2 ft
RE45-06-66887 0–0.5 ft Soil
Nitrate 3.39
Perchlorate 0.000722 (J)
RE45-06-66888 1–1.5 ft Soil
Nitrate 2.28
Perchlorate 0.00059 (J)
RE45-06-66889 1.5–2 ft Qbt 3
Chromium 15.3
Nitrate 1.11

PU-611433 0–3 ft
CAPU-10-12602 0–1.3 ft Qbt 3
Lead 11.6
Nitrate 1.21
RE00-10-22622 2–3 ft Qbt 3
Nitrate 0.85

PU-611432 1.2–6.2 ft
CAPU-10-12599 1.2–2.2 ft Qbt 3
Chromium 11.9
Nitrate 1.15
Perchlorate 0.000863 (J)
CAPU-10-12600 4.2–5.2 ft Qbt 3
Chromium 62.6
Nitrate 1.44
RE00-10-22626 5.7–6.2 ft Qbt 3
Arsenic 2.8

45-01072 0–2 ft
RE45-06-66899 0–0.5 ft Soil
Nitrate 4.94
Perchlorate 0.00108 (J-)
RE45-06-66900 1–1.5 ft Soil
Nickel 17
Nitrate 3.11
Perchlorate 0.00133 (J-)
RE45-06-66901 1.5–2 ft Soil
Nitrate 2.45
Perchlorate 0.00261 (J-)

45-25461 0–2 ft
RE45-06-67350 0–0.5 ft Soil
Nitrate 2.13
Perchlorate 0.000695 (J-)
Zinc 50.6
RE45-06-67351 1–1.5 ft Soil
Mercury 0.151
Perchlorate 0.000839 (J-)
RE45-06-67352 1.5–2 ft Soil
Perchlorate 0.00129 (J-)

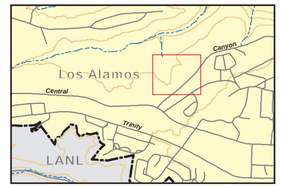
45-25464 0–13 ft
RE45-06-67367 1–1.5 ft Fill
Perchlorate 0.000722 (J)
Silver 1.04
RE45-06-67369 7–7.5 ft Qbt 2
Manganese 634
Perchlorate 0.000702 (J)
RE45-06-67370 12–13 ft Qbt 2
Perchlorate 0.000726 (J)

00-25509 5–7.5 ft
RE00-06-67240 5–5.5 ft Soil
Nitrate 1.71
RE00-06-67241 6–6.5 ft Soil
Nitrate 3.24
RE00-06-67242 7–7.5 ft Soil
Cadmium 0.527 (J)
Nitrate 5.97

00-25510 0–2 ft
RE00-06-67245 0–0.5 ft Soil
Cadmium 0.423 (J)
Copper 21.2
Lead 45.1
Mercury 0.318
Zinc 71.1
RE00-06-67246 1–1.5 ft Soil
Lead 30.7

00-25508 7–12.5 ft
RE00-06-67235 7–7.5 ft Soil
Nitrate 4.92
RE00-06-67236 10–10.5 ft Soil
Nitrate 5.8
RE00-06-67237 12–12.5 ft Soil
Nitrate 10.4

00-25507 7–12.5 ft
RE00-06-67230 7–7.5 ft Soil
Nitrate 2.06
RE00-06-67232 12–12.5 ft Soil
Nitrate 2.27



Index Map

This map was created for work processes associated with the Pueblo Canyon Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

0 12.5 25 50 75 100
Feet

contour interval = 10 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

- 2010 sampling location
- Historical sampling location
- Subject SWMU or AOC
- Other SWMU or AOC
- Former drainline
- Septic tank
- Paved roads/parking
- Structure
- Los Alamos County parcel boundary
- 10-ft contour

Location ID (*2010* - red or underlined [in B&W], *historical* - black or not underlined) *and* ***Overall sampled interval*** (min–max)

Sample description (sample ID, depth (ft), media)

12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
⋮

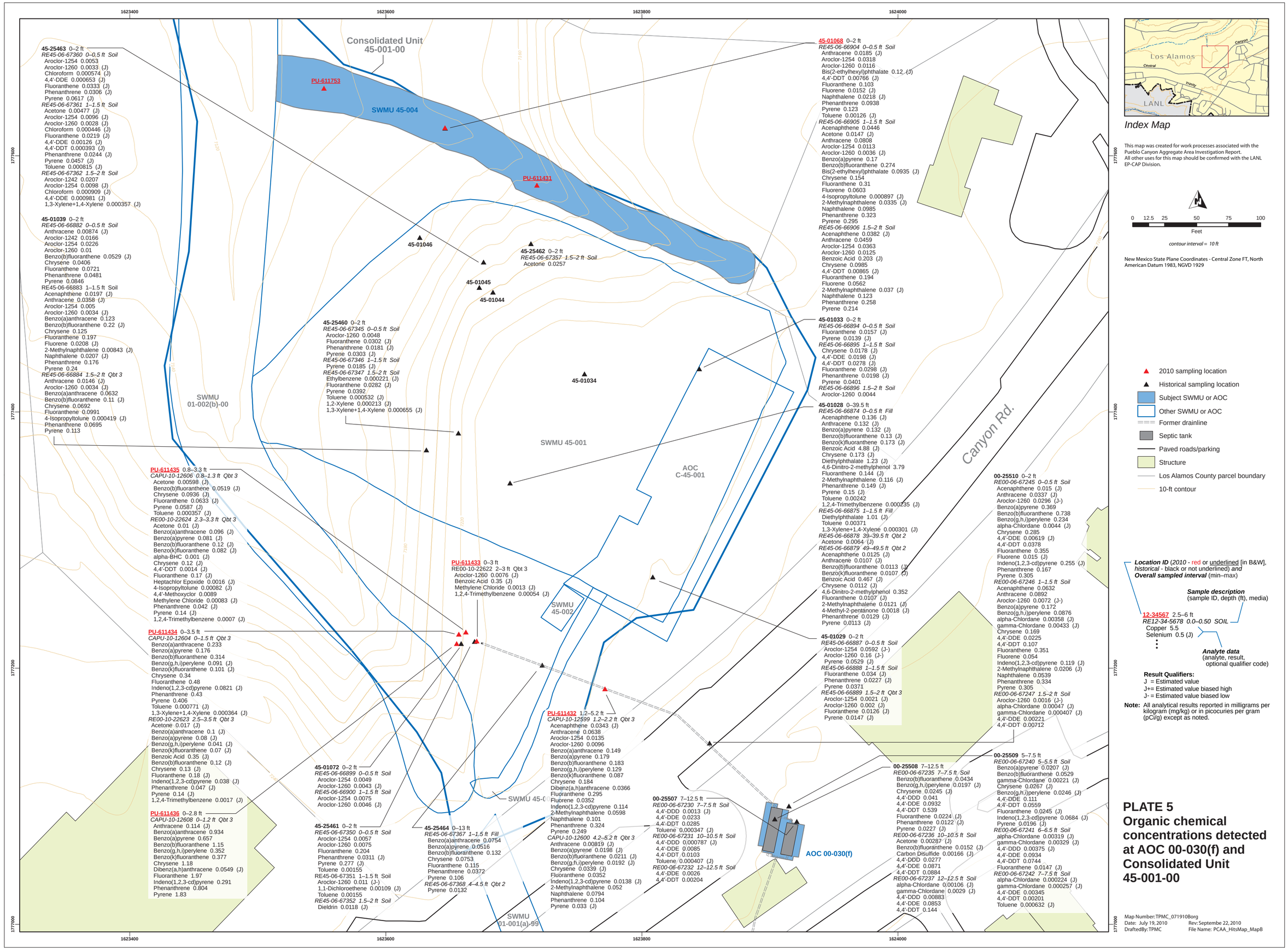
Analyte data (analyte, result, optional qualifier code)

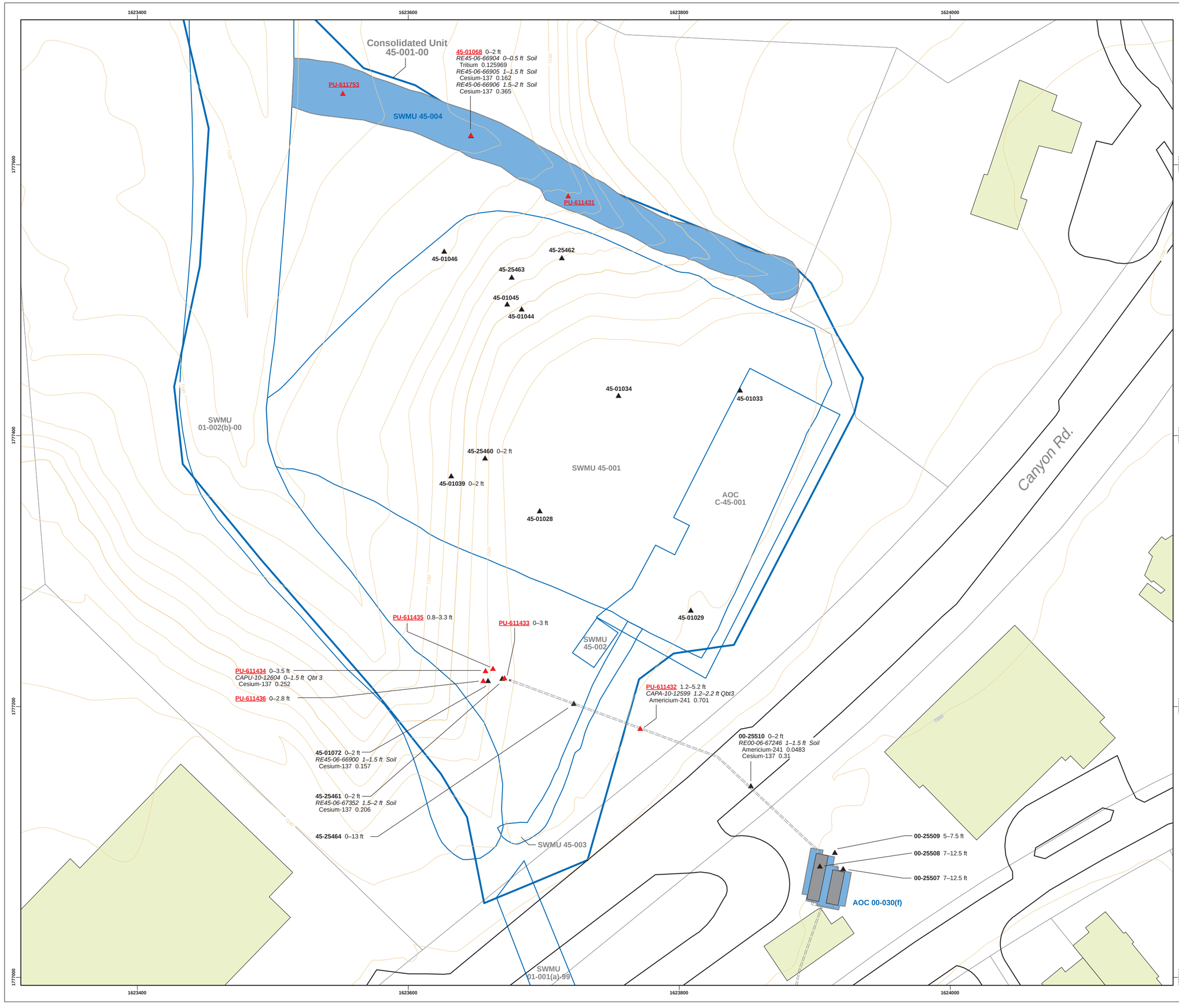
Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

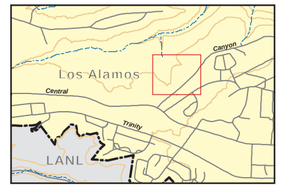
Note: All analytical results reported in milligrams per kilogram (mg/kg) or in picocuries per gram (pCi/g) except as noted.

PLATE 4
Inorganic chemical concentrations detected or detected above BVs at AOC 00-030(f) and Consolidated Unit 45-001-00

Map Number: TPMC_071910Binorg
Date: July 19, 2010 Rev: Septembe 22, 2010
DraftedBy: TPMC File Name: PCAA_HitsMap_MapB


1623400
1623600
1623800
1624000
1777600
1777400
1777200
1777000
Consolidated Unit 45-001-00
SWMU 45-004
SWMU 01-002(b)-00
SWMU 45-001
AOC C-45-001
SWMU 45-002
SWMU 45-C
SWMU 01-001(a)-99
AOC 00-030(f)
Canyon Rd.
PU-611753
PU-611431
PU-611435
PU-611434
PU-611436
PU-611433
PU-611432
45-01046
45-01045
45-01044
45-01034
45-25462 0–2 ft
RE45-06-67357 1.5–2 ft Soil
Acetone 0.0257
45-25460 0–2 ft
RE45-06-67345 0–0.5 ft Soil
Aroclor-1260 0.0048
Fluoranthene 0.0302 (J)
Phenanthrene 0.0181 (J)
Pyrene 0.0303 (J)
RE45-06-67346 1–1.5 ft Soil
Pyrene 0.0185 (J)
RE45-06-67347 1.5–2 ft Soil
Ethylbenzene 0.000221 (J)
Fluoranthene 0.0282 (J)
Pyrene 0.0392
Toluene 0.000532 (J)
1,2-Xylene 0.000213 (J)
1,3-Xylene+1,4-Xylene 0.000655 (J)
45-25463 0–2 ft
RE45-06-67360 0–0.5 ft Soil
Aroclor-1254 0.0053
Aroclor-1260 0.0033 (J)
Chloroform 0.000574 (J)
4,4'-DDE 0.000653 (J)
Fluoranthene 0.0333 (J)
Phenanthrene 0.0306 (J)
Pyrene 0.0617 (J)
RE45-06-67361 1–1.5 ft Soil
Acetone 0.00477 (J)
Aroclor-1254 0.0096 (J)
Aroclor-1260 0.0028 (J)
Chloroform 0.000446 (J)
Fluoranthene 0.0219 (J)
4,4'-DDE 0.00126 (J)
4,4'-DDT 0.000393 (J)
Phenanthrene 0.0244 (J)
Pyrene 0.0457 (J)
Toluene 0.000815 (J)
RE45-06-67362 1.5–2 ft Soil
Aroclor-1242 0.0207
Aroclor-1254 0.0098 (J)
Chloroform 0.000909 (J)
4,4'-DDE 0.000981 (J)
1,3-Xylene+1,4-Xylene 0.000357 (J)
45-01039 0–2 ft
RE45-06-66882 0–0.5 ft Soil
Anthracene 0.00874 (J)
Aroclor-1242 0.0166
Aroclor-1254 0.0226
Aroclor-1260 0.01
Benzo(b)fluoranthene 0.0529 (J)
Chrysene 0.0406
Fluoranthene 0.0721
Phenanthrene 0.0481
Pyrene 0.0646
RE45-06-66883 1–1.5 ft Soil
Acenaphthene 0.0197 (J)
Anthracene 0.0358 (J)
Aroclor-1254 0.005
Aroclor-1260 0.0034 (J)
Benzo(a)anthracene 0.123
Benzo(b)fluoranthene 0.22 (J)
Chrysene 0.125
Fluoranthene 0.197
Fluorene 0.0208 (J)
2-Methylnaphthalene 0.00843 (J)
Naphthalene 0.0207 (J)
Phenanthrene 0.176
Pyrene 0.24
RE45-06-66884 1.5–2 ft Qbt 3
Anthracene 0.0146 (J)
Aroclor-1260 0.0034 (J)
Benzo(a)anthracene 0.0632
Benzo(b)fluoranthene 0.11 (J)
Chrysene 0.0692
Fluoranthene 0.0991
4-Isopropyltolune 0.000419 (J)
Phenanthrene 0.0695
Pyrene 0.113
PU-611435 0.8–3.3 ft
CAPU-10-12606 0.8–1.3 ft Qbt 3
Acetone 0.00598 (J)
Benzo(b)fluoranthene 0.0519 (J)
Chrysene 0.0936 (J)
Fluoranthene 0.0633 (J)
Pyrene 0.0587 (J)
Toluene 0.000357 (J)
RE00-10-22624 2.3–3.3 ft Qbt 3
Acetone 0.01 (J)
Benzo(a)anthracene 0.096 (J)
Benzo(a)pyrene 0.081 (J)
Benzo(b)fluoranthene 0.12 (J)
Benzo(k)fluoranthene 0.082 (J)
alpha-BHC 0.001 (J)
Chrysene 0.12 (J)
4,4'-DDT 0.0014 (J)
Fluoranthene 0.17 (J)
Heptachlor Epoxide 0.0016 (J)
4-Isopropyltolune 0.00082 (J)
4,4'-Methoxyclor 0.0089
Methylene Chloride 0.00083 (J)
Phenanthrene 0.042 (J)
Pyrene 0.14 (J)
1,2,4-Trimethylbenzene 0.0007 (J)
PU-611434 0–3.5 ft
CAPU-10-12604 0–1.5 ft Qbt 3
Benzo(a)anthracene 0.233
Benzo(a)pyrene 0.176
Benzo(b)fluoranthene 0.314
Benzo(g,h,i)perylene 0.091 (J)
Benzo(k)fluoranthene 0.101 (J)
Chrysene 0.34
Fluoranthene 0.48
Indeno(1,2,3-cd)pyrene 0.0821 (J)
Phenanthrene 0.43
Pyrene 0.406
Toluene 0.000771 (J)
1,3-Xylene+1,4-Xylene 0.000364 (J)
RE00-10-22623 2.5–3.5 ft Qbt 3
Acetone 0.017 (J)
Benzo(a)anthracene 0.1 (J)
Benzo(a)pyrene 0.08 (J)
Benzo(g,h,i)perylene 0.041 (J)
Benzo(k)fluoranthene 0.07 (J)
Benzoic Acid 0.35 (J)
Benzo(b)fluoranthene 0.12 (J)
Chrysene 0.13 (J)
Fluoranthene 0.18 (J)
Indeno(1,2,3-cd)pyrene 0.038 (J)
Phenanthrene 0.047 (J)
Pyrene 0.14 (J)
1,2,4-Trimethylbenzene 0.0017 (J)
PU-611436 0–2.8 ft
CAPU-10-12608 0–1.2 ft Qbt 3
Anthracene 0.114 (J)
Benzo(a)anthracene 0.934
Benzo(a)pyrene 0.657
Benzo(b)fluoranthene 1.15
Benzo(g,h,i)perylene 0.352
Benzo(k)fluoranthene 0.377
Chrysene 1.18
Dibenz(a,h)anthracene 0.0549 (J)
Fluoranthene 1.97
Indeno(1,2,3-cd)pyrene 0.291
Phenanthrene 0.804
Pyrene 1.83
PU-611433 0–3 ft
RE00-10-22622 2–3 ft Qbt 3
Aroclor-1260 0.0076 (J)
Benzoic Acid 0.35 (J)
Methylene Chloride 0.0013 (J)
1,2,4-Trimethylbenzene 0.00054 (J)
45-01072 0–2 ft
RE45-06-66899 0–0.5 ft Soil
Aroclor-1254 0.0049
Aroclor-1260 0.0043 (J)
RE45-06-66900 1–1.5 ft Soil
Aroclor-1254 0.0075
Aroclor-1260 0.0046 (J)
45-25461 0–2 ft
RE45-06-67350 0–0.5 ft Soil
Aroclor-1254 0.0057
Aroclor-1260 0.0075
Fluoranthene 0.204
Phenanthrene 0.0311 (J)
Pyrene 0.277 (J)
Toluene 0.00155
RE45-06-67351 1–1.5 ft Soil
Aroclor-1260 0.011 (J-)
1,1-Dichloroethene 0.00109 (J)
Toluene 0.00155
RE45-06-67352 1.5–2 ft Soil
Dieldrin 0.0118 (J)
45-25464 0–13 ft
RE45-06-67367 1–1.5 ft Fill
Benzo(a)anthracene 0.0754
Benzo(a)pyrene 0.0516
Benzo(b)fluoranthene 0.132
Chrysene 0.0753
Fluoranthene 0.115
Phenanthrene 0.0372
Pyrene 0.106
RE45-06-67368 4–4.5 ft Qbt 2
Pyrene 0.0132
PU-611432 1.2–5.2 ft
CAPU-10-12599 1.2–2.2 ft Qbt 3
Acenaphthene 0.0343 (J)
Anthracene 0.0638
Aroclor-1254 0.0135
Aroclor-1260 0.0096
Benzo(a)anthracene 0.149
Benzo(a)pyrene 0.179
Benzo(b)fluoranthene 0.183
Benzo(g,h,i)perylene 0.129
Benzo(k)fluoranthene 0.087
Chrysene 0.184
Dibenz(a,h)anthracene 0.0366
Fluoranthene 0.295
Fluorene 0.0352
Indeno(1,2,3-cd)pyrene 0.114
2-Methylnaphthalene 0.0598
Naphthalene 0.101
Phenanthrene 0.324
Pyrene 0.249
CAPU-10-12600 4.2–5.2 ft Qbt 3
Anthracene 0.00819 (J)
Benzo(a)pyrene 0.0198 (J)
Benzo(b)fluoranthene 0.0211 (J)
Benzo(g,h,i)perylene 0.0192 (J)
Chrysene 0.0339 (J)
Fluoranthene 0.0352
Indeno(1,2,3-cd)pyrene 0.0138 (J)
2-Methylnaphthalene 0.052
Naphthalene 0.0794
Phenanthrene 0.104
Pyrene 0.033 (J)
00-25507 7–12.5 ft
RE00-06-67230 7–7.5 ft Soil
4,4'-DDD 0.0013 (J)
4,4'-DDE 0.0233
4,4'-DDT 0.0285
Toluene 0.000347 (J)
RE00-06-67231 10–10.5 ft Soil
4,4'-DDD 0.000787 (J)
4,4'-DDE 0.0085
4,4'-DDT 0.0103
Toluene 0.000407 (J)
RE00-06-67232 12–12.5 ft Soil
4,4'-DDE 0.0026
4,4'-DDT 0.00204
45-01068 0–2 ft
RE45-06-66904 0–0.5 ft Soil
Anthracene 0.0185 (J)
Aroclor-1254 0.0318
Aroclor-1260 0.0116
Bis(2-ethylhexyl)phthalate 0.12 (J)
4,4'-DDT 0.00766 (J)
Fluoranthene 0.103
Fluorene 0.0152 (J)
Naphthalene 0.0218 (J)
Phenanthrene 0.0938
Pyrene 0.123
Toluene 0.00126 (J)
RE45-06-66905 1–1.5 ft Soil
Acenaphthene 0.0446
Acetone 0.0147 (J)
Anthracene 0.0808
Aroclor-1254 0.0113
Aroclor-1260 0.0036 (J)
Benzo(a)pyrene 0.17
Benzo(b)fluoranthene 0.274
Bis(2-ethylhexyl)phthalate 0.0935 (J)
Chrysene 0.154
Fluoranthene 0.31
Fluorene 0.0603
4-Isopropyltoluene 0.000897 (J)
2-Methylnaphthalene 0.0335 (J)
Naphthalene 0.0985
Phenanthrene 0.323
Pyrene 0.295
RE45-06-66906 1.5–2 ft Soil
Acenaphthene 0.0382 (J)
Anthracene 0.0459
Aroclor-1254 0.0363
Aroclor-1260 0.0125
Benzoic Acid 0.203 (J)
Chrysene 0.0985
4,4'-DDT 0.00865 (J)
Fluoranthene 0.194
Fluorene 0.0562
2-Methylnaphthalene 0.037 (J)
Naphthalene 0.123
Phenanthrene 0.258
Pyrene 0.214
45-01033 0–2 ft
RE45-06-66894 0–0.5 ft Soil
Fluoranthene 0.0157 (J)
Pyrene 0.0139 (J)
RE45-06-66895 1–1.5 ft Soil
Chrysene 0.0178 (J)
4,4'-DDE 0.0198 (J)
4,4'-DDT 0.0278 (J)
Fluoranthene 0.0298 (J)
Phenanthrene 0.0198 (J)
Pyrene 0.0401
RE45-06-66896 1.5–2 ft Soil
Aroclor-1260 0.0044
45-01028 0–39.5 ft
RE45-06-66874 0–0.5 ft Fill
Acenaphthene 0.136 (J)
Anthracene 0.132 (J)
Benzo(a)pyrene 0.132 (J)
Benzo(b)fluoranthene 0.13 (J)
Benzo(k)fluoranthene 0.173 (J)
Benzoic Acid 4.88 (J)
Chrysene 0.173 (J)
Diethylphthalate 1.23 (J)
4,6-Dinitro-2-methylphenol 3.79
Fluoranthene 0.144 (J)
2-Methylnaphthalene 0.116 (J)
Phenanthrene 0.149 (J)
Pyrene 0.15 (J)
Toluene 0.00242
1,2,4-Trimethylbenzene 0.000235 (J)
RE45-06-66875 1–1.5 ft Fill
Diethylphthalate 1.01 (J)
Toluene 0.00371
1,3-Xylene+1,4-Xylene 0.000301 (J)
RE45-06-66878 39–39.5 ft Qbt 2
Acetone 0.0064 (J)
RE45-06-66879 49–49.5 ft Qbt 2
Acenaphthene 0.0125 (J)
Anthracene 0.0107 (J)
Benzo(b)fluoranthene 0.0113 (J)
Benzo(k)fluoranthene 0.0107 (J)
Benzoic Acid 0.467 (J)
Chrysene 0.0112 (J)
4,6-Dinitro-2-methylphenol 0.352
Fluoranthene 0.0107 (J)
2-Methylnaphthalene 0.0121 (J)
4-Methyl-2-pentanone 0.0018 (J)
Phenanthrene 0.0129 (J)
Pyrene 0.0113 (J)
45-01029 0–2 ft
RE45-06-66887 0–0.5 ft Soil
Aroclor-1254 0.0592 (J-)
Aroclor-1260 0.16 (J-)
Pyrene 0.0529 (J)
RE45-06-66888 1–1.5 ft Soil
Fluoranthene 0.034 (J)
Phenanthrene 0.0227 (J)
Pyrene 0.0371
RE45-06-66889 1.5–2 ft Qbt 3
Aroclor-1254 0.0021 (J)
Aroclor-1260 0.002 (J)
Fluoranthene 0.0126 (J)
Pyrene 0.0147 (J)
00-25508 7–12.5 ft
RE00-06-67235 7–7.5 ft Soil
Benzo(b)fluoranthene 0.0434
Benzo(g,h,i)perylene 0.0197 (J)
Chrysene 0.0245 (J)
4,4'-DDD 0.041
4,4'-DDE 0.0932
4,4'-DDT 0.539
Fluoranthene 0.0224 (J)
Phenanthrene 0.0122 (J)
Pyrene 0.0227 (J)
RE00-06-67236 10–10.5 ft Soil
Acetone 0.00287 (J)
Benzo(b)fluoranthene 0.0152 (J)
Carbon Disulfide 0.00166 (J)
4,4'-DDD 0.0277
4,4'-DDE 0.0871
4,4'-DDT 0.0884
RE00-06-67237 12–12.5 ft Soil
alpha-Chlordane 0.00106 (J)
gamma-Chlordane 0.0029 (J)
4,4'-DDD 0.00883
4,4'-DDE 0.0853
4,4'-DDT 0.144
00-25510 0–2 ft
RE00-06-67245 0–0.5 ft Soil
Acenaphthene 0.015 (J)
Anthracene 0.0337 (J)
Aroclor-1260 0.0296 (J-)
Benzo(a)pyrene 0.369
Benzo(b)fluoranthene 0.738
Benzo(g,h,i)perylene 0.234
alpha-Chlordane 0.0044 (J)
Chrysene 0.285
4,4'-DDE 0.00619 (J)
4,4'-DDT 0.0378
Fluoranthene 0.355
Fluorene 0.015 (J)
Indeno(1,2,3-cd)pyrene 0.255 (J)
Phenanthrene 0.167
Pyrene 0.305
RE00-06-67246 1–1.5 ft Soil
Acenaphthene 0.0632
Anthracene 0.0892
Aroclor-1260 0.0072 (J-)
Benzo(a)pyrene 0.172
Benzo(g,h,i)perylene 0.0876
alpha-Chlordane 0.00358 (J)
gamma-Chlordane 0.00433 (J)
Chrysene 0.169
4,4'-DDE 0.0225
4,4'-DDT 0.107
Fluoranthene 0.351
Fluorene 0.054
Indeno(1,2,3-cd)pyrene 0.119 (J)
2-Methylnaphthalene 0.0206 (J)
Naphthalene 0.0539
Phenanthrene 0.334
Pyrene 0.305
RE00-06-67247 1.5–2 ft Soil
Aroclor-1260 0.0016 (J-)
alpha-Chlordane 0.00047 (J)
gamma-Chlordane 0.000407 (J)
4,4'-DDE 0.00221
4,4'-DDT 0.00712
00-25509 5–7.5 ft
RE00-06-67240 5–5.5 ft Soil
Benzo(a)pyrene 0.0207 (J)
Benzo(b)fluoranthene 0.0529
gamma-Chlordane 0.00221 (J)
Chrysene 0.0267 (J)
Benzo(g,h,i)perylene 0.0246 (J)
4,4'-DDE 0.111
4,4'-DDT 0.0559
Fluoranthene 0.0245 (J)
Indeno(1,2,3-cd)pyrene 0.0684 (J)
Pyrene 0.0196 (J)
RE00-06-67241 6–6.5 ft Soil
alpha-Chlordane 0.00319 (J)
gamma-Chlordane 0.00329 (J)
4,4'-DDD 0.00375 (J)
4,4'-DDE 0.0934
4,4'-DDT 0.0744
Fluoranthene 0.0147 (J)
RE00-06-67242 7–7.5 ft Soil
alpha-Chlordane 0.000224 (J)
gamma-Chlordane 0.000257 (J)
4,4'-DDE 0.00345
4,4'-DDT 0.00201
Toluene 0.000632 (J)
Index Map
Los Alamos
Canyon
Central
Trinity
LANL
This map was created for work processes associated with the Pueblo Canyon Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.
N
0 12.5 25 50 75 100
Feet
contour interval = 10 ft
New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929
2010 sampling location
Historical sampling location
Subject SWMU or AOC
Other SWMU or AOC
Former drainline
Septic tank
Paved roads/parking
Structure
Los Alamos County parcel boundary
10-ft contour
Location ID (2010 - red or underlined [in B&W], historical - black or not underlined) and Overall sampled interval (min–max)
Sample description (sample ID, depth (ft), media)
12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
Analyte data (analyte, result, optional qualifier code)
Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low
Note: All analytical results reported in milligrams per kilogram (mg/kg) or in picocuries per gram (pCi/g) except as noted.
PLATE 5
Organic chemical concentrations detected at AOC 00-030(f) and Consolidated Unit 45-001-00
Map Number:TPMC_071910Borg
Date: July 19, 2010
Rev:Septembe 22, 2010
DraftedBy:TPMC
File Name: PCAA_HitsMap_MapB





Index Map

This map was created for work processes associated with the Pueblo Canyon Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

0 12.5 25 50 75 100
Feet

contour interval = 10 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

- 2010 sampling location
- Historical sampling location
- Subject SWMU or AOC
- Other SWMU or AOC
- Former drainline
- Septic tank
- Paved roads/parking
- Structure
- Los Alamos County parcel boundary
- 10-ft contour

Location ID (*2010* - red or underlined [in B&W], *historical* - black or not underlined) *and* ***Overall sampled interval*** (min–max)

Sample description (sample ID, depth (ft), media)

12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
⋮

Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in milligrams per kilogram (mg/kg) or in picocuries per gram (pCi/g) except as noted.

PLATE 6
Radionuclides detected or detected above BVs/FVs at AOC 00-030(f) and Consolidated Unit 45-001-00

Map Number:TPMC_071910Brad
Date: July 19, 2010 Rev:Septembe 22, 2010
DraftedBy:TPMC File Name: PCAA_HitsMap_MapB

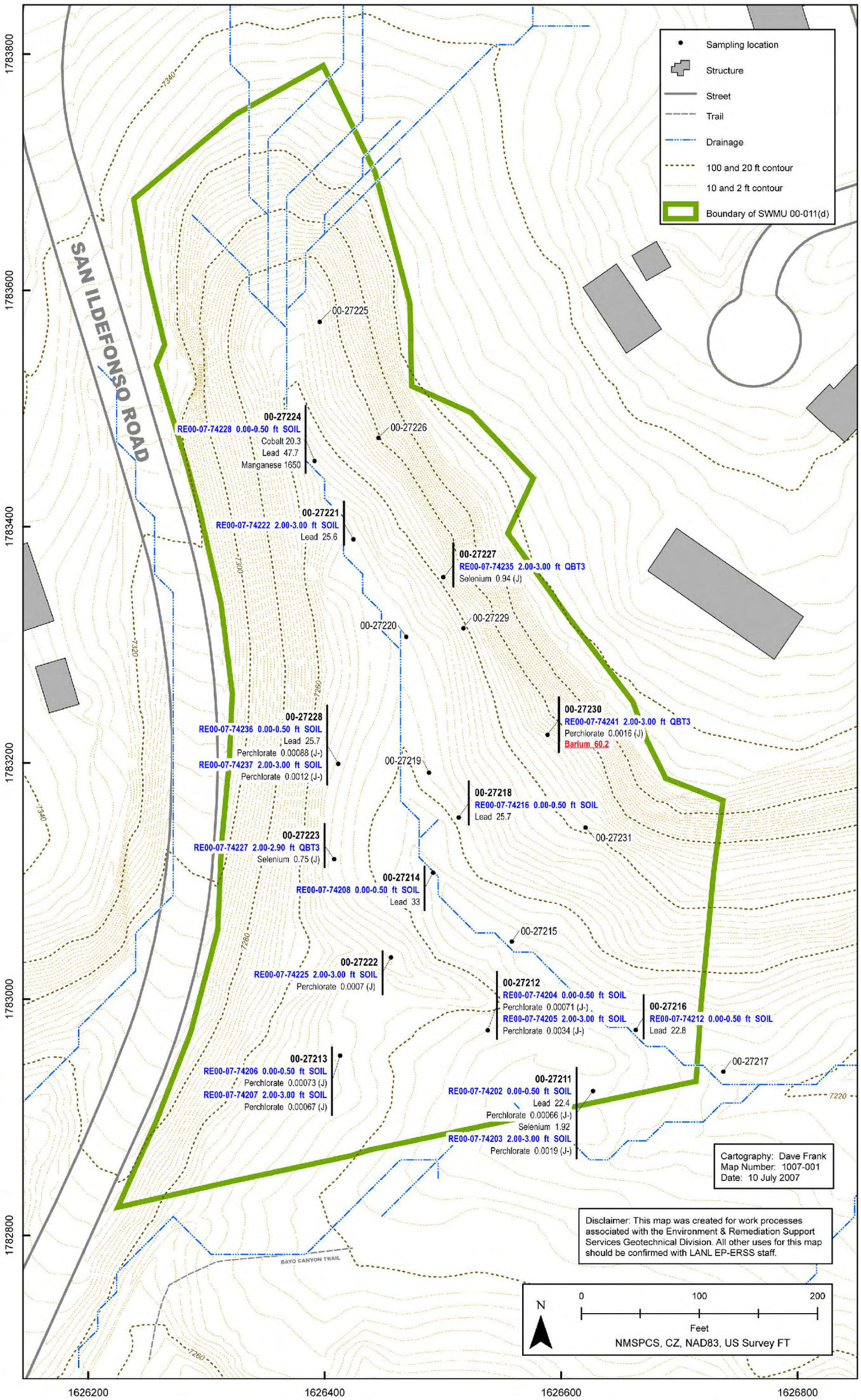


Figure 6.3-2 SWMU 00-011(d) sampling locations with inorganic COPCs detected or detected above background in all media

1630800 1631000 1631200 1631400 1631600 1631800 1632000 1632200

1,570,000 1,569,800 1,569,600 1,569,400 1,569,200

CDB-1W

TA-05

TA-46

Cañada del Buey

SWMU 46-004(g)

SWMU 46-004(c2)

SWMU 46-004(m)

SWMU 46-004(a2)

SWMU 46-004(f)

AOC 46-004(f2)

SWMU 46-004(y)

SWMU 46-004(u)

SWMU 46-004(v)

AOC 46-004(e2)

AOC 46-003

AOC C-46-002

SWMU 46-006(a)

SWMU 46-004(b2)

SWMU 46-004(g)

SWMU 46-003(d)

SWMU 46-006(d)

SWMU 46-004(c)

SWMU 46-006(g)

SWMU 46-004(a)

SWMU 46-004(h)

SWMU 46-004(q)

SWMU 46-004(d)

SWMU 46-004(k)

SWMU 46-003(e)

46-611120 0–2 ft
RE46-10-11150 0–0.25 ft Soil
Cesium 1.14
Lead 32.3
Lithium 4.49 (J-)
Nitrate 5.03
Zinc 64.5
RE46-10-12041 1–2 ft Qbt 3
Cesium 0.153
Lithium 3.29
Nitrate 1.83

46-611121 0–2 ft
RE46-10-11152 0–1 ft Soil
Cesium 0.759
Lithium 5.42 (J-)
Nitrate 3.03
RE46-10-12042 1–2 ft Qbt 3
Cesium 0.162
Lithium 2.65

46-611451 0–2 ft
RE46-10-12651 0–1 ft Soil
Zinc 56.1
RE46-10-12652 1–2 ft Soil
Zinc 52.7

46-611461 0–2 ft
RE46-10-12679 0–1 ft Qbt 3
Copper 10.7
RE46-10-12680 1–2 ft Qbt 3
Copper 8.93

46-611449 0–2 ft
RE46-10-12647 0–1 ft Soil
Cadmium 1.51
Chromium 21.4
Copper 222
Lead 36.4
Mercury 1.33
Nickel 20.8
Silver 12.2
Zinc 68.8
RE46-10-12648 1–2 ft Soil
Cadmium 0.458 (J)
Copper 36
Mercury 0.128
Silver 2.3

46-611118 0–2 ft
RE46-10-11146 0–0.25 ft Soil
Cesium 0.866
Lithium 6.17 (J-)
Nitrate 1.37
Zinc 49
RE46-10-12040 1–2 ft Qbt 3
Cesium 1.16
Lithium 5.26 (J+)

46-611119 0–2 ft
RE46-10-11148 0–1 ft Soil
Cesium 1.22
Lithium 6.84 (J-)
RE46-10-12039 1–2 ft Qbt 3
Cesium 1.14
Lithium 6.69 (J+)

46-611115 0–2 ft
RE46-10-11140 0–1 ft Soil
Cesium 1.23
Lithium 7.47
Perchlorate 0.000626 (J)
RE46-10-11141 1–2 ft Soil
Cesium 2.29
Lithium 14
Perchlorate 0.00123 (J)
Zinc 196

46-611117 0–2 ft
RE46-10-11144 0–1 ft Soil
Cesium 5.68
Lithium 14.9 (J-)
Nitrate 1.34
Perchlorate 0.000613 (J)
RE46-10-11145 1–2 ft Soil
Cesium 1.88
Lithium 11.6 (J-)
Nitrate 1.31
Perchlorate 0.00218 (J)

46-611116 0–2 ft
RE46-10-11142 0–1 ft Soil
Cesium 0.974
Copper 18.9
Lead 65.1
Lithium 7.78
Mercury 0.107
Zinc 120
RE46-10-11143 1–2 ft Soil
Cesium 0.631
Lead 28.7
Lithium 5.94
Zinc 60.1

46-611450 0–2 ft

46-611460 0–2 ft
RE46-10-12677 0–1 ft Soil
Zinc 50
RE46-10-12678 1–2 ft Qbt 3
Manganese 680

46-611472 0–2 ft

46-611521 0–2 ft
RE46-10-13020 0–1 ft Soil
Cadmium 0.489 (J)
Copper 16
Mercury 0.139 (J+)
Zinc 170
RE46-10-13021 1–2 ft Soil
Zinc 62

46-611479 0–2 ft
RE46-10-12758 0–1 ft Soil
Perchlorate 0.000598 (J)

46-611471 0–2 ft
RE46-10-12734 0–1 ft Soil
Perchlorate 0.000722 (J)
RE46-10-12735 1–2 ft Soil
Perchlorate 0.00493

46-611478 0–2 ft
RE46-10-12756 0–1 ft Soil
Mercury 0.325
Perchlorate 0.000798 (J)
RE46-10-12757 1–2 ft Soil
Perchlorate 0.000695 (J)

46-611523 0–2 ft
RE46-10-13024 0–1 ft Soil
Cadmium 0.424 (J)
Mercury 0.16 (J+)
Zinc 121
RE46-10-13025 1–2 ft Soil
Zinc 73.4

46-611524 0–2 ft
RE46-10-13026 0–1 ft Soil
Calcium 7160 (J+)

46-611531 0–2 ft

46-611532 0–2 ft
RE46-10-13054 0–1 ft Soil
Perchlorate 0.000704 (J)

46-611526 0–2 ft
RE46-10-13030 0–1 ft Soil
Copper 10.8
Zinc 107
RE46-10-13031 1–2 ft Soil
Copper 18.2
Perchlorate 0.000945 (J)
Zinc 96.2

46-611533 0–2 ft
RE46-10-13056 0–1 ft Soil
Copper 17.7
Zinc 70.5

46-611458 0–2 ft
RE46-10-12674 1–2 ft Soil
Cadmium 0.44 (J)

46-611459 0–2 ft

46-611457 0–2 ft

46-611470 0–2 ft
RE46-10-12732 0–1 ft Soil
Mercury 0.126

46-611522 0–2 ft
RE46-10-13022 0–1 ft Soil
Iron 27100
Zinc 67.3

46-611469 0–2 ft
RE46-10-12731 1–2 ft Soil
Perchlorate 0.000676 (J)

46-611477 0–2 ft

46-611520 0–2 ft
RE46-10-13018 0–1 ft Soil
Cadmium 1.04
Chromium 20.3
Copper 72.8
Lead 29.1
Mercury 1.79 (J+)
Zinc 493
RE46-10-13019 1–2 ft Soil
Mercury 0.179 (J+)
Zinc 98.9

46-611517 0–2 ft

46-611530 0–2 ft

46-611527 0–2 ft
RE46-10-13045 1–2 ft Qbt 3
Copper 5.3
Lead 58.7
Perchlorate 0.0028 (J)
Selenium 2.1
Thallium 6.3
Zinc 69.3

46-611529 0–2 ft

46-611528 0–2 ft
RE46-10-13047 1–2 ft Qbt 3
Copper 9.8
Selenium 0.85

46-611516 0–2 ft

46-611514 0–2 ft
RE46-10-13006 0–1 ft Soil
Zinc 93 (J+)

46-611621 0–3 ft
RE46-10-13540 0–1 ft Soil
Perchlorate 0.00208 (J)
RE46-10-13541 2–3 ft Soil
Copper 22.1 (J)
Perchlorate 0.00445
Zinc 92.4

46-611822 0–2 ft
RE46-10-14231 0–1 ft Qbt 3
Copper 6.6
Selenium 1
RE46-10-14232 1–2 ft Qbt 3
Copper 5.7
Selenium 1.1

46-611455 0–2 ft

46-611456 0–2 ft
RE46-10-12669 0–1 ft Soil
Zinc 87.7
RE46-10-12670 1–2 ft Soil
Zinc 55.5

46-611475 0–2 ft

46-611478 0–2 ft
RE46-10-12752 0–1 ft Qbt 3
Mercury 1.57
RE46-10-12753 1–2 ft Qbt 3
Mercury 0.564

46-611473 0–2 ft
RE46-10-12739 1–2 ft Qbt 3
Lead 11.7 (J)
Manganese 497 (J)

46-611480 0–2 ft
RE46-10-12790 0–1 ft Soil
Copper 18.8
RE46-10-12791 1–2 ft Qbt 3
Barium 88.4
Copper 7.21

46-611525 0–2 ft
RE46-10-13028 0–1 ft Qbt 3
Barium 76.1
Copper 4.73
Manganese 606

46-611534 0–2 ft
RE46-10-13058 0–1 ft Qbt 3
Chromium 7.15
Copper 10.7

46-611536 0–2 ft
RE46-10-13063 1–2 ft Qbt 3
Barium 106
Calcium 2240
Cobalt 4.26
Copper 6.67

46-611535 0–2 ft
RE46-10-13061 1–2 ft Qbt 3
Chromium 15.8

46-611454 0–2 ft
RE46-10-12665 0–1 ft Soil
Copper 22.5
Iron 34800
Mercury 0.199
Zinc 238

46-611444 0–2 ft
RE46-10-12637 0–1 ft Soil
Zinc 50.2

46-611518 0–2 ft
RE46-10-13014 0–1 ft Soil
Perchlorate 0.000934 (J)
RE46-10-13015 1–2 ft Soil
Perchlorate 0.00173 (J)

46-611519 0–2 ft
RE46-10-13016 0–1 ft Soil
Cadmium 0.543 (J)
Copper 49.2 (J+)
Lead 33.1
Mercury 4.8 (J+)
Zinc 326
RE46-10-13017 1–2 ft Soil
Mercury 0.836 (J+)
Zinc 105

46-611515 0–2 ft
RE46-10-13008 0–1 ft Soil
Perchlorate 0.00105 (J)
RE46-10-13009 1–2 ft Soil
Perchlorate 0.000661 (J)

46-611551 0–3 ft
RE46-10-13194 0–1 ft Soil
Copper 22.8
Zinc 69.3

46-611520 0–3 ft
RE46-10-13538 0–1 ft Qbt 3
Copper 6.88
Perchlorate 0.0067
RE46-10-13539 2–3 ft Qbt 3
Perchlorate 0.00239

46-611618 0–3 ft
RE46-10-13534 0–1 ft Soil
Copper 26.9
Zinc 150

46-611821 0–2 ft
RE46-10-14230 1–2 ft Soil
Perchlorate 0.0023 (J)
Zinc 112

46-611619 0–3 ft

46-611552 0–3 ft

46-611555 0–4 ft
RE46-10-13205 0–1 ft Soil
Calcium 7770 (J)
Copper 15.1 (J+)

46-611550 0–4 ft

46-611554 0–4 ft

46-611556 0–4 ft

46-611553 0–4 ft

46-611452 0–6 ft
RE46-10-12662 5–6 ft Qbt 3
Antimony 0.599 (J)

46-611468 0–2 ft
RE46-10-12728 0–1 ft Soil
Copper 42.9 (J+)
Lead 50.9
Mercury 1.41 (J)
Zinc 189
RE46-10-12729 1–2 ft Soil
Mercury 0.491 (J)
Zinc 65.9

46-611453 0–2 ft

46-611448 0–2 ft
RE46-10-12646 1–2 ft Soil
Chromium 22.3

46-611447 0–2 ft
RE46-10-12643 0–1 ft Soil
Copper 15
Mercury 0.345
Silver 1.03
RE46-10-12644 1–2 ft Soil
Cadmium 1.26
Copper 163
Lead 24.5
Mercury 4.04
Nickel 36.9
Perchlorate 0.00101 (J)
Silver 8.32
Zinc 60.1

46-611445 0–2 ft
RE46-10-12639 0–1 ft Soil
Cadmium 3.38
Copper 118 (J+)
Lead 76
Mercury 2.44 (J+)
Silver 7.8
Zinc 86.4
RE46-10-12640 1–2 ft Qbt 3
Copper 36 (J+)
Lead 34.5
Mercury 0.492 (J+)
Silver 1.68

46-611446 0–2 ft
RE46-10-12641 0–1 ft Soil
Cadmium 1.03
Copper 170 (J+)
Lead 22.6
Mercury 0.857 (J+)
Perchlorate 0.000755 (J)
Silver 16.8
Zinc 61.5
RE46-10-12642 1–2 ft Soil
Mercury 0.222 (J+)
Silver 4.34

46-611114 0–2 ft
RE46-10-11138 0–1 ft Soil
Cesium 1.07
Copper 20.4
Lead 42.1
Lithium 7.45
Zinc 114
RE46-10-12043 1–2 ft Soil
Cesium 0.635
Lead 56.6
Lithium 7.76 (J+)
Zinc 77.9

46-611113 0–2 ft
RE46-10-11136 0–1 ft Soil
Cadmium 0.53 (J)
Cesium 1.25
Copper 45.4
Lead 34.6
Lithium 11.4
Zinc 286
RE46-10-11137 1–2 ft Soil
Cesium 0.781
Copper 32.5
Lead 50.1
Lithium 10.2
Perchlorate 0.00888
Zinc 193

46-611111 0–2 ft
RE46-10-11132 0–1 ft Soil
Cesium 2.85
Copper 16.9 (J)
Lead 36.3
Lithium 12
Mercury 0.105
Perchlorate 0.0012 (J)
Zinc 84.1
RE46-10-11133 1–2 ft Soil
Cesium 3.05
Lithium 16.4
Perchlorate 0.00168 (J)

46-611112 0–2 ft
RE46-10-11134 0–1 ft Soil
Cesium 1.64
Chromium 29.2 (J)
Lithium 8.68
Perchlorate 0.000788 (J)
Zinc 63.9
RE46-10-11135 1–2 ft Soil
Cesium 2.27
Lead 25.3
Lithium 11.5
Perchlorate 0.00116 (J)
Zinc 64

Upper Cañada del Buey Aggregate Area

This map was created for work processes associated with the Upper Cañada del Buey Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

N

0 20 40 60 80 100 Feet

contour interval = 10 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

2010 sampling location
Subject SWMU or AOC
Septic tank
Drain field
Drain line (associated)
Drain line (inferred)
Former structure
LANL structure
Paved road/parking
Dirt road
Fence
Canyon reach
Inferred drainage
10-ft contour

Location ID *(2010 - red or underlined [in B&W], historical - black or not underlined) and* ***Overall sampled interval*** (min–max)

Sample description
(sample ID, depth (ft), media)

12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
⋮

Analyte data
(analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in mg/kg.

PLATE 19
Inorganic chemicals detected or detected above BVs at SWMUs 46-004(a2,c2,g,m,u,v,x,y,z), 46-008(f), and AOC 46-004(f2)

Map Number:TPMC_072810A_Inorg
Date: July 28, 2010 Rev: August 17, 2010
Drafted By: TPMC File Name: UCdBAA_HITS_MapH

1631000 1631200 1631400 1631600 1631800

1760000 1759800

TA-05

TA-46

Cañada del Buey

SWMU 46-004(g)

SWMU 46-004(c2)

SWMU 46-004(b2)

SWMU 46-004(g)

SWMU 46-003(d)

SWMU 46-004(g)

SWMU 46-004(2)

AOC 46-004(f2)

SWMU 46-004(c)

SWMU 46-004(a)

SWMU 46-006(g)

SWMU 46-004(m)

AOC C-46-002

AOC C-46-003

SWMU 46-006(a)

SWMU 46-006(d)

SWMU 46-004(y)

SWMU 46-004(x)

SWMU 46-004(v)

SWMU 46-004(u)

SWMU 46-004(a2)

SWMU 46-008(f)

SWMU 46-004(d)

SWMU 46-004(d)

SWMU 46-004(d)

SWMU 46-004(h)

46-611520 0–2 ft
RE46-10-21760 0-0.25 ft Soil
Acetone 0.00897 (J)
Aroclor-1254 0.025
Aroclor-1260 0.039
Benzo(a)anthracene 0.0389 (J)
Benzo(a)pyrene 0.0372 (J)
Benzo(b)fluoranthene 0.049 (J)
Benzo(g,h,i)perylene 0.0201 (J)
Benzo(k)fluoranthene 0.0238 (J)
Chrysene 0.0615
Fluoranthene 0.0855
Indeno(1,2,3-cd)pyrene 0.165
Phenanthrene 0.0446 (J)
Pyrene 0.0799

46-611521 0–2 ft
RE46-10-21152 0–1 ft Soil
Benzo(a)pyrene 0.0128 (J)
Benzo(b)fluoranthene 0.0161 (J)
Chrysene 0.012 (J)
Fluoranthene 0.0243 (J)
Phenanthrene 0.0123 (J)
Pyrene 0.0227 (J)

46-611451 0–2 ft
RE46-10-12661 0–1 ft Soil
Toluene 0.00129

46-611518 0–2 ft
RE46-10-1148 0–0.25 ft Soil
Acetone 0.00539 (J)
Aroclor-1260 0.0044
Benzo(a)anthracene 0.0161 (J)
Benzo(a)pyrene 0.0148 (J)
Benzo(b)fluoranthene 0.0179 (J)
Chrysene 0.0205 (J)
Fluoranthene 0.0309 (J)
Isopropylbenzene 0.00219
4-Isopropyltoluene 0.00201
Phenanthrene 0.0167 (J)
Pyrene 0.029 (J)

46-611461 0–2 ft
RE46-10-12679 0–1 ft Qbt 3
Bis(2-ethylhexyl)phthalate 0.0843 (J)

46-611471 0–2 ft

46-611489 0–2 ft

46-611519 0–2 ft
RE46-10-1149 0–1 ft Soil
Acetone 0.0042 (J)

46-611515 0–2 ft
RE46-10-1140 0–1 ft Soil
Aroclor-1254 0.0023 (J)
Aroclor-1260 0.0018 (J)
1,3-Xylene+1,4-Xylene 0.000458 (J)

46-611490 0–2 ft

46-611460 0–2 ft

46-611472 0–2 ft

46-611516 0–2 ft
RE46-10-1142 0–1 ft Soil
Acenaphthene 0.0384 (J)
Anthracene 0.0986
Aroclor-1254 0.0221
Aroclor-1260 0.0114
Benzo(a)anthracene 0.159
Benzo(a)pyrene 0.181
Benzo(b)fluoranthene 0.237
Benzo(g,h,i)perylene 0.109 (J)
Benzo(k)fluoranthene 0.0652
Chrysene 0.187
Fluoranthene 0.474
Fluorene 0.034 (J)
Indeno(1,2,3-cd)pyrene 0.117 (J)
Naphthalene 0.0316 (J)
Phenanthrene 0.32
Pyrene 0.384
RE46-10-11243 1–2 ft Soil
Acenaphthene 0.0389 (J)
Anthracene 0.0102
Aroclor-1254 0.0114
Aroclor-1260 0.0132
Benzo(a)anthracene 0.145
Benzo(a)pyrene 0.147
Benzo(b)fluoranthene 0.169
Benzo(g,h,i)perylene 0.107 (J)
Benzo(k)fluoranthene 0.0742
Chrysene 0.148
Dibenz(a,h)anthracene 0.0281 (J)
Fluoranthene 0.307
Indeno(1,2,3-cd)pyrene 0.0999 (J)
2-Methylnaphthalene 0.012 (J)
Naphthalene 0.0384 (J)
Phenanthrene 0.294
Pyrene 0.311

46-611117 0–2 ft

46-611448 0–2 ft
RE46-10-12645 0–1 ft Soil
Benzo(b)fluoranthene 0.0164 (J)
Fluoranthene 0.0203 (J)
Pyrene 0.0181 (J)

46-611447 0–2 ft
RE46-10-12643 0–1 ft Soil
Benzo(a)anthracene 0.0327 (J)
Benzo(a)pyrene 0.0316 (J)
Benzo(b)fluoranthene 0.0502
Benzo(g,h,i)perylene 0.0152 (J)
Chrysene 0.0305 (J)
Fluoranthene 0.0671
Indeno(1,2,3-cd)pyrene 0.0123 (J)
Phenanthrene 0.043
Pyrene 0.0585
RE46-10-12644 1–2 ft Soil
Aroclor-1254 0.12
Benzo(a)anthracene 0.0781 (J)
Benzo(a)pyrene 0.0292 (J)
Benzo(b)fluoranthene 0.0642
Benzo(g,h,i)perylene 0.0303 (J)
Chrysene 0.0318 (J)
Fluoranthene 0.0488
Indeno(1,2,3-cd)pyrene 0.028 (J)
Phenanthrene 0.0279 (J)
Pyrene 0.0452

46-611445 0–2 ft
RE46-10-12639 0–1 ft Soil
Acenaphthene 0.0607
Anthracene 0.112
Aroclor-1254 0.0421
Aroclor-1260 0.0213
Benzo(a)anthracene 0.282
Benzo(a)pyrene 0.291
Benzo(b)fluoranthene 0.374
Benzo(g,h,i)perylene 0.178
Benzo(k)fluoranthene 0.145
Chrysene 0.302
Fluoranthene 0.641
Fluorene 0.0445
Indeno(1,2,3-cd)pyrene 0.165
2-Methylnaphthalene 0.0252 (J-)
Naphthalene 0.0741 (J-)
Phenanthrene 0.494
Pyrene 0.58
1,3-Xylene+1,4-Xylene 0.000495 (J)
RE46-10-12640 1–2 ft Qbt 3
Anthracene 0.0141 (J)
Aroclor-1254 0.0066
Aroclor-1260 0.0032 (J)
Benzo(a)anthracene 0.0597
Benzo(a)pyrene 0.0561
Benzo(b)fluoranthene 0.0714
Benzo(g,h,i)perylene 0.0459
Benzo(k)fluoranthene 0.032 (J)
Chrysene 0.065
Dibenz(a,h)anthracene 0.147
Fluorene 0.108
Indeno(1,2,3-cd)pyrene 0.0401
Phenanthrene 0.067
Pyrene 0.109
Toluene 0.00043 (J)

46-611642 0–2 ft
RE46-10-12642 1–2 ft Soil
Acenaphthene 0.176
Acenaphthylene 0.0173 (J-)
Anthracene 0.34
Benzo(a)anthracene 0.728
Benzo(a)pyrene 0.709
Benzo(b)fluoranthene 0.854
Benzo(g,h,i)perylene 0.379
Benzo(k)fluoranthene 0.374
Chrysene 0.753
Dibenz(a,h)anthracene 0.147 (J-)
Di-n-butylphthalate 0.154 (J)
Fluoranthene 1.71
Fluorene 0.138
Indeno(1,2,3-cd)pyrene 0.368
2-Methylnaphthalene 0.0955 (J-)
Naphthalene 0.0741 (J-)
Phenanthrene 1.49
Pyrene 1.58
Toluene 0.000666 (J)
1,2,4-Trimethylbenzene 0.000924 (J)
1,2-Xylene 0.00043 (J)
1,3-Xylene+1,4-Xylene 0.00112 (J)

46-611457 0–2 ft
RE46-10-12671 0–1 ft Soil
Anthracene 0.00988 (J)
Aroclor-1254 0.0109
Aroclor-1260 0.0085 (J)
Benzo(a)anthracene 0.085
Benzo(a)pyrene 0.0213 (J)
Benzo(b)fluoranthene 0.094 (J)
Benzo(g,h,i)perylene 0.0203 (J)
Bis(2-ethylhexyl)phthalate 0.094 (J)
Chrysene 0.0246 (J)
Fluoranthene 0.0977
Indeno(1,2,3-cd)pyrene 0.0164 (J)
Phenanthrene 0.0504
Pyrene 0.0917
RE46-10-12672 1–2 ft Soil
Aroclor-1254 0.006
Bis(2-ethylhexyl)phthalate 0.153 (J)

46-611456 0–2 ft
RE46-10-12669 0–1 ft Soil
Anthracene 0.0092 (J)
Aroclor-1254 0.01
Benzo(a)anthracene 0.0292 (J)
Benzo(a)pyrene 0.0434
Benzo(g,h,i)perylene 0.0209 (J)
Benzo(k)fluoranthene 0.0152 (J)
Chrysene 0.0336 (J)
Fluoranthene 0.0596
Indeno(1,2,3-cd)pyrene 0.0813
Phenanthrene 0.0554
Pyrene 0.0679
RE46-10-12670 1–2 ft Soil
Aroclor-1254 0.006

46-611468 0–2 ft
RE46-10-12728 0–1 ft Soil
1,2,4-Trimethylbenzene 0.00046 (J)
1,3-Xylene+1,4-Xylene 0.000435 (J)

46-611469 0–2 ft

46-611476 0–2 ft

46-611455 0–2 ft
RE46-10-12667 0–1 ft Soil
Aroclor-1260 0.0028 (J)
Bis(2-ethylhexyl)phthalate 0.608

46-611444 0–2 ft
RE46-10-12637 0–1 ft Soil
Benzo(a)pyrene 0.0185 (J)
Benzo(b)fluoranthene 0.027 (J)
Benzo(g,h,i)perylene 0.0156 (J)
Chrysene 0.017 (J)
Fluoranthene 0.034 (J)
4-Isopropyltoluene 0.00041 (J)
Phenanthrene 0.028 (J)
Pyrene 0.0256
RE46-10-12638 1–2 ft Soil
Benzo(b)fluoranthene 0.0156 (J)
Benzo(g,h,i)perylene 0.0207 (J)
Fluoranthene 0.0135 (J)
Indeno(1,2,3-cd)pyrene 0.00258 (J)
Pyrene 0.0205 (J)
Toluene 0.000466 (J)
1,3-Xylene+1,4-Xylene 0.000409 (J)

46-611453 0–2 ft
RE46-10-12661 0–1 ft Soil
Toluene 0.00117 (J+)
RE46-10-12662 1–2 ft Qbt 3
Methylene Chloride 0.00252 (J)

46-611452 0–2 ft
RE46-10-12661 0–1 ft Soil
Toluene 0.00117 (J+)
RE46-10-12662 1–2 ft Qbt 3
Methylene Chloride 0.00252 (J)

46-611454 0–2 ft
RE46-10-12666 0–1 ft Soil
Acenaphthene 0.207
Anthracene 0.428
Aroclor-1254 0.0189 (J)
Benzo(a)anthracene 1.07
Benzo(a)pyrene 1.08
Benzo(b)fluoranthene 2.1
Benzo(g,h,i)perylene 0.502
Bis(2-ethylhexyl)phthalate 0.0854 (J)
Chrysene 1.08
Dibenzofuran 0.0838 (J)
Fluoranthene 2.26
Fluorene 0.18
Indeno(1,2,3-cd)pyrene 0.536
2-Methylnaphthalene 0.0289 (J)
Naphthalene 0.0837
Phenanthrene 1.43
Pyrene 2.37
RE46-10-12666 1–2 ft Qbt 3
Acenaphthene 0.0354 (J)
Anthracene 0.064
Aroclor-1254 0.0134 (J)
Benzo(a)anthracene 0.779
Benzo(a)pyrene 0.765
Benzo(b)fluoranthene 1.31
Benzo(g,h,i)perylene 0.378
Chrysene 0.77
Fluoranthene 1.67
Fluorene 0.147
Indeno(1,2,3-cd)pyrene 0.375
2-Methylnaphthalene 0.0245 (J)
Naphthalene 0.104
Phenanthrene 1.16
Pyrene 1.58

46-611458 0–2 ft
RE46-10-12673 0–1 ft Soil
Aroclor-1254 0.0026 (J)
Bis(2-ethylhexyl)phthalate 0.0811 (J)
Chrysene 0.0141 (J)
Phenanthrene 0.012 (J)
Pyrene 0.0141 (J)
RE46-10-12674 1–2 ft Soil
Bis(2-ethylhexyl)phthalate 0.145 (J)

46-611455 0–2 ft
RE46-10-12679 0–1 ft Soil
Aroclor-1254 0.0026 (J)

46-611478 0–2 ft
RE46-10-12706 0–1 ft Soil
Aroclor-1260 0.0146 (J)
Chrysene 0.0191 (J)
RE46-10-12707 1–2 ft Soil
Aroclor-1254 0.0018 (J)
Aroclor-1260 0.0018 (J)
Trichloroethene 0.000409 (J)

46-611470 0–2 ft

46-611477 0–2 ft
RE46-10-12708 0–1 ft Soil
Aroclor-1254 0.0045
Aroclor-1260 0.0062
Chrysene 0.0167 (J)

46-611669 0–2 ft

46-611476 0–2 ft

46-611468 0–2 ft
RE46-10-12728 0–1 ft Soil
1,2,4-Trimethylbenzene 0.00046 (J)
1,3-Xylene+1,4-Xylene 0.000435 (J)

46-611455 0–2 ft
RE46-10-12667 0–1 ft Soil
Aroclor-1260 0.0028 (J)
Bis(2-ethylhexyl)phthalate 0.608

46-611478 0–2 ft
RE46-10-12706 0–1 ft Soil
Aroclor-1260 0.0146 (J)
Chrysene 0.0191 (J)
RE46-10-12707 1–2 ft Soil
Aroclor-1254 0.0018 (J)
Aroclor-1260 0.0018 (J)
Trichloroethene 0.000409 (J)

46-611521 0–2 ft
RE46-10-13020 0–1 ft Soil
Toluene 0.000371 (J)
1,2,4-Trimethylbenzene 0.000371 (J)
1,2-Xylene 0.000695 (J)
1,3-Xylene+1,4-Xylene 0.00139 (J)

46-611522 0–2 ft
RE46-10-13022 0–1 ft Soil
Acetone 0.0162
Aroclor-1254 0.016
Aroclor-1260 0.0748
RE46-10-13023 1–2 ft Soil
Acetone 0.00801

46-611520 0–2 ft
RE46-10-13018 0–1 ft Soil
Anthracene 0.037 (J)
Aroclor-1254 0.0467
Aroclor-1260 0.0467
Benzo(a)anthracene 0.132
Benzo(a)pyrene 0.109
Benzo(b)fluoranthene 0.214
Benzo(g,h,i)perylene 0.0706
Chrysene 0.154
Ethylbenzene 0.00043 (J)
Fluoranthene 0.23
Indeno(1,2,3-cd)pyrene 0.063
Methylene Chloride 0.00579 (J)
Phenanthrene 0.159
Pyrene 0.215
Toluene 0.00226
1,1,1-Trichloroethane 0.00184
Trichloroethene 0.0206
1,2-Xylene 0.000408 (J)
1,3-Xylene+1,4-Xylene 0.001 (J)
RE46-10-13019 1–2 ft Soil
Aroclor-1254 0.0037 (J+)
Aroclor-1260 0.0038 (J)

46-611518 0–2 ft
RE46-10-13004 0–1 ft Soil
Acenaphthene 0.0267 (J)
Benzo(a)pyrene 0.037 (J)
Benzo(b)fluoranthene 0.055
Benzo(g,h,i)perylene 0.0192 (J)
Indeno(1,2,3-cd)pyrene 0.0201 (J)
Trichloroethene 0.00213 (J)
RE46-10-13015 1–2 ft Soil
Aroclor-1254 0.0122 (J)
Benzo(b)fluoranthene 0.019 (J)
Trichloroethene 0.00125

46-611515 0–2 ft
RE46-10-13009 0–1 ft Soil
Benzo(b)fluoranthene 0.0172 (J)
Chrysene 0.0157 (J)
Fluoranthene 0.0337
4-Isopropyltoluene 0.000687 (J)
Phenanthrene 0.0289 (J)
Pyrene 0.0458
Trichloroethene 0.000445 (J)

46-611516 0–2 ft
RE46-10-13002 0–1 ft Soil
Benzo(b)fluoranthene 0.0197 (J)
Chrysene 0.0167 (J)
Fluoranthene 0.0287 (J)
Phenanthrene 0.0139 (J)
Pyrene 0.0289 (J)
Trichloroethene 0.00016 (J)
RE46-10-13011 1–2 ft Soil
Toluene 0.000389 (J)
Trichloroethene 0.000484 (J)

46-611524 0–2 ft
RE46-10-13026 0–1 ft Soil
Acetone 0.0162
Ethylbenzene 0.000443 (J)
Toluene 0.00101
1,2,4-Trimethylbenzene 0.0014 (J)
1,3-Xylene+1,4-Xylene 0.00114 (J)
RE46-10-13027 1–2 ft Soil
Acetone 0.00369 (J)
Ethylbenzene 0.000348 (J)
Toluene 0.00101
1,2-Xylene 0.00043 (J)
1,3-Xylene+1,4-Xylene 0.00112 (J)

46-611523 0–2 ft
RE46-10-13024 0–1 ft Soil
Aroclor-1254 0.0043 (J+)
Aroclor-1260 0.0026 (J)
Benzo(a)pyrene 0.016 (J)
Benzo(b)fluoranthene 0.0264 (J)
Fluoranthene 0.0149 (J)
Pyrene 0.0234 (J)
Toluene 0.000399 (J)
1,2,4-Trimethylbenzene 0.00049 (J)
1,2-Xylene 0.000468 (J)
1,3-Xylene+1,4-Xylene 0.000867 (J)

46-611519 0–2 ft
RE46-10-13008 0–1 ft Qbt 3
Acetone 0.00244 (J)
Ethylbenzene 0.000765 (J)
Toluene 0.00413
1,2,4-Trimethylbenzene 0.000506 (J)
1,2-Xylene 0.000516 (J)
1,3-Xylene+1,4-Xylene 0.00218 (J)

46-611534 0–2 ft
RE46-10-13058 0–1 ft Qbt 3
Aroclor-1254 0.0018
Aroclor-1254 0.0042
Benzo(a)anthracene 0.0182 (J)
Benzo(a)pyrene 0.0125 (J)
Benzo(b)fluoranthene 0.0223 (J)
Chrysene 0.0172 (J)
Fluoranthene 0.0213 (J)
Pyrene 0.0233 (J)
RE46-10-13059 1–2 ft Soil
Aroclor-1254 0.0021 (J)

46-611535 0–2 ft
RE46-10-13060 0–1 ft Soil
Aroclor-1254 0.0037 (J)
Benzo(b)fluoranthene 0.0173 (J)
Fluoranthene 0.0211 (J)
Phenanthrene 0.0151 (J)
Pyrene 0.0178
Tetrachloroethene 0.000397 (J)
1,2-Xylene 0.000432 (J)
1,3-Xylene+1,4-Xylene 0.000817 (J)
RE46-10-13061 1–2 ft Qbt 3
Aroclor-1254 0.0039
Toluene 0.000358 (J)

46-611536 0–2 ft

46-611531 0–2 ft

46-611532 0–2 ft
RE46-10-13054 0–1 ft Soil
Aroclor-1254 0.0022 (J)
Trichloroethene 0.00254
RE46-10-13055 1–2 ft Soil
Trichloroethene 0.000509 (J)

46-611533 0–2 ft
RE46-10-13056 0–1 ft Soil
Aroclor-1254 0.0038 (J)

46-611530 0–2 ft
RE46-10-13050 0–1 ft Soil
Aroclor-1260 0.0032 (J)
Benzo(a)anthracene 0.0148 (J)
Fluoranthene 0.0156 (J)
Pyrene 0.0119 (J)
Toluene 0.00126
Trichloroethene 0.0000607 (J)
1,3-Xylene+1,4-Xylene 0.0000621 (J)

46-611529 0–2 ft
RE46-10-13048 0–1 ft Soil
Acenaphthene 0.0168 (J)
Anthracene 0.0218 (J)
Aroclor-1254 0.0463
Aroclor-1260 0.0463
Benzo(a)anthracene 0.138
Benzo(a)pyrene 0.0962
Benzo(b)fluoranthene 0.174
Benzo(g,h,i)perylene 0.049
Chrysene 0.154
Fluoranthene 0.251
Indeno(1,2,3-cd)pyrene 0.0472
Phenanthrene 0.154
Pyrene 0.226
RE46-10-13049 1–2 ft Soil
Aroclor-1254 0.0425
Aroclor-1260 0.0449
Benzo(a)anthracene 0.0218 (J)
Benzo(b)fluoranthene 0.0154 (J)
Fluoranthene 0.0198 (J)
Pyrene 0.0197 (J)
Toluene 0.000359 (J)

46-611517 0–2 ft
RE46-10-13017 0–1 ft Soil
Toluene 0.00072 (J)
1,2,4-Trimethylbenzene 0.000811 (J)
1,3-Xylene 0.000588 (J)

46-611528 0–2 ft
RE46-10-13046 0–1 ft Soil
Aroclor-1254 0.0036
Fluoranthene 0.0041 (J)
RE46-10-13047 1–2 ft Qbt 3
Aroclor-1254 0.0017 (J)

46-611527 0–2 ft
RE46-10-13044 0–1 ft Soil
Aroclor-1254 0.041 (J)
Endrin Aldehyde 0.00054 (J)
Fluoranthene 0.093 (J)
Pyrene 0.0709 (J)
RE46-10-13045 1–2 ft Soil
Aroclor-1254 0.046

46-611522 0–2 ft
RE46-10-14232 1–2 ft Qbt 3
Benzo(a)anthracene 0.067 (J)
Benzo(a)pyrene 0.059 (J)
Benzo(b)fluoranthene 0.072 (J)
Benzo(g,h,i)perylene 0.073 (J)
Chrysene 0.072 (J)
Fluoranthene 0.18 (J)
Methylene Chloride 0.0027 (J)
4-Isopropyltoluene 0.00074 (J)
Phenanthrene 0.089 (J)
Pyrene 0.174 (J)
Trichloroethene 0.0003 (J)

46-611521 0–2 ft
RE46-10-13041 0–1 ft Soil
Aroclor-1254 0.0164
Aroclor-1260 0.0046
Benzo(a)anthracene 0.0112 (J)
Benzo(b)fluoranthene 0.0159 (J)
Chrysene 0.0107 (J)
Fluoranthene 0.0237 (J)
4-Isopropyltoluene 0.000955 (J)
Pyrene 0.019 (J)
RE46-10-13042 1–3 ft Soil
Aroclor-1254 0.0164
Aroclor-1260 0.0046
Methylene Chloride 0.00381 (J)

46-611521 0–2 ft
RE46-10-13020 0–1 ft Soil
Toluene 0.000371 (J)
1,2,4-Trimethylbenzene 0.000371 (J)
1,2-Xylene 0.000695 (J)
1,3-Xylene+1,4-Xylene 0.00139 (J)

46-611514 0–2 ft
RE46-10-13006 0–1 ft Soil
Acenaphthylene 0.0603
Aroclor-1254 0.0043 (J+)
Aroclor-1260 0.0026 (J)
Benzo(a)anthracene 0.364
Benzo(a)pyrene 0.525
Benzo(b)fluoranthene 0.842
Chrysene 0.796
Dibenz(a,h)anthracene 0.176
Fluoranthene 2.5
Fluorene 0.0445
Indeno(1,2,3-cd)pyrene 0.0886
2-Methylnaphthalene 0.0105 (J)
Naphthalene 0.0252 (J)
Phenanthrene 1.21
Pyrene 1.98
RE46-10-13007 1–2 ft Soil
Benzo(a)pyrene 0.0163 (J)
Benzo(b)fluoranthene 0.0302 (J)
Benzo(g,h,i)perylene 0.0159 (J)
Benzo(k)fluoranthene 0.0157 (J)
Chrysene 0.0311 (J)
Fluoranthene 0.0643
4-Isopropyltoluene 0.000676 (J)
Indeno(1,2,3-cd)pyrene 0.0131 (J)
Phenanthrene 0.0318 (J)
Pyrene 0.0554

46-611513 0–2 ft
RE46-10-13034 0–1 ft Soil
Acenaphthene 0.15 (J)
Anthracene 0.24
Aroclor-1254 0.0176 (J)
Benzo(a)anthracene 0.729
Benzo(a)pyrene 0.66
Benzo(b)fluoranthene 1.19
Benzo(g,h,i)perylene 0.231
Chrysene 0.763
Fluoranthene 1.81
Fluorene 0.15 (J)
Indeno(1,2,3-cd)pyrene 0.253
Phenanthrene 1.3
RE46-10-13035 2–3 ft Qbt 3
Benzo(a)anthracene 0.0189 (J)
Benzo(b)fluoranthene 0.0213 (J)
Chrysene 0.0153 (J)
Fluoranthene 0.0334 (J)
Pyrene 0.0283 (J)

46-611519 0–3 ft

46-611520 0–2 ft
RE46-10-13018 0–1 ft Soil
Anthracene 0.037 (J)
Aroclor-1254 0.0467
Aroclor-1260 0.0467
Benzo(a)anthracene 0.132
Benzo(a)pyrene 0.109
Benzo(b)fluoranthene 0.214
Benzo(g,h,i)perylene 0.0706
Chrysene 0.154
Ethylbenzene 0.00043 (J)
Fluoranthene 0.23
Indeno(1,2,3-cd)pyrene 0.063
Methylene Chloride 0.00579 (J)
Phenanthrene 0.159
Pyrene 0.215
Toluene 0.00226
1,1,1-Trichloroethane 0.00184
Trichloroethene 0.0206
1,2-Xylene 0.000408 (J)
1,3-Xylene+1,4-Xylene 0.001 (J)
RE46-10-13019 1–2 ft Soil
Aroclor-1254 0.0037 (J+)
Aroclor-1260 0.0038 (J)

46-611518 0–2 ft
RE46-10-13004 0–1 ft Soil
Acenaphthene 0.0267 (J)
Benzo(a)pyrene 0.037 (J)
Benzo(b)fluoranthene 0.055
Benzo(g,h,i)perylene 0.0192 (J)
Indeno(1,2,3-cd)pyrene 0.0201 (J)
Trichloroethene 0.00213 (J)
RE46-10-13015 1–2 ft Soil
Aroclor-1254 0.0122 (J)
Benzo(b)fluoranthene 0.019 (J)
Trichloroethene 0.00125

46-611515 0–2 ft
RE46-10-13009 0–1 ft Soil
Benzo(b)fluoranthene 0.0172 (J)
Chrysene 0.0157 (J)
Fluoranthene 0.0337
4-Isopropyltoluene 0.000687 (J)
Phenanthrene 0.0289 (J)
Pyrene 0.0458
Trichloroethene 0.000445 (J)

46-611516 0–2 ft
RE46-10-13002 0–1 ft Soil
Benzo(b)fluoranthene 0.0197 (J)
Chrysene 0.0167 (J)
Fluoranthene 0.0287 (J)
Phenanthrene 0.0139 (J)
Pyrene 0.0289 (J)
Trichloroethene 0.00016 (J)
RE46-10-13011 1–2 ft Soil
Toluene 0.000389 (J)
Trichloroethene 0.000484 (J)

46-611517 0–2 ft
RE46-10-13017 0–1 ft Soil
Toluene 0.00072 (J)
1,2,4-Trimethylbenzene 0.000811 (J)
1,3-Xylene 0.000588 (J)

46-611528 0–2 ft
RE46-10-13046 0–1 ft Soil
Aroclor-1254 0.0036
Fluoranthene 0.0041 (J)
RE46-10-13047 1–2 ft Qbt 3
Aroclor-1254 0.0017 (J)

46-611527 0–2 ft
RE46-10-13044 0–1 ft Soil
Aroclor-1254 0.041 (J)
Endrin Aldehyde 0.00054 (J)
Fluoranthene 0.093 (J)
Pyrene 0.0709 (J)
RE46-10-13045 1–2 ft Soil
Aroclor-1254 0.046

46-611522 0–2 ft
RE46-10-14232 1–2 ft Qbt 3
Benzo(a)anthracene 0.067 (J)
Benzo(a)pyrene 0.059 (J)
Benzo(b)fluoranthene 0.072 (J)
Benzo(g,h,i)perylene 0.073 (J)
Chrysene 0.072 (J)
Fluoranthene 0.18 (J)
Methylene Chloride 0.0027 (J)
4-Isopropyltoluene 0.00074 (J)
Phenanthrene 0.089 (J)
Pyrene 0.174 (J)
Trichloroethene 0.0003 (J)

46-611521 0–2 ft
RE46-10-13041 0–1 ft Soil
Aroclor-1254 0.0164
Aroclor-1260 0.0046
Benzo(a)anthracene 0.0112 (J)
Benzo(b)fluoranthene 0.0159 (J)
Chrysene 0.0107 (J)
Fluoranthene 0.0237 (J)
4-Isopropyltoluene 0.000955 (J)
Pyrene 0.019 (J)
RE46-10-13042 1–3 ft Soil
Aroclor-1254 0.0164
Aroclor-1260 0.0046
Methylene Chloride 0.00381 (J)

46-611521 0–2 ft
RE46-10-13020 0–1 ft Soil
Toluene 0.000371 (J)
1,2,4-Trimethylbenzene 0.000371 (J)
1,2-Xylene 0.000695 (J)
1,3-Xylene+1,4-Xylene 0.00139 (J)

46-611522 0–2 ft
RE46-10-13022 0–1 ft Soil
Acetone 0.0162
Aroclor-1254 0.016
Aroclor-1260 0.0748
RE46-10-13023 1–2 ft Soil
Acetone 0.00801

46-611520 0–2 ft
RE46-10-13018 0–1 ft Soil
Anthracene 0.037 (J)
Aroclor-1254 0.0467
Aroclor-1260 0.0467
Benzo(a)anthracene 0.132
Benzo(a)pyrene 0.109
Benzo(b)fluoranthene 0.214
Benzo(g,h,i)perylene 0.0706
Chrysene 0.154
Ethylbenzene 0.00043 (J)
Fluoranthene 0.23
Indeno(1,2,3-cd)pyrene 0.063
Methylene Chloride 0.00579 (J)
Phenanthrene 0.159
Pyrene 0.215
Toluene 0.00226
1,1,1-Trichloroethane 0.00184
Trichloroethene 0.0206
1,2-Xylene 0.000408 (J)
1,3-Xylene+1,4-Xylene 0.001 (J)
RE46-10-13019 1–2 ft Soil
Aroclor-1254 0.0037 (J+)
Aroclor-1260 0.0038 (J)

46-611518 0–2 ft
RE46-10-13004 0–1 ft Soil
Acenaphthene 0.0267 (J)
Benzo(a)pyrene 0.037 (J)
Benzo(b)fluoranthene 0.055
Benzo(g,h,i)perylene 0.0192 (J)
Indeno(1,2,3-cd)pyrene 0.0201 (J)
Trichloroethene 0.00213 (J)
RE46-10-13015 1–2 ft Soil
Aroclor-1254 0.0122 (J)
Benzo(b)fluoranthene 0.019 (J)
Trichloroethene 0.00125

46-611515 0–2 ft
RE46-10-13009 0–1 ft Soil
Benzo(b)fluoranthene 0.0172 (J)
Chrysene 0.0157 (J)
Fluoranthene 0.0337
4-Isopropyltoluene 0.000687 (J)
Phenanthrene 0.0289 (J)
Pyrene 0.0458
Trichloroethene 0.000445 (J)

46-611516 0–2 ft
RE46-10-13002 0–1 ft Soil
Benzo(b)fluoranthene 0.0197 (J)
Chrysene 0.0167 (J)
Fluoranthene 0.0287 (J)
Phenanthrene 0.0139 (J)
Pyrene 0.0289 (J)
Trichloroethene 0.00016 (J)
RE46-10-13011 1–2 ft Soil
Toluene 0.000389 (J)
Trichloroethene 0.000484 (J)

46-611517 0–2 ft
RE46-10-13017 0–1 ft Soil
Toluene 0.00072 (J)
1,2,4-Trimethylbenzene 0.000811 (J)
1,3-Xylene 0.000588 (J)

46-611528 0–2 ft
RE46-10-13046 0–1 ft Soil
Aroclor-1254 0.0036
Fluoranthene 0.0041 (J)
RE46-10-13047 1–2 ft Qbt 3
Aroclor-1254 0.0017 (J)

46-611527 0–2 ft
RE46-10-13044 0–1 ft Soil
Aroclor-1254 0.041 (J)
Endrin Aldehyde 0.00054 (J)
Fluoranthene 0.093 (J)
Pyrene 0.0709 (J)
RE46-10-13045 1–2 ft Soil
Aroclor-1254 0.046

46-611522 0–2 ft
RE46-10-14232 1–2 ft Qbt 3
Benzo(a)anthracene 0.067 (J)
Benzo(a)pyrene 0.059 (J)
Benzo(b)fluoranthene 0.072 (J)
Benzo(g,h,i)perylene 0.073 (J)
Chrysene 0.072 (J)
Fluoranthene 0.18 (J)
Methylene Chloride 0.0027 (J)
4-Isopropyltoluene 0.00074 (J)
Phenanthrene 0.089 (J)
Pyrene 0.174 (J)
Trichloroethene 0.0003 (J)

46-611521 0–2 ft
RE46-10-13041 0–1 ft Soil
Aroclor-1254 0.0164
Aroclor-1260 0.0046
Benzo(a)anthracene 0.0112 (J)
Benzo(b)fluoranthene 0.0159 (J)
Chrysene 0.0107 (J)
Fluoranthene 0.0237 (J)
4-Isopropyltoluene 0.000955 (J)
Pyrene 0.019 (J)
RE46-10-13042 1–3 ft Soil
Aroclor-1254 0.0164
Aroclor-1260 0.0046
Methylene Chloride 0.00381 (J)

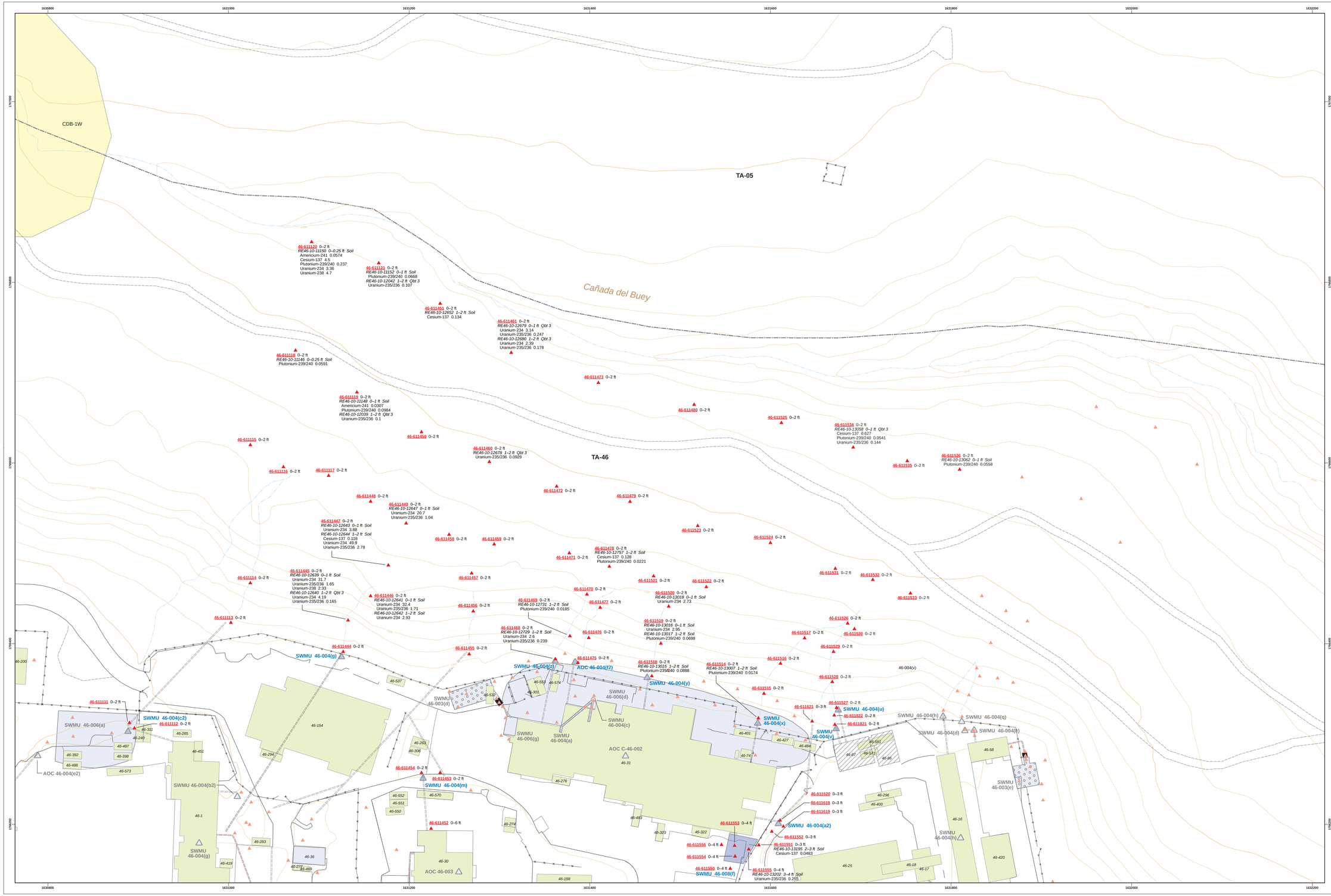
46-611514 0–2 ft
RE46-10-13006 0–1 ft Soil
Acenaphthylene 0.0603
Aroclor-1254 0.0043 (J+)
Aroclor-1260 0.0026 (J)
Benzo(a)anthracene 0.364
Benzo(a)pyrene 0.525
Benzo(b)fluoranthene 0.842
Chrysene 0.796
Dibenz(a,h)anthracene 0.176
Fluoranthene 2.5
Fluorene 0.0445
Indeno(1,2,3-cd)pyrene 0.0886
2-Methylnaphthalene 0.0105 (J)
Naphthalene 0.0252 (J)
Phenanthrene 1.21
Pyrene 1.98
RE46-10-13007 1–2 ft Soil
Benzo(a)pyrene 0.0163 (J)
Benzo(b)fluoranthene 0.0302 (J)
Benzo(g,h,i)perylene 0.0159 (J)
Benzo(k)fluoranthene 0.0157 (J)
Chrysene 0.0311 (J)
Fluoranthene 0.0643
4-Isopropyltoluene 0.000676 (J)
Indeno(1,2,3-cd)pyrene 0.0131 (J)
Phenanthrene 0.0318 (J)
Pyrene 0.0554

46-611513 0–2 ft
RE46-10-13034 0–1 ft Soil
Acenaphthene 0.15 (J)
Anthracene 0.24
Aroclor-1254 0.0176 (J)
Benzo(a)anthracene 0.729
Benzo(a)pyrene 0.66
Benzo(b)fluoranthene 1.19
Benzo(g,h,i)perylene 0.231
Chrysene 0.763
Fluoranthene 1.81
Fluorene 0.15 (J)
Indeno(1,2,3-cd)pyrene 0.253
Phenanthrene 1.3
RE46-10-13035 2–3 ft Qbt 3
Benzo(a)anthracene 0.0189 (J)
Benzo(b)fluoranthene 0.0213 (J)
Chrysene 0.0153 (J)
Fluoranthene 0.0334 (J)
Pyrene 0.0283 (J)

46-611519 0–3 ft

46-611520 0–2 ft
RE46-10-13018 0–1 ft Soil
Anthracene 0.037 (J)
Aroclor-1254 0.0467
Aroclor-1260 0.0467
Benzo(a)anthracene 0.132
Benzo(a)pyrene 0.109
Benzo(b)fluoranthene 0.214
Benzo(g,h,i)perylene 0.0706
Chrysene 0.154
Ethylbenzene 0.00043 (J)
Fluoranthene 0.23
Indeno(1,2,3-cd)pyrene 0.063
Methylene Chloride 0.00579 (J)
Phenanthrene 0.159
Pyrene 0.215
Toluene 0.00226
1,1,1-Trichloroethane 0.00184
Trichloroethene 0.0206
1,2-Xylene 0.000408 (J)
1,3-Xylene+1,4-Xylene 0.001 (J)
RE46-10-13019 1–2 ft Soil
Aroclor-1254 0.0037 (J+)
Aroclor-1260 0.0038 (J)

46-611518 0–2 ft
RE46-10-13004 0–1 ft Soil
Acenaphthene 0.0267 (J)
Benzo(a)pyrene 0.037 (J)
Benzo(b)fluoranthene 0.055
Benzo(g,h,i)perylene 0.0192 (J)
Indeno(1,2,3-cd)pyrene 0.0201 (J)
Trichloroethene 0.00213 (J)
*RE46-10-13015 1–2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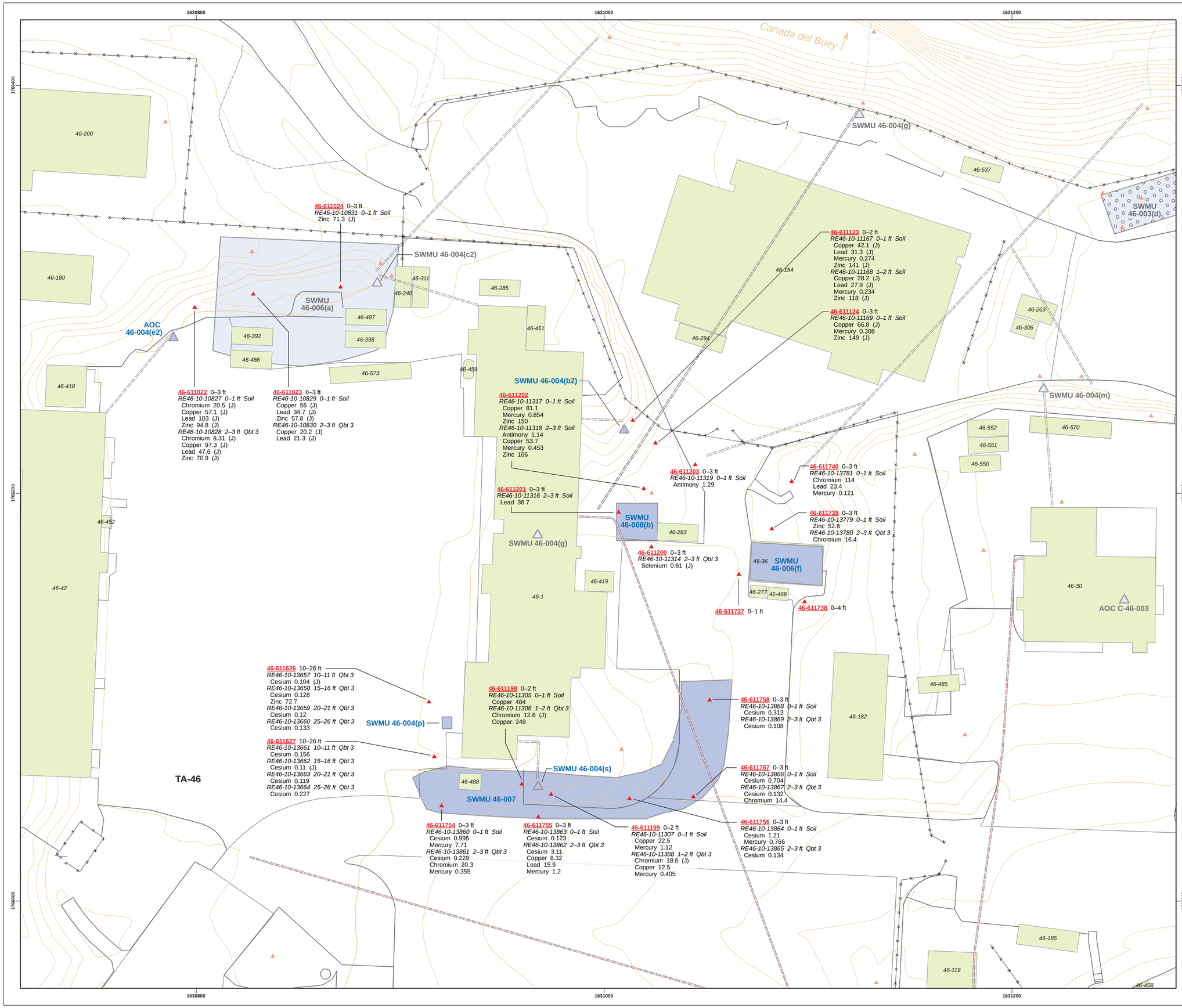
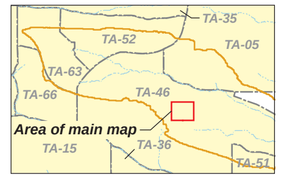
1631000
1631200
1631400
1631600
1631800
1632000
1632200
1763200
1763400
1763600
1763800
1764000
CDB-1W
TA-05
TA-46
Cañada del Buey
46-611120 0–2 ft
RE46-10-11150 0–0.25 ft Soil
Americium-241 0.0574
Cesium-137 4.5
Plutonium-239/240 0.237
Uranium-234 3.36
Uranium-238 4.7
46-611121 0–2 ft
RE46-10-11152 0–1 ft Soil
Plutonium-239/240 0.0668
RE46-10-12042 1–2 ft Qbt 3
Uranium-235/236 0.107
46-611451 0–2 ft
RE46-10-12652 1–2 ft Soil
Cesium-137 0.134
46-611461 0–2 ft
RE46-10-12679 0–1 ft Qbt 3
Uranium-234 3.14
Uranium-235/236 0.247
RE46-10-12680 1–2 ft Qbt 3
Uranium-234 2.39
Uranium-235/236 0.178
46-611118 0–2 ft
RE46-10-11146 0–0.25 ft Soil
Plutonium-239/240 0.0591
46-611473 0–2 ft
46-611119 0–2 ft
RE46-10-11148 0–1 ft Soil
Americium-241 0.0307
Plutonium-239/240 0.0984
RE46-10-12039 1–2 ft Qbt 3
Uranium-235/236 0.1
46-611480 0–2 ft
46-611525 0–2 ft
46-611534 0–2 ft
RE46-10-13058 0–1 ft Qbt 3
Cesium-137 0.627
Plutonium-239/240 0.0541
Uranium-235/236 0.144
46-611115 0–2 ft
46-611450 0–2 ft
46-611460 0–2 ft
RE46-10-12678 1–2 ft Qbt 3
Uranium-235/236 0.0929
46-611535 0–2 ft
46-611536 0–2 ft
RE46-10-13062 0–1 ft Soil
Plutonium-239/240 0.0558
46-611116 0–2 ft
46-611117 0–2 ft
46-611472 0–2 ft
46-611479 0–2 ft
46-611448 0–2 ft
46-611449 0–2 ft
RE46-10-12647 0–1 ft Soil
Uranium-234 20.7
Uranium-235/236 1.04
46-611447 0–2 ft
RE46-10-12643 0–1 ft Soil
Uranium-234 3.88
RE46-10-12644 1–2 ft Soil
Cesium-137 0.118
Uranium-234 49.9
Uranium-235/236 2.78
46-611458 0–2 ft
46-611459 0–2 ft
46-611523 0–2 ft
46-611524 0–2 ft
46-611478 0–2 ft
RE46-10-12757 1–2 ft Soil
Cesium-137 0.128
Plutonium-239/240 0.0221
46-611471 0–2 ft
46-611445 0–2 ft
RE46-10-12639 0–1 ft Soil
Uranium-234 31.7
Uranium-235/236 1.65
Uranium-238 2.33
RE46-10-12640 1–2 ft Qbt 3
Uranium-234 4.19
Uranium-235/236 0.165
46-611457 0–2 ft
46-611521 0–2 ft
46-611522 0–2 ft
46-611531 0–2 ft
46-611532 0–2 ft
46-611533 0–2 ft
46-611114 0–2 ft
46-611446 0–2 ft
RE46-10-12641 0–1 ft Soil
Uranium-234 32.4
Uranium-235/236 1.71
RE46-10-12642 1–2 ft Soil
Uranium-234 2.93
46-611470 0–2 ft
46-611520 0–2 ft
RE46-10-13018 0–1 ft Soil
Uranium-234 2.73
46-611477 0–2 ft
46-611456 0–2 ft
46-611469 0–2 ft
RE46-10-12731 1–2 ft Soil
Plutonium-239/240 0.0185
46-611519 0–2 ft
RE46-10-13016 0–1 ft Soil
Uranium-234 2.95
RE46-10-13017 1–2 ft Soil
Plutonium-239/240 0.0698
46-611526 0–2 ft
46-611113 0–2 ft
46-611468 0–2 ft
RE46-10-12729 1–2 ft Soil
Uranium-234 2.6
Uranium-235/236 0.239
46-611476 0–2 ft
46-611517 0–2 ft
46-611530 0–2 ft
46-611444 0–2 ft
46-611455 0–2 ft
46-611529 0–2 ft
SWMU 46-004(g)
46-611475 0–2 ft
AOC 46-004(f2)
SWMU 46-004(z)
46-611518 0–2 ft
RE46-10-13015 1–2 ft Soil
Plutonium-239/240 0.0888
46-611514 0–2 ft
RE46-10-13007 1–2 ft Soil
Plutonium-239/240 0.0174
46-611516 0–2 ft
46-004(v)
SWMU 46-004(y)
46-611528 0–2 ft
46-611515 0–2 ft
46-611111 0–2 ft
46-611112 0–2 ft
46-611621 0–3 ft
46-611527 0–2 ft
SWMU 46-004(u)
46-611822 0–2 ft
46-611821 0–2 ft
SWMU 46-004(h)
SWMU 46-004(q)
SWMU 46-004(d)
SWMU 46-004(t)
SWMU 46-004(c2)
SWMU 46-006(a)
SWMU 46-004(x)
SWMU 46-004(v)
SWMU 46-003(d)
SWMU 46-006(d)
SWMU 46-006(g)
SWMU 46-004(a)
SWMU 46-004(c)
AOC C-46-002
AOC 46-004(e2)
SWMU 46-004(b2)
SWMU 46-004(g)
AOC 46-003
SWMU 46-003(e)
46-611620 0–3 ft
46-611618 0–3 ft
46-611619 0–3 ft
SWMU 46-004(a2)
46-611553 0–4 ft
46-611552 0–3 ft
46-611551 0–3 ft
RE46-10-13195 2–3 ft Soil
Cesium-137 0.0483
46-611556 0–4 ft
46-611554 0–4 ft
46-611550 0–4 ft
SWMU 46-008(f)
46-611555 0–4 ft
RE46-10-13202 3–4 ft Soil
Uranium-235/236 0.255
46-611454 0–2 ft
46-611453 0–2 ft
SWMU 46-004(m)
46-611452 0–6 ft
46-200
46-154
46-451
46-294
46-1
46-30
46-36
46-188
46-16
46-25
46-18
46-17
46-420
46-58
46-74
46-31
46-276
46-274
46-283
46-419
46-427
46-484
46-401
46-537
46-532
46-301
46-553
46-574
46-263
46-306
46-552
46-551
46-550
46-570
46-483
46-323
46-322
46-296
46-400
46-561
46-87
46-521
46-86
46-321
46-331
46-285
46-487
46-392
46-398
46-486
46-573
46-249
46-277
46-469
TA-35
TA-63
TA-52
TA-05
TA-46
TA-66
Area of main map
TA-54
TA-15
TA-36
TA-51
Upper Cañada del Buey Aggregate Area
This map was created for work processes associated with the Upper Cañada del Buey Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.
N
0 20 40 60 80 100 Feet
contour interval = 10 ft
New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929
2010 sampling location
Subject SWMU or AOC
Septic tank
Drain field
Drain line (associated)
Drain line (inferred)
Former structure
LANL structure
Paved road/parking
Dirt road
Fence
Canyon reach
Inferred drainage
10-ft contour
Location ID (2010 - red or underlined [in B&W], historical - black or not underlined) and Overall sampled interval (min–max)
Sample description (sample ID, depth (ft), media)
12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
Analyte data (analyte, result, optional qualifier code)
Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low
Note: All analytical results reported in pCi/g.
PLATE 21
Radionuclides detected or detected above BVs/FVs at SWMUs 46-004(a2,c2,g,m,u,v,x,y,z), 46-008(f), and AOC 46-004(f2)
Map Number: TPMC_072810A_rad
Date: July 28, 2010
Rev: August 17, 2010
Drafted By: TPMC
File Name: UCdBAA_HITS_MapH





Upper Cañada del Buey Aggregate Area

This map was created for work processes associated with the Upper Cañada del Buey Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

0 10 20 30 40 50 60 Feet

contour interval = 2 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

- 2010 sampling location
- Subject SWMU or AOC
- Drain field
- LANL structure
- Drain line (associated)
- Drain line (inferred)
- Fence
- Paved road/parking
- Dirt road
- Inferred drainage
- 2-ft contour

Location ID (*2010* - red or underlined [in B&W], *historical* - black or not underlined) *and* ***Overall sampled interval*** (min–max)

Sample description (sample ID, depth (ft), media)

12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
⋮

Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in mg/kg.

PLATE 22
Inorganic chemicals detected or detected above BVs at SWMUs 46-004(b2,p,s), 46-006(f), 46-007, 46-008(b), and AOC 46-004(e2)

Map Number:TPMC_071410A
Date: July 14, 2010 Rev: August 6, 2010
DraftedBy:TPMC File Name: UCdBAA_HITS_MapG

1630800 1631000 1631200

1766400 1766200 1766000

Canada del Buey

7080

SWMU 46-004(c2)

SWMU 46-006(a)

AOC 46-004(e2)

SWMU 46-004(b2)

SWMU 46-004(g)

SWMU 46-008(b)

SWMU 46-006(f)

SWMU 46-004(m)

SWMU 46-003(d)

AOC C-46-003

SWMU 46-004(p)

SWMU 46-004(s)

SWMU 46-007

TA-46

46-200 46-180 46-418 46-42 46-452 46-1 46-311 46-240 46-285 46-487 46-398 46-392 46-486 46-573 46-451 46-459 46-154 46-294 46-263 46-306 46-552 46-551 46-550 46-570 46-283 46-36 46-419 46-277 46-469 46-30 46-485 46-182 46-488 46-185 46-119 46-458

46-611022 0–3 ft
RE46-10-10827 0–1 ft Soil
Acenaphthene 0.553
Acetone 0.0818 (J)
Anthracene 0.795
Aroclor-1254 0.108
Aroclor-1260 0.0978
Benzo(a)anthracene 1.37
Benzo(a)pyrene 1.34
Benzo(b)fluoranthene 1.69
Benzo(g,h,i)perylene 0.672
Benzo(k)fluoranthene 0.711
Chrysene 1.45
Dibenz(a,h)anthracene 0.211
Dibenzofuran 0.287 (J)
Ethylbenzene 0.000788 (J+)
Fluoranthene 4.65
Fluorene 0.477
Indeno(1,2,3-cd)pyrene 0.673
4-Isopropyltoluene 0.0158 (J+)
Methylene Chloride 0.00423 (J+)
2-Methylnaphthalene 0.136
Naphthalene 0.451
Phenanthrene 4.1
Pyrene 3.85
Toluene 0.00814 (J+)
1,3,5-Trimethylbenzene 0.000436 (J+)
1,2-Xylene 0.000703 (J+)
1,3-Xylene+1,4-Xylene 0.00195 (J+)
RE46-10-10828 2–3 ft Qbt 3
Acenaphthene 0.0334 (J)
Acetone 0.00297 (J)
Anthracene 0.0446
Aroclor-1254 0.0275
Aroclor-1260 0.0148 (J)
Benzo(a)anthracene 0.0981
Benzo(a)pyrene 0.0925
Benzo(b)fluoranthene 0.11
Benzo(g,h,i)perylene 0.0678
Benzo(k)fluoranthene 0.0502
Chrysene 0.106
Fluoranthene 0.294
Fluorene 0.0269 (J)
Indeno(1,2,3-cd)pyrene 0.0549
Naphthalene 0.0216 (J)
Phenanthrene 0.239
Pyrene 0.243
1,1,1-Trichloroethane 0.000362 (J)
1,2-Xylene 0.000548 (J)
1,3-Xylene+1,4-Xylene 0.000642 (J)

46-611023 0–3 ft
RE46-10-10829 0–1 ft Soil
Acenaphthene 0.0809
Anthracene 0.103
Aroclor-1254 0.0693
Aroclor-1260 0.0355
Benzo(a)anthracene 0.231
Benzo(a)pyrene 0.242
Benzo(b)fluoranthene 0.324
Benzo(g,h,i)perylene 0.129
Benzo(k)fluoranthene 0.134
Chrysene 0.27
Dibenz(a,h)anthracene 0.0375 (J)
Fluoranthene 0.763
Fluorene 0.069
Indeno(1,2,3-cd)pyrene 0.125
2-Methylnaphthalene 0.0188 (J)
Naphthalene 0.0612
Phenanthrene 0.576
Pyrene 0.614
RE46-10-10830 2–3 ft Qbt 3
Acenaphthene 0.018 (J)
Anthracene 0.0247 (J)
Aroclor-1254 0.0278
Aroclor-1260 0.015
Benzo(a)anthracene 0.0658
Benzo(a)pyrene 0.0592
Benzo(b)fluoranthene 0.0711
Benzo(g,h,i)perylene 0.0474
Benzo(k)fluoranthene 0.0334 (J)
Chrysene 0.0711
Fluoranthene 0.194
Fluorene 0.0146 (J)
Indeno(1,2,3-cd)pyrene 0.0338 (J)
Phenanthrene 0.144
Pyrene 0.163

46-611024 0–3 ft
RE46-10-10831 0–1 ft Soil
Aroclor-1254 0.0052
Aroclor-1260 0.0031 (J)
Fluoranthene 0.0188 (J)
2-Methylphenol 0.0836 (J)
4-Methylphenol 0.224 (J)
Phenanthrene 0.0128 (J)
Pyrene 0.0154 (J)
RE46-10-10832 2–3 ft Qbt 3
Anthracene 0.00769 (J)
Benzo(a)pyrene 0.0123 (J)
Benzo(b)fluoranthene 0.0155 (J)
Chrysene 0.0133 (J)
Fluoranthene 0.0441
Phenanthrene 0.0348 (J)
Pyrene 0.0346 (J)

46-611123 0–2 ft
RE46-10-11167 0–1 ft Soil
Acenaphthene 2.08
Acenaphthylene 0.137 (J)
Anthracene 3.19
Aroclor-1254 1.55
Aroclor-1260 0.679
Benzo(a)anthracene 6.89
Benzo(a)pyrene 7.01
Benzo(b)fluoranthene 8
Benzo(g,h,i)perylene 4.18
Benzo(k)fluoranthene 3.85
Chrysene 7.45
Dibenz(a,h)anthracene 1.07
Dibenzofuran 1.36 (J)
Fluoranthene 19.1
Fluorene 2.15
Indeno(1,2,3-cd)pyrene 3.94
2-Methylnaphthalene 0.838
Naphthalene 3.02
Phenanthrene 16
Pyrene 15.2
RE46-10-11168 1–2 ft Soil
Acenaphthene 1.34
Anthracene 2.26
Aroclor-1254 1.68
Aroclor-1260 0.764
Benzo(a)anthracene 3.97
Benzo(a)pyrene 3.74
Benzo(b)fluoranthene 4.42
Benzo(g,h,i)perylene 2.22
Benzo(k)fluoranthene 1.97
Chrysene 4.33
Dibenz(a,h)anthracene 0.669
Dibenzofuran 0.846 (J)
Fluoranthene 12.5
Fluorene 1.39
Indeno(1,2,3-cd)pyrene 2.11
2-Methylnaphthalene 0.391
Naphthalene 1.28
Phenanthrene 11.2
Pyrene 9.51

46-611124 0–2 ft
RE46-10-11169 0–1 ft Soil
Acenaphthene 0.47
Acenaphthylene 0.0188 (J)
Anthracene 0.785
Aroclor-1254 0.0316 (J)
Benzo(a)anthracene 1.72
Benzo(a)pyrene 1.51
Benzo(b)fluoranthene 1.85
Benzo(g,h,i)perylene 0.755
Benzo(k)fluoranthene 0.876
Chrysene 1.77
Dibenz(a,h)anthracene 0.268
Dibenzofuran 0.293 (J)
Fluoranthene 4.82
Fluorene 0.479
Indeno(1,2,3-cd)pyrene 0.799
2-Methylnaphthalene 0.152
Naphthalene 0.496
Phenanthrene 4.03
Pyrene 3.72
RE46-10-12044 1–2 ft Soil
Acenaphthene 0.025 (J)
Anthracene 0.0333 (J)
Benzo(a)anthracene 0.0822
Benzo(a)pyrene 0.0918
Benzo(g,h,i)perylene 0.0497
Benzo(k)fluoranthene 0.0231 (J)
Chrysene 0.0856
Fluoranthene 0.207
Fluorene 0.0225 (J)
Indeno(1,2,3-cd)pyrene 0.172
Naphthalene 0.0295 (J)
Phenanthrene 0.176
Pyrene 0.204

46-611201 0–3 ft
RE46-10-11315 0–1 ft Soil
Aroclor-1254 0.0905
Aroclor-1260 0.0295
Benzo(a)anthracene 0.18 (J)
Benzo(a)pyrene 0.19 (J)
Benzo(b)fluoranthene 0.236
Benzo(g,h,i)perylene 0.121
Benzo(k)fluoranthene 0.115 (J)
Chrysene 0.209 (J)
Fluoranthene 0.451 (J)
Indeno(1,2,3-cd)pyrene 0.12
Phenanthrene 0.281 (J)
Pyrene 0.399 (J)
RE46-10-11316 2–3 ft Soil
Benzo(b)fluoranthene 0.0165 (J)
Benzo(g,h,i)perylene 0.0137 (J)
Indeno(1,2,3-cd)pyrene 0.0134 (J)
TPH-DRO 3.64 (J)

46-611202 0–3 ft
RE46-10-11317 0–1 ft Soil
Acenaphthene 0.352 (J)
Anthracene 0.548 (J)
Aroclor-1254 0.017 (J)
Benzo(a)anthracene 1.59
Benzo(a)pyrene 1.51
Benzo(b)fluoranthene 1.99
Benzo(g,h,i)perylene 0.736
Benzo(k)fluoranthene 0.902
Chrysene 1.79
Dibenzofuran 0.171 (J)
Fluoranthene 3.71
Fluorene 0.327 (J)
Indeno(1,2,3-cd)pyrene 0.776
2-Methylnaphthalene 0.0609 (J)
Naphthalene 0.141 (J)
TPH-DRO 73.4 (J)
1,1,1-Trichloroethane 0.00407
1,1,2-Trichloro-1,2,2-trifluoroethane 0.00489 (J)
RE46-10-11318 2–3 ft Soil
Acenaphthene 0.178 (J)
Anthracene 0.311 (J)
Aroclor-1254 0.0212 (J)
Benzo(a)anthracene 0.851 (J)
Benzo(a)pyrene 0.854
Benzo(b)fluoranthene 1.1
Benzo(g,h,i)perylene 0.508
Benzo(k)fluoranthene 0.434 (J)
Chrysene 0.91
2,4-Dinitrotoluene 1.05
Fluoranthene 1.99
Fluorene 0.17 (J)
Indeno(1,2,3-cd)pyrene 0.494
Naphthalene 0.0728 (J)
Phenanthrene 1.46
Pyrene 1.83
TPH-DRO 65.4 (J)

46-611203 0–3 ft
RE46-10-11319 0–1 ft Soil
Benzo(a)anthracene 0.103 (J)
Benzo(a)pyrene 0.105 (J)
Benzo(b)fluoranthene 0.132
Benzo(g,h,i)perylene 0.0567
Chrysene 0.112 (J)
Fluoranthene 0.272 (J)
Indeno(1,2,3-cd)pyrene 0.0543
Phenanthrene 0.202 (J)
Pyrene 0.24 (J)
Toluene 0.00166
TPH-DRO 37.5 (J)
1,3-Xylene+1,4-Xylene 0.00035 (J)
RE46-10-11320 2–3 ft Soil
Acenaphthene 7.79
Anthracene 9.75
Benzo(a)anthracene 13
Benzo(a)pyrene 12
Benzo(b)fluoranthene 13.7
Benzo(g,h,i)perylene 7.24
Benzo(k)fluoranthene 5.53
Chrysene 12
Dibenzofuran 4.21
Fluoranthene 27.4
Fluorene 7.15
Indeno(1,2,3-cd)pyrene 7.06
2-Methylnaphthalene 3.43
Naphthalene 10.2 (J)
Phenanthrene 28.7
Pyrene 24.9

46-611200 0–3 ft
RE46-10-11313 0–1 ft Soil
Benzo(b)fluoranthene 0.0533
Benzo(g,h,i)perylene 0.0369
Ethylbenzene 0.000361 (J)
Fluoranthene 0.154 (J)
Indeno(1,2,3-cd)pyrene 0.035 (J)
Phenanthrene 0.137 (J)
Pyrene 0.142 (J)
Toluene 0.00286
TPH-DRO 33.1 (J)
1,2-Xylene 0.00036 (J)
1,3-Xylene+1,4-Xylene 0.00103 (J)
RE46-10-11314 2–3 ft Qbt 3
Acetone 0.00354 (J)
Toluene 0.00222
1,3-Xylene+1,4-Xylene 0.000462 (J)

46-611740 0–3 ft
RE46-10-13781 0–1 ft Soil
Anthracene 0.0161 (J)
Benzo(a)pyrene 0.0556
Benzo(b)fluoranthene 0.0882
Benzo(g,h,i)perylene 0.0327 (J)
Chrysene 0.0592
Fluoranthene 0.125
Indeno(1,2,3-cd)pyrene 0.0323 (J)
Phenanthrene 0.0767
Pyrene 0.0949
TPH-DRO 7.17 (J)

46-611739 0–3 ft
RE46-10-13779 0–1 ft Soil
Anthracene 0.0121 (J)
Aroclor-1254 0.0725 (J)
Benzo(a)pyrene 0.0341 (J)
Benzo(b)fluoranthene 0.0549
Benzo(g,h,i)perylene 0.0225 (J)
Chrysene 0.0357 (J)
Fluoranthene 0.0791
Indeno(1,2,3-cd)pyrene 0.0184 (J)
Phenanthrene 0.0545
Pyrene 0.0647

46-611738 0–4 ft
RE46-10-13777 0–1 ft Soil
Anthracene 0.0191 (J)
Benzo(a)pyrene 0.0447
Benzo(b)fluoranthene 0.0711
Benzo(g,h,i)perylene 0.0425
Chrysene 0.0452
Ethylbenzene 0.000392 (J)
Fluoranthene 0.102
Indeno(1,2,3-cd)pyrene 0.032 (J)
Phenanthrene 0.0858
Pyrene 0.0829
Toluene 0.00641
1,3-Xylene+1,4-Xylene 0.00085 (J)
RE46-10-13778 3–4 ft Qbt 3
Bis(2-ethylhexyl)phthalate 0.0833 (J)
TPH-DRO 4.24 (J)

46-611737 0–4 ft
RE46-10-13775 0–1 ft Soil
Benzo(b)fluoranthene 0.0111 (J)
Fluoranthene 0.0149 (J)
Pyrene 0.0126 (J)
TPH-DRO 3.87 (J)
RE46-10-13776 3–4 ft Qbt 3
Acetone 0.00188 (J)

46-611198 0–2 ft
RE46-10-11305 0–1 ft Soil
Tetrachloroethene 0.000445 (J)
Toluene 0.00228
1,3-Xylene+1,4-Xylene 0.000631 (J)
RE46-10-11306 1–2 ft Qbt 3
Toluene 0.00109 (J)
1,3-Xylene+1,4-Xylene 0.00061 (J)

46-611758 0–3 ft

46-611626 10–26 ft

46-611627 10–26 ft

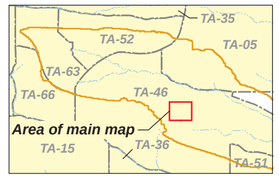
46-611754 0–3 ft
RE46-10-13860 0–1 ft Soil
Aroclor-1254 0.0064 (J)
Fluoranthene 0.116 (J)
Pyrene 0.119 (J)
Toluene 0.00255 (J+)
TPH-DRO 163
1,1,1-Trichloroethane 0.000674 (J+)
Trichloroethene 0.00388 (J+)

46-611199 0–2 ft
RE46-10-11307 0–1 ft Soil
Aroclor-1254 0.0331
Aroclor-1260 0.0133 (J)
Benzo(a)anthracene 0.141 (J)
Benzo(a)pyrene 0.137 (J)
Benzo(b)fluoranthene 0.152
Benzo(g,h,i)perylene 0.087
Benzo(k)fluoranthene 0.0857 (J)
Chrysene 0.141 (J)
Fluoranthene 0.345 (J)
Indeno(1,2,3-cd)pyrene 0.0714
Pyrene 0.295 (J)
RE46-10-11308 1–2 ft Qbt 3
Anthracene 0.0721 (J)
Aroclor-1254 0.0173 (J)
Benzo(a)anthracene 0.19 (J)
Benzo(a)pyrene 0.184 (J)
Benzo(b)fluoranthene 0.24
Benzo(g,h,i)perylene 0.0869
Benzo(k)fluoranthene 0.105 (J)
Chrysene 0.192 (J)
Fluoranthene 0.445 (J)
Indeno(1,2,3-cd)pyrene 0.0764
Phenanthrene 0.343 (J)
Pyrene 0.388 (J)

46-611755 0–3 ft
RE46-10-13863 0–1 ft Soil
Indeno(1,2,3-cd)pyrene 0.0128 (J)
RE46-10-13862 2–3 ft Qbt 3
Anthracene 0.0114 (J)
Aroclor-1254 0.0274
Aroclor-1260 0.0209
Benzo(a)anthracene 0.0371 (J)
Benzo(a)pyrene 0.0378
Benzo(b)fluoranthene 0.0602
Benzo(g,h,i)perylene 0.0309 (J)
Chrysene 0.0371 (J)
Di-n-octylphthalate 0.0845 (J)
Fluoranthene 0.0691
Indeno(1,2,3-cd)pyrene 0.0229 (J)
Phenanthrene 0.0435
Pyrene 0.0669
TPH-DRO 62.2 (J)

46-611756 0–3 ft
RE46-10-13864 0–1 ft Soil
Acenaphthene 0.0367 (J)
Anthracene 0.0602
Benzo(a)anthracene 0.181
Benzo(a)pyrene 0.19
Benzo(b)fluoranthene 0.32
Benzo(g,h,i)perylene 0.151 (J)
Chrysene 0.206
Fluoranthene 0.438
Fluorene 0.0321 (J)
Indeno(1,2,3-cd)pyrene 0.14 (J)
Naphthalene 0.018 (J)
Phenanthrene 0.327
Pyrene 0.438
TPH-DRO 11.1
RE46-10-13865 2–3 ft Qbt 3
Benzo(a)anthracene 0.0204 (J)
Benzo(a)pyrene 0.0155 (J)
Benzo(b)fluoranthene 0.027 (J)
Benzo(g,h,i)perylene 0.0169 (J)
Chrysene 0.0197 (J)
Fluoranthene 0.0413
Indeno(1,2,3-cd)pyrene 0.014 (J)
Phenanthrene 0.0278 (J)
Pyrene 0.0387

46-611757 0–3 ft
RE46-10-13866 0–1 ft Soil
Benzo(a)anthracene 0.0207 (J)
Benzo(a)pyrene 0.0198 (J)
Benzo(b)fluoranthene 0.0321 (J)
Benzo(g,h,i)perylene 0.0203 (J)
Chrysene 0.0181 (J)
Fluoranthene 0.0357 (J)
Indeno(1,2,3-cd)pyrene 0.0164 (J)
Phenanthrene 0.0254 (J)
Pyrene 0.0318 (J)
TPH-DRO 14.8 (J)
Trichloroethene 0.000893 (J)
RE46-10-13867 2–3 ft Qbt 3
Benzo(a)anthracene 0.0217 (J)
Benzo(a)pyrene 0.0307 (J)
Benzo(b)fluoranthene 0.0576
Benzo(g,h,i)perylene 0.0255 (J)
Chrysene 0.029 (J)
Fluoranthene 0.0197 (J)
Indeno(1,2,3-cd)pyrene 0.0238 (J)
Phenanthrene 0.0152 (J)
Pyrene 0.0191 (J)



Upper Cañada del Buey Aggregate Area

This map was created for work processes associated with the Upper Cañada del Buey Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

0 10 20 30 40 50 60 Feet

contour interval = 2 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

- 2010 sampling location
- Subject SWMU or AOC
- Drain field
- LANL structure
- Drain line (associated)
- Drain line (inferred)
- Fence
- Paved road/parking
- Dirt road
- Inferred drainage
- 2-ft contour

Location ID (*2010* - red or underlined [in B&W], *historical* - black or not underlined) *and* ***Overall sampled interval*** (min–max)

Sample description (sample ID, depth (ft), media)

12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
⋮

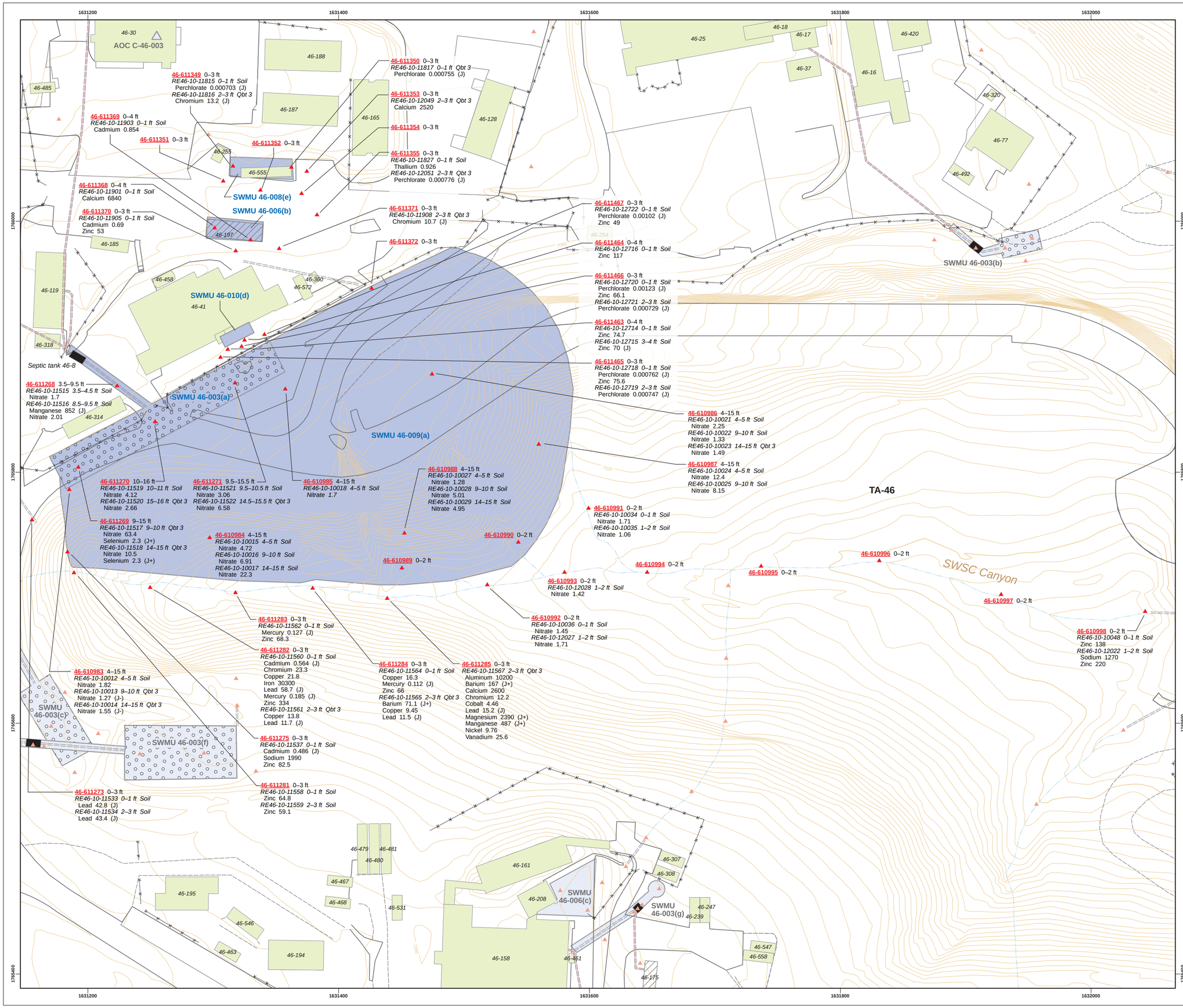
Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in mg/kg.

PLATE 23
Organic chemicals detected at SWMUs 46-004(b2,p,s), 46-006(f), 46-007, 46-008(b), and AOC 46-004(e2)

Map Number:TPMC_071410A
Date: July 14, 2010 Rev: August 6, 2010
DraftedBy:TPMC File Name: UCdBAA_HITS_MapG



Upper Cañada del Buey Aggregate Area

This map was created for work processes associated with the Upper Cañada del Buey Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

Location ID (*2010* - red or underlined [in B&W], *historical* - black or not underlined) *and* ***Overall sampled interval*** (min–max)

Sample description (sample ID, depth (ft), media)

12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
⋮

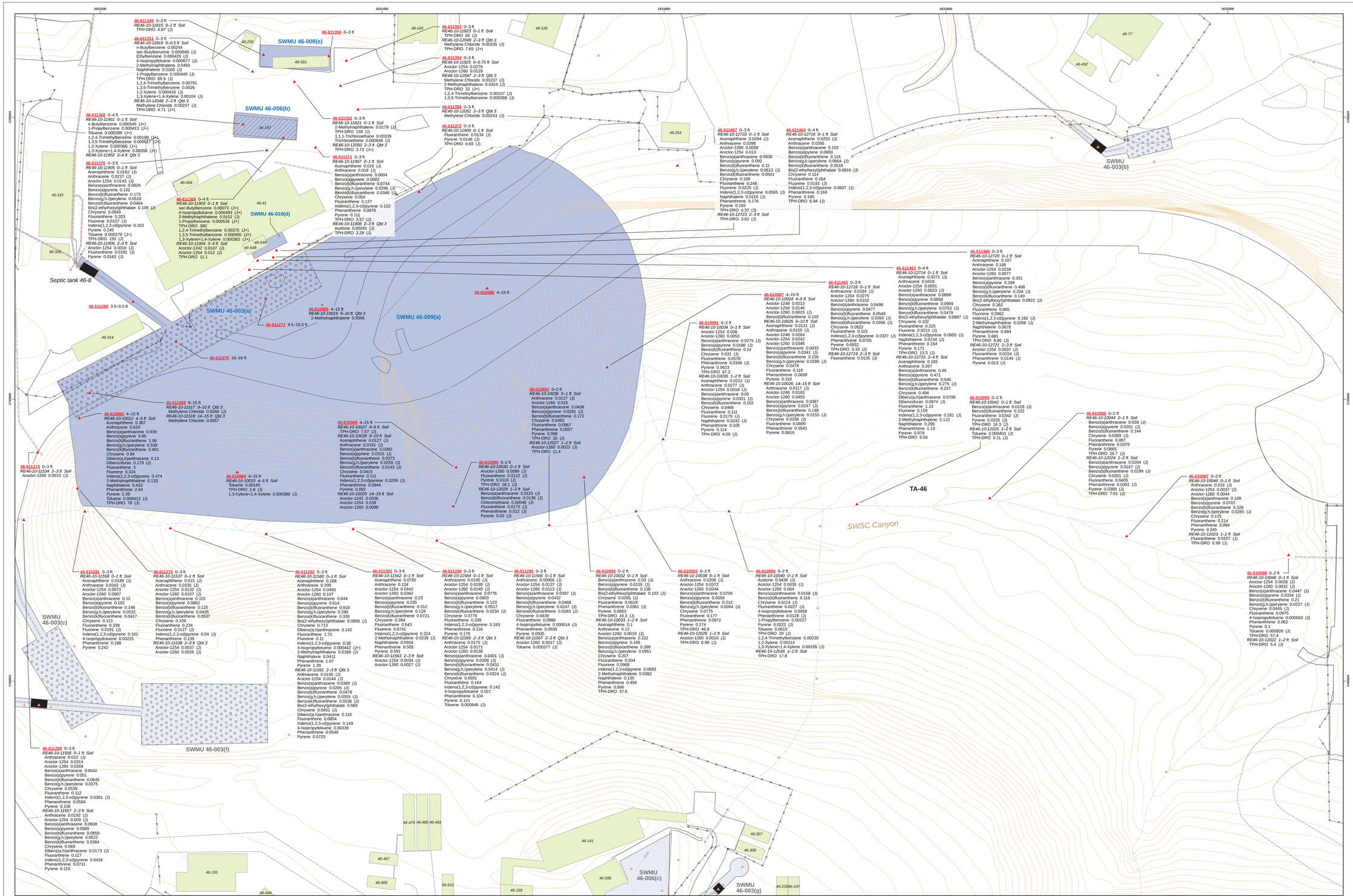
Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in mg/kg.

PLATE 4
Inorganic chemicals detected or detected above BVs at SWMUs 46-003(a), 46-006(b), 46-008(e), 46-009(a), and 46-010(d)

Map Number:TPMC_072810C
Date: July 28, 2010 Rev: September 24, 2010
DraftedBy:TPMC File Name: UCdBAA_HITS_MapE



Upper Cañada del Buey Aggregate Area

This map was created for work processes associated with the Upper Cañada del Buey Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

Location ID *(2010 - red or underlined [in B&W], historical - black or not underlined) and* ***Overall sampled interval*** *(min–max)*

Sample description (sample ID, depth (ft), media)

12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
⋮

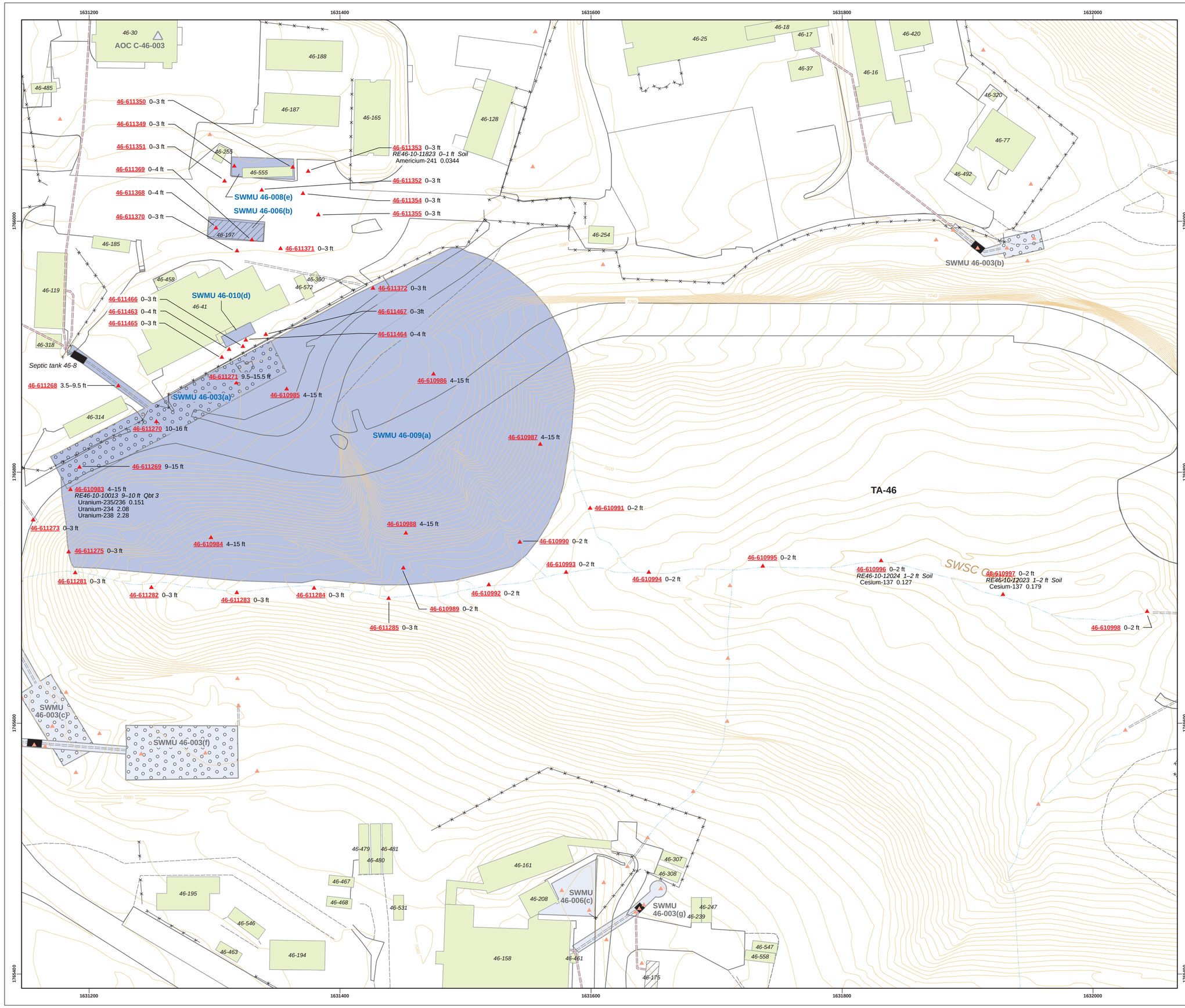
Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in mg/kg.

PLATE 5
Organic chemicals detected at SWMUs 46-003(a), 46-006(b), 46-008(e), 46-009(a), and 46-010(d)

Map Number:TPMC_082610Aorg
Date: August 26, 2010 Rev:
Drafted By:TPMC File Name: UCdBAA_HITS_MapED



Upper Cañada del Buey Aggregate Area

This map was created for work processes associated with the Upper Cañada del Buey Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

Location ID (*2010* - red or underlined [in B&W], *historical* - black or not underlined) ***and Overall sampled interval*** (min–max)

Sample description (sample ID, depth (ft), media)

12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
⋮

Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in pCi/g.

PLATE 6
Radionuclides detected or detected above BVs/FVs at SWMUs 46-003(a),46-006(b), 46-008(e), 46-009(a), and 46-010(d)

Map Number:TPMC_072810C
Date: July 28, 2010 Rev:September 24, 2010
DraftedBy:TPMC File Name: UCdBAA_HITS_MapE

1630800 1631000 1631200 1631400

1766000 1765800 1765600

TA-46

SWMU 46-004(d2)

SWMU 46-008(d)

SWMU 46-004(f)

SWMU 46-004(r)

SWMU 46-004(w)

SWMU 46-004(t)

SWMU 46-008(g)

SWMU 46-008(a)

SWMU 46-003(c)

SWMU 46-003(f)

SWMU 46-003(a)

SWMU 46-006(b)

SWMU 46-010(d)

SWMU 46-009(a)

AOC C-46-001

SWSC Canyon

Septic tank 46-49

Septic tank 46-94

46-2 46-24 46-257 46-258 46-319 46-557 46-416 46-450 46-454 46-286 46-120 46-221 46-59 46-76 46-121 46-217 46-218 46-88 46-357 46-271 46-119 46-185 46-318 46-314 46-41 46-458 46-548 46-549 46-572 46-380 46-197 46-480 46-479 46-481 46-467 46-468 46-531 46-195 46-546

46-611343 0–3 ft
RE46-10-11804 2–3 ft Qbt 3
Chromium 7.46
Lead 14

46-611346 0–3 ft

46-611347 0–3 ft
RE46-10-11812 2–3 ft Qbt 3
Chromium 8.91 (J)

46-611345 0–3 ft
RE46-10-11807 0–1 ft Qbt 3
Manganese 705 (J+)
RE46-10-11808 2–3 ft Qbt 3
Manganese 602 (J+)

46-611344 0–3 ft

46-611348 0–3 ft
RE46-10-11814 2–3 ft Qbt 3
Copper 6.35 (J)
Nickel 12.6 (J)

46-611274 0–3 ft

46-611272 0–3 ft

46-612231 0–0.5 ft
RE46-10-17386 0–0.25 ft Soil
Cadmium 0.98
Copper 98.9 (J)
Cyanide (Total) 0.93
Lead 73.5
Mercury 0.111
Zinc 414 (J+)
RE46-10-17387 0.25–0.5 ft Soil
Cadmium 1.1
Copper 108 (J)
Cyanide (Total) 0.8
Lead 47.8
Mercury 0.344
Silver 1.6 (J+)
Zinc 357 (J+)

46-611255 7–12.5 ft
RE46-10-11481 7–8 ft Soil
Nitrate 1.54
RE46-10-11482 11.5–12.5 ft Qbt 3
Chromium 31.5
Nitrate 1.39

46-611752 0–3 ft
RE46-10-13809 0–1 ft Soil
Antimony 2.05
Cadmium 1
Chromium 494
Copper 69.4
Lead 180
Silver 3.01
Zinc 167 (J+)
RE46-10-13810 2–3 ft Soil
Lead 40.7
Zinc 51.5 (J+)

46-612232 0–2 ft

46-611746 0–3 ft
RE46-10-13798 2–3 ft Qbt 3
Lead 23.8

46-611751 0–3 ft

46-611748 0–3 ft
RE46-10-13801 0–1 ft Soil
Zinc 102 (J+)

46-611747 0–3 ft
RE46-10-13799 0–1 ft Soil
Silver 1.07
Zinc 176 (J+)

46-611750 0–3 ft
RE46-10-13805 0–1 ft Soil
Zinc 75.1 (J+)

46-611749 0–3 ft

46-611276 4.5–10.5 ft
RE46-10-11549 9.5–10.5 ft Qbt 3
Selenium 1.3 (J+)

46-611338 0–3 ft

46-611341 0–3 ft

46-611340 0–3 ft

46-611339 0–3 ft

46-611342 0–3 ft

46-611277 2.5–5.5 ft

46-611279 0–3 ft
RE46-10-11554 0–1 ft Soil
Copper 15.5
Lead 30.3
Zinc 52.8
RE46-10-11555 2–3 ft Soil

46-611260 4.5–10.5 ft
RE46-10-11491 4.5–5.5 ft Soil
Nitrate 3.1 (J-)
RE46-10-11492 9.5–10.5 ft Qbt 3
Nitrate 2.04 (J-)

46-611278 3–6 ft
RE46-10-11552 3–4 ft Soil
Perchlorate 0.00143 (J)
RE46-10-11553 5–6 ft Qbt 3
Perchlorate 0.000691 (J)

46-611359 3–6 ft
RE46-10-11875 3–4 ft Soil
Nitrate 1.58
Perchlorate 0.00206 (J)
RE46-10-11876 5–6 ft Qbt 3
Perchlorate 0.000688 (J)

46-611360 8–14 ft
RE46-10-11877 8–9 ft Soil
Nitrate 1.87
RE46-10-11878 13–14 ft Soil
Nitrate 4.78

46-611361 12–18 ft
RE46-10-11879 12–13 ft Qbt 3
Barium 49.4 (J)
Lead 11.2 (J)
Nitrate 1.72
RE46-10-11880 17–18 ft Qbt 3
Nitrate 1.68

46-611362 11–17 ft
RE46-10-11881 11–12 ft Soil
Mercury 0.237
Nitrate 1.99
RE46-10-11882 16–17 ft Qbt 3
Nitrate 1.18

46-611273 0–3 ft
RE46-10-11533 0–1 ft Soil
Lead 42.8 (J)
RE46-10-11534 2–3 ft Soil
Lead 43.4 (J)

46-611257 9–11 ft
RE46-10-11485 9–10 ft Soil
Nitrate 2.22
RE46-10-11486 10–11 ft Qbt 3
Nitrate 1.93

46-611259 5–11 ft
RE46-10-11489 5–6 ft Soil
Nitrate 1.53

46-611264 3–9 ft
RE46-10-11499 3–4 ft Soil
Nitrate 5.53 (J-)
Perchlorate 0.00162 (J)

46-611280 0–3 ft
RE46-10-11556 0–1 ft Soil
Chromium 23.8
Copper 34.3
RE46-10-11557 2–3 ft Soil
Zinc 53.2

46-611275 0–3 ft
RE46-10-11537 0–1 ft Soil
Cadmium 0.486 (J)
Sodium 1990
Zinc 82.5

46-611281 0–3 ft
RE46-10-11558 0–1 ft Soil
Zinc 64.8
RE46-10-11559 2–3 ft Soil
Zinc 59.1

46-611283 0–3 ft
RE46-10-11562 0–1 ft Soil
Mercury 0.127 (J)
Zinc 68.3

46-611285 0–3 ft
RE46-10-11567 2–3 ft Qbt 3
Aluminum 10200
Barium 167 (J+)
Calcium 2600
Chromium 12.2
Cobalt 4.46
Lead 15.2 (J)
Magnesium 2390 (J+)
Manganese 487 (J+)
Nickel 9.76
Vanadium 25.6

46-611282 0–3 ft
RE46-10-11560 0–1 ft Soil
Cadmium 0.564 (J)
Chromium 23.3
Copper 21.8
Iron 30300
Lead 58.7 (J)
Mercury 0.185 (J)
Zinc 334
RE46-10-11561 2–3 ft Qbt 3
Copper 13.8
Lead 11.7 (J)

46-611284 0–3 ft
RE46-10-11564 0–1 ft Soil
Copper 16.3
Mercury 0.112 (J)
Zinc 66
RE46-10-11565 2–3 ft Qbt 3
Barium 71.1 (J+)
Copper 9.45
Lead 11.5 (J)

46-611263 3–9 ft
RE46-10-11497 3–4 ft Soil
Nitrate 86.4 (J-)
Perchlorate 0.00253
RE46-10-11498 8–9 ft Qbt 3
Lead 12.8

46-611367 0–2 ft

46-611366 5–11 ft
RE46-10-11889 5–6 ft Qbt 3
Nitrate 1.3 (J-)

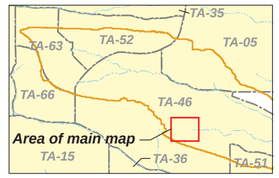
46-611365 5–11 ft
RE46-10-11887 5–6 ft Soil
Perchlorate 0.000554 (J)

46-611364 3–9.5 ft
RE46-10-11886 8.5–9.5 ft Qbt 3
Lead 43.1
Zinc 77.2

46-611363 5–11 ft

46-611262 0.3–6.3 ft
RE46-10-11496 5.3–6.3 ft Qbt 3
Antimony 5.69
Cadmium 2.03
Chromium 13.2 (J)
Cobalt 3.88 (J)
Copper 7.06 (J)
Lead 11.3

46-611261 2–8 ft
RE46-10-11493 2–3 ft Soil
Nitrate 40.8 (J-)
Perchlorate 0.000606 (J)
RE46-10-11494 7–8 ft Qbt 3
Lead 12.6
Nitrate 1.78 (J-)



Upper Cañada del Buey Aggregate Area

This map was created for work processes associated with the Upper Cañada del Buey Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

N

0 10 20 30 40 50 60 70 80 Feet

contour interval = 2 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

- 2010 sampling location
- Subject SWMU or AOC
- Septic tank
- Drain field
- Drain line (associated)
- Drain line (inferred)
- LANL structure
- Former structure
- Fence
- Paved road/parking
- Dirt road
- Inferred drainage
- 2-ft contour

Location ID (*2010* - red or underlined [in B&W], *historical* - black or not underlined) *and* ***Overall sampled interval*** (min–max)

Sample description (sample ID, depth (ft), media)

12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
⋮

Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in mg/kg.

PLATE 7
Inorganic chemicals detected or detected above BVs at SWMUs 46-003(c), 46-003(f), 46-004(f,r,t), 46-008(a,d,g), and AOC C-46-001

Map Number:TPMC_072810B
Date: July 28, 2010 Rev:
DraftedBy:TPMC File Name: UCdBAA_HITS_MapD

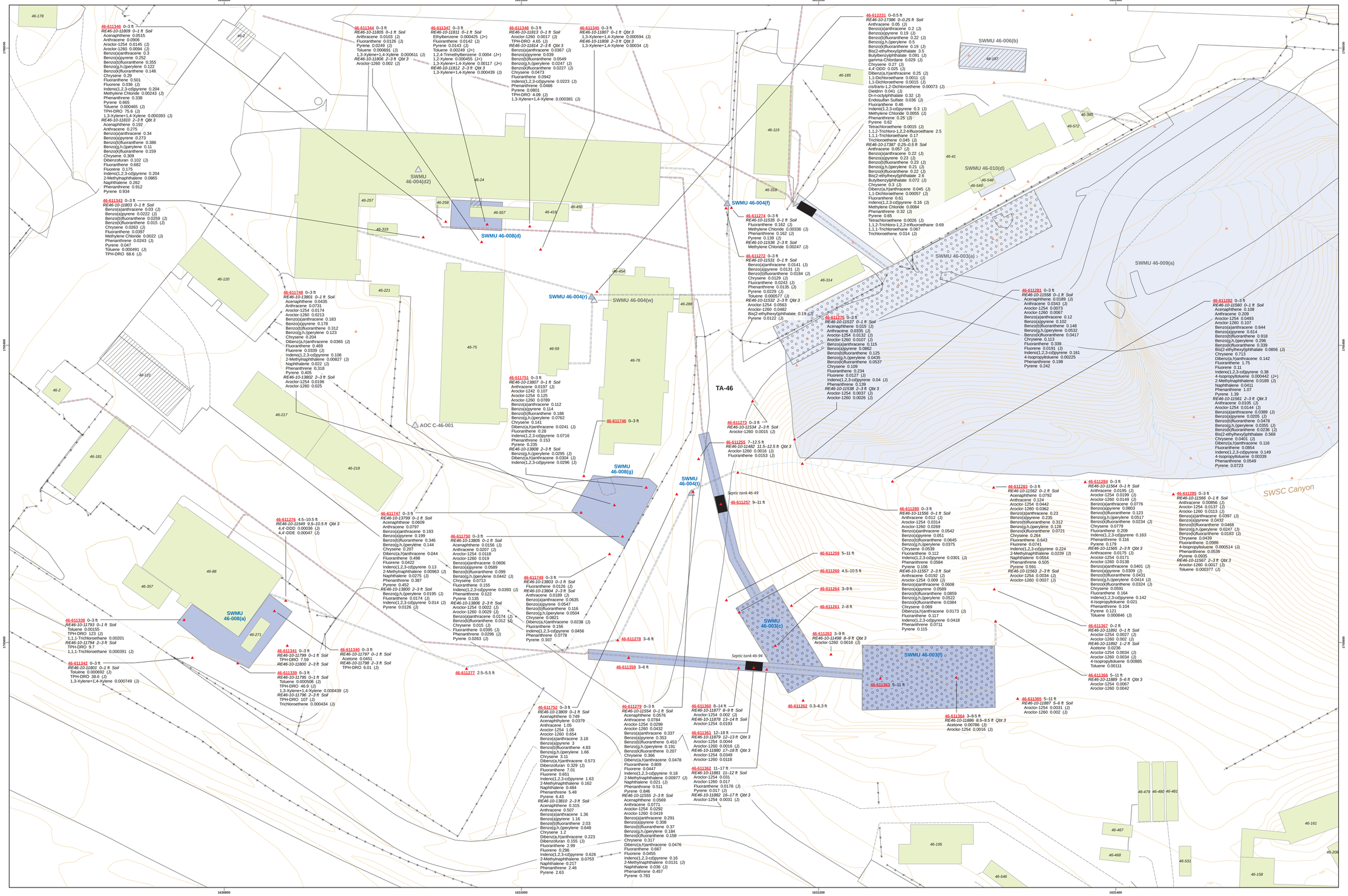
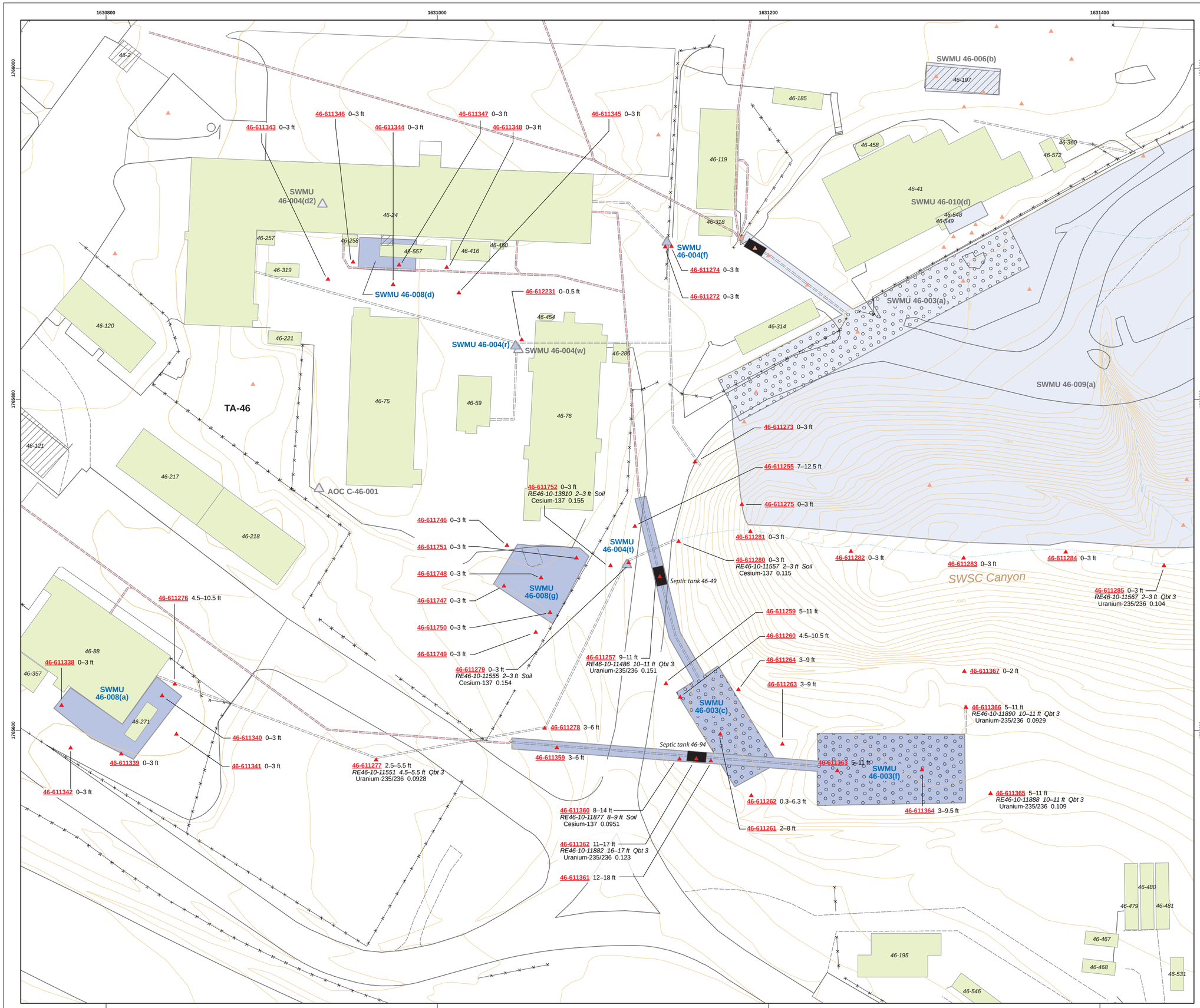
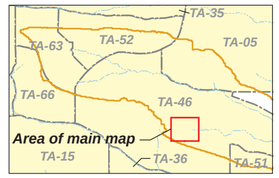


PLATE 8
Organic chemicals detected at SWMUs 46-003(c), 46-003(f), 46-004(f,r,t), and 46-008(a,d,g)

Map Number:TPMC_080910A
Date: August 9,2010 Rev:
Drafted By:TPMC File Name: UCdBAA_HITS_MapOD





Upper Cañada del Buey Aggregate Area

This map was created for work processes associated with the Upper Cañada del Buey Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

0 10 20 30 40 50 60 70 80 Feet

contour interval = 2 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

- 2010 sampling location
- Subject SWMU or AOC
- Septic tank
- Drain field
- Drain line (associated)
- Drain line (inferred)
- LANL structure
- Former structure
- Fence
- Paved road/parking
- Dirt road
- Inferred drainage
- 2-ft contour

Location ID (*2010* - red or underlined [in B&W], *historical* - black or not underlined) *and* ***Overall sampled interval*** (min–max)

Sample description (sample ID, depth (ft), media)

12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
⋮

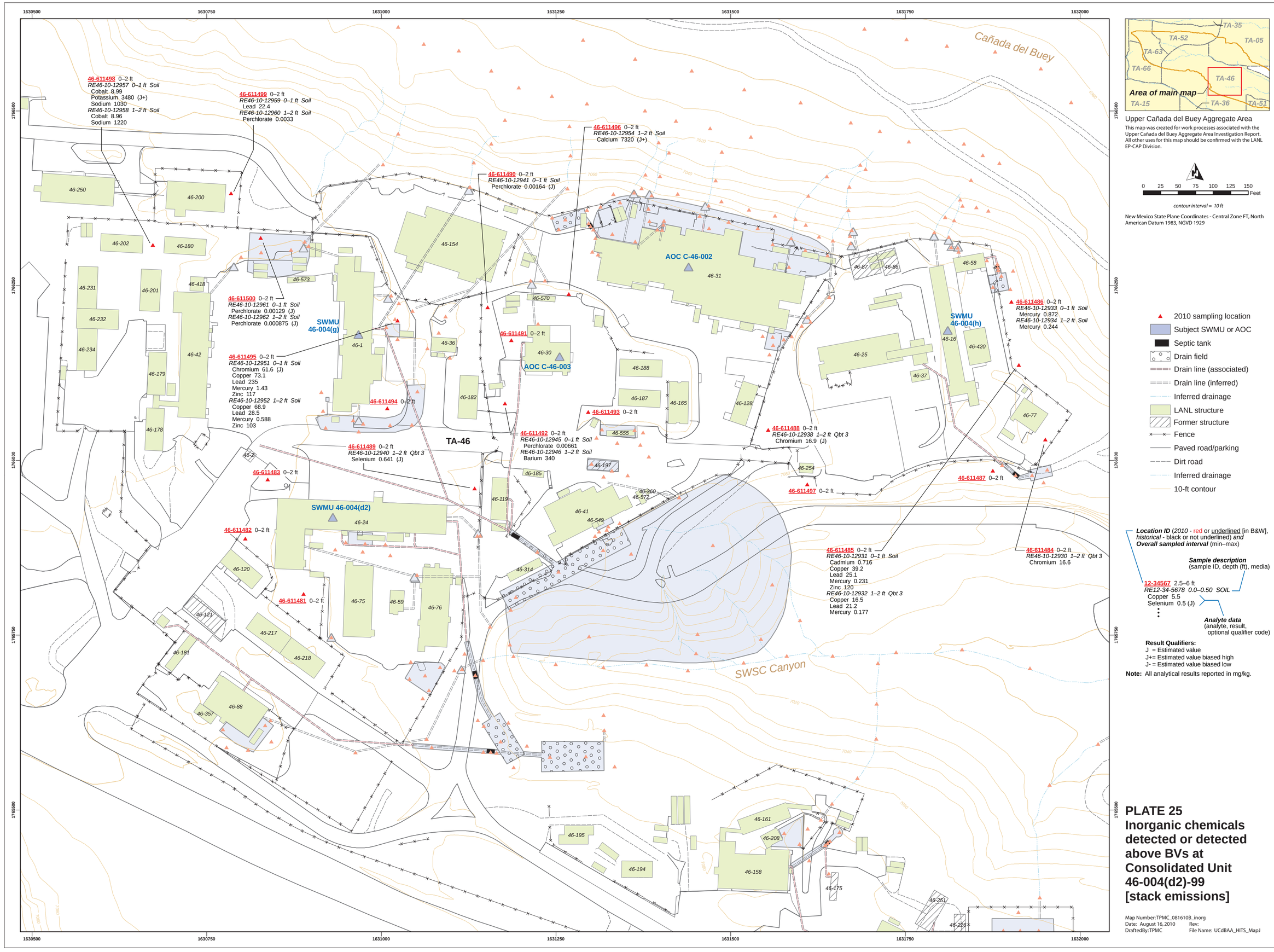
Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in pCi/g.

PLATE 9
Radionuclides detected or detected above BVs/FVs at SWMUs 46-003(c), 46-003(f), 46-004(f,r,t), and 46-008(a,d,g)

Map Number:TPMC_072810B
Date: July 28, 2010 Rev:
DraftedBy:TPMC File Name: UCdBAA_HITS_MapD



Upper Cañada del Buey Aggregate Area

This map was created for work processes associated with the Upper Cañada del Buey Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

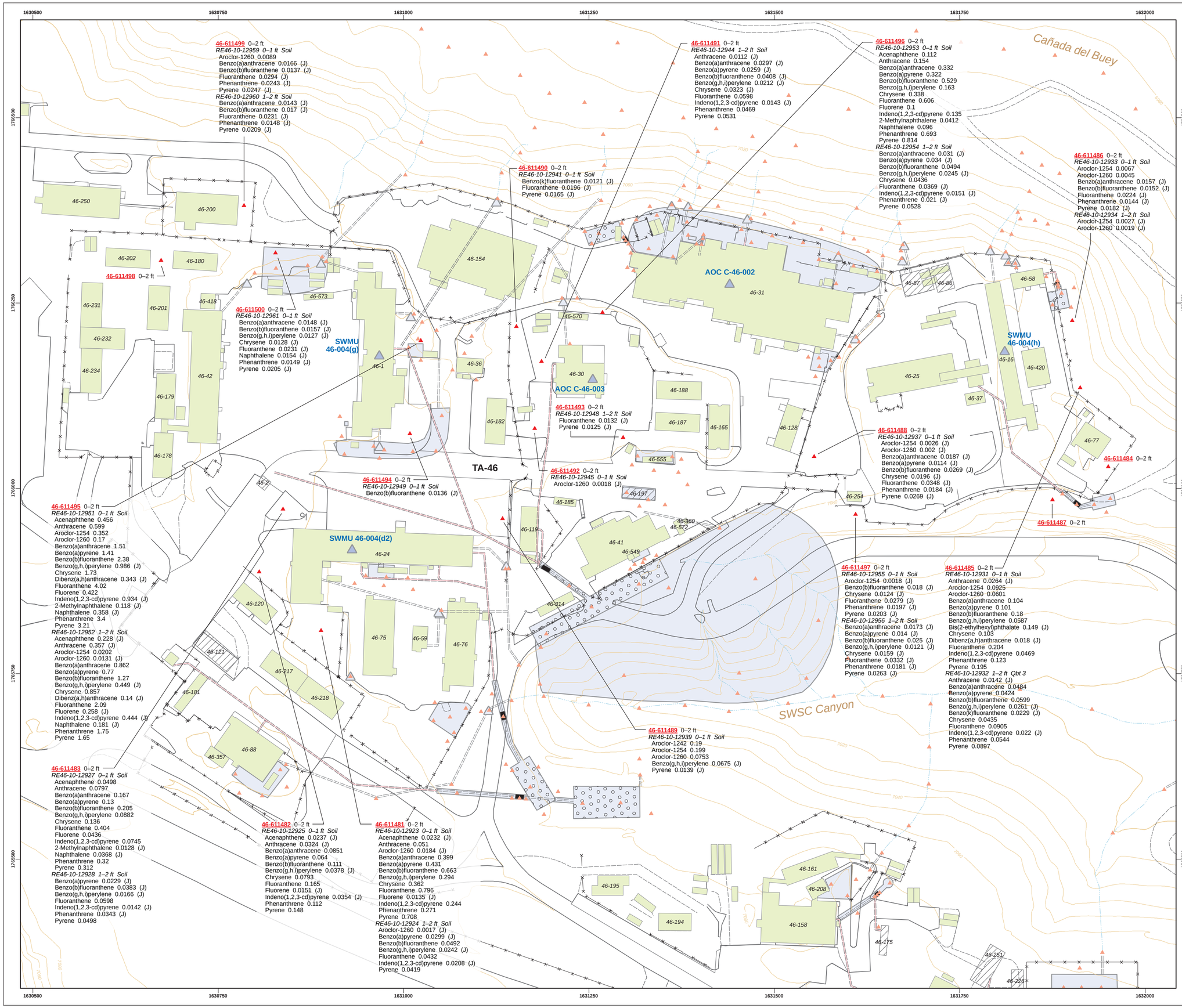
New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

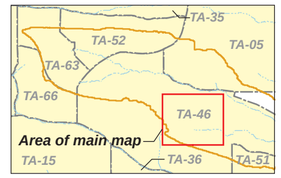
Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in mg/kg.

PLATE 25
Inorganic chemicals detected or detected above BVs at Consolidated Unit 46-004(d2)-99 [stack emissions]

Map Number: TPMC_0816108_inorg
Date: August 16, 2010 Rev:
DrafterBy: TPMC File Name: UCdBAA_HITS_MapJ





Upper Cañada del Buey Aggregate Area

This map was created for work processes associated with the Upper Cañada del Buey Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

0 25 50 75 100 125 150 Feet

contour interval = 10 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

- 2010 sampling location
- Subject SWMU or AOC
- Septic tank
- Drain field
- Drain line (associated)
- Drain line (inferred)
- Inferred drainage
- LANL structure
- Former structure
- Fence
- Paved road/parking
- Dirt road
- Inferred drainage
- 10-ft contour

Location ID (*2010* - red or underlined [in B&W], *historical* - black or not underlined) *and* ***Overall sampled interval*** (min–max)

Sample description (sample ID, depth (ft), media)

12-34567 2.5–6 ft
RE12-34-5678 0.0–0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
⋮

Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in mg/kg.

PLATE 26
Organic chemicals detected at Consolidated Unit 46-004(d2)-99 [stack emissions]

Map Number: TPMC_081610B_org
Date: August 16, 2010 Rev:
Drafted By: TPMC File Name: UCdBAA_HITS_MapJ

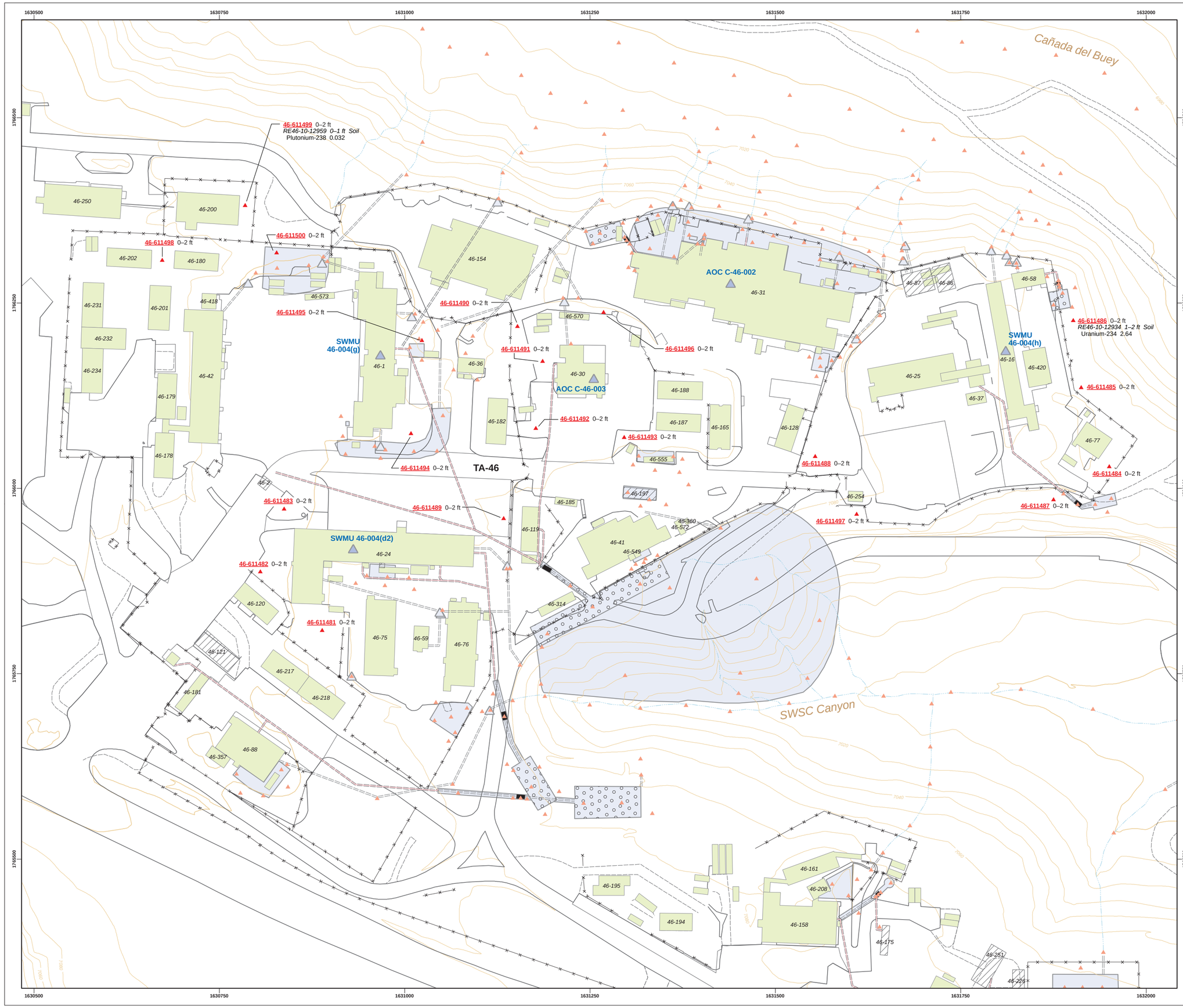


PLATE 27
Radionuclides detected or detected above BVs/FVs at Consolidated Unit 46-004(d2)-99 [stack emissions]

Upper Cañada del Buey Aggregate Area

This map was created for work processes associated with the Upper Cañada del Buey Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

Map Number:TPMC_0816108_rad
Date: August 16, 2010 Rev:
DraftedBy:TPMC File Name: UCdBAA_HITS_MapJ

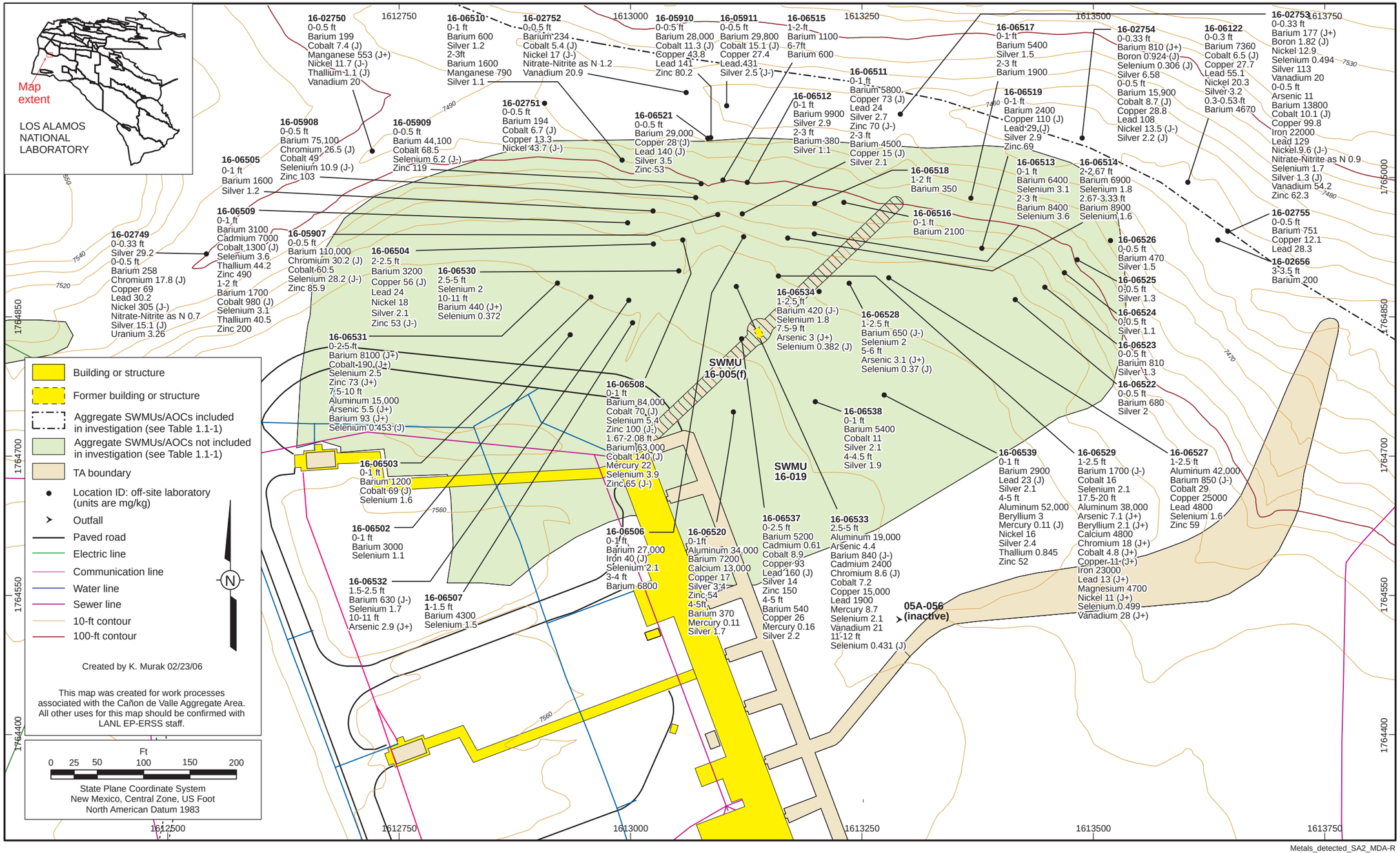
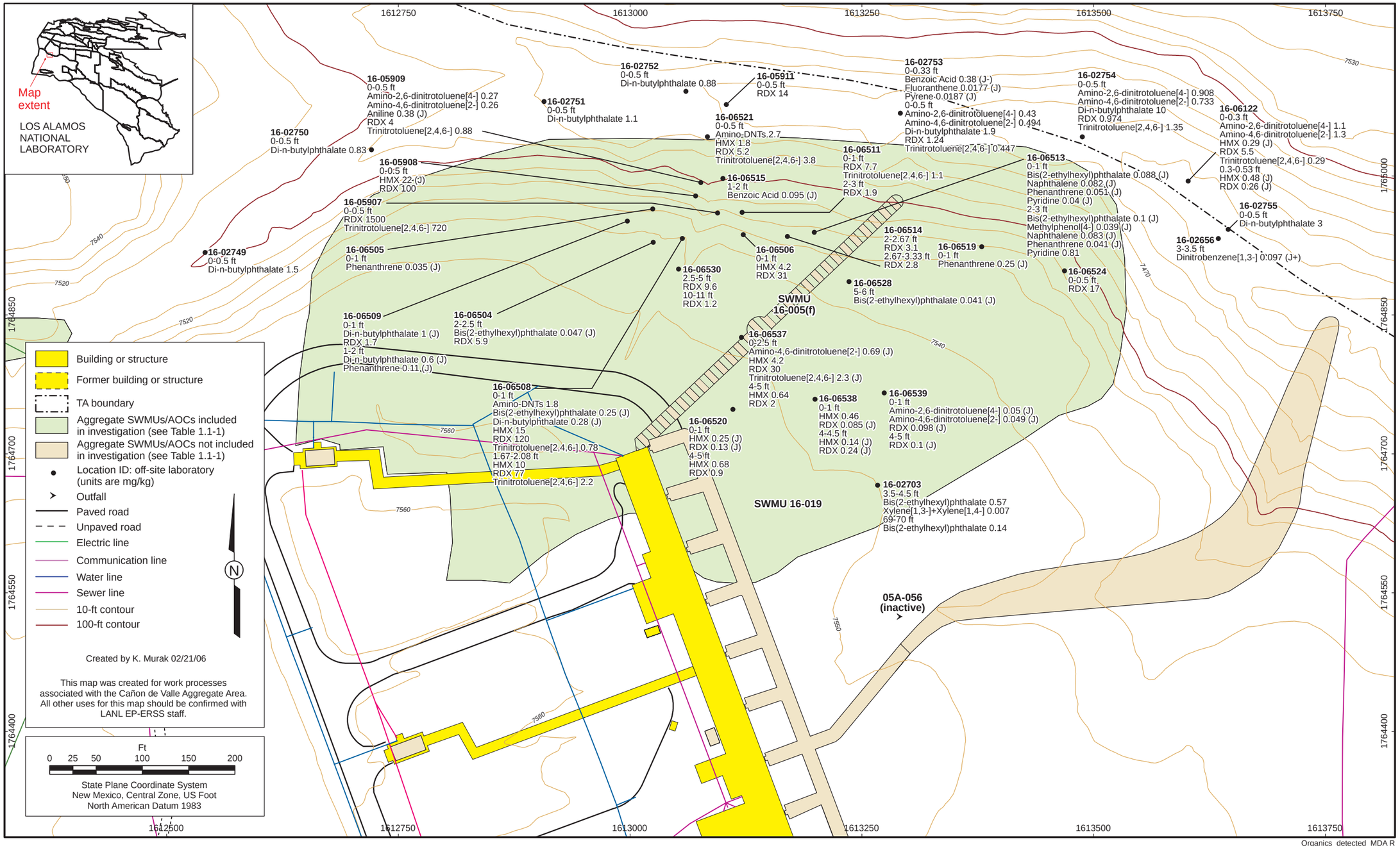


Figure 3.1-2. Subaggregate 2 (MDA R) historical sampling locations with inorganic chemicals detected greater than background values



Organics detected MDA R

Figure 3.1-3. Subaggregate 2 (MDA R) historical sampling locations with detected organic chemicals

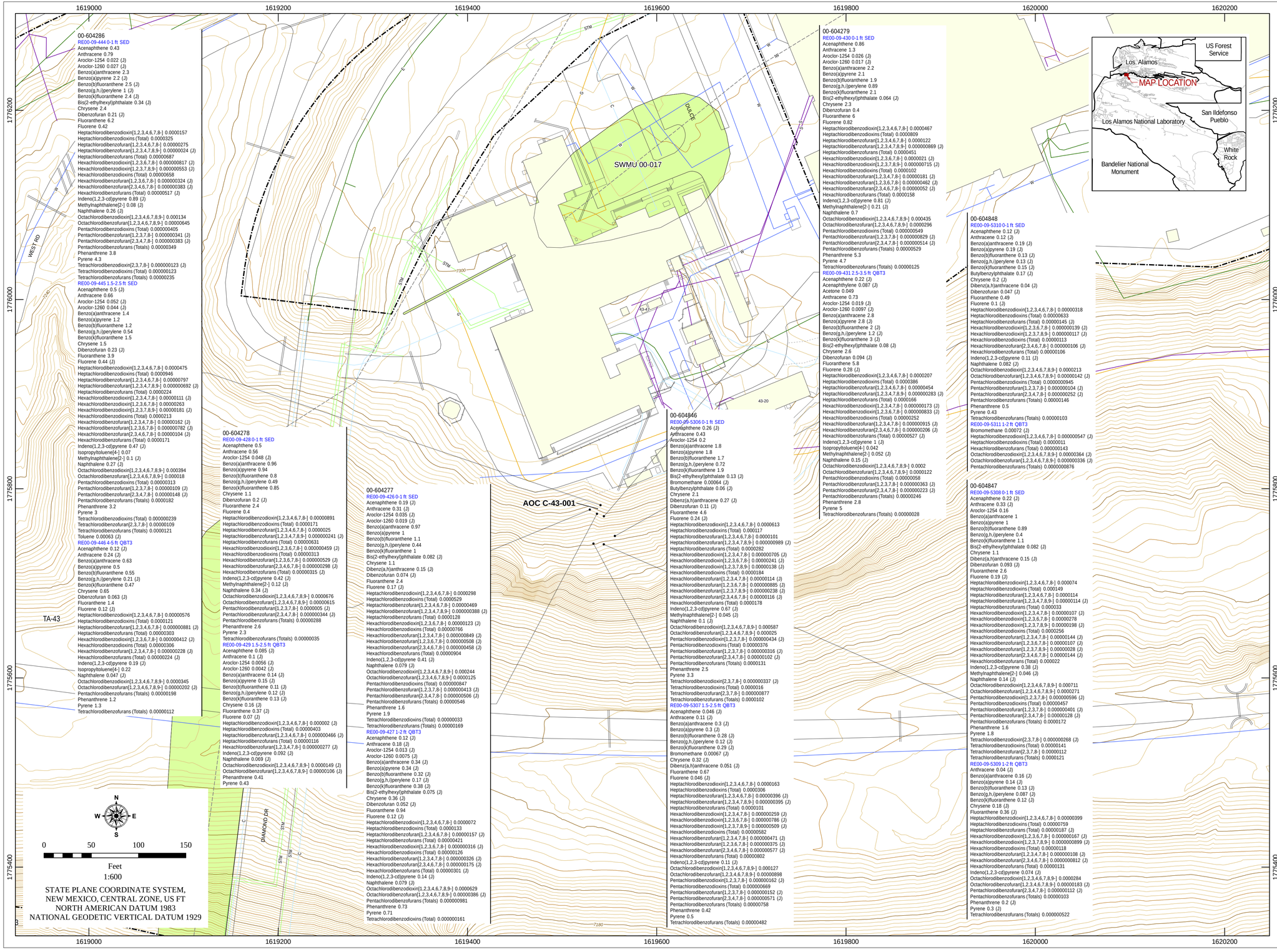


PLATE 10.4-1

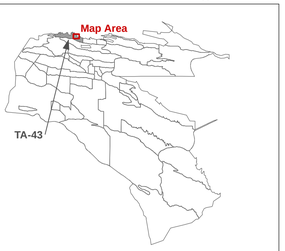
ORGANIC CHEMICALS DETECTED AT AOC C-43-001

LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENTAL PROGRAMS DIRECTORATE
CORRECTIVE ACTIONS PROJECTS
Los Alamos, New Mexico 87545

Map ULA09-IR-46-ORG (R) 21 May 2009 PLANNERER
NOD Revision 14 January 2010
Los Alamos Technical Associates (LATA-LAO)

This map was created for work processes associated with the Corrective Actions Projects (CAP) of the Los Alamos National Laboratory (LANL) Environmental Programs (EP) Directorate. All other uses for this map should be confirmed with LANL EP-CAP staff.

Plate 1. PCBs detected in confirmation samples following interim removal activities implemented in 2009 and 2010 within the SWMU 01-001(f) outfall and drainage



Location ID Depth interval sampled
Sample ID *Depth, Media*
Aroclor-ID #
= Analytical lab results (mg/kg)

- Confirmation sampling location
- Stormwater sampling location
- Former FFCA sampling location
- PRS 01-001(f)
- Electric line
- Gas line
- Sewer line
- Water line
- Former sewer line
- Paved road
- TA boundary
- LANL boundary
- Structure
- Former structure
- Approximate excavation boundary

Topographic Contour

- 2 ft contour
- 10 ft contour
- 20 ft contour
- 100 ft contour

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD 1983, NGVD 1929

Feet
0 25 50 100
0 5 10 20
Meters

Map: UppLA_ConfSampVR_v1.Rev0
Darren Green, Portage Inc.
Date: 03.30.2010

Analytical data added by Liz Miller
09.10.2010, LANL GISLab map #m202105
Edited 04.20.2011

Feature Data References:

Electric Utility Grid; County of Los Alamos, Information Services; as published 04 March 2009.

Former Structures of the Los Alamos Site; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2008-0441; 1:2,500 Scale Data; 08 August 2008.

Former Structures of the Los Alamos Site; Line Feature Representation; Los Alamos National Laboratory, Environment and Remediation Support Services Division,EP2007-0566; 1:2,500 Scale Data; 16 April 2008.

Hypsography, 2, 10, 20 and 100 Foot Contour Intervals; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 2000.

LANL Areas Used and Occupied ; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; 19 September 2007; as published 04 December 2008.

Natural Gas Supply Distribution; County of Los Alamos, Information Services; as published 04 March 2009.

Ownership Boundaries Around LANL Area; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; 19 September 2007; as published 04 December 2008.

Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2010-0035; 21 January 2010.

Potential Release Sites; Los Alamos National Laboratory; ESH&Q WES Environmental Data & Analysis Group; as published 17 June 2010.

Sewer Line System Maintained by the County of Los Alamos; County of Los Alamos, Information Services; as published 04 March 2009.

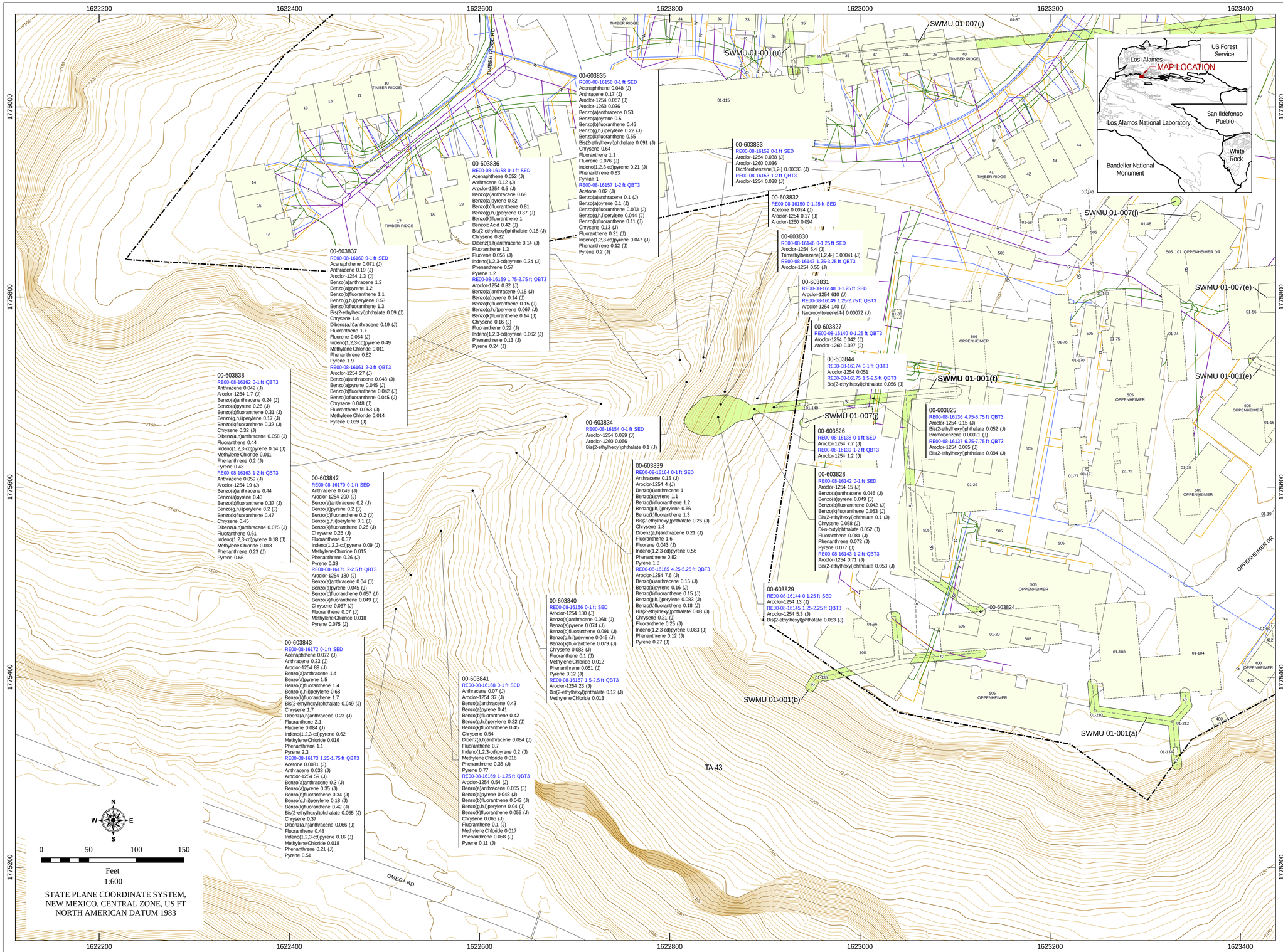
Streets; County of Los Alamos, Information Services; as published 16 May 2006.

Structures; County of Los Alamos, Information Services; as published 29 October 2007.

Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 04 December 2008.

Water Utility Distribution System Maintained by the County of Los Alamos; County of Los Alamos, Information Services; as published 04 March 2009.

Disclaimer: This map was created for work processes associated with the Upper Los Alamos Canyon PCB Remediation. All other uses for this map should be confirmed with the Environmental Programs Directorate.



- Sampled location
- SWMU or AOC

- Structure or building
- Former structure
- Former drain line
- Former industrial waste
- Former sewer
- Former storm drain

- Technical Area (TA) boundary
- Fence
- Paved road
- Dirt road

Elevation contours

- 100- and 20-ft contour
- 10-ft contour
- 2-ft contour

Utilities

- Communication
- Electric
- Gas
- Sewer
- Water

Note: Concentration values are mg/kg

FEATURE DATA REFERENCES

Hypsography; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.
Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2009-0162; 13 March 2009.
Potential Release Site Affected Areas; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; Unknown publication date.
Roads - Streets; County of Los Alamos, Information Services; as published 16 May 2006. Road Centerlines for the County of Los Alamos; County of Los Alamos, Information Services; as published 04 March 2009. Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Paved Parking; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 12 August 2002; as published 15 January 2009. Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.
Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.
Storm Drain Line Distribution System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.
Structures and Buildings - Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Structures; County of Los Alamos, Information Services; as published 29 October 2007. Primary Landscape Features; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Former Structures of the Los Alamos Site; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2007-0566; 12,500 Scale Data; 16 April 2008.
Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 04 December 2008.
Utilities - Communication Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 08 August 2002; as published 15 January 2009. Primary Electric Grid; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Electric Utility Grid; County of Los Alamos, Information Services; as published 04 March 2009. Primary Gas Distribution Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Natural Gas Supply Distribution; County of Los Alamos, Information Services; as published 04 March 2009. Point Features of the Sewer Line System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Sewer Line System Maintained by the County of Los Alamos; County of Los Alamos, Information Services; as published 04 March 2009. Steam Line Distribution System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Water Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Water Utility Distribution System Maintained by the County of Los Alamos; County of Los Alamos, Information Services; as published 04 March 2009.

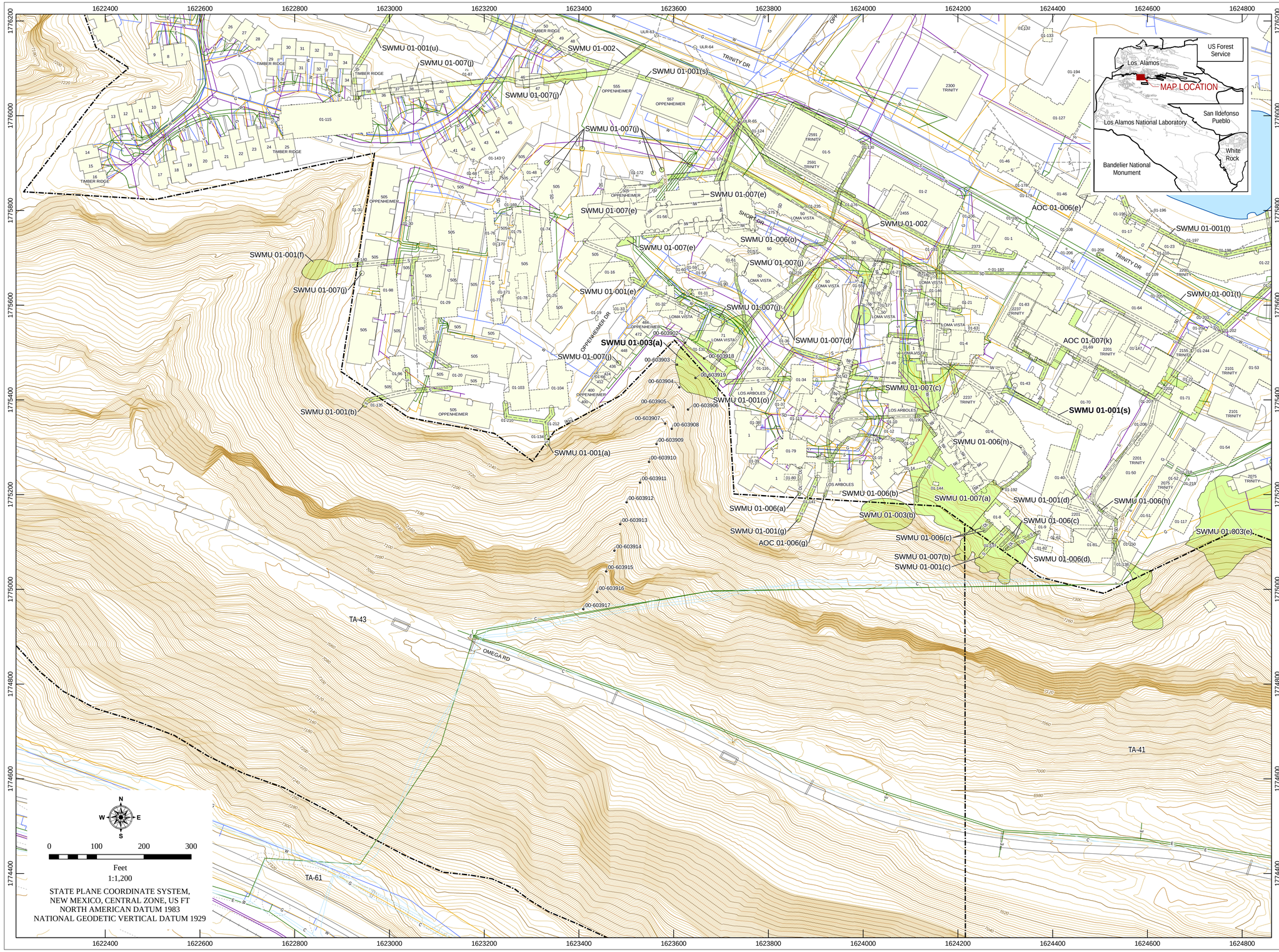
PLATE 6.8-1

ORGANIC CHEMICALS DETECTED AT SWMU 01-001(f)

LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENTAL PROGRAMS DIRECTORATE
CORRECTIVE ACTIONS PROJECTS
Los Alamos, New Mexico 87545

Map ULA09-IR-11-ORG (R) 19 May 2009 PLANNERER
Los Alamos Technical Associates (LATA-LAO)

This map was created for work processes associated with the Corrective Actions Projects (CAP) of the Los Alamos National Laboratory (LANL) Environmental Programs (EP) Directorate. All other uses for this map should be confirmed with LANL EP-CAP staff.



- Sampled location
- SWMU or AOC

- Structure or building
- Former structure
- Former drain line
- Former industrial waste
- Former sewer
- Former storm drain
- Pond

- Technical Area (TA) boundary
- Fence
- Paved road
- Dirt road

Elevation contours
- 100- and 20-ft contour
- 10-ft contour
- 2-ft contour

Utilities
- Communication
- Electric
- Gas
- Sewer
- Water

FEATURE DATA REFERENCES

Hypsography§; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.
Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2009-0162; 13 March 2009.
Ponds; County of Los Alamos, Information Services; as published 16 May 2006.
Potential Release Site Affected Areas; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; Unknown publication date.
Roads - Streets; County of Los Alamos, Information Services; as published 16 May 2006. Road Centerlines for the County of Los Alamos; County of Los Alamos, Information Services; as published 04 March 2009. Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Paved Parking; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 12 August 2002; as published 15 January 2009. Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.
Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.
Storm Drain Line Distribution System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009.
Structures and Buildings - Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Former Structures of the Los Alamos Site; Los Alamos National Laboratory, Waste and Environmental Services Division, EP2008-0441; 1:2,500 Scale Data; 08 August 2008. Former Structures of the Los Alamos Site, Line Feature Representation; Los Alamos National Laboratory, Environment and Remediation Support Services Division, EP2007-0566; 1:2,500 Scale Data; 16 April 2008.
Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 04 December 2008.
Utilities - Communication Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 08 August 2002; as published 15 January 2009. Primary Electric Grid; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Electric Utility Grid; County of Los Alamos, Information Services; as published 04 March 2009. Primary Gas Distribution Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Natural Gas Supply Distribution; County of Los Alamos, Information Services; as published 04 March 2009. Point Features of the Sewer Line System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Sewer Line System Maintained by the County of Los Alamos; County of Los Alamos, Information Services; as published 04 March 2009. Steam Line Distribution System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Water Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 15 January 2009. Water Utility Distribution System Maintained by the County of Los Alamos; County of Los Alamos, Information Services; as published 04 March 2009.

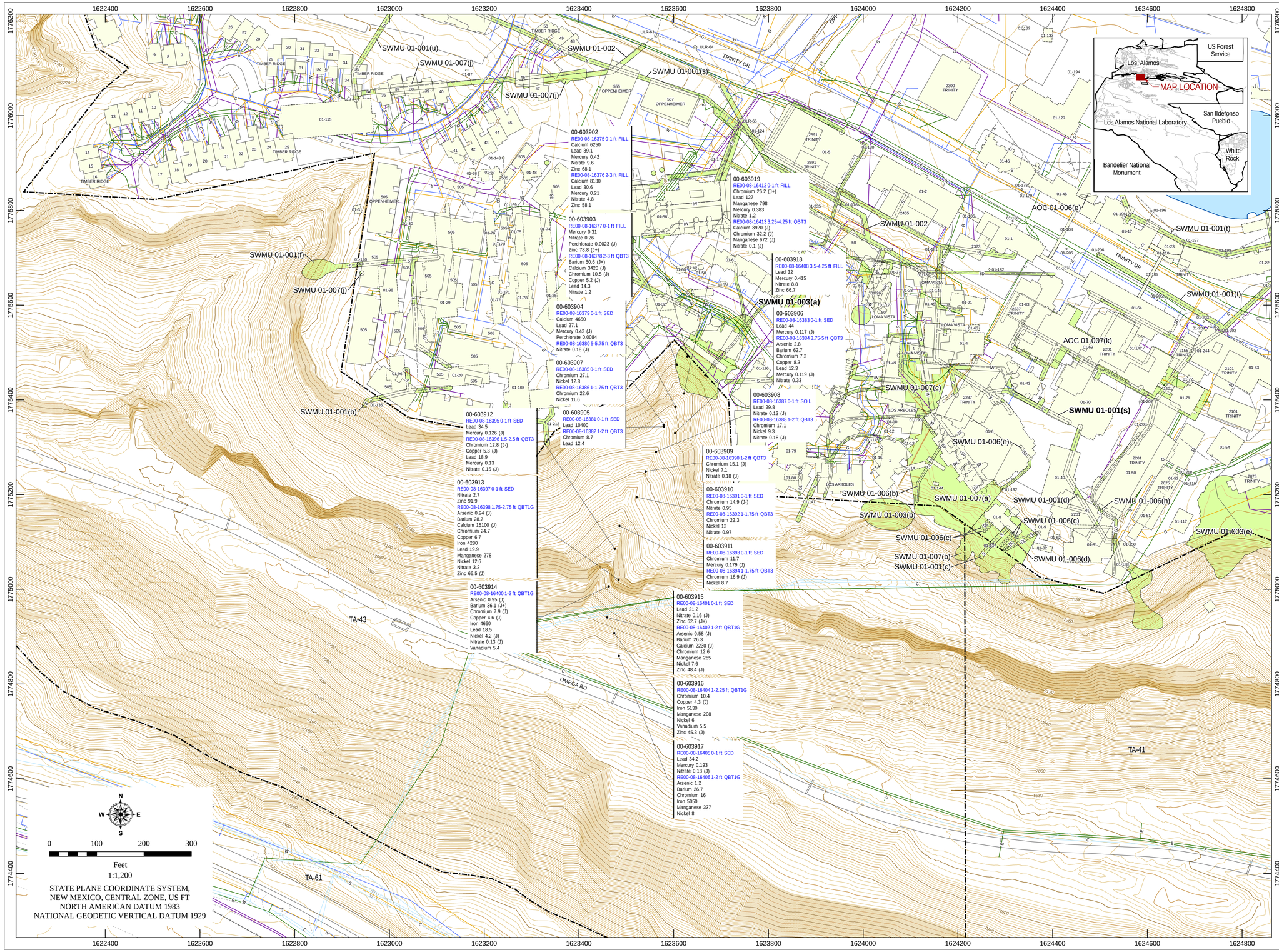
PLATE 6.15-1

SWMU 01-003(a) SITE MAP AND SAMPLING LOCATIONS

LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENTAL PROGRAMS DIRECTORATE
CORRECTIVE ACTIONS PROJECTS
Los Alamos, New Mexico 87545

Map ULA09-IR-18 (R) 20 May 2009 PLANNERER
Los Alamos Technical Associates (LATA-LAO)

This map was created for work processes associated with the Corrective Actions Projects (CAP) of the Los Alamos National Laboratory (LANL) Environmental Programs (EP) Directorate. All other uses for this map should be confirmed with LANL EP-CAP staff.



- Sampled location
- SWMU or AOC

- Structure or building
- Former structure
- Former drain line (DL)
- Former industrial waste (IW)
- Former sewer (S)
- Former storm drain (SD)
- Pond

- Technical Area (TA) boundary
- Fence
- Paved road
- Dirt road

Elevation contours
- 100- and 20-ft contour
- 10-ft contour
- 2-ft contour

Utilities
- Communication (C)
- Electric (E)
- Gas (G)
- Sewer (S)
- Water (W)

Note: Concentration values are mg/kg

FEATURE DATA REFERENCES

Hypsography9; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.
Point Feature Locations; Environmental Restoration Project Database Table View dbo_xGIS_LOCIDS, DATASRV1; Los Alamos National Laboratory, Waste and Environmental Services Division, 20 August 2009.
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Potential Release Site Affected Areas; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; Unknown publication date.
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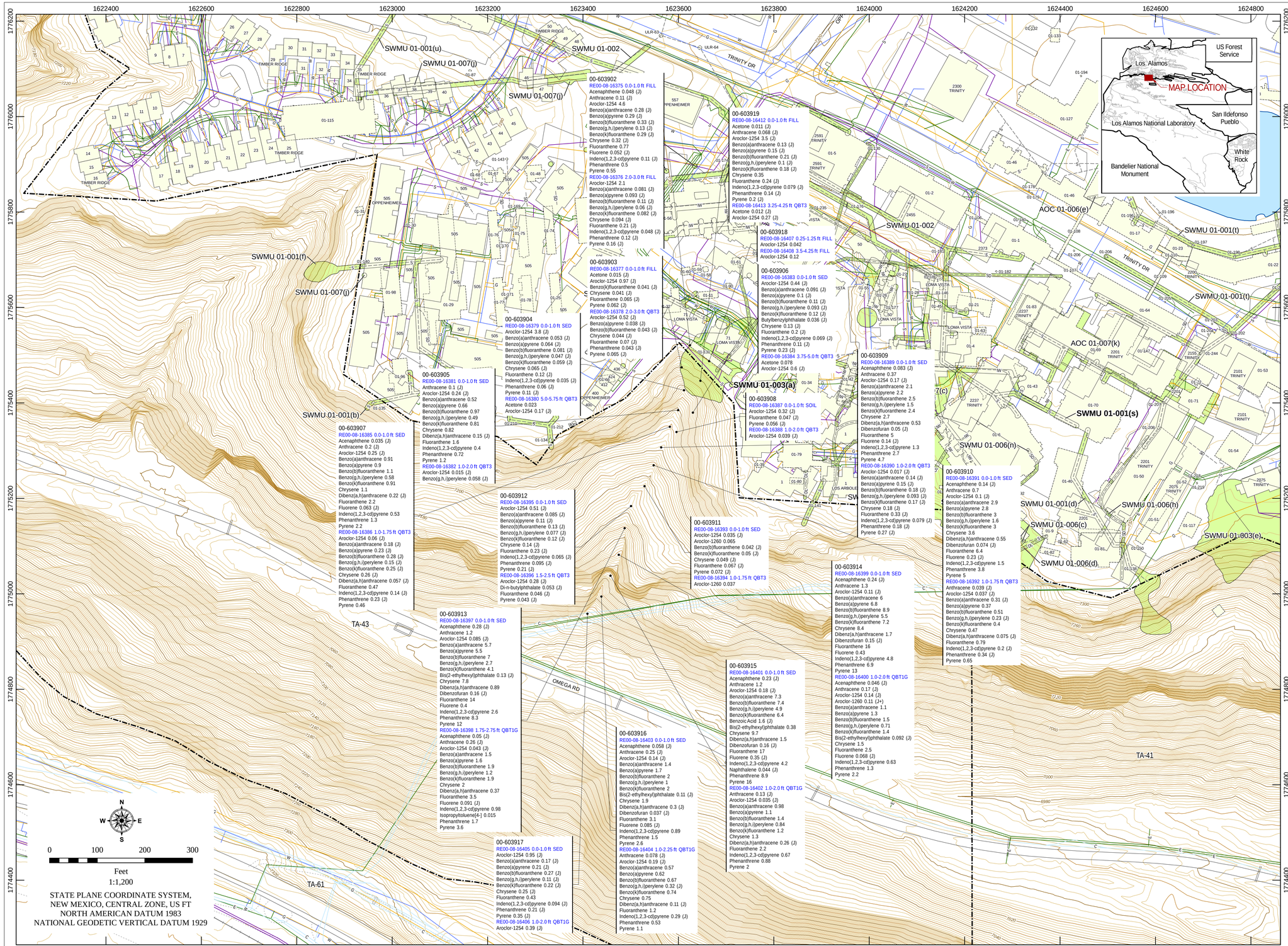
PLATE 6.15-2

INORGANIC COPCs DETECTED OR DETECTED ABOVE BVs AT SWMU 01-003(a)

LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENTAL PROGRAMS DIRECTORATE
CORRECTIVE ACTIONS PROJECTS
Los Alamos, New Mexico 87545

Map ULA09-IR-18R2-INORG 20 August 2009 PLANNERER
NOD Revision 23 December 2009
Los Alamos Technical Associates (LATA-LAO)

This map was created for work processes associated with the Corrective Actions Projects (CAP) of the Los Alamos National Laboratory (LANL) Environmental Programs (EP) Directorate. All other uses for this map should be confirmed with LANL EP-CAP staff.



- Sampled location
- SWMU or AOC

- Structure or building
- Former structure
- Former drain line (DL)
- Former industrial waste (IW)
- Former sewer (S)
- Former storm drain (SD)
- Pond

- Technical Area (TA) boundary
- Fence
- Paved road
- Dirt road

Elevation contours
- 100- and 20-ft contour
- 10-ft contour
- 2-ft contour

Utilities
- Communication (C)
- Electric (E)
- Gas (G)
- Sewer (S)
- Water (W)

Note: Concentration values are mg/kg

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PLATE 6.15-3

ORGANIC CHEMICALS DETECTED AT SWMU 01-003(a)

LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENTAL PROGRAMS DIRECTORATE
CORRECTIVE ACTIONS PROJECTS
Los Alamos, New Mexico 87545

Map ULA09-IR-18-ORG (R) 20 May 2009 PLANNERER
Los Alamos Technical Associates (LATA-LAO)

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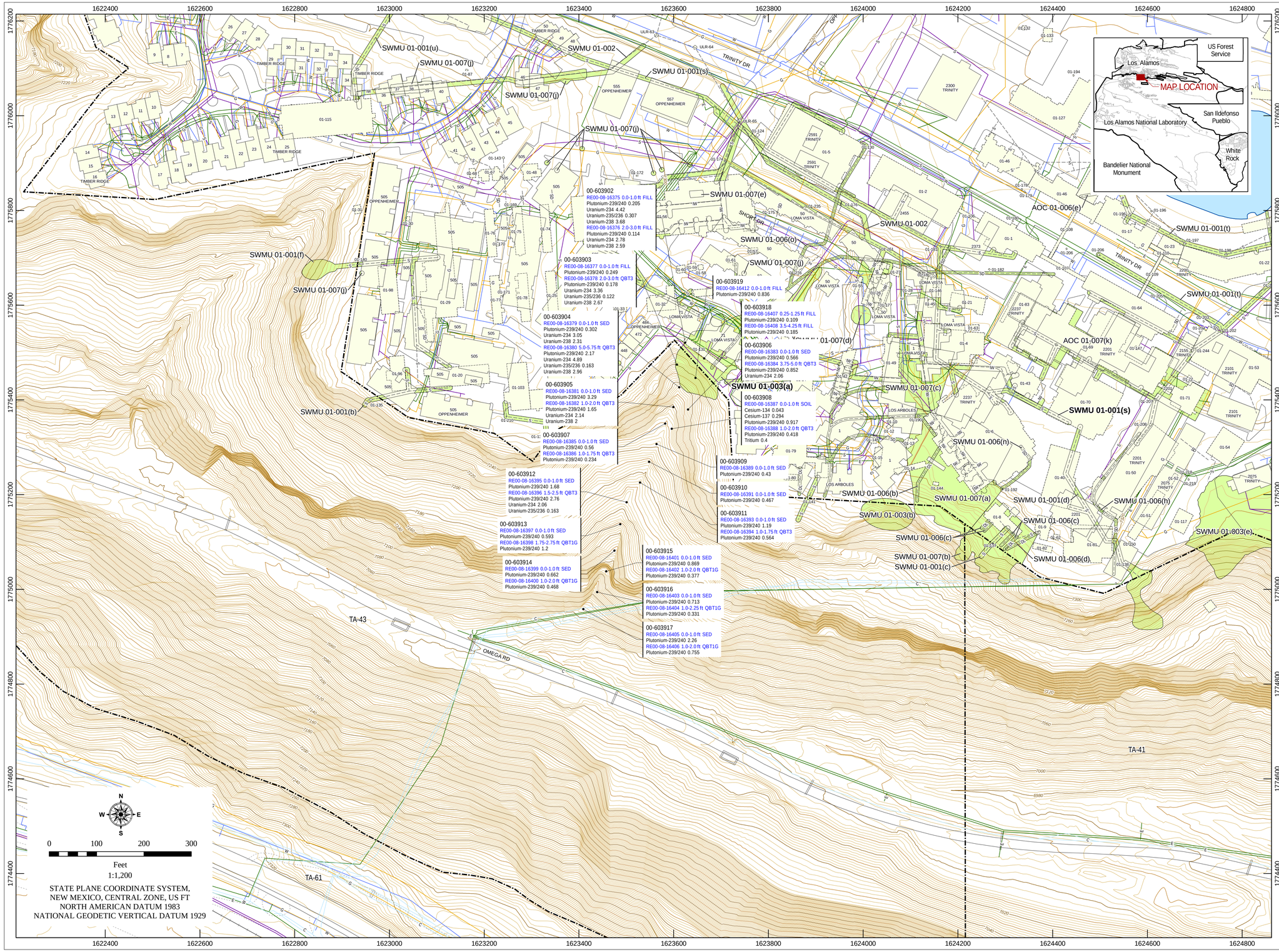

- Sampled location
- SWMU or AOC

- Structure or building
- Former structure
- Former drain line (DL)
- Former industrial waste (IW)
- Former sewer (S)
- Former storm drain (SD)
- Pond

- Technical Area (TA) boundary
- Fence
- Paved road
- Dirt road

Elevation contours
- 100- and 20-ft contour
- 10-ft contour
- 2-ft contour

Utilities
- Communication (C)
- Electric (E)
- Gas (G)
- Sewer (S)
- Water (W)

Note: Concentration values are pCi/g

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PLATE 6.15-4

RADIONUCLIDE COPCs DETECTED OR DETECTED ABOVE BVs/FVs AT SWMU 01-003(a)

LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENTAL PROGRAMS DIRECTORATE
CORRECTIVE ACTIONS PROJECTS
Los Alamos, New Mexico 87545

Map ULA09-IR-18-RAD (R) 20 May 2009 PLANNERER
Los Alamos Technical Associates (LATA-LAO)

This map was created for work processes associated with the Corrective Actions Projects (CAP) of the Los Alamos National Laboratory (LANL) Environmental Programs (EP) Directorate. All other uses for this map should be confirmed with LANL EP-CAP staff.

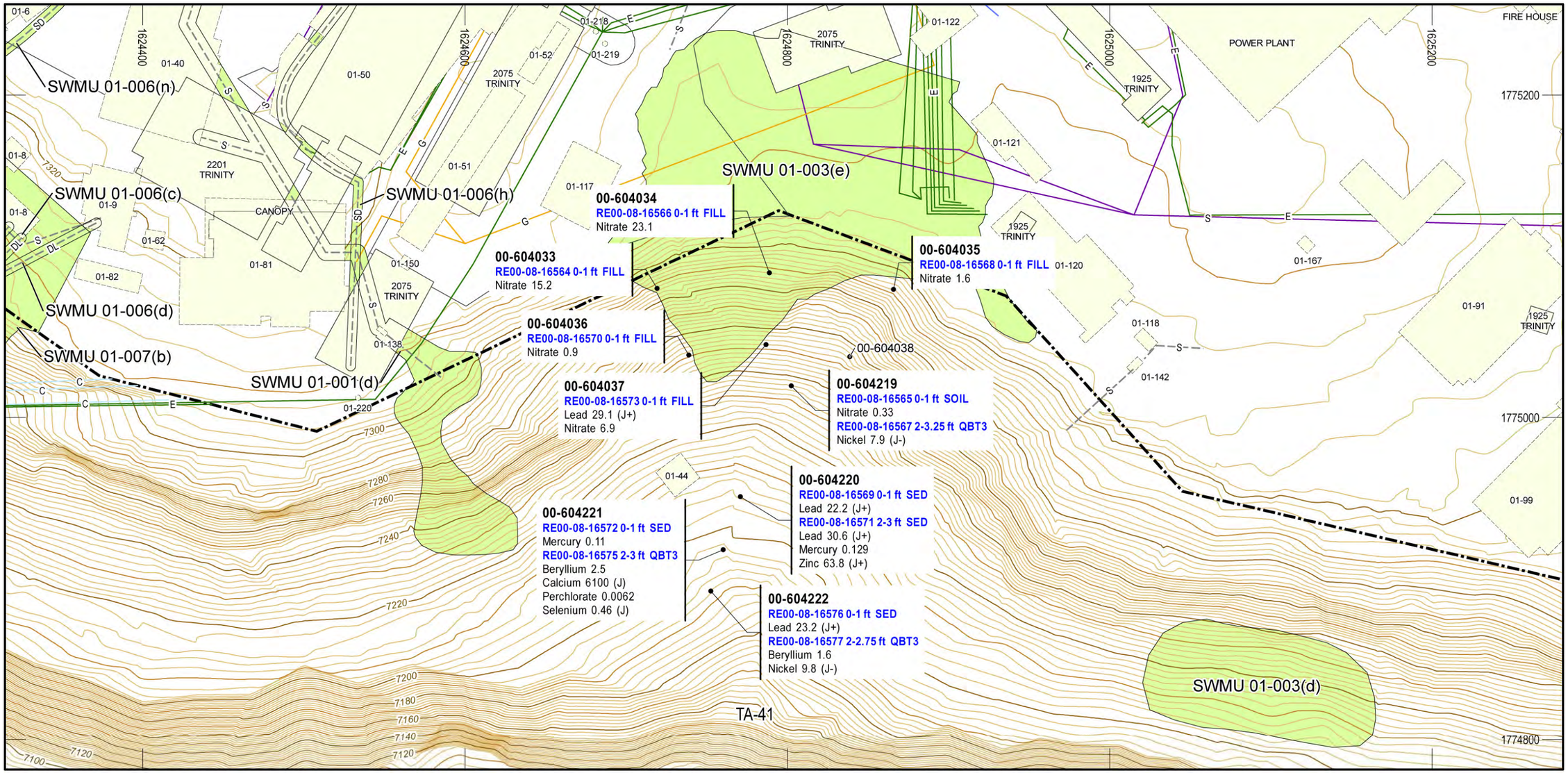


Figure 6.18-2 Inorganic COPCs detected or detected above BVs at SWMU 01-003(e)

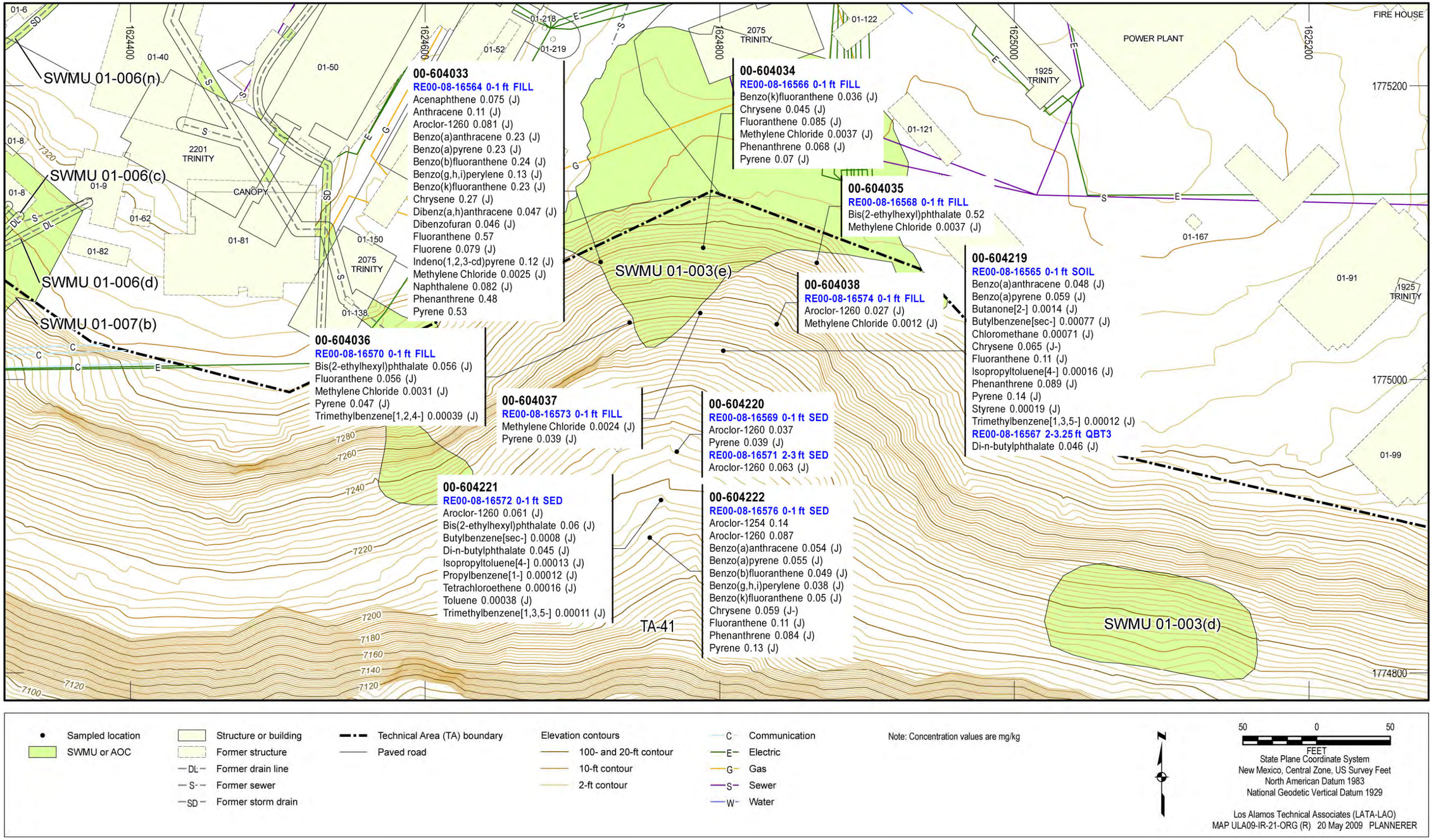
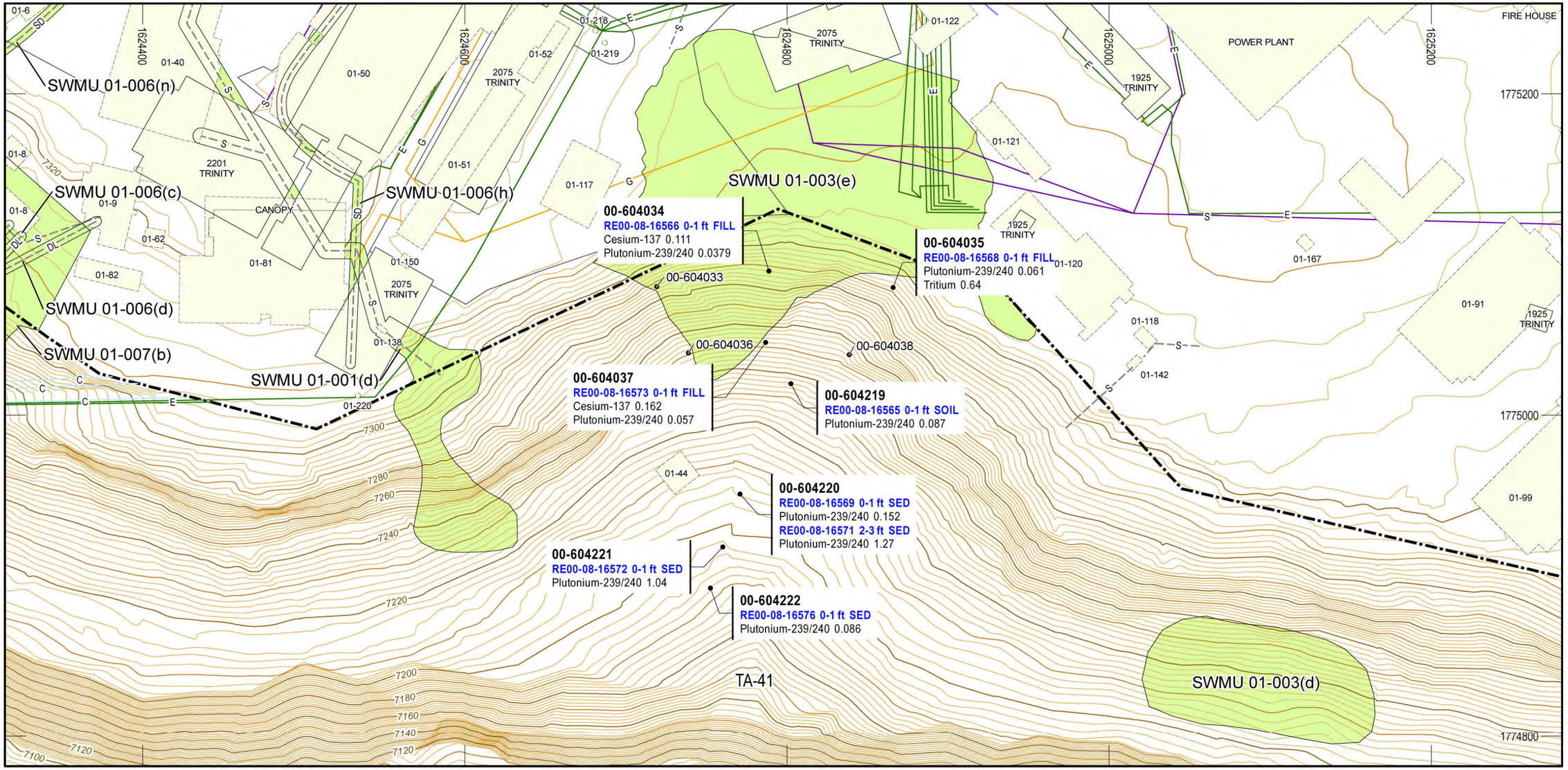


Figure 6.18-3 Organic COPCs detected at SWMU 01-003(e)



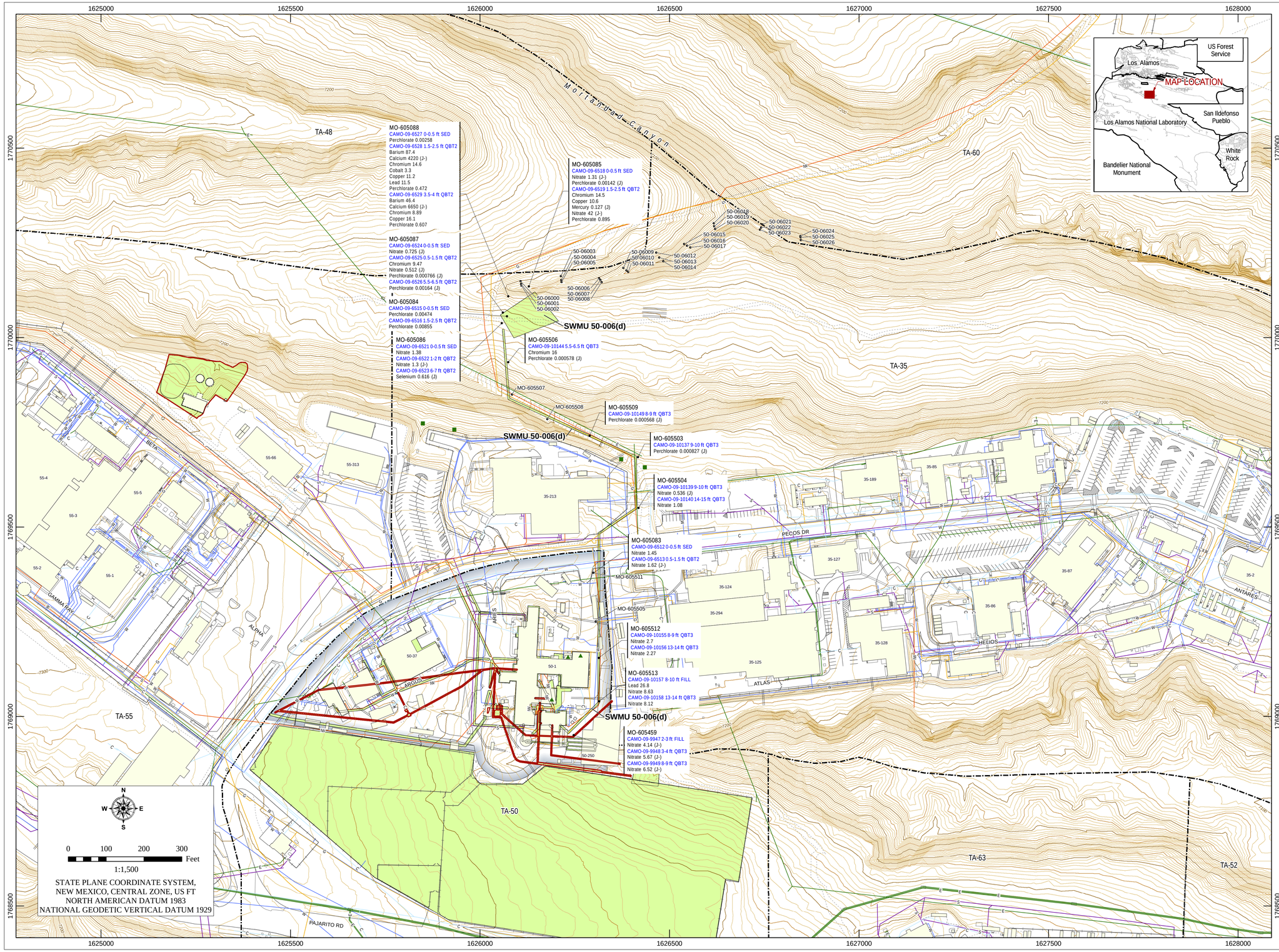
Sampled location
SWMU or AOC
Structure or building
Former structure
Former drain line
Former sewer
Former storm drain
Technical Area (TA) boundary
Paved road
Elevation contours
100- and 20-ft contour
10-ft contour
2-ft contour
Communication
Electric
Gas
Sewer
Water

Note: Concentration values are pCi/g

50 0 50
FEET
State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929

Los Alamos Technical Associates (LATA-LAO)
MAP ULA09-IR-21-RAD 01 May 2009 PLANNERER

Figure 6.18-4 Radionuclide COPCs detected or detected above BVs/FVs at SWMU 01-003(e)



- Sampling location
- SWMU or AOC
- Consolidated unit
- SWMU or AOC within building
- SWMU or AOC outfall
- SWMU 50-006(c) - stack emissions

- Structure or building
- Former structure

- Technical Area (TA) boundary
- Fence
- Paved road
- Dirt road

Elevation contours
- 100- and 20-ft contour
- 10-ft contour
- 2-ft contour

Utilities
- C Communication
- E Electric
- G Gas
- IW Industrial waste
- S Sewer
- W Water

Note: Concentration values are mg/kg

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PLATE 26

INORGANIC CHEMICALS DETECTED OR DETECTED ABOVE BVs AT SWMU 50-006(d)

LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENTAL PROGRAMS DIRECTORATE
CORRECTIVE ACTIONS PROJECTS
Los Alamos, New Mexico 87545

Revised 05/14/14, LANL
Map UMC09IR-44-0-INORG 24 September 2009 PLANNERER
Los Alamos Technical Associates (LATA-LAO)

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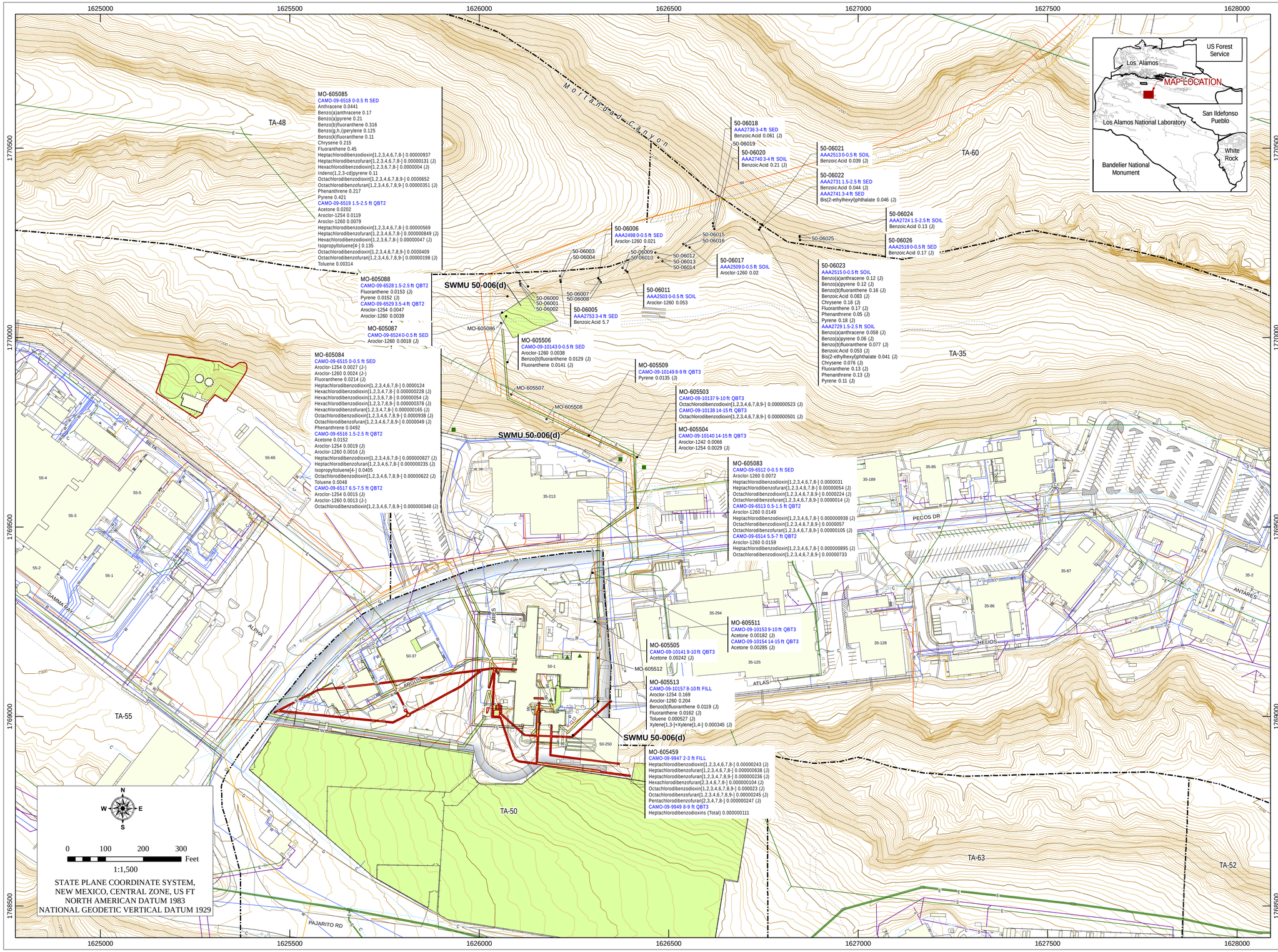

- Sampling location
- SWMU or AOC
- Consolidated unit
- SWMU or AOC within building
- SWMU or AOC outfall
- SWMU 50-006(c) - stack emissions

- Structure or building
- Former structure

- Technical Area (TA) boundary
- Fence
- Paved road
- Dirt road

Elevation contours
- 100- and 20-ft contour
- 10-ft contour
- 2-ft contour

Utilities
- Communication
- Electric
- Gas
- Industrial waste
- Sewer
- Water

Note: Concentration values are mg/kg

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PLATE 27

ORGANIC CHEMICALS DETECTED AT SWMU 50-006(d)

LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENTAL PROGRAMS DIRECTORATE
CORRECTIVE ACTIONS PROJECTS
Los Alamos, New Mexico 87545

Revised 05/15/14, LANL
Map UMC09IR-44-0-ORG 24 September 2009 PLANNERER
Los Alamos Technical Associates (LATA-LAO)

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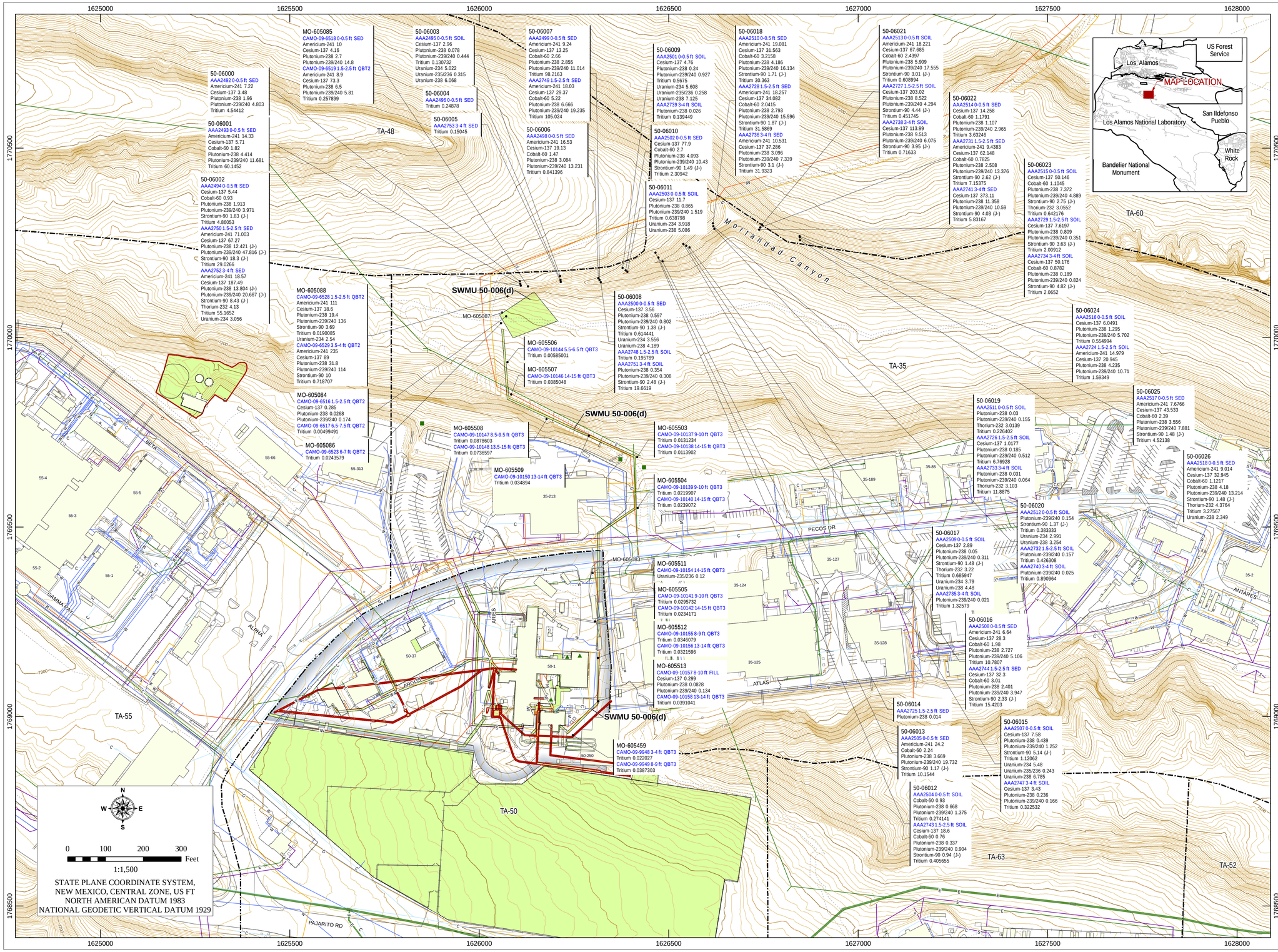

- Sampling location
- SWMU or AOC
- Consolidated unit
- SWMU or AOC within building
- SWMU or AOC outfall
- SWMU 50-006(c) - stack emissions
- Structure or building
- Former structure
- Technical Area (TA) boundary
- Fence
- Paved road
- Dirt road

Elevation contours
- 100- and 20-ft contour
- 10-ft contour
- 2-ft contour

Utilities
- C Communication
- E Electric
- G Gas
- W Industrial waste
- S Sewer
- W Water

Note: Concentration values are pCi/g

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PLATE 28

RADIONUCLIDES DETECTED OR DETECTED ABOVE BVs/FVs AT SWMU 50-006(d)

LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENTAL PROGRAMS DIRECTORATE
CORRECTIVE ACTIONS PROJECTS
Los Alamos, New Mexico 87545

Revised 05/15/14, LANL
Map UMC09IR-44-0-RAD 24 September 2009 PLANNERER
Los Alamos Technical Associates (LATA-LAO)

This map was created for work processes associated with the Corrective Actions Projects (CAP) of the Los Alamos National Laboratory (LANL) Environmental Programs (EP) Directorate. All other uses for this map should be confirmed with LANL EP-CAP staff.

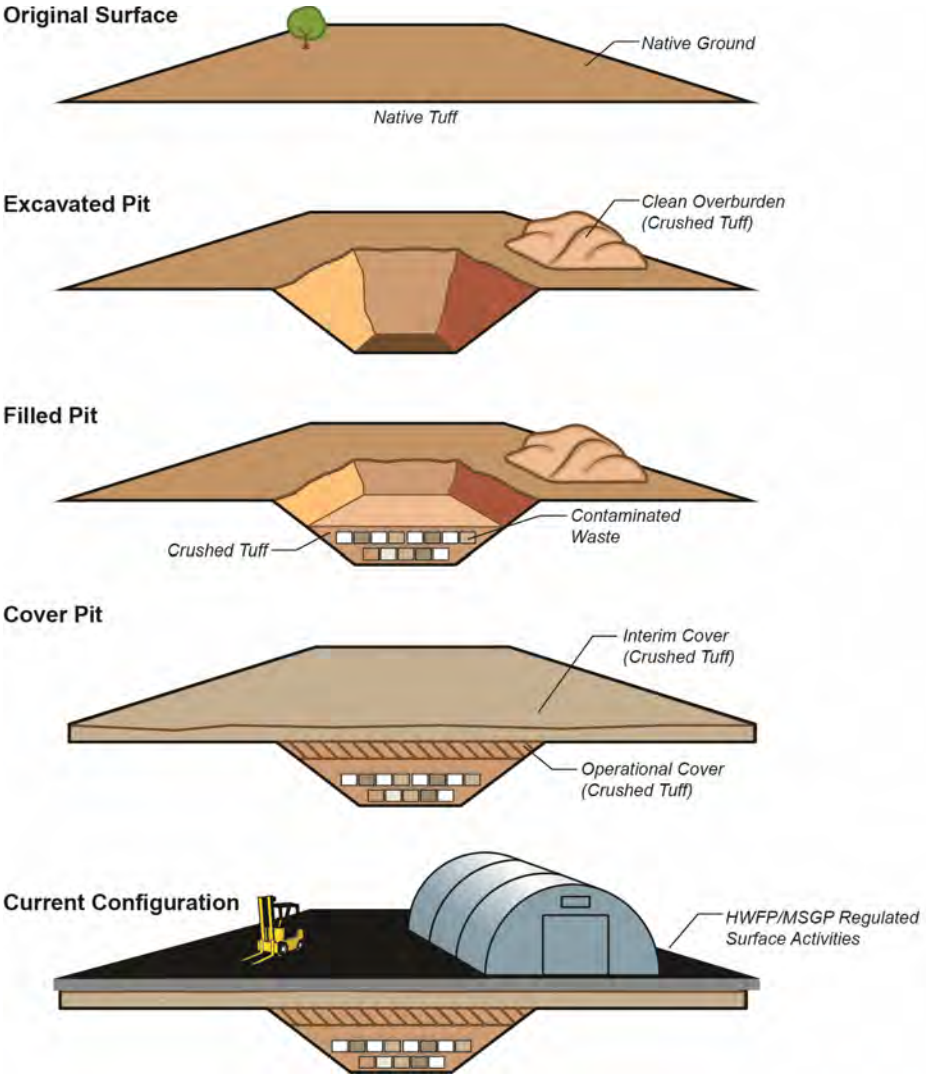


Figure 2 Typical pit evolution at Area G

Waste placement operation protocol for Pits 1 through 5 at Site 54-017 required wastes to be placed no closer than within 2 ft of the existing land surface (Koopman1965). The remaining capacity of each pit was filled and compacted with crushed tuff. This final layer of fill/tuff is referred to as the operational cover. Waste disposal operations at disposal Pits 1 through 5 (i.e., that portion of Site 54-017 within the PJ-SMA-20 drainage area) were complete and the pits covered by 1974 (Rogers 1977a). After 1974, additional activities at Area G provided added cover thickness over the pits. This cover is identified as the interim cover and was the result of grading and stabilization activities for erosion control that began in the mid-1970s and the placement of additional fill over the site to support the more recent construction of facilities and infrastructure (such as temporary domes, storage pads and asphalt areas) for managing mixed

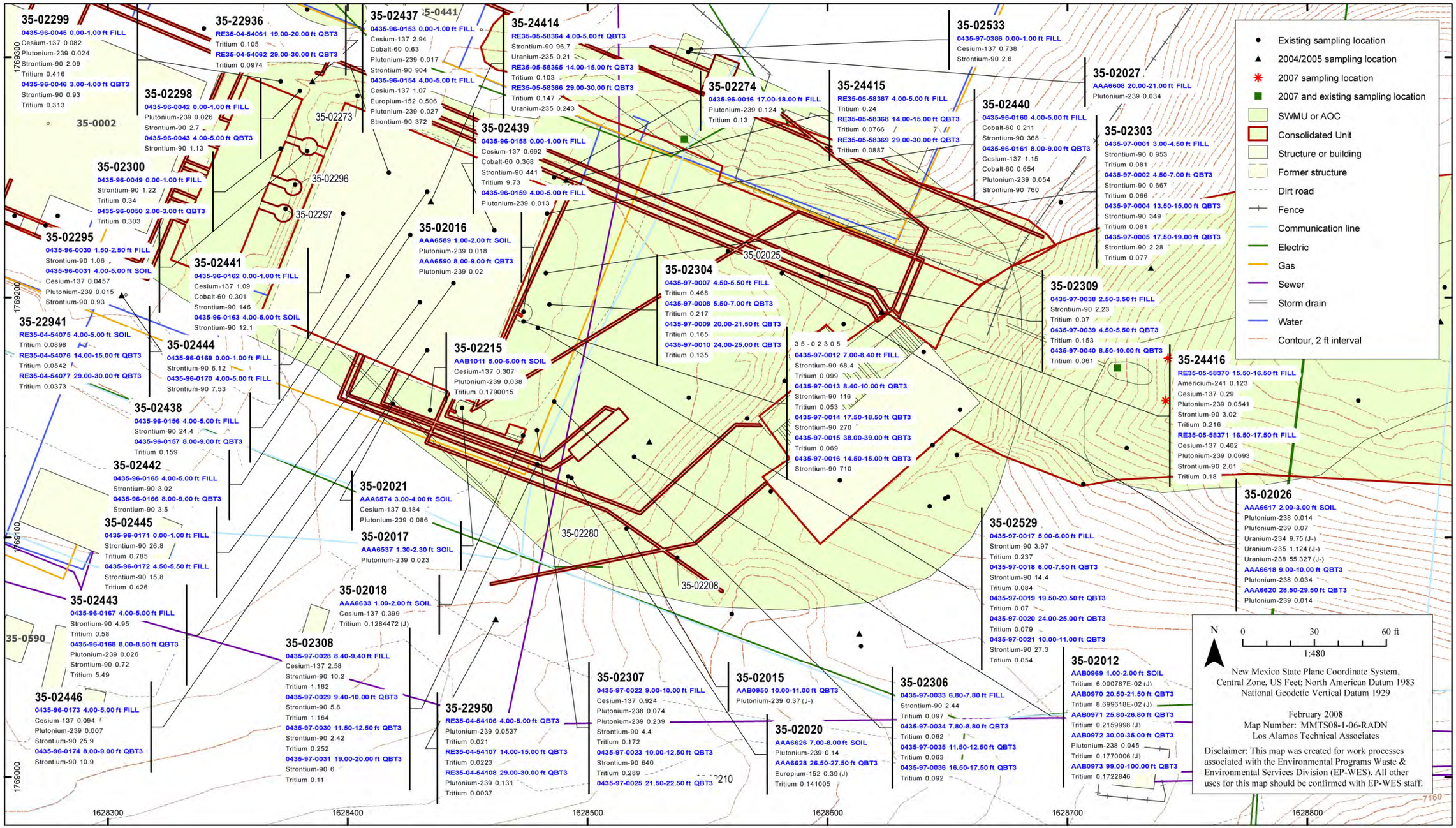


Figure F-3.2-15 Mesa Top Area E radionuclide COPCs detected above background values in all media (1 of 2)

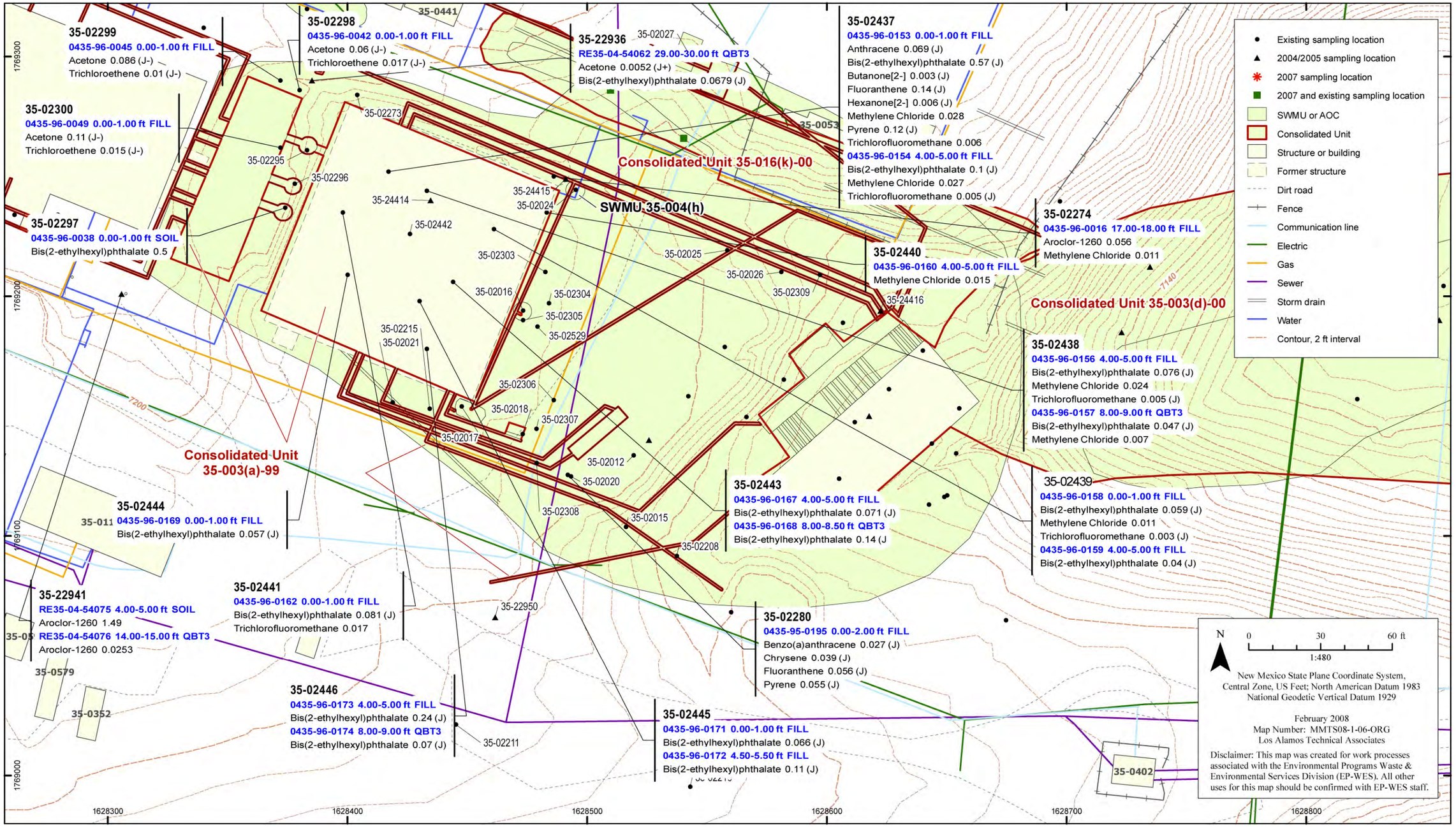


Figure F-3.2-20 Mesa Top Area E organic COPCs detected in all media

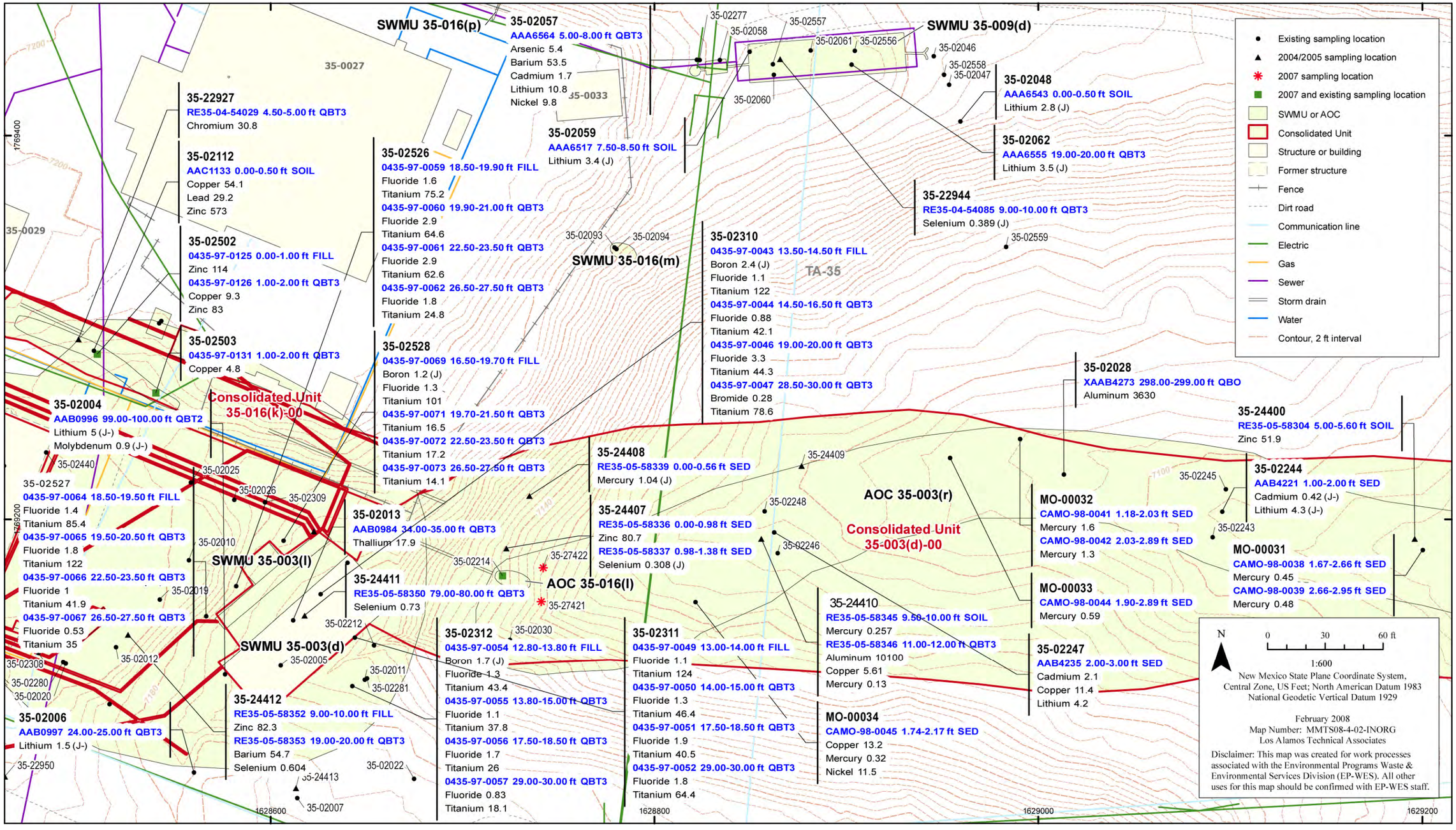


Figure F-6.2-4 Pratt Canyon Area A inorganic COPCs detected above background values in all media

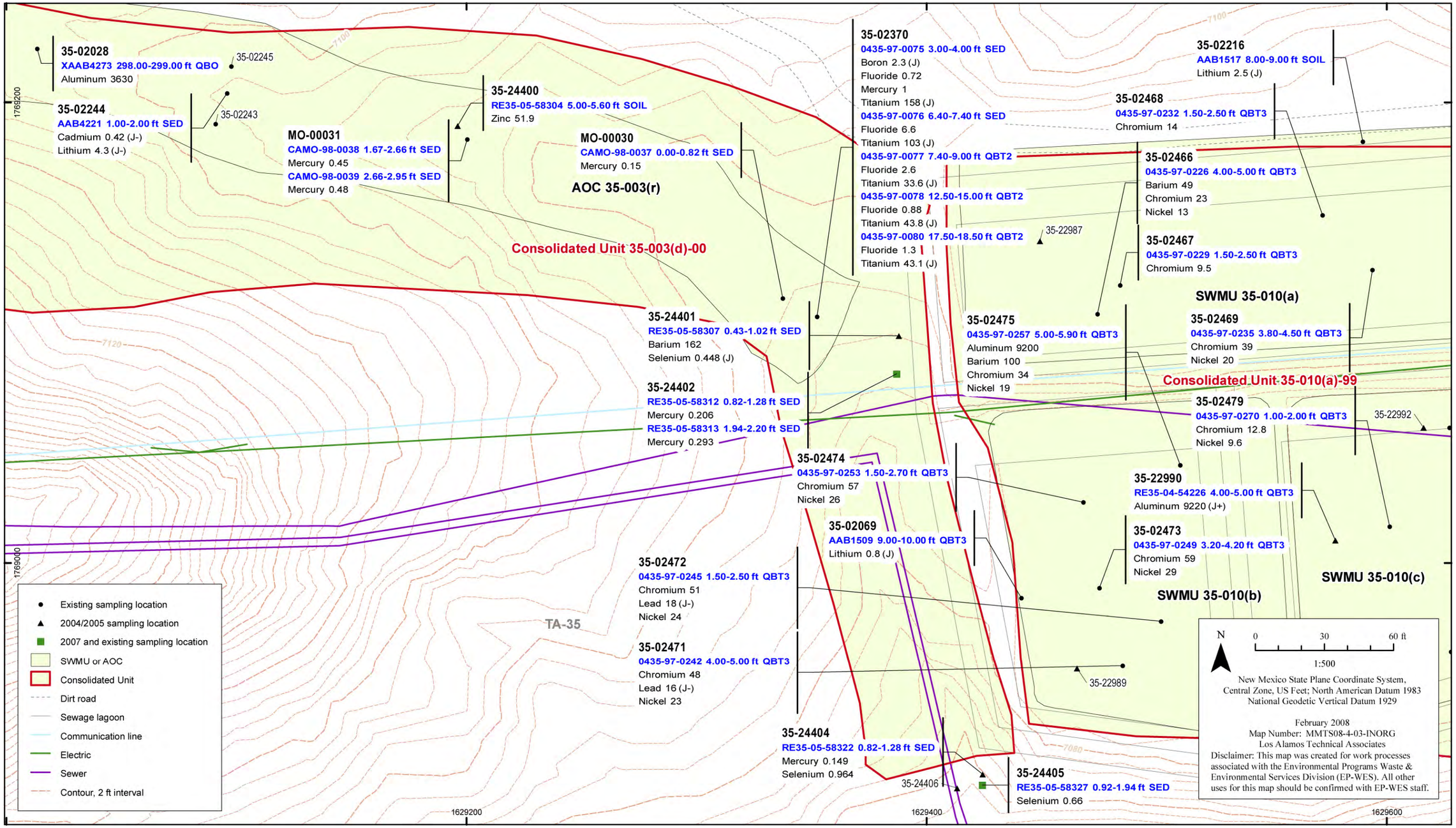
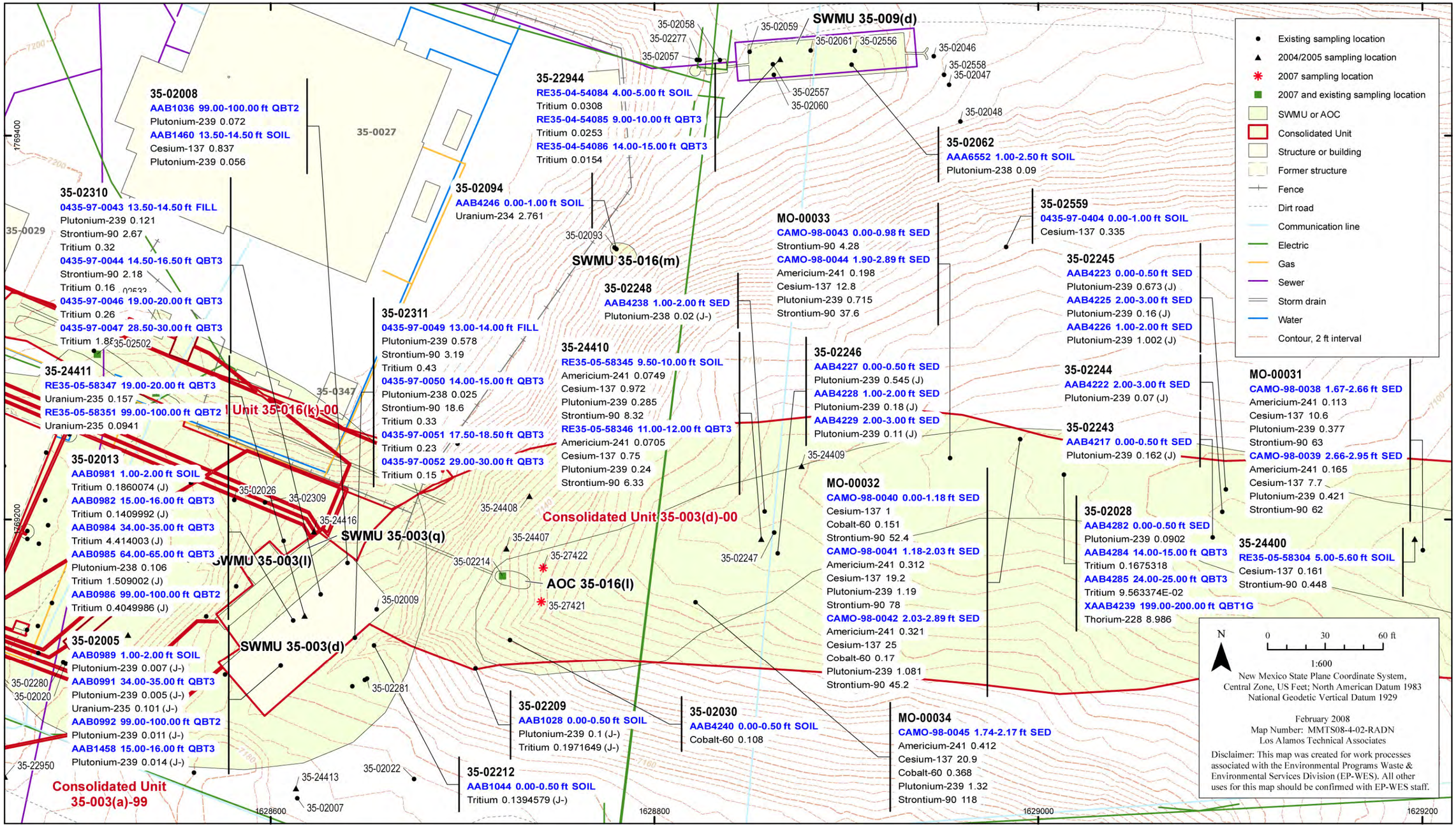


Figure F-6.2-5 Pratt Canyon Area B inorganic COPCs detected above background values in all media



Figue F-6.2-6 Pratt Canyon Area A radionuclide COPCs detected above background/fallout values in all media

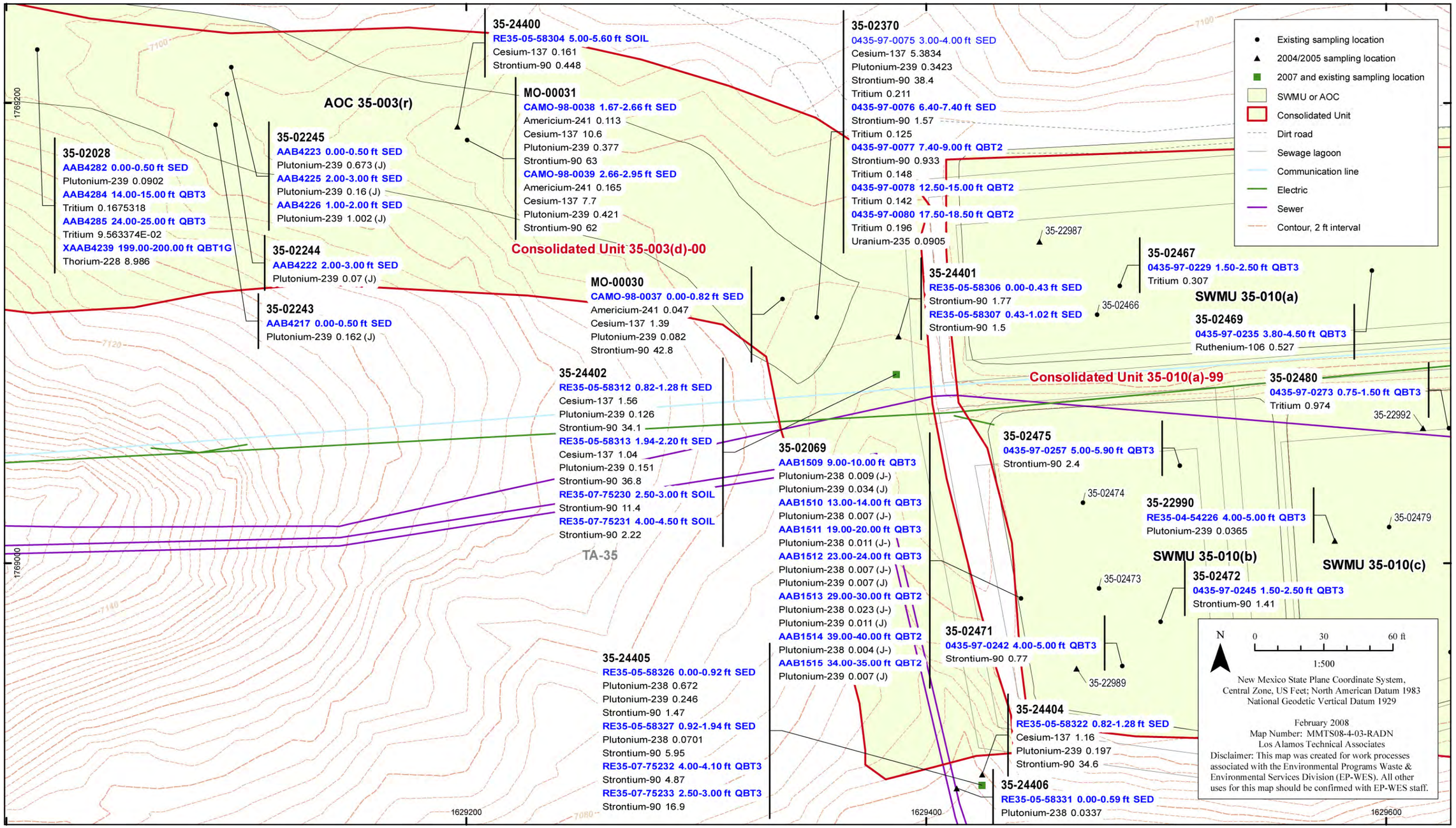


Figure F-6.2-7 Pratt Canyon Area B radionuclide COPCs detected above background values in all media

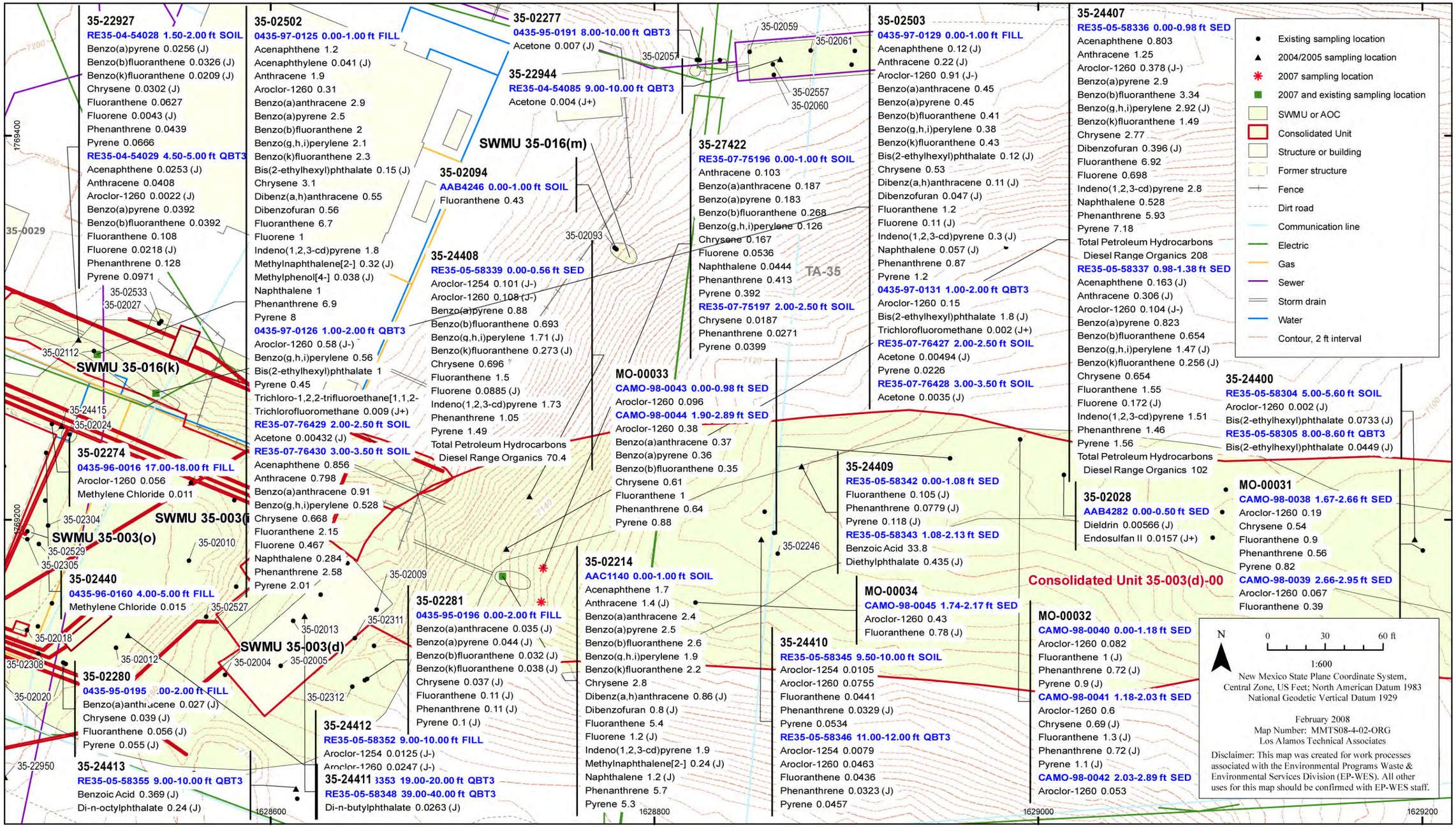


Figure F-6.2-8 Pratt Canyon Area A organic COPCs detected above background values in all media

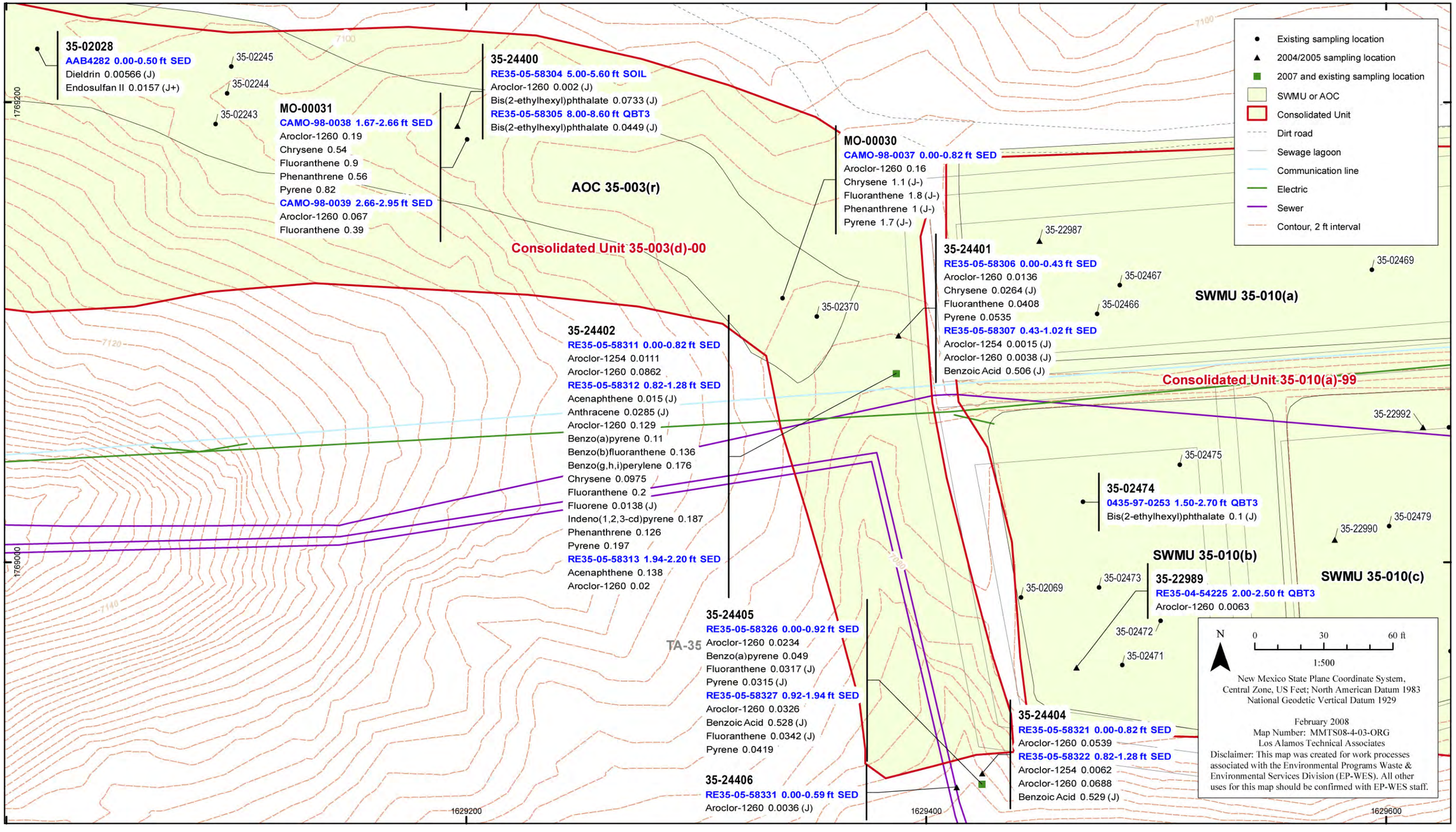


Figure F-6.2-9 Pratt Canyon Area B organic COPCs detected in all media

1632100 1632400 1632700 1633000 1633300 1633600 1633900

1777500 1777000 1776500

Pueblo Canyon

6680 6720 6740 6760 6840 6860 6880 6900 6920 6940 6960 6980 7020 7040 7060 7080 7120 7140 7160

73-25620 73-02451 73-25619 73-25611 73-02452 73-25601 73-25610 73-25618 73-25600 73-25609 73-25617 73-25599 73-25608 73-25616 73-25598 73-25607 73-25615 73-25597 73-25614 73-25606 73-25596 73-25613 73-25605 73-02255 73-25595 73-02254 73-25612 73-25604 73-27681 73-27679 73-25594 73-27680 73-25570 73-02253 73-25571 73-25572 73-25573 73-25574 73-27678 73-25569 73-27311 73-27312 73-27313 73-27314 73-27315 73-27284 73-27304 73-27305 73-27306 73-27307 73-27308 73-27309 73-27310 73-25575 73-27283 73-27297 73-25593 73-27298 73-27299 73-27300 73-27301 73-27302 73-27303 73-25564 73-27292 73-27293 73-27294 73-27295 73-27296 73-25563 73-27287 73-27288 73-27289 73-25568 73-25562 73-27280 73-27279 73-27286 73-27290 73-27291 73-25567 73-27285 73-25566 73-25561 73-27281 73-27316 73-27319 73-27282 73-25565

73-0002 73-0003 73-0001

- Sample location
- Drainage
- Paved road
- Unpaved road
- 20-ft contour interval
- Consolidated unit boundary
- Structure

N

Feet
0 25 50 100 150 200

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD83, NGVD29

Plate 1 Sampling locations at SWMU 73-002

Russell Lyon 12/21/06
Tom Gagliano 06/29/07
Revised Tom Gagliano 07/02/07

Disclaimer: This map was created for work processes associated with the Investigation Report for Consolidated Unit 73-002-99 and Corrective Action of SWMU 73-002. All other uses for this map should be confirmed with the LANL Environmental Programs Directorate.

1632100 1632400 1632700 1633000 1633300 1633600 1633900

1777500 1777000 1776700 1776600

Pueblo Canyon

6680 6720 6740 6760 6780 6800 6820 6840 6860 6880 6900 6920 6940 6960 6980 7000 7020 7040 7060 7080 7100 7120 7140 7160

73-25611
0.00-0.25 ft
Nitrate 0.88(J)

73-25610
0.00-0.25 ft
Nitrate 2.07(J)
Selenium 1.84(J)

73-27312
0.00–0.50 ft
Lead 11.8
Selenium 0.46 (J)
2.00–2.50 ft
Selenium 0.39 (J)

73-25620

73-02451
0.50-1.00 ft
Thallium 0.87(J)

73-25619

73-25606
0.00-0.25 ft
Lead 45.5(J+)
Nitrate 0.828(J)
Silver 1.18
Zinc 64.7

73-25609
0.00-0.25 ft
Nitrate 2.12(J)

73-02452
0.10-0.50 ft
Thallium 0.8(J)

73-25618
0.00-0.25 ft
Nitrate 9.35

73-25614
0.00-0.25 ft
Calcium 6140 (J+)
Lead 232
Perchlorate 0.000687(J)
Zinc 61.1

73-25601
0.00-0.25 ft
Nitrate 0.956(J)
Perchlorate 0.00112(J)

73-25600
0.00-0.25 ft
Lead 26.6(J)
Nitrate 0.94(J)
Zinc 88.6

73-25597
0.00-0.25 ft
Lead 25.1(J)
Nitrate 0.898(J)
Zinc 56.4
1.0–2.0 ft
Lead 24.9
Zinc 56.8

73-25596
0.00-0.25 ft
Nitrate 1.11

73-25595
0.00-0.25 ft
Lead 22.7(J)
Nitrate 1.06
Zinc 91.9

73-25594
0.00-0.25 ft
Lead 51.7(J)
Nitrate 0.959(J)
Perchlorate 0.000826(J)
Silver 1.3(J)
Zinc 105

73-25574
0.00-0.50 ft
Calcium 2940
Selenium 0.6
2.00–2.50 ft
Selenium 0.44

73-27307
2.00–2.50 ft
Copper 4.7

73-27680
2.00–2.50 ft
Selenium 0.84

73-25605
0.00-0.25 ft
Lead 37(J+)
Nitrate 1.04(J)
Silver 9.22
Zinc 78.7

73-25613
0.00-0.25 ft
Lead 36.7
Nitrate 8.46
Zinc 50.6

73-25617

73-25599
0.00-0.25 ft
Lead 30.5(J)
Nitrate 1.43
Perchlorate 0.000821(J)
Silver 1.07(J)
Zinc 73.2

73-25573
0.00-0.50 ft
Lead 12.5 (J)
Selenium 0.37
2.00–2.50 ft
Selenium 0.45

73-27308

73-27314
0.00–0.50 ft
Arsenic 13.2

73-27681
2.00–2.50 ft
Selenium 0.4 (J)

73-25608
0.00-0.25 ft
Nitrate 1.66(J)

73-25569
2.0–3.0 ft
Nitrate 0.766 (J-)
Perchlorate 0.000548 (J)
Zinc 61.1
2.0-2.5 ft
Selenium 0.36 (J)

73-02255
0.00-0.50 ft
Lead 48
Zinc 52(J-)

73-27679
0.00–0.50 ft
Lead 11.8 (J+)
2.00–2.50 ft
Selenium 0.33 (J)

73-25616
0.00-0.25 ft
Lead 30.9

73-25598
0.00-0.25 ft
Nitrate 2.66
Zinc 55.3

73-25607
0.00-0.25 ft
Lead 23.4(J+)
Nitrate 1.03(J)

73-25615
0.00-0.25 ft
Lead 50.6
Zinc 58.2

73-27313
0.00–0.50 ft
Copper 5.3
Selenium 0.32 (J-)
2.00–2.50 ft
Selenium 0.47 (J-)

73-02253

73-27678
3.50–4.00 ft
Perchlorate 0.0056
Selenium 0.34 (J-)
5.50–6.00 ft
Perchlorate 0.0035 (J)
Selenium 0.45 (J-)

73-27299
0.0-1.5 ft
Arsenic 5.05
Barium 55.8
Copper 13.6
Lead 42.6 (J+)
Selenium 0.67 (J)
Silver 2.1 (J)
2.0-3.5 ft
Arsenic 3.96
Barium 80.6
Copper 27.8
Iron 19300 (J)
Lead 61.5 (J+)
Selenium 0.702 (J)
Silver 2.69 (J)
Zinc 97.1 (J+)

73-27284
0.0–2.0 ft
Lead 23.7
Silver 5.39
Zinc 49.7

73-27298
0.0–1.0 ft
Copper 50.4
Lead 98.6 (J+)
Nickel 81.6
Silver 1.25 (J)
Zinc 104 (J+)

73-27297
0.0–0.5 ft
Arsenic 3.43
Barium 66.7
Copper 18.1
Iron 15600 (J)
Lead 90 (J+)
Nickel 10.3
Selenium 0.61 (J)
Silver 2.47 (J)
Zinc 79.1 (J+)

73-27300

73-02254
0.00-0.50 ft
Zinc 470(J-)

73-25572
0.00-0.50 ft
Selenium 0.32 (J-)
Zinc 71
2.00–2.50 ft
Selenium 0.47 (J-)
Zinc 71.9

73-25571
2.00–2.50 ft
Selenium 0.71

73-25604

73-25612
0.0-0.25 ft
Lead 48.9
Zinc 52.8

73-25570
0.00–0.50 ft
Selenium 0.38 (J)
2.00–2.50 ft
Selenium 0.48 (J)

73-27294
0.0–1.5 ft
Arsenic 5.81
Barium 68.1
Copper 16.2
Lead 24.6
Silver 1.52
Zinc 88.4
2.0–3.0 ft
Copper 7.88

73-25575
0.00-0.50 ft
Selenium 0.34
1.50–2.00 ft
Selenium 0.34

73-27309
2.00–2.50 ft
Selenium 0.31

73-27301
2.5–3.5 ft
Perchlorate 0.000727 (J-)

73-25593
0.00-0.25 ft
Lead 27.2(J)
Nitrate 0.876(J)
Zinc 61.7

73-27283
0.0–1.0 ft
Lead 28.7
Zinc 55.2

73-27293

73-27310
0.00–0.50 ft
Copper 4.8
Lead 20.2 (J)

73-27302
0.00–0.50 ft
Lead 124 (J)
Selenium 0.34
2.00–2.50 ft
Selenium 0.61

73-27292

73-27311

73-27304

73-27305

73-27306

73-27315

73-25564

73-27297

73-25563
0.00-0.50 ft
Nitrate 0.808(J)
1.00-2.00 ft
Nitrate 0.839(J)

73-27303
0.00–0.50 ft
Barium 66.4 (J)
Copper 8.6
Lead 25.6 (J)
Silver 1.2
1.00–1.50 ft
Copper 5.8
Lead 17.5 (J)
Selenium 0.33

73-27296
0.00–0.50 ft
Selenium 0.39 (J-)
2.00–2.50 ft
Selenium 0.32 (J-)

73-27295

73-27287

73-27288

73-25562
0.00-0.50 ft
Nitrate 0.843(J)
Silver 4.09
Zinc 59.3
1.00-2.00 ft
Nitrate 0.844(J)
2.5-4.0 ft
Chromium 58.6

73-27280
0.0–1.5 ft
Cadmium 1.03
Copper 39.3 (J)
Lead 178 (J)
Silver 2.36
Zinc 126
1.5–2.5 ft
Chromium 15.9
Copper 10.2 (J)
Lead 27.4(J)
3.5–5.0 ft
Cyanide (Total) 0.757

73-27279
0.0–1.0 ft
Copper 24 (J)
Lead 47.4 (J)
Mercury 0.345
Silver 2.67
Uranium 3.22
Zinc 83.5
1.5–2.75 ft
Chromium 9.94
3.5–4.5 ft
Chromium 9.07
Copper 14.5 (J)
Lead 12.6 (J)

73-25568
0.0–1.0 ft
Cadmium 0.926
Copper 35.2
Lead 70.2
Mercury 0.104
Silver 4.5
Zinc 136
3.0–4.5 ft
Copper 5.33
Lead 11.3

73-27290
0.0–1.5 ft
Lead 13.2

73-27291
0.0–2.0 ft
Zinc 51.9

73-27281
0.00–0.50 ft
Cadmium 5.8
Copper 22.7 (J+)
Lead 204 (J+)
Perchlorate 0.0075
Silver 5.6 (J+)
Zinc 105 (J-)
1.5–2.5 ft
Barium 154
Chromium 16
Copper 12.1 (J)
Lead 20 (J)
Perchlorate 0.000594 (J)
Silver 4.78
Zinc 66.2
3.5–4.5 ft
Barium 164
Chromium 17.5
Copper 12.3 (J)
Lead 21 (J)
Silver 5.89
Zinc 68.8

73-27286
0.0–2.0 ft
Perchlorate 0.000986 (J-)
Potassium 3610
Sodium 969
2.0–3.0 ft
Aluminum 11200 (J+)
Barium 62.4
Chromium 8.48
3.0–5.0 ft
Aluminum 13600 (J+)
Barium 46.5
Chromium 8.78
Selenium 1.08 (J)

73-0002

73-27319
0.00–0.50 ft
Barium 62.6
Lead 23.9 (J)
Perchlorate 0.0024 (J)

73-27316
0.0–1.0 ft
Silver 1.81
1.0–2.0 ft
Aluminum 9240 (J+)
Barium 85.6 (J+)
Lead 12.7

73-27289
0.0–2.5 ft
Copper 4.87
Lead 12.9

73-0003

73-0001

73-25566
1.0-2.0 ft
Nitrate 0.869 (J-)
2.0–3.0 ft
Perchlorate 0.000569 (J-)

73-27285

73-27282
0.0–2.0 ft
Cadmium 0.536 (J)
Copper 21.8
Lead 54.6
Silver 4.72
Zinc 120
2.5–3.75 ft
Barium 49.6
Calcium 2370
4.0–5.0 ft
Calcium 6070
Magnesium 1790

73-25567
0.00-0.50 ft
Nitrate 0.836(J-)
2.00-3.00 ft
Nitrate 0.839(J-)

73-25565
0.0–1.0 ft
Lead 24
Silver 1.69
Zinc 61.4
3.0–4.0 ft
Cadmium 0.5 (J)
Lead 44.8
Silver 8.13
Zinc 76.5

Sample location
Drainage
Paved road
Unpaved road
20-ft contour interval
Consolidated unit boundary
Structure

N

Note: Units are milligrams per kilogram (mg/kg).

Feet
0 25 50 100 150 200

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD83, NGVD29

Plate 2 Inorganic chemicals detected above BVs in samples at SWMU 73-002

Carrie Ancell 05/08/07
Revised 05/09/07
Thomas Gagliano 05/15/07
Revised 07/05/07

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1632100 1632400 1632700 1633000 1633300 1633600 1633900

1777500 1778000 1778500

Pueblo Canyon

6680 6720 6740 6760 6840 6860 6880 6900 6920 6940 6960 6980 7020 7060 7080 7120 7140 7160

73-25610
0.00-0.25 ft
Americium-241 0.303
Cesium-137 1.91
Plutonium-238 0.042
Plutonium-239 5.03
Uranium-234 3.02
Uranium-238 3.32

73-25620
0.00-0.25 ft
Plutonium-239 0.153

73-25609
0.00-0.25 ft
Plutonium-239 0.213
Uranium-238 2.33

73-02451

73-25619

73-25611
0.00-0.25 ft
Plutonium 0.414

73-25608
0.00-0.25 ft
Americium-241 0.0355
Plutonium-239 0.254

73-02452

73-25601
0.00-0.25 ft
Americium-241 0.0281
Plutonium-239 0.0573

73-25618
0.00-0.25 ft
Plutonium-239 0.231

73-25607
0.00-0.25 ft
Americium-241 0.063
Cesium-137 3.28
Plutonium-239 0.557

73-25600

73-25617
0.00-0.25 ft
Plutonium-239 0.419

73-25599
0.00-0.25 ft
Plutonium-239 0.0879

73-25606
0.00-0.25 ft
Americium-241 0.0829
Cesium-137 3.16
Plutonium-239 1.42
1.0–2.0 ft
Cesium-137 0.346
Plutonium-239 0.119

73-25614
0.00-0.25 ft
Americium-241 0.092
Cesium-137 5.43
Plutonium-238 0.031
Plutonium-239 1
Uranium-234 2.98
Uranium-238 3.66

73-25616
0.00-0.25 ft
Americium-241 0.0423
Plutonium-239 0.282

73-25597
0.0–0.25 ft
Plutonium-239 0.337
1.0–2.0 ft
Cesium-137 0.757
Plutonium-239 0.104
Strontium-90 0.17

73-25598

73-25613
0.00-0.25 ft
Plutonium-239 0.292

73-25604
0.00-0.25 ft
Americium-241 0.0975
Plutonium-239 0.394
1.0–2.0 ft
Cesium-137 0.154
Plutonium-239 0.0293

73-25615
0.00-0.25 ft
Americium-241 0.0924
Cesium-137 2.26
Plutonium-239 0.806
Uranium-238 3.02

73-25612
0.0–0.25 ft
Plutonium-239 0.483
Uranium-238 2.44

73-27681
2.00–2.50 ft
Uranium-235 0.093

73-02255
0.00-0.50 ft
Tritium 0.064

73-02254
0.00-0.50 ft
Tritium 0.054

73-27314
0.00-0.50 ft
Plutonium-239 0.154

73-25569
0.00-0.50 ft
Plutonium-239/240 0.11

73-25596

73-25605
0.00-0.25 ft
Plutonium-239 0.0999

73-27313
0.00-0.50 ft
Plutonium-239 0.063

73-25594
0.0–0.25 ft
Plutonium-239 0.099
1.0–2.0 ft
Cesium-137 0.186
Plutonium-239 0.034

73-27284
0.0–2.0 ft
Plutonium-239 0.368
2.0–3.0 ft
Plutonium-239 0.0633
Strontium-90 0.329

73-25572
2.00–2.50 ft
Uranium-235 0.101 (J-)

73-25595

73-27307
0.00–0.50 ft
Plutonium-239 0.084

73-27283
0.0–1.0 ft
Plutonium-239 0.632
Uranium-238 2.67

73-27679

73-25570

73-27680

73-25571

73-25573

73-25574

73-02253

73-25593
0.00-0.25 ft
Plutonium-239 0.065

73-27310
0.00–0.50 ft
Plutonium-239 0.0251

73-27288
0.0–1.5 ft
Strontium-90 0.371
Uranium-234 4.56
Uranium-235 0.315
Uranium-238 3.29
2.25–3.0 ft
Americium-241 0.0379
Uranium-235 0.124
4.0–5.5 ft
Uranium-235 0.109

73-27311

73-27312

73-27678

73-27304

73-27305

73-27306

73-27315

73-25575

73-27303
0.00–0.50 ft
Plutonium-239 0.0325
1.00–1.50 ft
Plutonium-239 0.0384

73-27297
0.0-0.5 ft
Plutonium-239 0.079 (J)

73-27308

73-27309

73-27298

73-27299

73-25564

73-27300

73-27292

73-27301

73-27302

73-25568
0.0–1.0 ft
Plutonium-238 0.0514
Plutonium-239 0.24

73-25563
0.00-0.50 ft
Plutonium-239 0.0614

73-27293

73-27294

73-27295

73-27296

73-27290
0.0–1.5 ft
Uranium-235 0.105

73-25562
0.00-0.50 ft
Plutonium-239 0.187
1.00–2.00 ft
Cesium-137 0.0799
Plutonium-239 0.0541

73-27287

73-27280

73-27291
2.0–3.5 ft
Uranium-235 0.103

73-25567

73-25566

73-27319

73-0002

73-27279
0.0–1.0 ft
Plutonium-239 0.0961
Uranium-234 2.92
1.5–2.75 ft
Plutonium-239 0.0902
Uranium-235 0.124

73-27282
0.0–2.0 ft
Plutonium-239 0.0915
4.0–5.0 ft
Strontium-90 0.398

73-25561
1.00-2.00 ft
Plutonium-239 0.0319

73-27286
2.0–3.0 ft
Uranium-235 0.103
3.0–5.0 ft
Uranium-234 2.05
Uranium-235 0.109

73-27289
0.0–2.5 ft
Uranium-235 0.109
3.0–4.0 ft
Uranium-235 0.0986

73-25565
0.0–1.0 ft
Plutonium-239 0.0595
3.0–4.0 ft
Plutonium-239 0.205

73-27285

73-27316
0.0–1.0 ft
Plutonium-239 0.0756
Strontium-90 0.176

73-0003

73-0001

73-27281
0.00–0.50 ft
Plutonium-239 0.079
1.5–2.5 ft
Uranium-235 0.101

Sample location
Drainage
Paved road
Unpaved road
20-ft contour interval
Consolidated unit boundary
Structure

Note: Units are picoCuries per gram (pCi/g).

N

Feet
0 25 50 100 150 200

State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD83, NGVD29

Plate 3 Radionuclides detected above BVs/FVs in samples at SWMU 73-002

Carrie Ancell 05/08/07
Revised 05/09/07
Thomas Gagliano 05/15/07
Revised 07/02/07

Disclaimer: This map was created for work processes associated with the Investigation Report for Consolidated Unit 73-002-99 and Corrective Action of SWMU 73-002. All other uses for this map should be confirmed with the LANL Environmental Programs Directorate.

1632100
1632400
1632700
1633000
1633300
1633600
1633900
1777500
1777000
1776500
1776000
6680
6700
6720
6740
6760
6780
6800
6820
6840
6860
6880
6900
6920
6940
6960
6980
7000
7020
7040
7060
7080
7100
7120
7140
Pueblo Canyon
Sample location
Drainage
Paved road
Unpaved road
20-ft contour interval
Consolidated unit boundary
Structure
N
Note: Units are milligrams per kilogram (mg/kg).
Feet
0 25 50 100 150 200
State Plane Coordinate System
New Mexico, Central Zone, US Foot
NAD83, NGVD29
Plate 4 Organics detected in samples at SWMU 73-002
73-0002
73-0003
73-0001
73-27300
0.0–1.0 ft
Di-n-butylphthalate 0.0609 (J)
TEQ 0.00E+00
2.0–3.0 ft
Di-n-butylphthalate 0.0462 (J)
TEQ 0.00E+00
73-25607
0.00-0.25 ft
Aroclor-1242 0.0097
Aroclor-1254 0.0534
Benzoic Acid 0.868(J)
Chrysene 0.038(J)
DDE[4,4'-] 0.00536(J)
DDT[4,4'-] 0.00718(J)
Fluoranthene 0.0615
Phenanthrene 0.0374(J)
Pyrene 0.0611
TEQ 2.66E-06
73-25606
0.00-0.25 ft
Anthracene 0.00931(J)
Chlordane[alpha-] 0.00522(J)
Chlordane[gamma-] 0.00428(J)
Chrysene 0.0691
DDE[4,4'-] 0.0395(J)
DDT[4,4'-] 0.0486(J)
Fluoranthene 0.122
Phenanthrene 0.0577
Pyrene 0.114
TEQ 1.35E-06
73-25605
0.00-0.25 ft
Chlordane[alpha-] 0.00127(J)
Chlordane[gamma-] 0.00135(J)
DDD[4,4'-] 0.00144
DDE[4,4'-] 0.0431(J)
DDT[4,4'-] 0.0302(J)
Fluoranthene 0.0212(J)
Pyrene 0.0173(J)
TEQ 1.41E-06
73-02255
0.00-0.50 ft
Chlordane[alpha-] 0.0035
DDE[4,4'-] 0.029
DDT[4,4'-] 0.034
TEQ 0.00E+00
73-27680
0.00–0.50 ft
TEQ 6.59E-10
73-25604
0.00-0.25 ft
Aroclor-1254 0.0828
Aroclor-1260 0.0093
Chlordane[alpha-] 0.0015(J)
Chlordane[gamma-] 0.0015(J)
DDE[4,4'-] 0.011(J)
DDT[4,4'-] 0.0152(J)
Dieldrin 0.000645(J)
Fluoranthene 0.0253(J)
Phenanthrene 0.0146(J)
Pyrene 0.0253(J)
TEQ 9.79E-07
73-27681
0.00–0.50 ft
TEQ 3.55E-09
2.00–2.50 ft
TEQ 1.01E-10
73-25569
2.00–2.50 ft
TEQ 3.36E-09
0.00–0.50 ft
TEQ 1.92E-07
2.00-3.00 ft
Chloroform 0.000228(J)
TEQ 0.00E+00
73-27284
0.0–2.0 ft
Benzoic Acid 0.486 (J)
DDE[4,4'-] 0.00746
DDT[4,4'-] 0.00804 (J)
Fluoranthene 0.0114 (J)
TEQ 4.01E-07
2.0–3.0 ft
DDE[4,4'-] 0.0018
DDT[4,4'-] 0.00167 (J)
TEQ 2.66E-07
73-27299
0.0–1.5 ft
Di-n-butylphthalate 0.0606 (J)
TEQ 1.10E-06
2.0–3.5 ft
DDE[4,4'-] 0.000478 (J)
DDT[4,4'-] 0.00175 (J)
Di-n-butylphthalate 0.0753 (J)
TEQ 2.08E-06
73-27304
0.00–0.50 ft
TEQ 1.55E-07
2.00–2.50 ft
TEQ 6.06E-09
73-27297
0.0–0.5 ft
Anthracene 0.00882 (J)
Benzo(a)anthracene 0.0315 (J)
Benzo(a)pyrene 0.0292 (J)
Benzo(b)fluoranthene 0.0566
Bis(2-ethylhexyl)phthalate 0.0738 (J)
Chrysene 0.0312 (J)
DDE[4,4'-] 0.000419 (J)
DDT[4,4'-] 0.000722 (J)
Di-n-butylphthalate 0.0623 (J)
Fluoranthene 0.0676
Phenanthrene 0.0464
Pyrene 0.0613
TEQ 1.18E-06
73-27298
0.0–1.0 ft
Chlordane[alpha-] 0.00149 (J)
Chlordane[gamma-] 0.00122 (J)
DDE[4,4'-] 0.0106
DDT[4,4'-] 0.0225
Di-n-butylphthalate 0.0515 (J)
TEQ 1.00E-06
2.00–2.50 ft
TEQ 9.78E-09
73-27283
0.0–1.0 ft
Aroclor-1254 0.0194
Aroclor-1260 0.0073
Benzo(b)fluoranthene 0.0457
Benzoic Acid 0.796 (J)
Chrysene 0.0219 (J)
DDE[4,4'-] 0.00132 (J)
DDT[4,4'-] 0.000956 (J)
Fluoranthene 0.0408 (J)
Phenanthrene 0.0195 (J)
Pyrene 0.0391 (J)
TEQ 8.24E-07
1.0–2.0 ft
Di-n-butylphthalate 0.0584 (J)
TEQ 1.65E-08
73-27293
0.0–1.5 ft
Di-n-butylphthalate 0.0567 (J)
TEQ 2.43E-10
1.5–3.0 ft
Di-n-butylphthalate 0.0544 (J)
TEQ 0.00E+00
3.0–4.0 ft
Di-n-butylphthalate 0.0471 (J)
TEQ 2.82E-09
73-27292
0.0–1.5 ft
Di-n-butylphthalate 0.049 (J)
TEQ 2.23E-09
2.0–3.0 ft
Di-n-butylphthalate 0.0487 (J)
TEQ 2.24E-09
73-25564
0.0–0.5 ft
DDE[4,4'] 0.0069
DDT[4,4'] 0.0057
TEQ 4.08E-07
2.5–3.0 ft
DDE[4,4'-] 0.00108 (J)
DDT[4,4'-] 0.00125 (J)
Di-n-butylphthalate 0.0642 (J)
TEQ 1.93E-08
73-25563
0.0–0.5 ft
Aroclor-1254 0.173
Aroclor-1260 0.073
Fluoranthene 0.0127 (J)
TEQ 4.88E-08
1.0–2.0 ft
TEQ 8.01E-10
3.0–4.0 ft
Benzoic Acid 0.461 (J)
Di-n-butylphthalate 0.0718 (J)
TEQ 3.80E-09
73-27287
0.0–1.0 ft
TEQ 1.23E-08
1.0–2.0 ft
TEQ 6.55E-09
3.0–4.0 ft
TEQ 4.77E-10
73-27288
0.0–1.5 ft
TEQ 5.49E-10
73-25562
0.00–0.50 ft
Anthracene 0.00824 (J)
Fluoranthene 0.0117 (J)
TEQ 7.01E-09
1.0–2.0 ft
TEQ 7.14E-09
2.5–4.0 ft
Di-n-butylphthalate 0.0418 (J)
TEQ 4.56E-10
73-27279
0.0–1.0 ft
DDD[4,4'-] 0.00106 (J)
DDE[4,4'-] 0.000687 (J)
DDT[4,4'-] 0.00279 (J)
Di-n-butylphthalate 0.0693 (J)
TEQ 7.69E-07
1.5–2.75 ft
Di-n-butylphthalate 0.0434 (J)
TEQ 6.58E-09
3.5–4.5 ft
Di-n-butylphthalate 0.0413 (J)
TEQ 2.17E-08
73-27280
0.00–1.50 ft
TEQ 1.48E-06
1.50–2.50 ft
TEQ 2.36E-07
3.50–5.00 ft
TEQ 1.84E-08
73-25561
1.00–2.00 ft
Fluoranthene 0.033 (J)
Phenanthrene 0.0189 (J)
Pyrene 0.0284 (J)
TEQ 1.09E-06
3.5–5.0 ft
DDE[4,4'-] 0.00199
DDT[4,4'-] 0.00173 (J)
Di-n-butylphthalate 0.0743 (J)
TEQ 1.05E-08
73-27281
0.0–0.5 ft
DDE[4,4'] 0.026
DDT[4,4'] 0.34
Fluoranthene 0.049 (J)
Pyrene 0.042 (J)
TEQ 9.46E-06
1.5–2.5 ft
DDD[4,4'-] 0.00547 (J)
DDE[4,4'-] 0.00526 (J)
DDT[4,4'-] 0.0167 (J)
Di-n-butylphthalate 0.0594 (J)
Methylnaphthalene[2-] 0.0244 (J)
Naphthalene 0.0242 (J)
TEQ 2.16E-06
3.5–4.5 ft
DDE[4,4'-] 0.00355 (J)
DDT[4,4'-] 0.0151 (J)
Methylnaphthalene[2-] 0.011 (J)
TEQ 1.46E-06
73-27286
0.0–2.0 ft
DDE[4,4'-] 0.000761 (J)
TEQ 1.11E-07
2.0–3.0 ft
TEQ 1.86E-08
3.0–5.0 ft
Di-n-butylphthalate 0.0412 (J)
TEQ 5.13E-09
73-27312
0.00–0.50 ft
TEQ 1.36E-08
2.00–2.50 ft
TEQ 3.42E-10
73-25570
0.00–0.50 ft
TEQ 2.27E-09
2.00–2.50 ft
TEQ 6.78E-11
73-25610
0.00-0.25 ft
Aroclor-1254 0.0236
Benzoic Acid 0.712(J)
Chlordane[alpha-] 0.000926(J)
Chlordane[gamma-] 0.000265(J)
DDE[4,4'-] 0.00312(J)
DDT[4,4'-] 0.00148(J)
Fluoranthene 0.0229(J)
Phenanthrene 0.0151(J)
Pyrene 0.0242(J)
TEQ 8.75E-07
73-25620
0.00-0.25 ft
Aroclor-1254 0.0042
Aroclor-1260 0.0019(J)
TEQ 1.15E-08
73-25611
0.00-0.25 ft
Fluoranthene 0.0117(J)
Pyrene 0.0123(J)
TEQ 1.06E-07
73-02451
0.10-0.50 ft
TEQ 1.67E-08
73-25619
0.00-0.25 ft
Aroclor-1254 0.0038(J)
Aroclor-1260 0.0025(J)
Fluoranthene 0.0126(J)
TEQ 8.11E-08
73-25618
0.00-0.25 ft
Aroclor-1254 0.0044(J)
Aroclor-1260 0.003(J)
Fluoranthene 0.0307(J)
Phenanthrene 0.0167(J)
Pyrene 0.0238(J)
TEQ 1.51E-07
73-25617
0.00-0.25 ft
Aroclor-1254 0.0066
Aroclor-1260 0.0048
Fluoranthene 0.0311(J)
Phenanthrene 0.0179(J)
Pyrene 0.0257(J)
TEQ 3.73E-07
73-25601
0.00-0.25 ft
Aroclor-1254 0.0097
Benzo(b)fluoranthene 0.0362(J)
Di-n-octylphthalate 0.227(J)
Fluoranthene 0.231(J)
Methylnaphthalene[2-] 0.00741(J)
Phenanthrene 0.0138(J)
Pyrene 0.035(J)
TEQ 3.26E-07
73-25616
0.00-0.25 ft
Aroclor-1242 0.0127
Aroclor-1254 0.0152
Aroclor-1260 0.0082
TEQ 2.54E-07
73-25615
0.00-0.25 ft
Aroclor-1254 0.0272
Aroclor-1260 0.0149
Chlordane[alpha-] 0.000365(J)
Chlordane[gamma-] 0.00129(J)
DDE[4,4'-] 0.00171(J-)
DDT[4,4'-] 0.00323(J)
Dieldrin 0.00109(J)
Fluoranthene 0.0327(J)
Phenanthrene 0.0223(J)
Pyrene 0.0357(J)
TEQ 1.60E-06
73-25600
0.00-0.25 ft
Anthracene 0.0106(J)
Aroclor-1254 0.0343(J)
Benzo(a)pyrene 0.169(J)
Benzo(b)fluoranthene 0.389(J)
Benzo(g,h,i)perylene 0.143(J)
Benzoic Acid 0.593(J)
Chrysene 0.198(J)
Fluoranthene 0.463(J)
Indeno(1,2,3-cd)pyrene 0.12(J)
Phenanthrene 0.191
Pyrene 0.426
TEQ 2.24E-06
73-25599
0.00-0.25 ft
Benzo(a)pyrene 0.0354(J)
Benzo(b)fluoranthene 0.0669(J)
Benzo(k)fluoranthene 0.0262(J)
Chrysene 0.0378(J)
DDE[4,4'-] 0.00474(J)
Fluoranthene 0.276(J)
Phenanthrene 0.0251(J)
Pyrene 0.0555
TEQ 5.13E-06
73-25598
0.00-0.25 ft
Aroclor-1254 0.0299(J)
Benzo(a)pyrene 0.0776(J)
Benzo(b)fluoranthene 0.183(J)
Benzo(g,h,i)perylene 0.0596(J)
Chrysene 0.114
Fluoranthene 0.351(J)
Indeno(1,2,3-cd)pyrene 0.0519(J)
Phenanthrene 0.0987
Pyrene 0.161
TEQ 1.30E-06
73-25597
0.00-0.25 ft
Benzo(a)pyrene 0.0351(J)
Benzo(b)fluoranthene 0.0875(J)
Chrysene 0.0446(J)
Fluoranthene 0.27(J)
Indeno(1,2,3-cd)pyrene 0.025(J)
Phenanthrene 0.0385
Pyrene 0.079
TEQ 1.26E-06
73-25596
0.00-0.25 ft
Benzo(a)pyrene 0.09(J)
Benzo(b)fluoranthene 0.226(J)
Benzo(g,h,i)perylene 0.0877(J)
Chrysene 0.138
Fluoranthene 0.336(J)
Indeno(1,2,3-cd)pyrene 0.0726(J)
Phenanthrene 0.0919
Pyrene 0.191
TEQ 1.69E-06
73-25609
0.00-0.25 ft
Chlordane[alpha-] 0.0007724(J)
Chlordane[gamma-] 0.0009932(J)
DDD[4,4'-] 0.00105
DDE[4,4'-] 0.00589(J)
DDT[4,4'-] 0.00367(J)
Fluoranthene 0.0283(J)
Phenanthrene 0.0227(J)
Pyrene 0.0336(J)
TEQ 7.42E-07
73-02452
73-25571
2.00–2.50 ft
TEQ 1.04E-10
73-27679
0.00–0.50 ft
TEQ 4E-08
2.00–2.50 ft
TEQ 1.07E-08
73-25608
0.00-0.25 ft
Aroclor-1254 0.0075
Pyrene 0.0133 (J)
TEQ 2.81E-07
73-25614
0.00-0.25 ft
Aroclor-1254 0.0223
Aroclor-1260 0.0143
Fluoranthene 0.0955
Phenanthrene 0.0588
Pyrene 0.0864
TEQ 2.33E-06
73-25613
0.00-0.25 ft
Aroclor-1254 0.013
Aroclor-1260 ..0.0079
DDE[4,4'-] 0.000665(J)
DDT[4,4'-] 0.00163(J)
TEQ 2.90E-07
73-25572
0.00-0.50 ft
TEQ 2.69E-09
2.0–2.5 ft
TEQ 9E-11
73-27313
0.00–0.50 ft
TEQ 7.83E-08
2.00–2.50 ft
TEQ 5.73E-10
73-25612
0.00-0.25 ft
Aroclor-1254 0.0145
Aroclor-1260 ..0.009
Fluoranthene 0.0243(J)
Phenanthrene 0.0154(J)
Pyrene 0.0211(J)
TEQ 4.31E-07
73-02254
73-02253
73-27311
73-27305
0.00–0.50 ft
TEQ 2.47E-09
73-27306
73-27315
73-27319
0.0–0.5 ft
TEQ 1.29E-06
2.0–2.5 ft
TEQ 5.58E-08
73-27316
0.0–1.0 ft
Acenaphthene 0.0367
Anthracene 0.0561
Benzo(a)anthracene 0.0853
Benzo(a)pyrene 0.0876
Benzo(b)fluoranthene 0.131
Benzo(g,h,i)perylene 0.0441
Benzo(k)fluoranthene 0.0369
Benzoic Acid 0.523 (J)
Chrysene 0.0731
Fluoranthene 0.245
Fluorene 0.0342 (J)
Methylnaphthalene[2-] 0.00757 (J)
Phenanthrene 0.225
Pyrene 0.158
TEQ 3.52E-07
1.0–2.0 ft
TEQ 9.89E-08
73-27289
0.0–2.5 ft
DDE[4,4'-] 0.0013
TEQ 3.63E-06
3.0–4.0 ft
TEQ 8.21E-08
73-25566
1.0–2.0 ft
DDE[4,4'-] 0.00041(J)
DDT[4,4'-] 0.000928(J)
Pyrene 0.0148(J)
TEQ 2.61E-07
2.0–3.0 ft
Di-n-butylphthalate 0.06039 (J)
TEQ 0.00E+00
73-27285
0.0–1.0 ft
TEQ 0.00E+00
73-27282
0.0–2.0 ft
Benzo(a)anthracene 0.0289 (J)
Benzo(a)pyrene 0.0429
Benzo(b)fluoranthene 0.0676
Benzo(k)fluoranthene 0.0182 (J)
Benzoic Acid 0.534 (J)
Bis(2-ethylhexyl)phthalate 0.0939 (J)
Chrysene 0.0385 (J)
DDT[4,4'-] 0.00545 (J)
Di-n-butylphthalate 0.0539 (J)
Fluoranthene 0.0853
Phenanthrene 0.0422
Pyrene 0.067
TEQ 2.88E-06
2.5–3.7 ft
Benzoic Acid 0.477 (J)
TEQ 8.61E-09
4.0–5.0 ft
Benzo(a)anthracene 0.0271 (J)
Chrysene 0.0272 (J)
Fluoranthene 0.0298
Phenanthrene 0.0154 (J)
Pyrene 0.044
TEQ 1.27E-07
73-25567
0.00-0.50 ft
DDT[4,4'-] 0.00111(J)
TEQ 1.07E-07
2.5–4.0 ft
Aroclor-1242 0.0025 (J)
TEQ 0.00E+00
73-25565
0.0–1.0 ft
Aroclor-1260 0.0024 (J)
Benzo(a)anthracene 0.0321 (J)
Benzo(a)pyrene 0.0351 (J)
Benzo(b)fluoranthene 0.0503
Benzo(g,h,i)perylene 0.0284 (J)
Chrysene 0.0342 (J)
DDE[4,4'-] 0.00243 (J)
DDT[4,4'-] 0.00231 (J)
Fluoranthene 0.0627
Phenanthrene 0.0272 (J)
Pyrene 0.0609
TEQ 1.20E-06
3.0–4.0 ft
Anthracene 0.00996 (J)
Aroclor-1260 0.0033 (J)
DDE[4,4'-] 0.00396
DDT[4,4'-] 0.00495 (J)
Fluoranthene 0.0215 (J)
Pyrene 0.0259 (J)
TEQ 2.69E-06
73-27314
0.00–0.50 ft
TEQ 8.71E-05
73-27308
4.0–4.5 ft
TEQ 7.12E-06
73-27309
0.00–0.50 ft
TEQ 9.01E-08
2.00–2.50 ft
TEQ 7.37E-08
73-27301
0.0–2.0 ft
Aroclor-1254 0.002 (J)
TEQ 1.52E-08
73-27302
0.00–0.50 ft
TEQ 1.54E-07
2.00–2.50 ft
TEQ 4.44E-08
73-27294
0.0–1.5 ft
DDE[4,4'-] 0.00125
DDT[4,4'-] 0.0013 (J)
TEQ 1.18E-06
2.0–3.0 ft
TEQ 1.27E-07
73-27291
0.0–2.0 ft
TEQ 2.42E-07
2.0–3.5 ft
TEQ 7.37E-09
73-27290
0.0–1.5 ft
TEQ 2.91E-10
73-27307
0.00–0.50 ft
TEQ 3.71E-07
2.00–2.50 ft
Bis(2-ethylhexyl)phthalate 0.066 (J)
TEQ 2.87E-07
73-25573
0.00–0.50 ft
TEQ 7.34E-09
2.00–2.50 ft
TEQ 2.02E-10
73-02458
0.10-0.50 ft
Benzoic Acid .. 0.043(J)
TEQ 1.86E-07
73-27678
0.00–0.50 ft
TEQ 2.91E-07
3.50–4.00 ft
TEQ 3.42E-08
5.50–6.00 ft
TEQ 1.02E-07
73-25575
0.00-0.50 ft
TEQ 1.75E-10
73-25568
0.0–1.0 ft
Benzo(a)anthracene 0.0263 (J)
Benzo(a)pyrene 0.0269 (J)
Benzo(b)fluoranthene 0.0438
Benzo(k)fluoranthene 0.0138 (J)
Chrysene 0.0342 (J)
DDE[4,4'-] 0.00643 (J)
DDT[4,4'-] 0.0138 (J)
Fluoranthene 0.0719
Phenanthrene 0.0454
Pyrene 0.0684
TEQ 3.98E-06
1.25–2.0 ft
Benzo(a)anthracene 0.0299 (J)
Benzo(a)pyrene 0.0299 (J)
Benzo(b)fluoranthene 0.0407
Chrysene 0.0312 (J)
DDT[4,4'-] 0.00134 (J)
Fluoranthene 0.0523
Phenanthrene 0.0201 (J)
Pyrene 0.0445
TEQ 7.29E-07
3.0–4.5 ft
DDT[4,4'-] 0.000356 (J)
TEQ 8.46E-07
73-25595
0.00-0.25 ft
Benzo(a)pyrene 0.0458(J)
Benzo(b)fluoranthene 0.119(J)
Benzo(g,h,i)perylene 0.0445(J)
Chrysene 0.0748(J)
Fluoranthene 0.284(J)
Indeno(1,2,3-cd)pyrene 0.0348(J)
Phenanthrene 0.0491
Pyrene 0.103
TEQ 1.54E-06
73-25594
0.00-0.25 ft
Benzo(a)pyrene 0.276(J)
Benzo(b)fluoranthene 0.693(J)
Benzo(g,h,i)perylene 0.198(J)
Chrysene 0.392
Fluoranthene 1.36(J)
Indeno(1,2,3-cd)pyrene 0.169(J)
Phenanthrene 0.299
Pyrene 0.543
TEQ 4.88E-06
73-25574
0.00-0.50 ft
TEQ 1.55E-09
2.00–2.50 ft
TEQ 1.15E-10
73-25674
0.00-0.50 ft
TEQ 1.55E-09
2.00–2.50 ft
TEQ 1.15E-10
73-25593
0.00-0.25 ft
Benzo(a)pyrene 0.0366(J)
Benzo(b)fluoranthene 0.0599
Benzo(g,h,i)perylene 0.0345(J)
Benzo(k)fluoranthene 0.0284(J)
Chrysene 0.0478
DDT[4,4'-] 0.0039(J)
Fluoranthene 0.289(J)
Indeno(1,2,3-cd)pyrene 0.0272(J)
Phenanthrene 0.0452
Pyrene 0.0593(J)
TEQ 1.98E-06
73-27310
0.00–0.50 ft
DDE[4,4'-] 0.0022
DDT[4,4'-] 0.0048
TEQ 9.05E-07
2.00–2.50 ft
TEQ 6.3E-08
73-27303
0.00–0.50 ft
DDD[4,4'] 0.0092
DDE[4,4'] 0.068
DDT[4,4'] 0.11
TEQ 2.29E-06
1.00–1.50 ft
DDD[4,4'] 0.0041
DDE[4,4'] 0.055
DDT[4,4'] 0.083
TEQ 2.04E-06
73-27295
0.0–2.0 ft
Di-n-butylphthalate 0.059 (J)
TEQ 1.18E-07
2.5–4.0 ft
Di-n-butylphthalate 0.0498 (J)
TEQ 5.45E-09
73-27296
0.00–0.50 ft
Bis(2ethylhexyl)phthalate 0.056 (J)
Dimbro-2-methylphenol[4,6] 0.41 (J)
TEQ 5.67E-10
2.00–2.50 ft
DDT[4,4'] 0.0034 (J)
TEQ 1.25E-07
Carrie Ancell 05/08/07
Revised 05/09/07
Thomas Gagliano 05/15/07
Revised 07/06/07
Disclaimer: This map was created for work processes associated with the Investigative/Remediation Report for Corrective Action of SWMU 73-002 and Consolidated Unit 73-002-99. All other uses for this map should be confirmed with the LANL Environmental Programs Directorate.

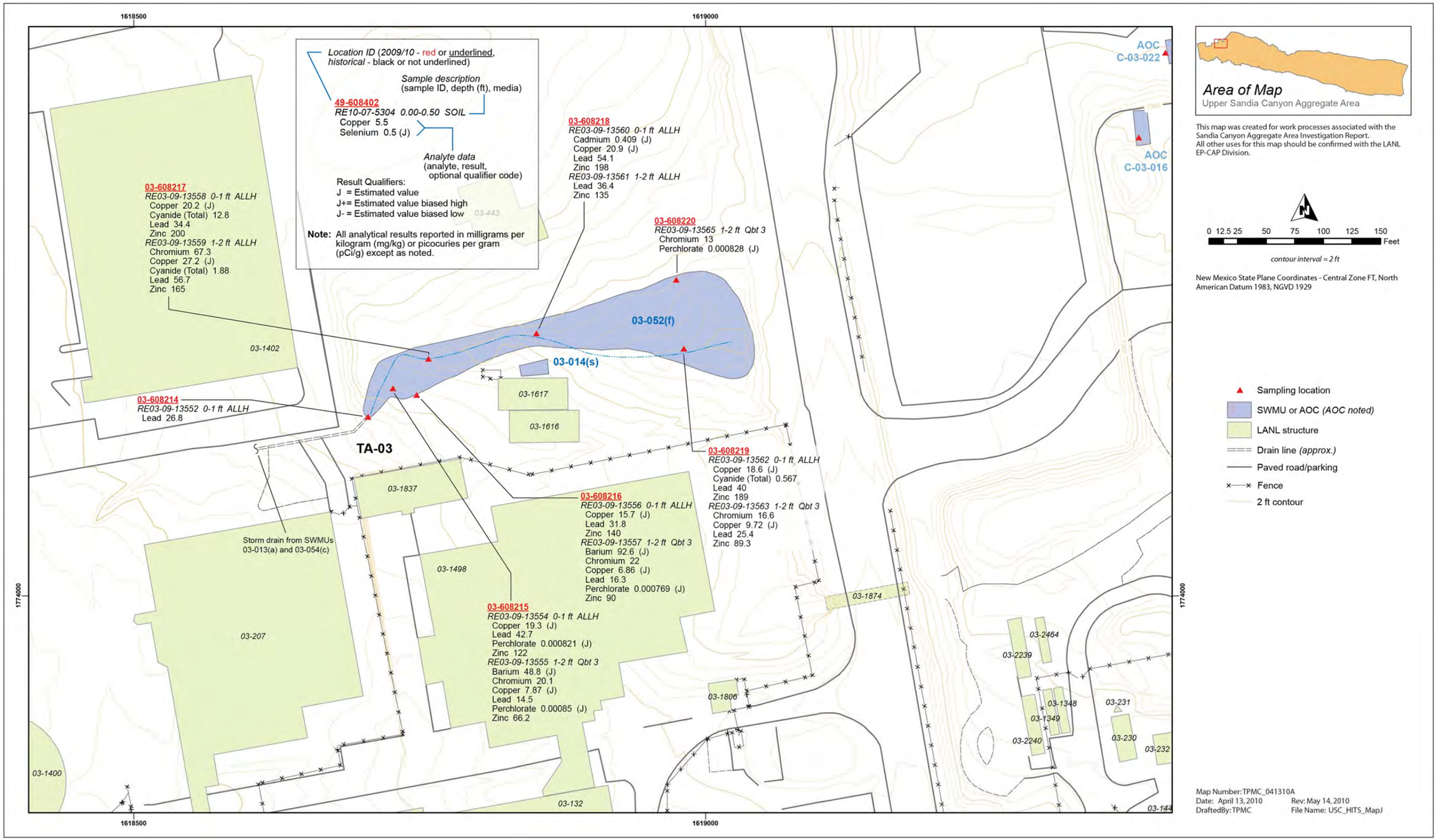


Figure 6.7-2 Inorganic chemical concentrations detected or detected above BVs at SWMU 03-052(f)

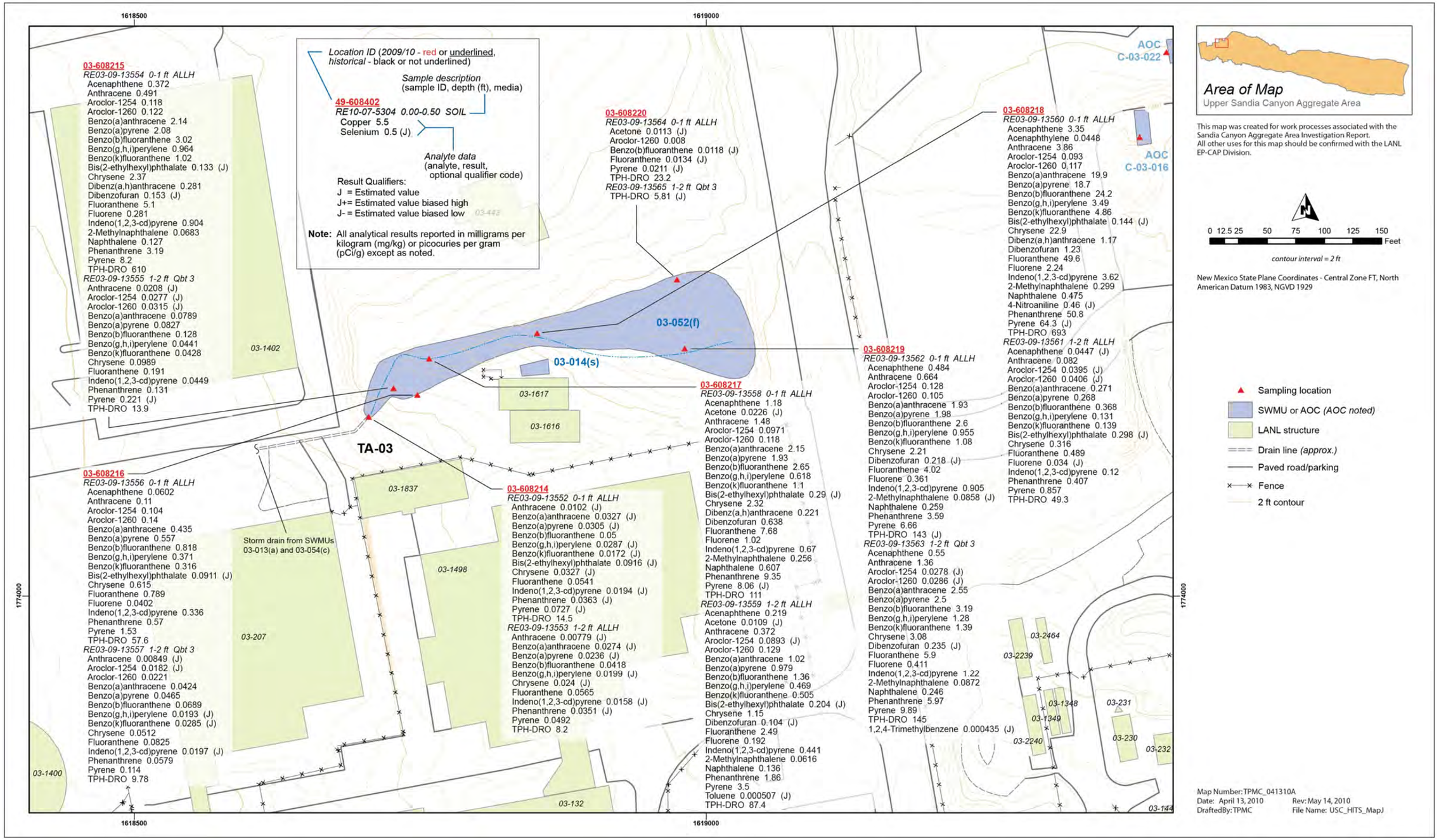
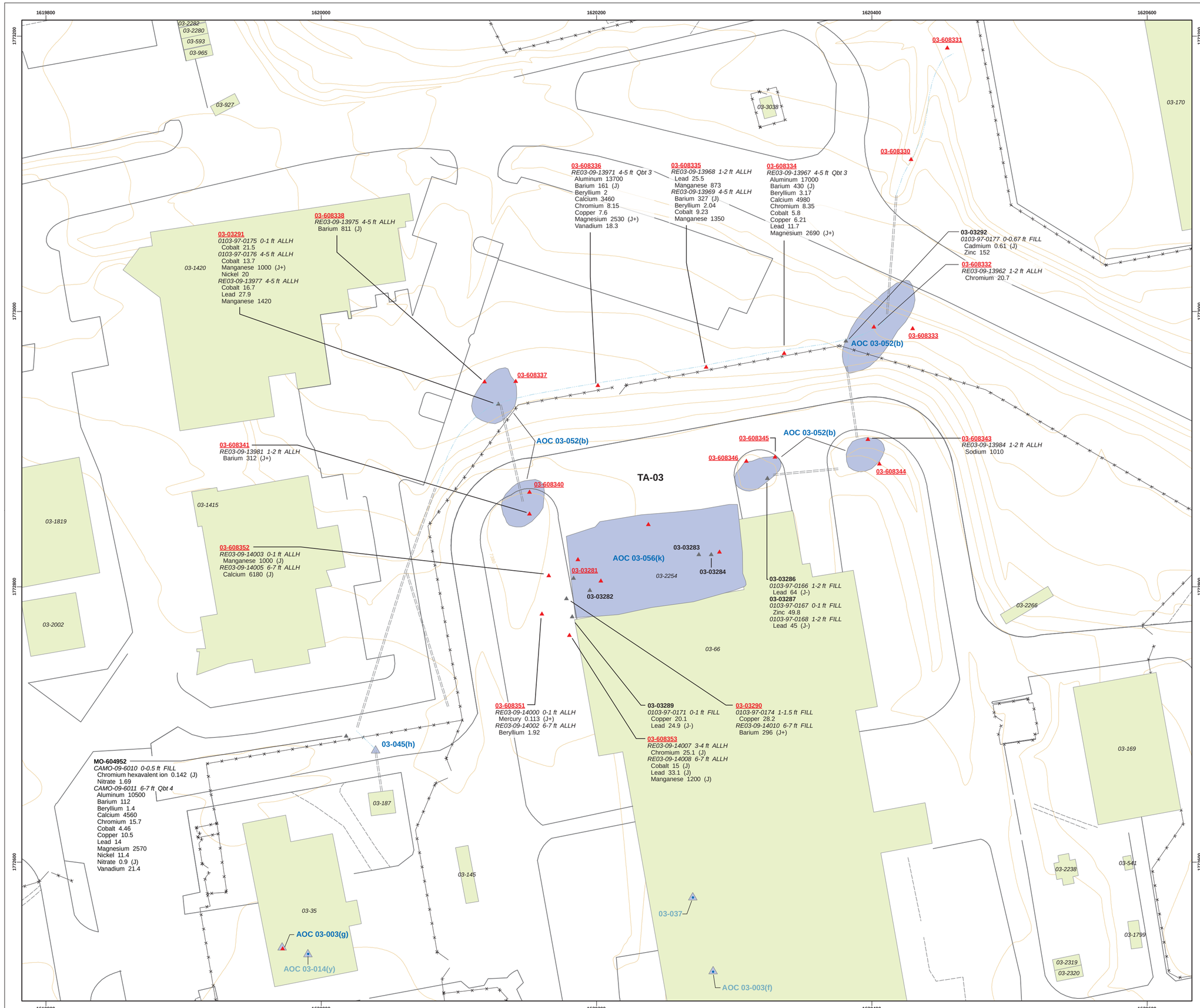
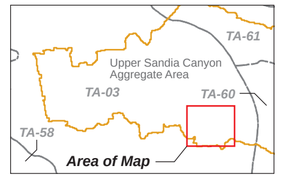


Figure 6.7-3 Organic chemical concentrations detected at SWMU 03-052(f)





This map was created for work processes associated with the Sandia Canyon Aggregate Area Investigation Report.
All other uses for this map should be confirmed with the LANL EP-CAP Division.

0 10 20 40 60 80 100 Feet

contour interval = 2 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

- Sampling location
- Historical sampling location
- SWMU or AOC (*AOC noted*)
- LANL structure
- Fence
- Drain Line (*approx. location*)
- Paved road/parking
- Inferred drainage
- 2 ft contour

Location ID (2009/10 - red or underlined, historical - black or not underlined)

Sample description (sample ID, depth (ft), media)

49-608402
RE10-07-5304 0.00-0.50 SOIL
Copper 5.5
Selenium 0.5 (J)

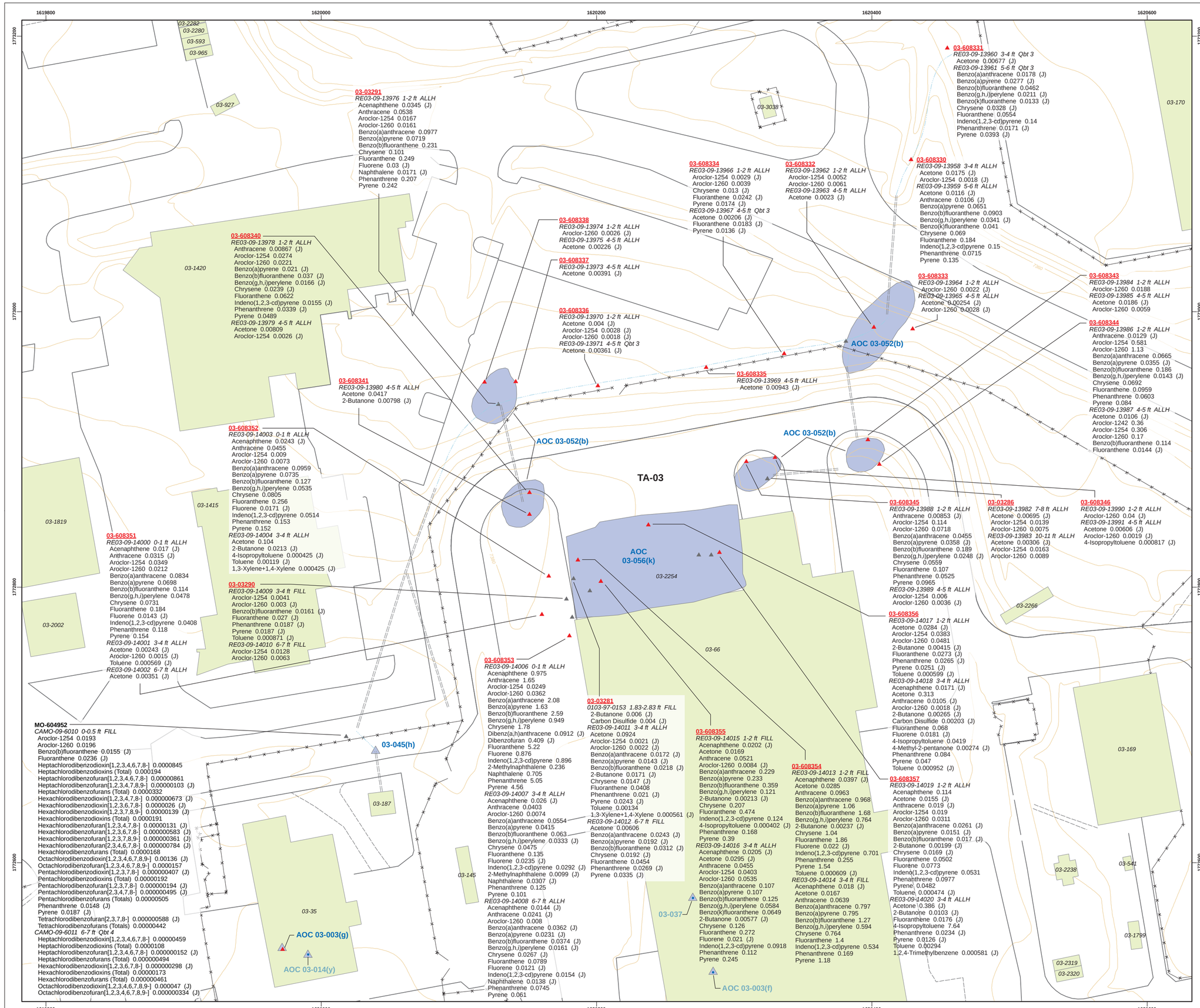
Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in milligrams per kilogram (mg/kg) or in picocuries per gram (pCi/g) except as noted.

PLATE 17
Inorganic chemical concentrations detected or detected above BVs at SWMU 03-045(h) and AOCs 03-052(b) and 03-056(k)

Map Number: TPMC_041110A
Date: April 11, 2010 Rev: May 13, 2010
DraftedBy: TPMC File Name: U5CAA_HITS_MapD
Revised 06/26/13, LANL


1619800
1620000
1620200
1620400
1620600
1773200
1773000
1772800
1772600
03-2282
03-2280
03-593
03-965
03-927
03-1420
03-1819
03-1415
03-2002
03-3038
03-170
03-2254
03-66
03-2266
03-169
03-2238
03-541
03-1799
03-2319
03-2320
03-187
03-145
03-35
03-037
TA-03
AOC 03-052(b)
AOC 03-052(b)
AOC 03-056(k)
AOC 03-003(g)
AOC 03-014(y)
AOC 03-003(f)
03-045(h)
03-608340
RE03-09-13978 1-2 ft ALLH
Anthracene 0.00867 (J)
Aroclor-1254 0.0274
Aroclor-1260 0.0221
Benzo(a)pyrene 0.021 (J)
Benzo(b)fluoranthene 0.037 (J)
Benzo(g,h,i)perylene 0.0166 (J)
Chrysene 0.0239 (J)
Fluoranthene 0.0622
Indeno(1,2,3-cd)pyrene 0.0155 (J)
Phenanthrene 0.0339 (J)
Pyrene 0.0489
RE03-09-13979 4-5 ft ALLH
Acetone 0.00809
Aroclor-1254 0.0026 (J)
03-03291
RE03-09-13976 1-2 ft ALLH
Acenaphthene 0.0345 (J)
Anthracene 0.0538
Aroclor-1254 0.0167
Aroclor-1260 0.0161
Benzo(a)anthracene 0.0977
Benzo(a)pyrene 0.0719
Benzo(b)fluoranthene 0.231
Chrysene 0.101
Fluoranthene 0.249
Fluorene 0.03 (J)
Naphthalene 0.0171 (J)
Phenanthrene 0.207
Pyrene 0.242
03-608338
RE03-09-13974 1-2 ft ALLH
Aroclor-1260 0.0026 (J)
RE03-09-13975 4-5 ft ALLH
Acetone 0.00226 (J)
03-608337
RE03-09-13973 4-5 ft ALLH
Acetone 0.00391 (J)
03-608336
RE03-09-13970 1-2 ft ALLH
Acetone 0.004 (J)
Aroclor-1254 0.0028 (J)
Aroclor-1260 0.0018 (J)
RE03-09-13971 4-5 ft Qbt 3
Acetone 0.00361 (J)
03-608341
RE03-09-13980 4-5 ft ALLH
Acetone 0.0417
2-Butanone 0.00798 (J)
03-608352
RE03-09-14003 0-1 ft ALLH
Acenaphthene 0.0243 (J)
Anthracene 0.0455
Aroclor-1254 0.009
Aroclor-1260 0.0073
Benzo(a)anthracene 0.0959
Benzo(a)pyrene 0.0735
Benzo(b)fluoranthene 0.127
Benzo(g,h,i)perylene 0.0535
Chrysene 0.0805
Fluoranthene 0.256
Fluorene 0.0171 (J)
Indeno(1,2,3-cd)pyrene 0.0514
Phenanthrene 0.153
Pyrene 0.152
RE03-09-14004 3-4 ft ALLH
Acetone 0.104
2-Butanone 0.0213 (J)
4-Isopropyltoluene 0.000425 (J)
Toluene 0.00119 (J)
1,3-Xylene+1,4-Xylene 0.000425 (J)
03-608351
RE03-09-14000 0-1 ft ALLH
Acenaphthene 0.017 (J)
Anthracene 0.0315 (J)
Aroclor-1254 0.0349
Aroclor-1260 0.0212
Benzo(a)anthracene 0.0834
Benzo(a)pyrene 0.0698
Benzo(b)fluoranthene 0.114
Benzo(g,h,i)perylene 0.0478
Chrysene 0.0731
Fluoranthene 0.184
Fluorene 0.0143 (J)
Indeno(1,2,3-cd)pyrene 0.0408
Phenanthrene 0.118
Pyrene 0.154
RE03-09-14001 3-4 ft ALLH
Acetone 0.00243 (J)
Aroclor-1260 0.0015 (J)
Toluene 0.000569 (J)
RE03-09-14002 6-7 ft ALLH
Acetone 0.00351 (J)
03-03290
RE03-09-14009 3-4 ft FILL
Aroclor-1254 0.0041
Aroclor-1260 0.003 (J)
Benzo(b)fluoranthene 0.0161 (J)
Fluoranthene 0.027 (J)
Phenanthrene 0.0187 (J)
Pyrene 0.0187 (J)
Toluene 0.000871 (J)
RE03-09-14010 6-7 ft FILL
Aroclor-1254 0.0128
Aroclor-1260 0.0063
03-608334
RE03-09-13966 1-2 ft ALLH
Aroclor-1254 0.0029 (J)
Aroclor-1260 0.0039
Chrysene 0.013 (J)
Fluoranthene 0.0242 (J)
Pyrene 0.0174 (J)
RE03-09-13967 4-5 ft Qbt 3
Acetone 0.00206 (J)
Fluoranthene 0.0183 (J)
Pyrene 0.0136 (J)
03-608332
RE03-09-13962 1-2 ft ALLH
Aroclor-1254 0.0052
Aroclor-1260 0.0061
RE03-09-13963 4-5 ft ALLH
Acetone 0.0023 (J)
03-608331
RE03-09-13960 3-4 ft Qbt 3
Acetone 0.00677 (J)
RE03-09-13961 5-6 ft Qbt 3
Benzo(a)anthracene 0.0178 (J)
Benzo(a)pyrene 0.0277 (J)
Benzo(b)fluoranthene 0.0462
Benzo(g,h,i)perylene 0.0211 (J)
Benzo(k)fluoranthene 0.0133 (J)
Chrysene 0.0328 (J)
Fluoranthene 0.0554
Indeno(1,2,3-cd)pyrene 0.14
Phenanthrene 0.0171 (J)
Pyrene 0.0393 (J)
03-608330
RE03-09-13958 3-4 ft ALLH
Acetone 0.0175 (J)
Aroclor-1254 0.0018 (J)
RE03-09-13959 5-6 ft ALLH
Acetone 0.0116 (J)
Anthracene 0.0106 (J)
Benzo(a)pyrene 0.0651
Benzo(b)fluoranthene 0.0903
Benzo(g,h,i)perylene 0.0341 (J)
Benzo(k)fluoranthene 0.041
Chrysene 0.069
Fluoranthene 0.184
Indeno(1,2,3-cd)pyrene 0.15
Phenanthrene 0.0715
Pyrene 0.135
03-608333
RE03-09-13964 1-2 ft ALLH
Aroclor-1260 0.0022 (J)
RE03-09-13965 4-5 ft ALLH
Acetone 0.00254 (J)
Aroclor-1260 0.0028 (J)
03-608343
RE03-09-13984 1-2 ft ALLH
Aroclor-1260 0.0188
RE03-09-13985 4-5 ft ALLH
Acetone 0.0186 (J)
Aroclor-1260 0.0059
03-608344
RE03-09-13986 1-2 ft ALLH
Anthracene 0.0129 (J)
Aroclor-1254 0.581
Aroclor-1260 1.13
Benzo(a)anthracene 0.0665
Benzo(a)pyrene 0.0355 (J)
Benzo(b)fluoranthene 0.186
Benzo(g,h,i)perylene 0.0143 (J)
Chrysene 0.0692
Fluoranthene 0.0959
Phenanthrene 0.0603
Pyrene 0.084
RE03-09-13987 4-5 ft ALLH
Acetone 0.0106 (J)
Aroclor-1242 0.36
Aroclor-1254 0.306
Aroclor-1260 0.17
Benzo(b)fluoranthene 0.114
Fluoranthene 0.0144 (J)
03-608345
RE03-09-13988 1-2 ft ALLH
Anthracene 0.00853 (J)
Aroclor-1254 0.114
Aroclor-1260 0.0718
Benzo(a)anthracene 0.0455
Benzo(a)pyrene 0.0358 (J)
Benzo(b)fluoranthene 0.189
Benzo(g,h,i)perylene 0.0248 (J)
Chrysene 0.0559
Fluoranthene 0.107
Phenanthrene 0.0525
Pyrene 0.0965
RE03-09-13989 4-5 ft ALLH
Aroclor-1254 0.006
Aroclor-1260 0.0036 (J)
03-03286
RE03-09-13982 7-8 ft ALLH
Acetone 0.00695 (J)
Aroclor-1254 0.0139
Aroclor-1260 0.0075
RE03-09-13983 10-11 ft ALLH
Acetone 0.00306 (J)
Aroclor-1254 0.0163
Aroclor-1260 0.0089
03-608346
RE03-09-13990 1-2 ft ALLH
Aroclor-1260 0.04 (J)
RE03-09-13991 4-5 ft ALLH
Acetone 0.00606 (J)
Aroclor-1260 0.0019 (J)
4-Isopropyltoluene 0.000817 (J)
03-608356
RE03-09-14017 1-2 ft ALLH
Acetone 0.0284 (J)
Aroclor-1254 0.0383
Aroclor-1260 0.0481
2-Butanone 0.00415 (J)
Fluoranthene 0.0273 (J)
Phenanthrene 0.0265 (J)
Pyrene 0.0251 (J)
Toluene 0.000599 (J)
RE03-09-14018 3-4 ft ALLH
Acenaphthene 0.0171 (J)
Acetone 0.313
Anthracene 0.0105 (J)
Aroclor-1260 0.0018 (J)
2-Butanone 0.00265 (J)
Carbon Disulfide 0.00203 (J)
Fluoranthene 0.068
Fluorene 0.0181 (J)
4-Isopropyltoluene 0.0419
4-Methyl-2-pentanone 0.00274 (J)
Phenanthrene 0.084
Pyrene 0.047
Toluene 0.000952 (J)
03-608357
RE03-09-14019 1-2 ft ALLH
Acenaphthene 0.114
Acetone 0.0155 (J)
Anthracene 0.019 (J)
Aroclor-1254 0.019
Aroclor-1260 0.0311
Benzo(a)anthracene 0.0261 (J)
Benzo(a)pyrene 0.0151 (J)
Benzo(b)fluoranthene 0.017 (J)
2-Butanone 0.00199 (J)
Chrysene 0.0169 (J)
Fluoranthene 0.0502
Fluorene 0.0773
Indeno(1,2,3-cd)pyrene 0.0531
Phenanthrene 0.0977
Pyrene 0.0482
Toluene 0.000474 (J)
RE03-09-14020 3-4 ft ALLH
Acetone 0.386 (J)
2-Butanone 0.0103 (J)
Fluoranthene 0.0176 (J)
4-Isopropyltoluene 7.64
Phenanthrene 0.0234 (J)
Pyrene 0.0126 (J)
Toluene 0.00294
1,2,4-Trimethylbenzene 0.000581 (J)
03-608353
RE03-09-14006 0-1 ft ALLH
Acenaphthene 0.975
Anthracene 1.65
Aroclor-1254 0.0249
Aroclor-1260 0.0362
Benzo(a)anthracene 2.08
Benzo(a)pyrene 1.63
Benzo(b)fluoranthene 2.59
Benzo(g,h,i)perylene 0.949
Chrysene 1.78
Dibenz(a,h)anthracene 0.0912 (J)
Dibenzofuran 0.409 (J)
Fluoranthene 5.22
Fluorene 0.876
Indeno(1,2,3-cd)pyrene 0.896
2-Methylnaphthalene 0.236
Naphthalene 0.705
Phenanthrene 5.05
Pyrene 4.56
RE03-09-14007 3-4 ft ALLH
Acenaphthene 0.026 (J)
Anthracene 0.0403
Aroclor-1260 0.0074
Benzo(a)anthracene 0.0554
Benzo(a)pyrene 0.0415
Benzo(b)fluoranthene 0.063
Benzo(g,h,i)perylene 0.0333 (J)
Chrysene 0.0475
Fluoranthene 0.135
Fluorene 0.0235 (J)
Indeno(1,2,3-cd)pyrene 0.0292 (J)
2-Methylnaphthalene 0.0099 (J)
Naphthalene 0.0307 (J)
Phenanthrene 0.125
Pyrene 0.101
RE03-09-14008 6-7 ft ALLH
Acenaphthene 0.0144 (J)
Anthracene 0.0241 (J)
Aroclor-1260 0.008
Benzo(a)anthracene 0.0362 (J)
Benzo(a)pyrene 0.0231 (J)
Benzo(b)fluoranthene 0.0374 (J)
Benzo(g,h,i)perylene 0.0161 (J)
Chrysene 0.0267 (J)
Fluoranthene 0.0789
Fluorene 0.0121 (J)
Indeno(1,2,3-cd)pyrene 0.0154 (J)
Naphthalene 0.0138 (J)
Phenanthrene 0.0745
Pyrene 0.061
03-03281
0103-97-0153 1.83-2.83 ft FILL
2-Butanone 0.006 (J)
Carbon Disulfide 0.004 (J)
RE03-09-14011 3-4 ft ALLH
Acetone 0.0924
Aroclor-1254 0.0021 (J)
Aroclor-1260 0.0022 (J)
Benzo(a)anthracene 0.0172 (J)
Benzo(a)pyrene 0.0143 (J)
Benzo(b)fluoranthene 0.0218 (J)
2-Butanone 0.0171 (J)
Chrysene 0.0147 (J)
Fluoranthene 0.0408
Phenanthrene 0.021 (J)
Pyrene 0.0243 (J)
Toluene 0.00134
1,3-Xylene+1,4-Xylene 0.000561 (J)
RE03-09-14012 6-7 ft FILL
Acetone 0.00606
Benzo(a)anthracene 0.0243 (J)
Benzo(a)pyrene 0.0192 (J)
Benzo(b)fluoranthene 0.0312 (J)
Chrysene 0.0192 (J)
Fluoranthene 0.0454
Phenanthrene 0.0269 (J)
Pyrene 0.0335 (J)
03-608355
RE03-09-14015 1-2 ft FILL
Acenaphthene 0.0202 (J)
Acetone 0.0169
Anthracene 0.0521
Aroclor-1260 0.0084 (J)
Benzo(a)anthracene 0.229
Benzo(a)pyrene 0.233
Benzo(b)fluoranthene 0.359
Benzo(g,h,i)perylene 0.121
2-Butanone 0.00213 (J)
Chrysene 0.207
Fluoranthene 0.474
Indeno(1,2,3-cd)pyrene 0.124
4-Isopropyltoluene 0.000402 (J)
Phenanthrene 0.168
Pyrene 0.39
RE03-09-14016 3-4 ft ALLH
Acenaphthene 0.0205 (J)
Acetone 0.0295 (J)
Anthracene 0.0455
Aroclor-1254 0.0403
Aroclor-1260 0.0535
Benzo(a)anthracene 0.107
Benzo(a)pyrene 0.107
Benzo(b)fluoranthene 0.125
Benzo(g,h,i)perylene 0.0584
Benzo(k)fluoranthene 0.0649
2-Butanone 0.00577 (J)
Chrysene 0.126
Fluoranthene 0.272
Fluorene 0.021 (J)
Indeno(1,2,3-cd)pyrene 0.0918
Phenanthrene 0.112
Pyrene 0.245
03-608354
RE03-09-14013 1-2 ft FILL
Acenaphthene 0.0397 (J)
Acetone 0.0285
Anthracene 0.0963
Benzo(a)anthracene 0.968
Benzo(a)pyrene 1.06
Benzo(b)fluoranthene 1.68
Benzo(g,h,i)perylene 0.764
2-Butanone 0.00237 (J)
Chrysene 1.04
Fluoranthene 1.86
Fluorene 0.022 (J)
Indeno(1,2,3-cd)pyrene 0.701
Phenanthrene 0.255
Pyrene 1.54
Toluene 0.000609 (J)
RE03-09-14014 3-4 ft FILL
Acenaphthene 0.018 (J)
Acetone 0.0167
Anthracene 0.0639
Benzo(a)anthracene 0.797
Benzo(a)pyrene 0.795
Benzo(b)fluoranthene 1.27
Benzo(g,h,i)perylene 0.594
Chrysene 0.764
Fluoranthene 1.4
Indeno(1,2,3-cd)pyrene 0.534
Phenanthrene 0.169
Pyrene 1.18
MO-604952
CAMO-09-6010 0-0.5 ft FILL
Aroclor-1254 0.0193
Aroclor-1260 0.0196
Benzo(b)fluoranthene 0.0155 (J)
Fluoranthene 0.0236 (J)
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-] 0.0000845
Heptachlorodibenzodioxins (Total) 0.000194
Heptachlorodibenzofuran[1,2,3,4,6,7,8-] 0.00000861
Heptachlorodibenzofuran[1,2,3,4,7,8,9-] 0.00000103 (J)
Heptachlorodibenzofurans (Total) 0.0000332
Hexachlorodibenzodioxin[1,2,3,4,7,8-] 0.000000673 (J)
Hexachlorodibenzodioxin[1,2,3,6,7,8-] 0.0000026 (J)
Hexachlorodibenzodioxin[1,2,3,7,8,9-] 0.00000139 (J)
Hexachlorodibenzodioxins (Total) 0.0000191
Hexachlorodibenzofuran[1,2,3,4,7,8-] 0.00000131 (J)
Hexachlorodibenzofuran[1,2,3,6,7,8-] 0.000000583 (J)
Hexachlorodibenzofuran[1,2,3,7,8,9-] 0.000000361 (J)
Hexachlorodibenzofuran[2,3,4,6,7,8-] 0.000000784 (J)
Hexachlorodibenzofurans (Total) 0.0000168
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-] 0.00136 (J)
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-] 0.0000157
Pentachlorodibenzodioxin[1,2,3,7,8-] 0.000000407 (J)
Pentachlorodibenzodioxins (Total) 0.00000192
Pentachlorodibenzofuran[1,2,3,7,8-] 0.000000194 (J)
Pentachlorodibenzofuran[2,3,4,7,8-] 0.000000495 (J)
Pentachlorodibenzofurans (Totals) 0.00000505
Phenanthrene 0.0148 (J)
Pyrene 0.0187 (J)
Tetrachlorodibenzofuran[2,3,7,8-] 0.000000588 (J)
Tetrachlorodibenzofurans (Totals) 0.00000442
CAMO-09-6011 6-7 ft Qbt 4
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-] 0.00000459
Heptachlorodibenzodioxins (Total) 0.0000108
Heptachlorodibenzofuran[1,2,3,4,6,7,8-] 0.000000152 (J)
Heptachlorodibenzofurans (Total) 0.000000494
Hexachlorodibenzodioxin[1,2,3,6,7,8-] 0.000000298 (J)
Hexachlorodibenzodioxins (Total) 0.00000173
Hexachlorodibenzofurans (Total) 0.000000461
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-] 0.000047 (J)
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-] 0.000000334 (J)
TA-61
Upper Sandia Canyon Aggregate Area
TA-03
TA-60
TA-58
Area of Map
This map was created for work processes associated with the Sandia Canyon Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.
0 10 20 40 60 80 100 Feet
contour interval = 2 ft
New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929
Sampling location
Historical sampling location
SWMU or AOC (AOC noted)
LANL structure
Fence
Drain Line (approx. location)
Paved road/parking
Inferred drainage
2 ft contour
Location ID (2009/10 - red or underlined, historical - black or not underlined)
Sample description (sample ID, depth (ft), media)
49-608402
RE10-07-5304 0.00-0.50 SOIL
Copper 5.5
Selenium 0.5 (J)
Analyte data (analyte, result, optional qualifier code)
Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low
Note: All analytical results reported in milligrams per kilogram (mg/kg) or in picocuries per gram (pCi/g) except as noted.
PLATE 18
Organic chemical concentrations detected at SWMU 03-045(h) and AOCs 03-052(b) and 03-056(k)
Map Number:TPMC_041110A
Date: April 11, 2010
Rev: May 13, 2010
Drafted By: TPMC
File Name: USCAA_HITS_MapD
Revised 06/26/13, LANL

1619600 1619800 1620000 1620200

1773800 1773600 1773400

TA-03

03-608320
RE03-09-13940 0-1 ft ALLH
Lead 70.7
Zinc 54.2
RE03-09-13941 1-2 ft ALLH
Lead 99.6
Thallium 1.04
Zinc 54.6

03-045(e)

03-233 03-144 03-1188 03-26 03-2382 03-57 03-1790

03-02-21036
RE03-02-49270 0-0.5 ft FILL
Cadmium 0.687855
Chromium 156.64
Copper 26.1067
Mercury 0.102157
Silver 6.44722
Zinc 97.9569

03-02-21038
RE03-02-49272 0-0.5 ft FILL
Chromium 42.8736
Copper 20.5747
Silver 1.49425
Zinc 49.8851

CONSOLIDATED UNIT 03-012(b)-00

03-02-21037
03-02-22576
03-02-21039

03-2373 03-2330 03-1682 03-1437

03-22577
RE03-04-52776 0-0.5 ft ALLH
Chromium 31
Chromium hexavalent ion 0.241
Silver 1.18
Zinc 54.5

03-02-21050

03-22578
RE03-04-52777 0-0.5 ft ALLH
Chromium 25
Silver 1.88

03-02-21041
03-02-21040
03-02-21051

03-592 03-336 03-014(q) 03-1398

03-22580
RE03-04-52779 0-0.5 ft ALLH
Chromium hexavalent ion 0.0952 (J)
Silver 1.99

03-1382

03-02-21045
RE03-02-49279 0-0.5 ft FILL
Zinc 130.17
RE03-02-49293 0.5-1 ft FILL
Chromium 22.1761
Zinc 78.7634

03-02-21044
RE03-02-49278 0-0.5 ft FILL
Chromium 21.34
Silver 1.27792
Zinc 145.161
RE03-02-49292 0.5-1 ft FILL
Zinc 73.6963

03-02-21046
03-02-21047

03-1404 03-1535 03-2447 03-251 03-24 03-2422 03-2424

AOC 03-047(d)

03-012(b)

03-02-21052

03-55 03-58 03-2423 03-2425

03-22579
RE03-04-52778 0-0.5 ft ALLH
Chromium 28
Silver 1.04
Zinc 54.6
RE03-04-52788 3.5-4 ft ALLH
Chromium hexavalent ion 0.102 (J)

03-22585
RE03-04-52784 0-0.5 ft ALLH
Chromium 32.5
Silver 2.08
Zinc 54.2
RE03-04-52794 3.5-4 ft ALLH
Chromium hexavalent ion 0.21

03-285 03-2306

03-02-21042
03-02-21043
RE03-02-49277 0-0.5 ft FILL
Zinc 62

03-056(c)

03-02-21049
RE03-02-49283 0-0.5 ft FILL
Chromium 45.8333
Silver 1.63194
Zinc 52.3148

03-02-21048
RE03-02-49296 0.5-1 ft FILL
Chromium 19.3705
Zinc 57.2639

03-608321
RE03-09-13942 0-1 ft ALLH
Antimony 0.984 (J)

03-045(f)

03-784 03-22583 03-223

03-02-21053
RE03-02-49301 0.5-1 ft FILL
Cadmium 0.469939
Zinc 67.7301

03-02-22582

03-608322
RE03-09-13945 1-2 ft ALLH
Antimony 1.08

03-014(p)

03-045(b) 03-045(c)

03-22584
RE03-04-52783 0-0.5 ft ALLH
Chromium hexavalent ion 0.157

03-045(a)

03-608316
RE03-09-13933 1-2 ft Qbt 3
Chromium 9.71

03-608317
RE03-09-13934 0-1 ft ALLH
Chromium 88.2
Lead 365
Zinc 161
RE03-09-13935 1-2 ft ALLH
Lead 44
Zinc 63.7

03-608318
RE03-09-13936 0-1 ft Qbt 3
Chromium 26
RE03-09-13937 1-2 ft Qbt 3
Chromium 27.6
Copper 5.22

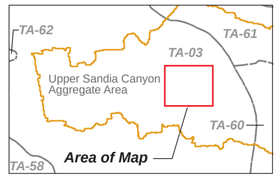
03-608319
RE03-09-13938 0-1 ft ALLH
Copper 34
Lead 39.1
Mercury 0.374
Silver 1.76
Zinc 96.8
RE03-09-13939 1-2 ft Qbt 3
Chromium 7.3
Copper 9.21
Lead 14.1
Zinc 65.1

03-608197
RE03-09-13480 0-1 ft ALLH
Mercury 0.159
Silver 1.17
Zinc 53.4

03-608196
RE03-09-13478 0-1 ft ALLH
Calcium 22800 (J+)
Magnesium 5240 (J+)
Sodium 1450
RE03-09-13479 1-2 ft ALLH
Calcium 8460 (J+)
Zinc 50.3

03-1441 03-2333 03-2281 03-2283

1360



This map was created for work processes associated with the Sandia Canyon Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

0 10 20 40 60 80 100 Feet

contour interval = 2 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

- Sampling location
- Historical sampling location
- SWMU or AOC (*AOC noted*)
- LANL structure
- Fence
- DrainPipe
- Paved road/parking
- Dirt road
- Inferred drainage
- 2 ft contour

Location ID (2009/10 - red or underlined, historical - black or not underlined)

Sample description (sample ID, depth (ft), media)

49-608402
RE10-07-5304 0.00-0.50 SOIL
Copper 5.5
Selenium 0.5 (J)

Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in milligrams per kilogram (mg/kg) or in picocuries per gram (pCi/g) except as noted.

PLATE 8
Inorganic chemical concentrations detected or detected above BVs at SWMUs 03-012(b) and 03-045(a,b,c,e,f)

Map Number:TPMC_041410A
Date: April 14, 2010 Rev:May 13, 2010
DraftedBy:TPMC File Name: USCAA_HITS_MapH
Revised 08/13/13, LANL

1619600 1619800 1620000 1620200

1773800 1773600 1773400

TA-03

03-608320
RE03-09-13940 0-1 ft ALLH
Aroclor-1254 0.0024 (J)
Aroclor-1260 0.0058
Benzo(b)fluoranthene 0.0599 (J)
Fluoranthene 0.0814 (J)
Phenanthrene 0.0589 (J)
Pyrene 0.0796 (J)
Toluene 0.000479 (J)
TPH-DRO 300
RE03-09-13941 1-2 ft ALLH
Fluoranthene 0.239 (J)
4-Isopropyltoluene 0.00173
Phenanthrene 0.251 (J)
Pyrene 0.288 (J)
TPH-DRO 3250

03-045(e)

03-233 03-144 03-1188 03-26 03-2382 03-57 03-1790

03-22576 (0-0.5 ft)

03-22578 (0-0.5 ft)
RE03-04-52777 0-0.5 ft ALLH
Aroclor-1254 0.0085 (J)
Aroclor-1260 0.0321 (J)

CONSOLIDATED UNIT 03-012(b)-00

03-014(q)

03-1682 03-2373 03-1437 03-2330 03-592 03-336 03-1398

03-22580 (0-0.5 ft)
RE03-04-52779 0-0.5 ft ALLH
Aroclor-1254 0.0213 (J)
Aroclor-1260 0.0711 (J)

03-608317
RE03-09-13934 0-1 ft ALLH
Acenaphthene 0.954
Anthracene 1.99
Aroclor-1254 0.0444
Aroclor-1260 0.0314 (J)
Benzo(a)anthracene 3.8
Benzo(a)pyrene 3.35
Benzo(b)fluoranthene 5.85
Benzo(g,h,i)perylene 1.63
Chrysene 3.56
Fluoranthene 9.3
Fluorene 1.05
Indeno(1,2,3-cd)pyrene 1.65
2-Methylnaphthalene 0.173 (J)
Naphthalene 0.72
Phenanthrene 8.26
Pyrene 8.32
TPH-DRO 273
RE03-09-13935 1-2 ft ALLH
Aroclor-1254 0.0573
Aroclor-1260 0.0449
Benzo(a)anthracene 0.0869 (J)
Benzo(a)pyrene 0.0779 (J)
Benzo(b)fluoranthene 0.148 (J)
Fluoranthene 0.157 (J)
Phenanthrene 0.102 (J)
Pyrene 0.163 (J)
TPH-DRO 48 (J)

03-1404 03-1535 03-2447 03-1382 03-251 03-24 03-55 03-58 03-2422 03-2424 03-2423 03-2425 03-285 03-2306

AOC 03-047(d)

03-22 03-608316
RE03-09-13932 0-1 ft Qbt 3
TPH-GRO 0.0129 (J)
RE03-09-13933 1-2 ft Qbt 3
Aroclor-1260 0.0018 (J)
TPH-DRO 6.58 (J)
TPH-GRO 0.0191 (J)

03-012(b)

03-608319
RE03-09-13938 0-1 ft ALLH
Acetone 0.00224 (J)
Anthracene 0.0851 (J)
Aroclor-1254 0.137
Aroclor-1260 0.366
Benzo(a)anthracene 0.352 (J)
Benzo(a)pyrene 0.33 (J)
Benzo(b)fluoranthene 0.6
Benzo(g,h,i)perylene 0.167 (J)
Chrysene 0.348 (J)
Fluoranthene 0.671
Indeno(1,2,3-cd)pyrene 0.157 (J)
4-Isopropyltoluene 0.023
Phenanthrene 0.394 (J)
Pyrene 0.721
TPH-DRO 42
RE03-09-13939 1-2 ft Qbt 3
Anthracene 0.0324 (J)
Aroclor-1254 0.0149 (J)
Aroclor-1260 0.0356
Benzo(a)anthracene 0.115
Benzo(a)pyrene 0.101
Benzo(b)fluoranthene 0.187
Benzo(g,h,i)perylene 0.0501
Chrysene 0.104
Fluoranthene 0.246
Fluorene 0.0178 (J)
Indeno(1,2,3-cd)pyrene 0.0514
Phenanthrene 0.172
Pyrene 0.215
TPH-DRO 7.47 (J)

03-608321
RE03-09-13942 0-1 ft ALLH
Aroclor-1260 0.0022 (J)
RE03-09-13943 1-2 ft ALLH
Aroclor-1260 0.0034 (J)

03-22582 (0.83-1.33 ft)
RE03-04-52781 0.83-1.33 ft ALLH
Aroclor-1260 0.259

03-056(c)

03-045(f)

03-784 03-223 03-014(p)

03-045(a) 03-045(b) 03-045(c)

03-608196
RE03-09-13478 0-1 ft ALLH
Aroclor-1254 0.235
Aroclor-1260 0.862
Benzo(b)fluoranthene
Chrysene 0.0233 (J)
Fluoranthene 0.0468
Methylene Chloride 0.00256 (J)
Phenanthrene 0.0615
Pyrene 0.0475
TPH-DRO 2.98 (J)
RE03-09-13479 1-2 ft ALLH
Acenaphthene 0.0542
Anthracene 0.139
Aroclor-1254 0.812
Aroclor-1260 3.19
Benzo(a)anthracene 0.287
Benzo(a)pyrene 0.242
Benzo(b)fluoranthene
Benzo(b)fluoranthene 0.451
Benzo(g,h,i)perylene 0.12
Chrysene 0.232
Fluoranthene 0.548
Fluorene 0.0624
Indeno(1,2,3-cd)pyrene 0.111
Methylene Chloride 0.00241 (J)
2-Methylnaphthalene 0.00868 (J)
Naphthalene 0.025 (J)
Phenanthrene 0.447
Pyrene 0.534
TPH-DRO 53.8

03-608322
RE03-09-13944 0-1 ft ALLH
Acetone 0.00474 (J)
Aroclor-1260 0.0314
Fluoranthene 0.0257 (J)
4-Isopropyltoluene 0.000364 (J)
Phenanthrene 0.0125 (J)
Pyrene 0.0175 (J)
RE03-09-13945 1-2 ft ALLH
Aroclor-1260 0.0047
Isopropylbenzene 0.000427 (J)

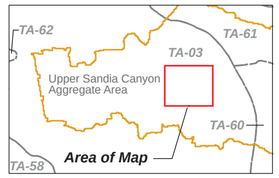
03-608318
RE03-09-13937 1-2 ft Qbt 3
Aroclor-1260 0.0027 (J)

03-608197
RE03-09-13480 0-1 ft ALLH
Anthracene 0.00901 (J)
Aroclor-1254 0.0803
Aroclor-1260 0.117
Benzo(a)pyrene 0.0562
Benzo(b)fluoranthene
Benzo(b)fluoranthene 0.111
Benzo(g,h,i)perylene 0.03 (J)
Chrysene 0.0493
Fluoranthene 0.102
Indeno(1,2,3-cd)pyrene 0.0297 (J)
Phenanthrene 0.0362
Pyrene 0.0845
TPH-DRO 8.88
RE03-09-13481 1-2 ft ALLH
Aroclor-1254 0.021
Aroclor-1260 0.0905
Benzo(b)fluoranthene
Benzo(b)fluoranthene 0.0492
Benzo(g,h,i)perylene 0.015 (J)
Fluoranthene 0.0389
Indeno(1,2,3-cd)pyrene 0.0141 (J)
Methylene Chloride 0.00225 (J)
Pyrene 0.0324 (J)
TPH-DRO 4.03 (J)

03-22584 (0-0.5 ft)
RE03-04-52783 0-0.5 ft ALLH
Aroclor-1254 0.336
Aroclor-1260 0.925

03-2333 03-2281 03-2283 03-1441

7360 7380



This map was created for work processes associated with the Sandia Canyon Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

N

0 10 20 40 60 80 100 Feet

contour interval = 2 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

- Sampling location
- Historical sampling location
- SWMU or AOC (*AOC noted*)
- LANL structure
- Fence
- DrainPipeAprox_MapH
- Paved road/parking
- Dirt road
- Inferred drainage
- 2 ft contour

Location ID (2009/10 - red or underlined, historical - black or not underlined)

Sample description (sample ID, depth (ft), media)

49-608402
RE10-07-5304 0.00-0.50 SOIL
Copper 5.5
Selenium 0.5 (J)

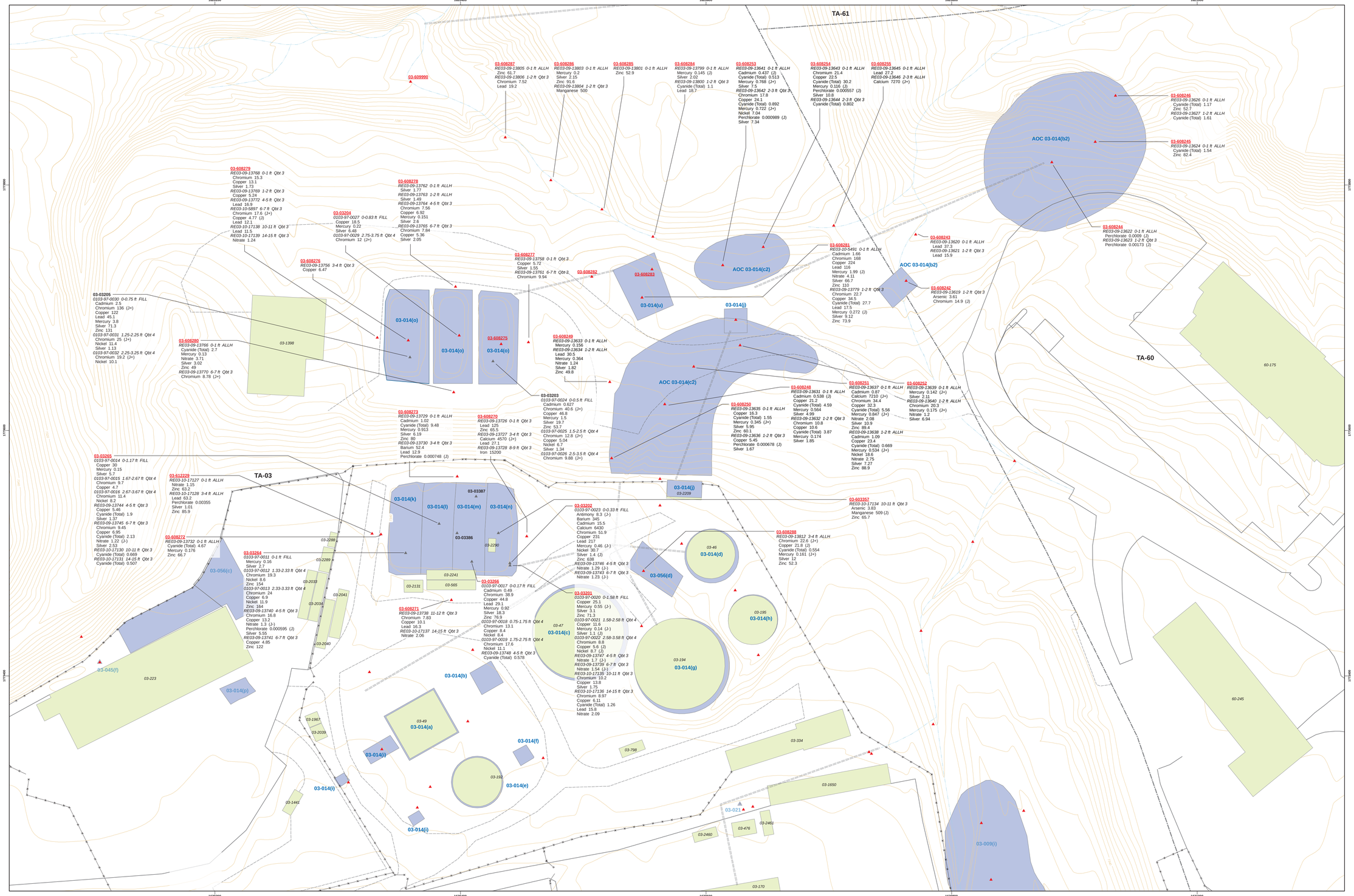
Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in milligrams per kilogram (mg/kg) or in picocuries per gram (pCi/g) except as noted.

PLATE 9
Organic chemical concentrations detected at SWMUs 03-012(b) and 03-045(a,b,c,e,f)

Map Number:TPMC_041410A
Date: April 14, 2010 Rev:May 13, 2010
DraftedBy:TPMC File Name: USCAA_HITS_MapH
Revised 08/14/13, LANL

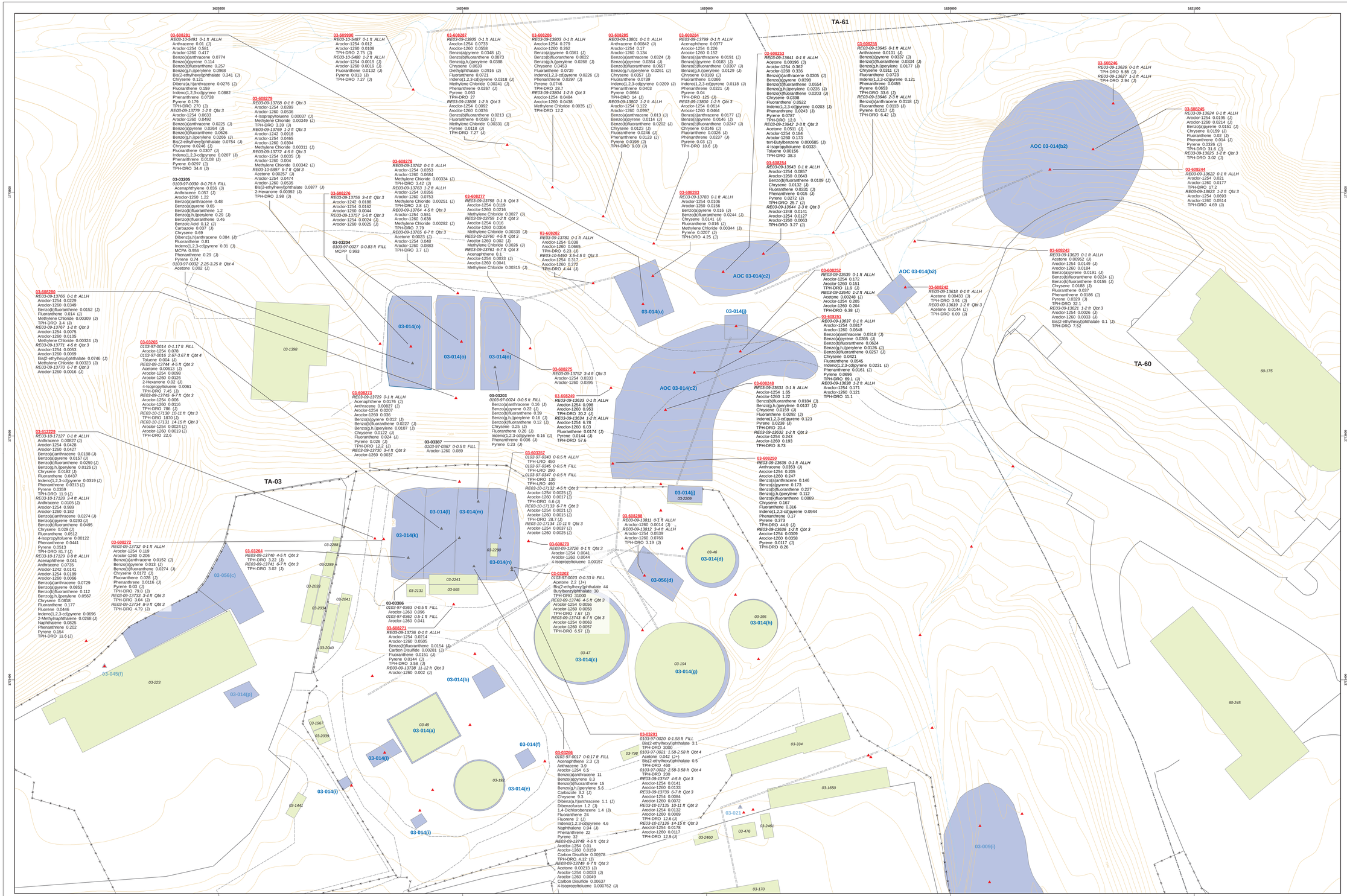


This map was created for work processes associated with the Sandia Canyon Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

Note: All analytical results reported in milligrams per kilogram (mg/kg) or in picocuries per gram (pCi/g) except as noted.

PLATE 12
Inorganic chemical concentrations detected or detected above BVs at SWMUs 03-014(k–o,u) and 03-056(d) and AOCs 03-014(b2) and 03-014(c2)

Map Number: TPMC_041310A
Date: April 13, 2010 Rev: May 14, 2010
Drafted By: TPMC File Name: USCAA_HITS_MapL
Revised 08/08/13, LANL


TA-61
TA-60
TA-03
AOC 03-014(b2)
AOC 03-014(c2)
03-014(u)
03-014(o)
03-014(m)
03-014(k)
03-014(l)
03-014(n)
03-014(j)
03-014(d)
03-014(h)
03-014(g)
03-014(c)
03-014(a)
03-014(b)
03-014(e)
03-014(f)
03-014(i)
03-056(c)
03-056(d)
03-045(f)
03-03203
0103-97-0024 0-0.5 ft FILL
Benzo(a)anthracene 0.16 (J)
Benzo(a)pyrene 0.22 (J)
Benzo(b)fluoranthene 0.39
Benzo(g,h,i)perylene 0.16 (J)
Benzo(k)fluoranthene 0.12 (J)
Chrysene 0.25 (J)
Fluoranthene 0.26 (J)
Indeno(1,2,3-cd)pyrene 0.16 (J)
Phenanthrene 0.036 (J)
Pyrene 0.23 (J)
03-03201
0103-97-0020 0-1.58 ft FILL
Bis(2-ethylhexyl)phthalate 3.1
TPH-DRO 3000
0103-97-0021 1.58-2.58 ft Qbt 4
Acetone 0.042 (J+)
Bis(2-ethylhexyl)phthalate 0.5
TPH-DRO 460
0103-97-0022 2.58-3.58 ft Qbt 4
TPH-DRO 200
03-03266
0103-97-0017 0-0.17 ft FILL
Acenaphthene 2.3 (J)
Anthracene 3.9
Aroclor-1254 6.5
Benzo(a)anthracene 11
Benzo(a)pyrene 8.3
Benzo(b)fluoranthene 15
Benzo(g,h,i)perylene 5.6
Carbazole 3.2 (J)
Chrysene 9.3
Dibenz(a,h)anthracene 1.1 (J)
Dibenzofuran 1.2 (J)
1,4-Dichlorobenzene 1.4 (J)
Fluoranthene 24
Fluorene 2 (J)
Indeno(1,2,3-cd)pyrene 4.6
Naphthalene 0.94 (J)
Phenanthrene 22
Pyrene 32
RE03-09-13748 4-5 ft Qbt 3
Aroclor-1254 0.01
Aroclor-1260 0.0159
Carbon Disulfide 0.00978
TPH-DRO 4.12 (J)
RE03-09-13749 6-7 ft Qbt 3
Acetone 0.00213 (J)
Aroclor-1254 0.0033 (J)
Aroclor-1260 0.0049
Carbon Disulfide 0.00637
4-Isopropyltoluene 0.000762 (J)
03-03202
0103-97-0023 0-0.33 ft FILL
Acetone 2.2 (J+)
Bis(2-ethylhexyl)phthalate 44
Butylbenzylphthalate 30
TPH-DRO 31000
RE03-09-13746 4-5 ft Qbt 3
Aroclor-1254 0.0056
Aroclor-1260 0.0058
TPH-DRO 7.67 (J)
RE03-09-13743 6-7 ft Qbt 3
Aroclor-1254 0.0063
Aroclor-1260 0.0057
TPH-DRO 6.57 (J)
03-03386
0103-97-0363 0-0.5 ft FILL
Aroclor-1260 0.096
0103-97-0362 0.5-1 ft FILL
Aroclor-1260 0.041
03-608277
RE03-09-13758 0-1 ft Qbt 3
Aroclor-1254 0.0119
Aroclor-1260 0.0216
Methylene Chloride 0.0027 (J)
RE03-09-13759 1-2 ft Qbt 3
Aroclor-1254 0.0102
Aroclor-1260 0.0304
Methylene Chloride 0.00339 (J)
RE03-09-13760 4-5 ft Qbt 3
Aroclor-1260 0.002 (J)
Methylene Chloride 0.0026 (J)
RE03-09-13761 6-7 ft Qbt 3
Acenaphthene 0.1
Aroclor-1254 0.0033 (J)
Aroclor-1260 0.0041
Methylene Chloride 0.00315 (J)
03-608278
RE03-09-13762 0-1 ft ALLH
Aroclor-1254 0.0353
Aroclor-1260 0.0684
Methylene Chloride 0.00334 (J)
TPH-DRO 3.42 (J)
RE03-09-13763 1-2 ft ALLH
Aroclor-1254 0.0356
Aroclor-1260 0.0753
Methylene Chloride 0.00251 (J)
TPH-DRO 2.8 (J)
RE03-09-13764 4-5 ft Qbt 3
Aroclor-1254 0.551
Aroclor-1260 0.638
Methylene Chloride 0.00282 (J)
TPH-DRO 7.79
RE03-09-13765 6-7 ft Qbt 3
Acetone 0.0023 (J)
Aroclor-1254 0.048
Aroclor-1260 0.0883
TPH-DRO 3.7 (J)
03-608282
RE03-09-13781 0-1 ft ALLH
Aroclor-1254 0.038
Aroclor-1260 0.0665
TPH-DRO 6.23 (J)
RE03-10-5490 3.5-4.5 ft Qbt 3
Aroclor-1254 0.317
Aroclor-1260 0.272
TPH-DRO 4.44 (J)
03-608283
RE03-09-13783 0-1 ft ALLH
Aroclor-1254 0.0106
Aroclor-1260 0.0156
Benzo(a)pyrene 0.016 (J)
Benzo(b)fluoranthene 0.0244 (J)
Chrysene 0.0141 (J)
Fluoranthene 0.016 (J)
Methylene Chloride 0.00344 (J)
Pyrene 0.0207 (J)
TPH-DRO 4.25 (J)
03-608285
RE03-09-13801 0-1 ft ALLH
Anthracene 0.00842 (J)
Aroclor-1254 0.17
Aroclor-1260 0.134
Benzo(a)anthracene 0.0324 (J)
Benzo(a)pyrene 0.0364 (J)
Benzo(b)fluoranthene 0.0657
Benzo(g,h,i)perylene 0.0261 (J)
Chrysene 0.0357 (J)
Fluoranthene 0.0739
Indeno(1,2,3-cd)pyrene 0.0209 (J)
Phenanthrene 0.0403
Pyrene 0.0664
TPH-DRO 14 (J)
RE03-09-13802 1-2 ft ALLH
Aroclor-1254 0.122
Aroclor-1260 0.0997
Benzo(a)anthracene 0.013 (J)
Benzo(a)pyrene 0.0114 (J)
Benzo(b)fluoranthene 0.0202 (J)
Chrysene 0.0123 (J)
Fluoranthene 0.0246 (J)
Phenanthrene 0.0123 (J)
Pyrene 0.0198 (J)
TPH-DRO 9.03 (J)
03-608286
RE03-09-13803 0-1 ft ALLH
Aroclor-1254 0.279
Aroclor-1260 0.262
Benzo(a)pyrene 0.0361 (J)
Benzo(b)fluoranthene 0.0622
Benzo(g,h,i)perylene 0.0268 (J)
Chrysene 0.0453
Fluoranthene 0.0739
Indeno(1,2,3-cd)pyrene 0.0226 (J)
Phenanthrene 0.0297 (J)
Pyrene 0.0746
TPH-DRO 28.7
RE03-09-13804 1-2 ft Qbt 3
Aroclor-1254 0.0484
Aroclor-1260 0.0438
Methylene Chloride 0.0035 (J)
TPH-DRO 12.2
03-608287
RE03-09-13805 0-1 ft ALLH
Aroclor-1254 0.0733
Aroclor-1260 0.0658
Benzo(a)pyrene 0.0348 (J)
Benzo(b)fluoranthene 0.0673
Benzo(g,h,i)perylene 0.0388
Chrysene 0.0639
Diethylphthalate 0.0916 (J)
Fluoranthene 0.0721
Indeno(1,2,3-cd)pyrene 0.0318 (J)
Methylene Chloride 0.00241 (J)
Phenanthrene 0.0267 (J)
Pyrene 0.053
TPH-DRO 27
RE03-09-13806 1-2 ft Qbt 3
Aroclor-1254 0.0092
Aroclor-1260 0.0076
Benzo(a)anthracene 0.0213 (J)
Fluoranthene 0.0169 (J)
Methylene Chloride 0.00331 (J)
Pyrene 0.0118 (J)
TPH-DRO 7.27 (J)
03-608289
RE03-09-13811 0-1 ft ALLH
Aroclor-1260 0.0014 (J)
RE03-09-13812 3-4 ft ALLH
Aroclor-1254 0.0539
Aroclor-1260 0.0769
TPH-DRO 3.19 (J)
03-608253
RE03-09-13641 0-1 ft ALLH
Acetone 0.00196 (J)
Aroclor-1254 0.362
Aroclor-1260 0.336
Benzo(a)anthracene 0.0305 (J)
Benzo(a)pyrene 0.0398
Benzo(b)fluoranthene 0.0554
Benzo(g,h,i)perylene 0.0235 (J)
Benzo(k)fluoranthene 0.0203 (J)
Chrysene 0.0398
Fluoranthene 0.0522
Indeno(1,2,3-cd)pyrene 0.0203 (J)
Phenanthrene 0.0243 (J)
Pyrene 0.0787
TPH-DRO 12.8
RE03-09-13642 2-3 ft Qbt 3
Acetone 0.0511 (J)
Aroclor-1254 0.184
Aroclor-1260 0.172
tert-Butylbenzene 0.000685 (J)
4-Isopropyltoluene 0.0333
Toluene 0.00156
TPH-DRO 38.3
03-608254
RE03-09-13643 0-1 ft ALLH
Aroclor-1254 0.0857
Aroclor-1260 0.0643
Benzo(b)fluoranthene 0.0109 (J)
Chrysene 0.0132 (J)
Fluoranthene 0.0331 (J)
Phenanthrene 0.015 (J)
Pyrene 0.0272 (J)
TPH-DRO 25.7 (J)
RE03-09-13644 2-3 ft Qbt 3
Aroclor-1248 0.0141
Aroclor-1254 0.0127
Aroclor-1260 0.0063
TPH-DRO 3.27 (J)
03-608255
RE03-09-13645 0-1 ft ALLH
Anthracene 0.0101 (J)
Benzo(a)pyrene 0.0337 (J)
Benzo(b)fluoranthene 0.0334 (J)
Benzo(g,h,i)perylene 0.0177 (J)
Chrysene 0.0311 (J)
Fluoranthene 0.0723
Indeno(1,2,3-cd)pyrene 0.121
Phenanthrene 0.0455
Pyrene 0.0653
TPH-DRO 33.6 (J)
RE03-09-13646 2-3 ft ALLH
Benzo(a)anthracene 0.0118 (J)
Fluoranthene 0.0113 (J)
Pyrene 0.0117 (J)
TPH-DRO 6.42 (J)
03-608246
RE03-09-13626 0-1 ft ALLH
TPH-DRO 5.55 (J)
RE03-09-13627 1-2 ft ALLH
TPH-DRO 2.94 (J)
03-608245
RE03-09-13624 0-1 ft ALLH
Aroclor-1254 0.0195 (J)
Aroclor-1260 0.0214 (J)
Benzo(a)pyrene 0.0151 (J)
Chrysene 0.0159 (J)
Fluoranthene 0.02 (J)
Phenanthrene 0.014 (J)
Pyrene 0.0326 (J)
TPH-DRO 31.6 (J)
RE03-09-13625 1-2 ft Qbt 3
TPH-DRO 3.02 (J)
03-608244
RE03-09-13622 0-1 ft ALLH
Aroclor-1254 0.021
Aroclor-1260 0.0177
TPH-DRO 17.2
RE03-09-13623 1-2 ft Qbt 3
Aroclor-1254 0.0693
Aroclor-1260 0.0514
TPH-DRO 4.69 (J)
03-608243
RE03-09-13620 0-1 ft ALLH
Acetone 0.00952 (J)
Aroclor-1254 0.0149 (J)
Aroclor-1260 0.0184
Benzo(a)pyrene 0.0191 (J)
Benzo(b)fluoranthene 0.0224 (J)
Benzo(k)fluoranthene 0.0155 (J)
Chrysene 0.0188 (J)
Fluoranthene 0.037
Phenanthrene 0.0186 (J)
Pyrene 0.0329 (J)
TPH-DRO 32.1
RE03-09-13621 1-2 ft Qbt 3
Aroclor-1254 0.0026 (J)
Aroclor-1260 0.0033 (J)
Bis(2-ethylhexyl)phthalate 0.1 (J)
TPH-DRO 7.52
03-608252
RE03-09-13639 0-1 ft ALLH
Aroclor-1254 0.172
Aroclor-1260 0.151
TPH-DRO 11.9 (J)
RE03-09-13640 1-2 ft ALLH
Acetone 0.00248 (J)
Aroclor-1254 0.205
Aroclor-1260 0.204
TPH-DRO 6.38 (J)
03-608242
RE03-09-13618 0-1 ft ALLH
Acetone 0.00433 (J)
TPH-DRO 3.91 (J)
RE03-09-13619 1-2 ft Qbt 3
Acetone 0.0144 (J)
TPH-DRO 6.09 (J)
03-608251
RE03-09-13637 0-1 ft ALLH
Aroclor-1254 0.0817
Aroclor-1260 0.0648
Benzo(a)anthracene 0.0318 (J)
Benzo(a)pyrene 0.0365 (J)
Benzo(b)fluoranthene 0.0624
Benzo(g,h,i)perylene 0.0126 (J)
Benzo(k)fluoranthene 0.0257 (J)
Chrysene 0.0421
Fluoranthene 0.0545
Indeno(1,2,3-cd)pyrene 0.0231 (J)
Phenanthrene 0.0161 (J)
Pyrene 0.0696
TPH-DRO 69.1 (J)
RE03-09-13638 1-2 ft ALLH
Aroclor-1254 0.171
Aroclor-1260 0.121
TPH-DRO 11.1
03-608248
RE03-09-13631 0-1 ft ALLH
Aroclor-1254 1.65
Aroclor-1260 1.22
Benzo(b)fluoranthene 0.0184 (J)
Benzo(g,h,i)perylene 0.0137 (J)
Chrysene 0.0159 (J)
Fluoranthene 0.0292 (J)
Indeno(1,2,3-cd)pyrene 0.123
Pyrene 0.0238 (J)
TPH-DRO 20.4
RE03-09-13632 1-2 ft Qbt 3
Aroclor-1254 0.243
Aroclor-1260 0.193
TPH-DRO 8.73
03-608250
RE03-09-13635 0-1 ft ALLH
Anthracene 0.0353 (J)
Aroclor-1254 0.205
Aroclor-1260 0.247
Benzo(a)anthracene 0.146
Benzo(a)pyrene 0.173
Benzo(b)fluoranthene 0.227
Benzo(g,h,i)perylene 0.112
Benzo(k)fluoranthene 0.0889
Chrysene 0.167
Fluoranthene 0.316
Indeno(1,2,3-cd)pyrene 0.0944
Phenanthrene 0.17
Pyrene 0.373
TPH-DRO 44.9 (J)
RE03-09-13636 1-2 ft Qbt 3
Aroclor-1254 0.0309
Aroclor-1260 0.0358
Pyrene 0.0117 (J)
TPH-DRO 8.26
03-608280
RE03-09-13766 0-1 ft ALLH
Aroclor-1254 0.0329
Aroclor-1260 0.0349
Benzo(b)fluoranthene 0.0152 (J)
Fluoranthene 0.014 (J)
Methylene Chloride 0.00309 (J)
TPH-DRO 3.4 (J)
RE03-09-13767 1-2 ft Qbt 3
Aroclor-1254 0.0075
Aroclor-1260 0.0105
Methylene Chloride 0.00324 (J)
RE03-09-13771 4-5 ft Qbt 3
Aroclor-1254 0.0053
Aroclor-1260 0.0069
Bis(2-ethylhexyl)phthalate 0.0746 (J)
Methylene Chloride 0.00323 (J)
RE03-09-13770 6-7 ft Qbt 3
Aroclor-1260 0.0016 (J)
03-612229
RE03-10-17127 0-1 ft ALLH
Anthracene 0.00827 (J)
Aroclor-1254 0.0428
Aroclor-1260 0.0427
Benzo(a)anthracene 0.0188 (J)
Benzo(a)pyrene 0.0157 (J)
Benzo(b)fluoranthene 0.0259 (J)
Benzo(g,h,i)perylene 0.0126 (J)
Chrysene 0.0182 (J)
Fluoranthene 0.0437
Indeno(1,2,3-cd)pyrene 0.0319 (J)
Phenanthrene 0.0313 (J)
Pyrene 0.0359
TPH-DRO 11.9 (J)
RE03-10-17128 3-4 ft ALLH
Anthracene 0.0105 (J)
Aroclor-1254 0.989
Aroclor-1260 0.182
Benzo(a)anthracene 0.0274 (J)
Benzo(a)pyrene 0.0293 (J)
Benzo(b)fluoranthene 0.0495
Chrysene 0.029 (J)
Fluoranthene 0.0512
4-Isopropyltoluene 0.00122
Phenanthrene 0.0441
Pyrene 0.0513
TPH-DRO 81.7 (J)
RE03-10-17129 8-9 ft ALLH
Acenaphthene 0.041
Anthracene 0.0735
Aroclor-1242 0.0141
Aroclor-1254 0.0189
Aroclor-1260 0.0066
Benzo(a)anthracene 0.0729
Benzo(a)pyrene 0.0853
Benzo(b)fluoranthene 0.112
Benzo(g,h,i)perylene 0.0567
Chrysene 0.0818
Fluoranthene 0.177
Fluorene 0.0446
Indeno(1,2,3-cd)pyrene 0.0696
2-Methylnaphthalene 0.0268 (J)
Naphthalene 0.0825
Phenanthrene 0.202
Pyrene 0.154
TPH-DRO 11.6 (J)
03-608281
RE03-10-5491 0-1 ft ALLH
Anthracene 0.01 (J)
Aroclor-1254 0.581
Aroclor-1260 0.417
Benzo(a)anthracene 0.0774
Benzo(a)pyrene 0.114
Benzo(b)fluoranthene 0.257
Benzo(g,h,i)perylene 0.0968
Bis(2-ethylhexyl)phthalate 0.341 (J)
Chrysene 0.121
Dibenz(a,h)anthracene 0.0276 (J)
Fluoranthene 0.159
Indeno(1,2,3-cd)pyrene 0.0882
Phenanthrene 0.0728
Pyrene 0.179
TPH-DRO 270 (J)
RE03-09-13779 1-2 ft Qbt 3
Aroclor-1254 0.0633
Aroclor-1260 0.0492
Benzo(a)anthracene 0.0225 (J)
Benzo(a)pyrene 0.0264 (J)
Benzo(b)fluoranthene 0.0626
Benzo(g,h,i)perylene 0.0266 (J)
Bis(2-ethylhexyl)phthalate 0.0754 (J)
Chrysene 0.0246 (J)
Fluoranthene 0.0307 (J)
Indeno(1,2,3-cd)pyrene 0.0207 (J)
Phenanthrene 0.0108 (J)
Pyrene 0.0297 (J)
TPH-DRO 34.4 (J)
03-03205
0103-97-0030 0-0.75 ft FILL
Acenaphthylene 0.036 (J)
Anthracene 0.057 (J)
Aroclor-1260 1.22
Benzo(a)anthracene 0.48
Benzo(a)pyrene 0.65
Benzo(b)fluoranthene 1.2
Benzo(g,h,i)perylene 0.29 (J)
Benzo(k)fluoranthene 0.46
Benzoic Acid 0.12 (J)
Carbazole 0.037 (J)
Chrysene 0.69
Dibenz(a,h)anthracene 0.084 (J)
Fluoranthene 0.81
Indeno(1,2,3-cd)pyrene 0.31 (J)
MCPA 0.956
Phenanthrene 0.29 (J)
Pyrene 0.74
0103-97-0032 2.25-3.25 ft Qbt 4
Acetone 0.002 (J)
03-608276
RE03-09-13756 3-4 ft Qbt 3
Aroclor-1242 0.0188
Aroclor-1254 0.0162
Aroclor-1260 0.0044
RE03-09-13757 5-6 ft Qbt 3
Aroclor-1254 0.0024 (J)
Aroclor-1260 0.0025 (J)
03-03204
0103-97-0027 0-0.83 ft FILL
MCPP 0.993
03-03265
0103-97-0014 0-1.17 ft FILL
Aroclor-1254 0.078
0103-97-0016 2.67-3.67 ft Qbt 4
Toluene 0.004 (J)
RE03-09-13744 4-5 ft Qbt 3
Acetone 0.00613 (J)
Aroclor-1254 0.0098
Aroclor-1260 0.0126
2-Hexanone 0.02 (J)
4-Isopropyltoluene 0.0061
TPH-DRO 7.45 (J)
RE03-09-13745 6-7 ft Qbt 3
Aroclor-1254 0.006
Aroclor-1260 0.0116
TPH-DRO 786 (J)
RE03-10-17130 10-11 ft Qbt 3
TPH-DRO 1870 (J)
RE03-10-17131 14-15 ft Qbt 3
Aroclor-1254 0.0024 (J)
Aroclor-1260 0.0019 (J)
TPH-DRO 22.6
03-608273
RE03-09-13729 0-1 ft ALLH
Acenaphthene 0.00827 (J)
Aroclor-1254 0.0207
Aroclor-1260 0.036
Benzo(a)pyrene 0.012 (J)
Benzo(b)fluoranthene 0.0227 (J)
Benzo(g,h,i)perylene 0.0107 (J)
Chrysene 0.0122 (J)
Fluoranthene 0.024 (J)
Pyrene 0.026 (J)
TPH-DRO 12.2 (J)
RE03-09-13730 3-4 ft Qbt 3
Aroclor-1260 0.0037
03-03387
0103-97-0367 0-0.5 ft FILL
Aroclor-1260 0.089
03-608272
RE03-09-13732 0-1 ft ALLH
Aroclor-1254 0.119
Aroclor-1260 0.206
Benzo(a)anthracene 0.0152 (J)
Benzo(a)pyrene 0.013 (J)
Benzo(b)fluoranthene 0.0274 (J)
Chrysene 0.0172 (J)
Fluoranthene 0.028 (J)
Phenanthrene 0.0116 (J)
Pyrene 0.03 (J)
TPH-DRO 79.8 (J)
RE03-09-13733 3-4 ft Qbt 3
TPH-DRO 3.04 (J)
RE03-09-13734 8-9 ft Qbt 3
TPH-DRO 4.79 (J)
03-03264
RE03-09-13740 4-5 ft Qbt 3
TPH-DRO 3.22 (J)
RE03-09-13741 6-7 ft Qbt 3
TPH-DRO 3.02 (J)
03-609990
RE03-10-5487 0-1 ft ALLH
Aroclor-1254 0.012
Aroclor-1260 0.0108
TPH-DRO 2.75 (J)
RE03-10-5488 1-2 ft ALLH
Aroclor-1254 0.0019 (J)
Aroclor-1260 0.0019 (J)
Fluoranthene 0.0132 (J)
Pyrene 0.013 (J)
TPH-DRO 7.27 (J)
03-608279
RE03-09-13726 0-1 ft Qbt 3
Aroclor-1254 0.0041
Aroclor-1260 0.0044
4-Isopropyltoluene 0.00157
03-608275
RE03-09-13752 3-4 ft Qbt 3
Aroclor-1254 0.0333
Aroclor-1260 0.0395
03-608248
RE03-09-13633 0-1 ft ALLH
Aroclor-1254 0.998
Aroclor-1260 0.953
TPH-DRO 20.2 (J)
RE03-09-13634 1-2 ft ALLH
Aroclor-1254 6.78
Aroclor-1260 6.03
Fluoranthene 0.0174 (J)
Pyrene 0.0144 (J)
TPH-DRO 57.6
03-603357
0103-97-0343 0-0.5 ft ALLH
TPH-LRO 450
0103-97-0345 0-0.5 ft FILL
TPH-LRO 290
0103-97-0347 0-0.5 ft FILL
TPH-DRO 130
TPH-LRO 490
RE03-10-17132 4-5 ft Qbt 3
Aroclor-1254 0.0025 (J)
Aroclor-1260 0.0017 (J)
TPH-DRO 6.6 (J)
RE03-10-17133 6-7 ft Qbt 3
Aroclor-1254 0.0021 (J)
Aroclor-1260 0.0015 (J)
TPH-DRO 28.7 (J)
RE03-10-17134 10-11 ft Qbt 3
Aroclor-1254 0.0037 (J)
Aroclor-1260 0.0025 (J)
03-608270
RE03-09-13725 0-1 ft ALLH
Aroclor-1254 0.0064
Aroclor-1260 0.0107
Benzo(a)pyrene 0.0107 (J)
Chrysene 0.0123 (J)
Fluoranthene 0.0246 (J)
Phenanthrene 0.0123 (J)
Pyrene 0.0198 (J)
TPH-DRO 9.03 (J)
03-608277
RE03-09-13758 0-1 ft Qbt 3
Aroclor-1254 0.0119
Aroclor-1260 0.0216
Methylene Chloride 0.0027 (J)
RE03-09-13759 1-2 ft Qbt 3
Aroclor-1254 0.0102
Aroclor-1260 0.0304
Methylene Chloride 0.00339 (J)
RE03-09-13760 4-5 ft Qbt 3
Aroclor-1260 0.002 (J)
Methylene Chloride 0.0026 (J)
RE03-09-13761 6-7 ft Qbt 3
Acenaphthene 0.1
Aroclor-1254 0.0033 (J)
Aroclor-1260 0.0041
Methylene Chloride 0.00315 (J)
03-608277
RE03-09-13758 0-1 ft Qbt 3
Aroclor-1254 0.0119
Aroclor-1260 0.0216
Methylene Chloride 0.0027 (J)
RE03-09-13759 1-2 ft Qbt 3
Aroclor-1254 0.0102
Aroclor-1260 0.0304
Methylene Chloride 0.00339 (J)
RE03-09-13760 4-5 ft Qbt 3
Aroclor-1260 0.002 (J)
Methylene Chloride 0.0026 (J)
RE03-09-13761 6-7 ft Qbt 3
Acenaphthene 0.1
Aroclor-1254 0.0033 (J)
Aroclor-1260 0.0041
Methylene Chloride 0.00315 (J)
03-608276
RE03-09-13756 3-4 ft Qbt 3
Aroclor-1242 0.0188
Aroclor-1254 0.0162
Aroclor-1260 0.0044
RE03-09-13757 5-6 ft Qbt 3
Aroclor-1254 0.0024 (J)
Aroclor-1260 0.0025 (J)
03-608279
RE03-09-13726 0-1 ft Qbt 3
Aroclor-1254 0.0041
Aroclor-1260 0.0044
4-Isopropyltoluene 0.00157
03-608275
RE03-09-13752 3-4 ft Qbt 3
Aroclor-1254 0.0333
Aroclor-1260 0.0395
03-608248
RE03-09-13633 0-1 ft ALLH
Aroclor-1254 0.998
Aroclor-1260 0.953
TPH-DRO 20.2 (J)
RE03-09-13634 1-2 ft ALLH
Aroclor-1254 6.78
Aroclor-1260 6.03
Fluoranthene 0.0174 (J)
Pyrene 0.0144 (J)
TPH-DRO 57.6
03-603357
0103-97-0343 0-0.5 ft ALLH
TPH-LRO 450
0103-97-0345 0-0.5 ft FILL
TPH-LRO 290
0103-97-0347 0-0.5 ft FILL
TPH-DRO 130
TPH-LRO 490
RE03-10-17132 4-5 ft Qbt 3
Aroclor-1254 0.0025 (J)
Aroclor-1260 0.0017 (J)
TPH-DRO 6.6 (J)
RE03-10-17133 6-7 ft Qbt 3
Aroclor-1254 0.0021 (J)
Aroclor-1260 0.0015 (J)
TPH-DRO 28.7 (J)
RE03-10-17134 10-11 ft Qbt 3
Aroclor-1254 0.0037 (J)
Aroclor-1260 0.0025 (J)
03-608272
RE03-09-13732 0-1 ft ALLH
Aroclor-1254 0.119
Aroclor-1260 0.206
Benzo(a)anthracene 0.0152 (J)
Benzo(a)pyrene 0.013 (J)
Benzo(b)fluoranthene 0.0274 (J)
Chrysene 0.0172 (J)
Fluoranthene 0.028 (J)
Phenanthrene 0.0116 (J)
Pyrene 0.03 (J)
TPH-DRO 79.8 (J)
RE03-09-13733 3-4 ft Qbt 3
TPH-DRO 3.04 (J)
RE03-09-13734 8-9 ft Qbt 3
TPH-DRO 4.79 (J)
03-608289
RE03-09-13811 0-1 ft ALLH
Aroclor-1260 0.0014 (J)
RE03-09-13812 3-4 ft ALLH
Aroclor-1254 0.0539
Aroclor-1260 0.0769
TPH-DRO 3.19 (J)
03-608283
RE03-09-13783 0-1 ft ALLH
Aroclor-1254 0.0106
Aroclor-1260 0.0156
Benzo(a)pyrene 0.016 (J)
Benzo(b)fluoranthene 0.0244 (J)
Chrysene 0.0141 (J)
Fluoranthene 0.016 (J)
Methylene Chloride 0.00344 (J)
Pyrene 0.0207 (J)
TPH-DRO 4.25 (J)
03-608285
RE03-09-13801 0-1 ft ALLH
Anthracene 0.00842 (J)
Aroclor-1254 0.17
Aroclor-1260 0.134
Benzo(a)anthracene 0.0324 (J)
Benzo(a)pyrene 0.0364 (J)
Benzo(b)fluoranthene 0.0657
Benzo(g,h,i)perylene 0.0261 (J)
Chrysene 0.0357 (J)
Fluoranthene 0.0739
Indeno(1,2,3-cd)pyrene 0.0209 (J)
Phenanthrene 0.0403
Pyrene 0.0664
TPH-DRO 14 (J)
RE03-09-13802 1-2 ft ALLH
Aroclor-1254 0.122
Aroclor-1260 0.0997
Benzo(a)anthracene 0.013 (J)
Benzo(a)pyrene 0.0114 (J)
Benzo(b)fluoranthene 0.0202 (J)
Chrysene 0.0123 (J)
Fluoranthene 0.0246 (J)
Phenanthrene 0.0123 (J)
Pyrene 0.0198 (J)
TPH-DRO 9.03 (J)
03-608286
RE03-09-13803 0-1 ft ALLH
Aroclor-1254 0.279
Aroclor-1260 0.262
Benzo(a)pyrene 0.0361 (J)
Benzo(b)fluoranthene 0.0622
Benzo(g,h,i)perylene 0.0268 (J)
Chrysene 0.0453
Fluoranthene 0.0739
Indeno(1,2,3-cd)pyrene 0.0226 (J)
Phenanthrene 0.0297 (J)
Pyrene 0.0746
TPH-DRO 28.7
RE03-09-13804 1-2 ft Qbt 3
Aroclor-1254 0.0484
Aroclor-1260 0.0438
Methylene Chloride 0.0035 (J)
TPH-DRO 12.2
03-608287
RE03-09-13805 0-1 ft ALLH
Aroclor-1254 0.0733
Aroclor-1260 0.0658
Benzo(a)pyrene 0.0348 (J)
Benzo(b)fluoranthene 0.0673
Benzo(g,h,i)perylene 0.0388
Chrysene 0.0639
Diethylphthalate 0.0916 (J)
Fluoranthene 0.0721
Indeno(1,2,3-cd)pyrene 0.0318 (J)
Methylene Chloride 0.00241 (J)
Phenanthrene 0.0267 (J)
Pyrene 0.053
TPH-DRO 27
RE03-09-13806 1-2 ft Qbt 3
Aroclor-1254 0.0092
Aroclor-1260 0.0076
Benzo(a)anthracene 0.0213 (J)
Fluoranthene 0.0169 (J)
Methylene Chloride 0.00331 (J)
Pyrene 0.0118 (J)
TPH-DRO 7.27 (J)
03-608289
RE03-09-13811 0-1 ft ALLH
Aroclor-1260 0.0014 (J)
RE03-09-13812 3-4 ft ALLH
Aroclor-1254 0.0539
Aroclor-1260 0.0769
TPH-DRO 3.19 (J)
03-608253
RE03-09-13641 0-1 ft ALLH
Acetone 0.00196 (J)
Aroclor-1254 0.362
Aroclor-1260 0.336
Benzo(a)anthracene 0.0305 (J)
Benzo(a)pyrene 0.0398
Benzo(b)fluoranthene 0.0554
Benzo(g,h,i)perylene 0.0235 (J)
Benzo(k)fluoranthene 0.0203 (J)
Chrysene 0.0398
Fluoranthene 0.0522
Indeno(1,2,3-cd)pyrene 0.0203 (J)
Phenanthrene 0.0243 (J)
Pyrene 0.0787
TPH-DRO 12.8
RE03-09-13642 2-3 ft Qbt 3
Acetone 0.0511 (J)
Aroclor-1254 0.184
Aroclor-1260 0.172
tert-Butylbenzene 0.000685 (J)
4-Isopropyltoluene 0.0333
Toluene 0.00156
TPH-DRO 38.3
03-608254
RE03-09-13643 0-1 ft ALLH
Aroclor-1254 0.0857
Aroclor-1260 0.0643
Benzo(b)fluoranthene 0.0109 (J)
Chrysene 0.0132 (J)
Fluoranthene 0.0331 (J)
Phenanthrene 0.015 (J)
Pyrene 0.0272 (J)
TPH-DRO 25.7 (J)
RE03-09-13644 2-3 ft Qbt 3
Aroclor-1248 0.0141
Aroclor-1254 0.0127
Aroclor-1260 0.0063
TPH-DRO 3.27 (J)
03-608255
RE03-09-13645 0-1 ft ALLH
Anthracene 0.0101 (J)
Benzo(a)pyrene 0.0337 (J)
Benzo(b)fluoranthene 0.0334 (J)
Benzo(g,h,i)perylene 0.0177 (J)
Chrysene 0.0311 (J)
Fluoranthene 0.0723
Indeno(1,2,3-cd)pyrene 0.121
Phenanthrene 0.0455
Pyrene 0.0653
TPH-DRO 33.6 (J)
RE03-09-13646 2-3 ft ALLH
Benzo(a)anthracene 0.0118 (J)
Fluoranthene 0.0113 (J)
Pyrene 0.0117 (J)
TPH-DRO 6.42 (J)
03-608246
RE03-09-13626 0-1 ft ALLH
TPH-DRO 5.55 (J)
RE03-09-13627 1-2 ft ALLH
TPH-DRO 2.94 (J)
03-608245
RE03-09-13624 0-1 ft ALLH
Aroclor-1254 0.0195 (J)
Aroclor-1260 0.0214 (J)
Benzo(a)pyrene 0.0151 (J)
Chrysene 0.0159 (J)
Fluoranthene 0.02 (J)
Phenanthrene 0.014 (J)
Pyrene 0.0326 (J)
TPH-DRO 31.6 (J)
RE03-09-13625 1-2 ft Qbt 3
TPH-DRO 3.02 (J)
03-608244
RE03-09-13622 0-1 ft ALLH
Aroclor-1254 0.021
Aroclor-1260 0.0177
TPH-DRO 17.2
RE03-09-13623 1-2 ft Qbt 3
Aroclor-1254 0.0693
Aroclor-1260 0.0514
TPH-DRO 4.69 (J)
03-608243
RE03-09-13620 0-1 ft ALLH
Acetone 0.00952 (J)
Aroclor-1254 0.0149 (J)
Aroclor-1260 0.0184
Benzo(a)pyrene 0.0191 (J)
Benzo(b)fluoranthene 0.0224 (J)
Benzo(k)fluoranthene 0.0155 (J)
Chrysene 0.0188 (J)
Fluoranthene 0.037
Phenanthrene 0.0186 (J)
Pyrene 0.0329 (J)
TPH-DRO 32.1
RE03-09-13621 1-2 ft Qbt 3
Aroclor-1254 0.0026 (J)
Aroclor-1260 0.0033 (J)
Bis(2-ethylhexyl)phthalate 0.1 (J)
TPH-DRO 7.52
03-608252
RE03-09-13639 0-1 ft ALLH
Aroclor-1254 0.172
Aroclor-1260 0.151
TPH-DRO 11.9 (J)
RE03-09-13640 1-2 ft ALLH
Acetone 0.00248 (J)
Aroclor-1254 0.205
Aroclor-1260 0.204
TPH-DRO 6.38 (J)
03-608242
RE03-09-13618 0-1 ft ALLH
Acetone 0.00433 (J)
TPH-DRO 3.91 (J)
RE03-09-13619 1-2 ft Qbt 3
Acetone 0.0144 (J)
TPH-DRO 6.09 (J)
03-608251
RE03-09-13637 0-1 ft ALLH
Aroclor-1254 0.0817
Aroclor-1260 0.0648
Benzo(a)anthracene 0.0318 (J)
Benzo(a)pyrene 0.0365 (J)
Benzo(b)fluoranthene 0.0624
Benzo(g,h,i)perylene 0.0126 (J)
Benzo(k)fluoranthene 0.0257 (J)
Chrysene 0.0421
Fluoranthene 0.0545
Indeno(1,2,3-cd)pyrene 0.0231 (J)
Phenanthrene 0.0161 (J)
Pyrene 0.0696
TPH-DRO 69.1 (J)
RE03-09-13638 1-2 ft ALLH
Aroclor-1254 0.171
Aroclor-1260 0.121
TPH-DRO 11.1
03-608250
RE03-09-13635 0-1 ft ALLH
Anthracene 0.0353 (J)
Aroclor-1254 0.205
Aroclor-1260 0.247
Benzo(a)anthracene 0.146
Benzo(a)pyrene 0.173
Benzo(b)fluoranthene 0.227
Benzo(g,h,i)perylene 0.112
Benzo(k)fluoranthene 0.0889
Chrysene 0.167
Fluoranthene 0.316
Indeno(1,2,3-cd)pyrene 0.0944
Phenanthrene 0.17
Pyrene 0.373
TPH-DRO 44.9 (J)
RE03-09-13636 1-2 ft Qbt 3
Aroclor-1254 0.0309
Aroclor-1260 0.0358
Pyrene 0.0117 (J)
TPH-DRO 8.26
03-608280
RE03-09-13766 0-1 ft ALLH
Aroclor-1254 0.0329
Aroclor-1260 0.0349
Benzo(b)fluoranthene 0.0152 (J)
Fluoranthene 0.014 (J)
Methylene Chloride 0.00309 (J)
TPH-DRO 3.4 (J)
RE03-09-13767 1-2 ft Qbt 3
Aroclor-1254 0.0075
Aroclor-1260 0.0105
Methylene Chloride 0.00324 (J)
RE03-09-

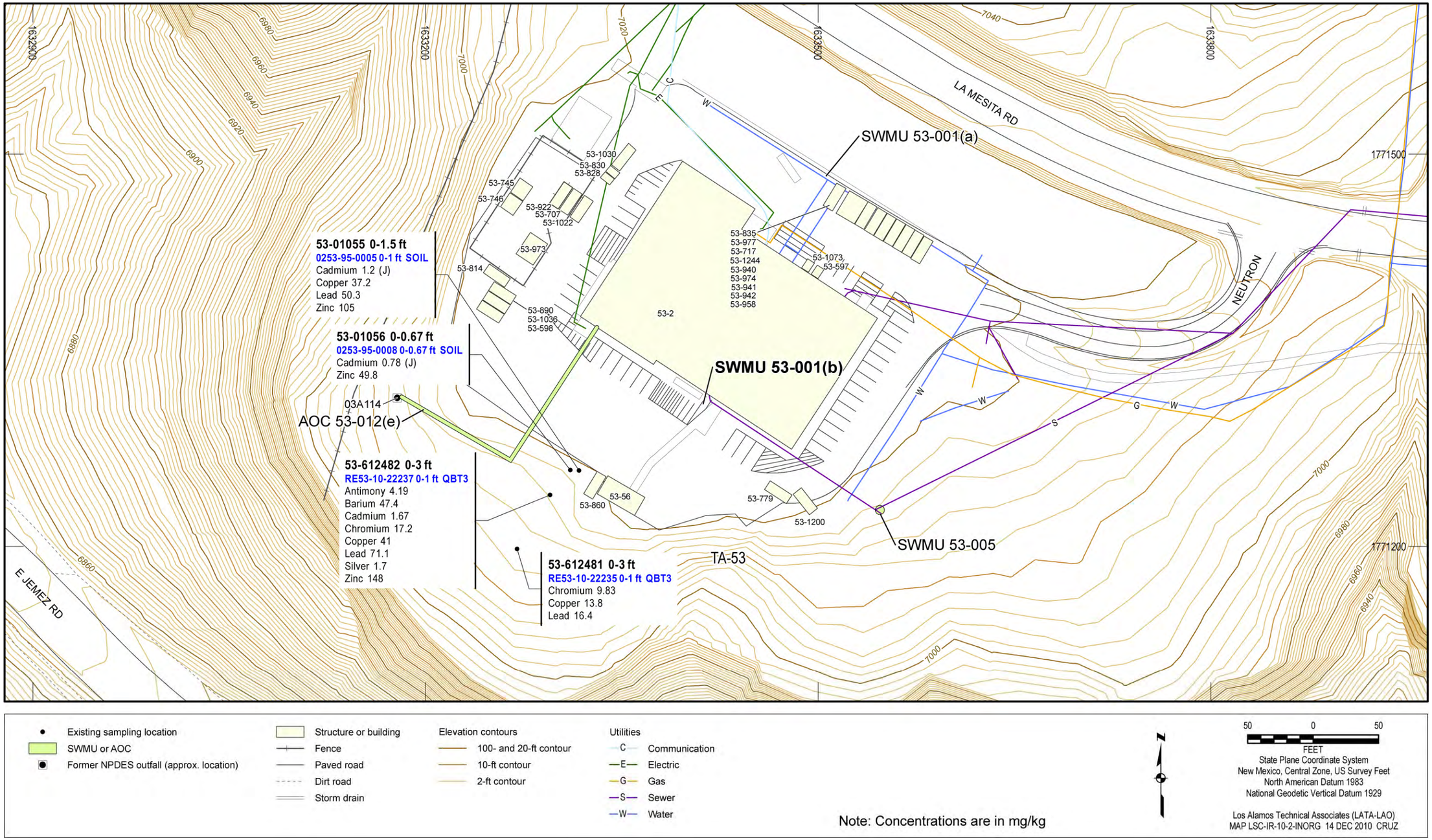


Figure 7.3-2 Inorganic chemicals detected or detected above BVs at SWMU 53-001(b)

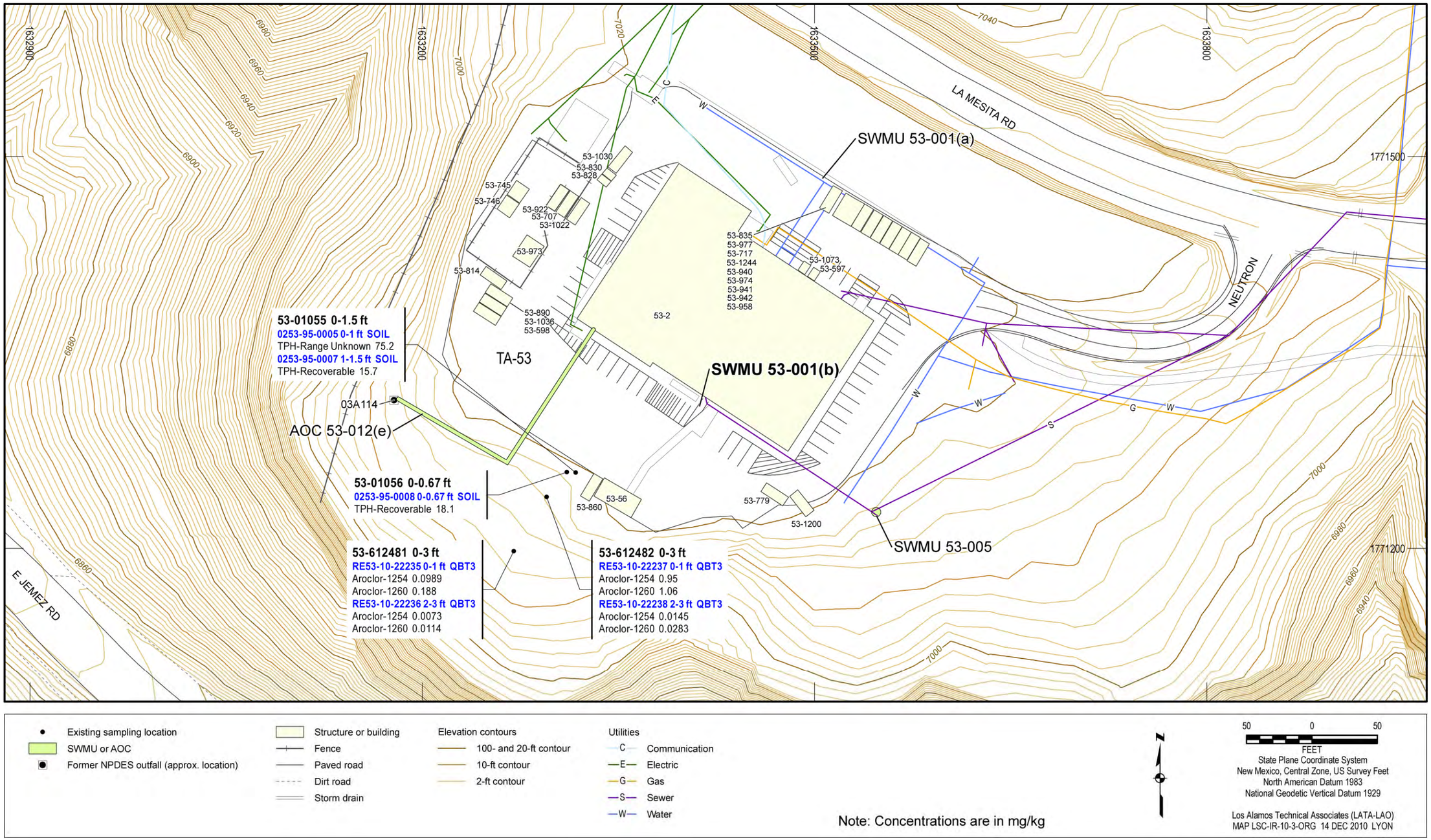


Figure 7.3-3 Organic chemicals detected at SWMU 53-001(b)

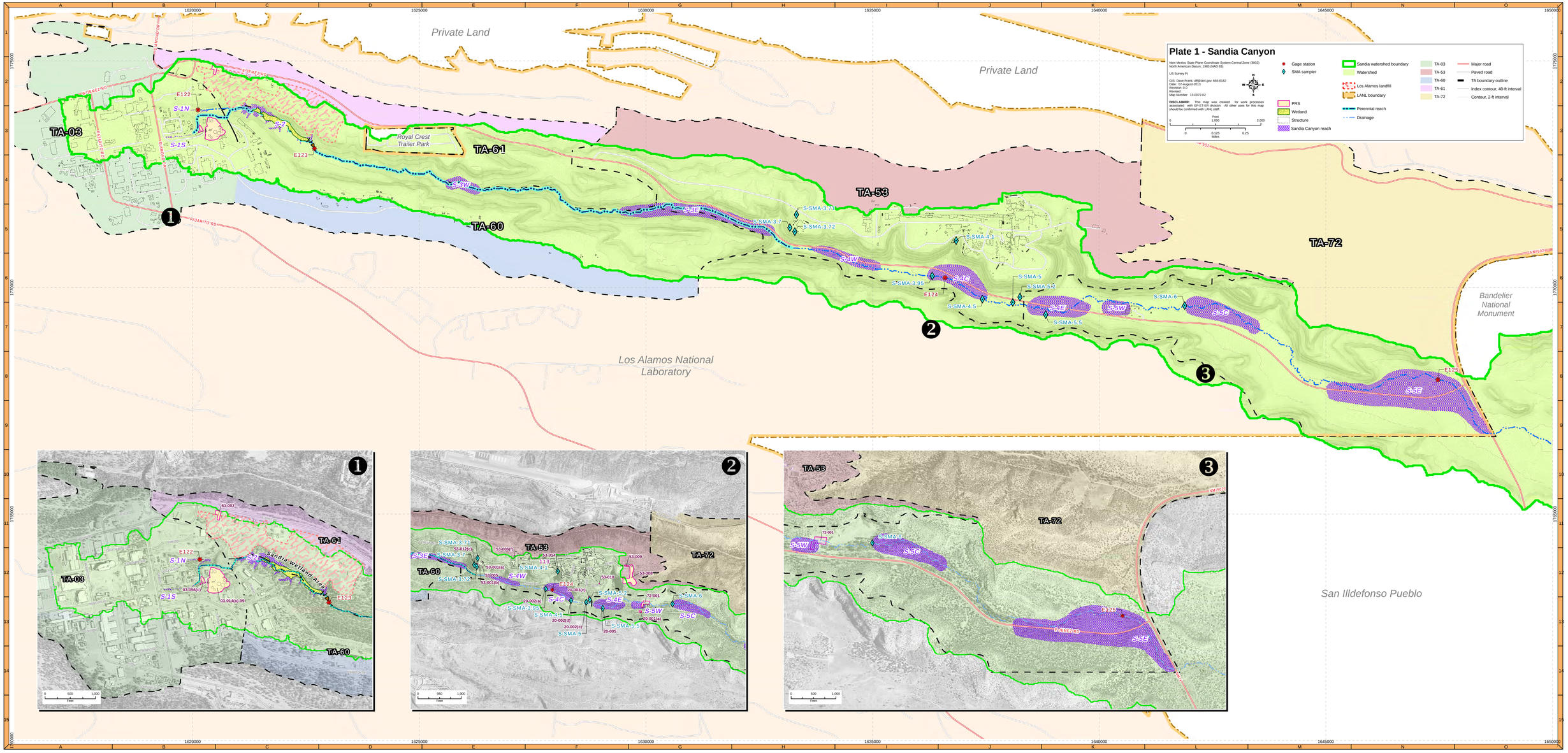


Plate 1 - Sandia Canyon
New Mexico State Plane Coordinate System Central Zone (3002)
North American Datum, 1983 (NAD 83)
US Survey Ft
GIS: Dave Frank, dff@lanl.gov, 665-8182
Date: 07-August-2013
Revision: 0.0
Revised:
Map Number: 13-0072-02
DISCLAIMER: This map was created for work processes associated with EP-ET-ER division. All other uses for this map should be confirmed with LANL staff.
Gage station
SMA sampler
PRS
Wetland
Structure
Sandia Canyon reach
Sandia watershed boundary
Watershed
Los Alamos landfill
LANL boundary
Perennial reach
Drainage
TA-03
TA-53
TA-60
TA-61
TA-72
Major road
Paved road
TA boundary outline
Index contour, 40-ft interval
Contour, 2-ft interval
Private Land
Private Land
Royal Crest Trailer Park
Los Alamos National Laboratory
Bandelier National Monument
San Illdefonso Pueblo
TA-03
TA-61
TA-60
TA-53
TA-72
E122
E123
E124
E125
S-1N
S-1S
S-2
S-3W
S-3E
S-4W
S-4E
S-5W
S-5E
S-SMA-3.7
S-SMA-3.72
S-SMA-4.1
S-SMA-5
S-SMA-5.2
S-SMA-5.5
S-SMA-6
S-SMA-3.95
S-SMA-4.5
PAJARITO RD
DIAMOND DR
NM 502
1
2
3

1621000 1621200 1621400 1621600 1621800 1622000 1622200 1622400

1773400 1773200 1773000 1772800 1772600 1772400 1772200

TA-03 TA-60 TA-61

60-245 60-91 60-140 60-141 60-161 60-162 60-99 60-248 60-249 60-85 60-213 60-275 60-276 60-211 60-215 60-216 60-217 60-251 60-218 60-1 60-15 60-14 60-119 60-227 60-220 60-7 60-3 60-2 60-4 60-6 60-127 60-126 60-69 60-68 60-9 60-8 60-128 60-278 60-10 60-124 60-125 60-131 60-11 60-70 60-71 60-72 60-169 60-12 60-129 60-230

60-007(b)

AOC 60-004(f)

60-002 (west)

03-608417
RE03-09-14265 0-1 ft ALLH
Sodium 2240

03-608418
RE03-09-14267 0-0.5 ft ALLH
Copper 38.9
Sodium 4270
Zinc 130

03-608419
RE03-09-14269 0-0.4 ft ALLH
Sodium 5710

03-608420
RE03-09-14271 0-0.5 ft ALLH
Potassium 3630
Sodium 9420
Zinc 55.8

03-608421

03-608426

03-608427

03-608428

03-608425
RE03-09-14281 0-1 ft Qbt 3
Zinc 64.4
RE03-09-14282 1-2 ft Qbt 3
Chromium 23.5

03-608424
RE03-09-14279 0-1 ft ALLH
Zinc 88.2 (J)
RE03-09-14280 1-2 ft Qbt 3
Aluminum 8660 (J)
Barium 93.7 (J+)
Calcium 2370 (J)
Chromium 9.14 (J)
Copper 6.02
Lead 12.5 (J)

03-608423
RE03-09-14277 0-1 ft ALLH
Cadmium 0.42 (J)
Calcium 7330
Zinc 89.9
RE03-09-14278 1-2 ft ALLH
Zinc 55.3

03-608422
RE03-09-14275 0-1 ft ALLH
Lead 22.6 (J)
Zinc 101 (J)

03-608406
RE03-09-14216 1-2 ft ALLH
Cobalt 9.79
Manganese 839

03-608407
RE03-09-14220 1-2 ft ALLH
Cadmium 0.693
Copper 65.3 (J)
Lead 61.1
Mercury 0.583 (J+)
Silver 1.21
Zinc 183 (J-)
RE03-09-14221 2-3 ft ALLH
Chromium 22.8
Copper 19.8 (J)
Lead 24.1
Zinc 67.8 (J-)
RE03-09-14222 4-5 ft ALLH
Chromium 38.2
Zinc 56.9 (J-)
RE03-09-14223 9-10 ft Qbt 3
Chromium 25.5

03-608405
RE03-09-14212 1-2 ft ALLH
Zinc 99.9
RE03-09-14214 4-5 ft Qbt 3
Barium 78.4 (J+)
Calcium 3590 (J+)
Chromium 33.8
Lithium 20.7 (J+)
Nickel 6.93

03-608408
RE03-09-14225 2-3 ft ALLH
Thallium 0.937
RE03-09-14226 4-5 ft ALLH
Zinc 54.2

03-608404
RE03-09-14209 2-3 ft Qbt 3
Aluminum 13500
Barium 170
Calcium 2250
Chromium 15.4
Cobalt 8.87
Copper 6.86 (J)
Iron 15100
Lead 21.2
Magnesium 2590
Nickel 8.1
Vanadium 25.6
RE03-09-14210 4-5 ft Qbt 3
Aluminum 10200
Barium 94
Calcium 3090
Chromium 12
Copper 7.72 (J)
Lead 22.5
Magnesium 2720
Zinc 98.2 (J-)
RE03-09-14211 9-10 ft Qbt 3
Barium 103
Copper 4.82 (J)
Lead 16.2

03-608394
RE03-09-14096 1-2 ft Qbt 3
Aluminum 10500 (J)
Barium 160 (J+)
Chromium 14.6 (J)
Cobalt 7.24 (J)
Copper 7.49
Lead 15.2 (J)
Magnesium 2030 (J+)
Manganese 502
Nickel 8.8
Vanadium 31.2 (J)
RE03-09-14097 4-5 ft Qbt 3
Aluminum 16000 (J)
Barium 158 (J+)
Beryllium 1.37
Calcium 5310 (J)
Chromium 9.17 (J)
Copper 7.35
Lead 16.8 (J)
Magnesium 2820 (J+)
Nickel 10.3

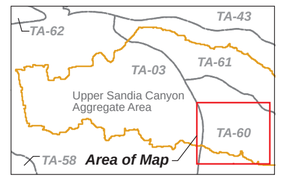
03-608398
RE03-09-14104 1-2 ft ALLH
Barium 331 (J+)
Calcium 11200 (J)
RE03-09-14105 4-5 ft Qbt 3
Aluminum 10500 (J)
Barium 90.5 (J+)
Calcium 2460 (J)
Chromium 9.77 (J)
Cobalt 4.74 (J)
Copper 6.69
Lead 12.4 (J)
Magnesium 2390 (J+)
Nickel 7.11
Vanadium 23 (J)

03-608393
RE03-09-14095 4-5 ft Qbt 3
Aluminum 10500 (J)
Barium 65.5 (J+)
Calcium 2680 (J)
Chromium 10.8 (J)
Cobalt 5.33 (J)
Copper 8.74
Iron 14900 (J)
Lead 14.7 (J)
Magnesium 2180 (J+)
Nickel 9.12
Vanadium 28.2 (J)

03-608395

03-608396

03-608397
RE03-09-14103 4-5 ft Qbt 3
Aluminum 8790 (J)
Barium 146 (J+)
Calcium 4070 (J)
Chromium 7.94 (J)
Lead 69.3 (J)
Magnesium 2050 (J+)
Nickel 6.78



This map was created for work processes associated with the Sandia Canyon Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

0 15 30 60 90 120 150 180 Feet

contour interval = 2 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

- Sampling location
- Historical sampling location
- SWMU or AOC (*AOC noted*)
- LANL structure
- Fence
- Paved road/parking
- Dirt road
- Inferred drainage
- LANL TA boundary
- 2 ft contour

Location ID (*2009/10* - red or underlined, *historical* - black or not underlined)

Sample description (sample ID, depth (ft), media)

49-608402
RE10-07-5304 0.00-0.50 SOIL
Copper 5.5
Selenium 0.5 (J)

Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in milligrams per kilogram (mg/kg) or in picocuries per gram (pCi/g) except as noted.

PLATE 2
Inorganic chemical concentrations detected or detected above BVs at SWMUs 60-002 (west) and 60-007(b) and AOC 60-004(f)

Map Number:TPMC_041410B
Date: April 14, 2010 Rev:May 13, 2010
DraftedBy:TPMC File Name: USCAA_HITS_MapQT

1619800 1620000 1620200 1620400 1620600

1774600 1774400 1774200 1774000

TA-61 TA-03

61-18 61-16 61-LAC 61-006 61-005

AOC C-61-002 03-056(a) AOC 03-003(n) 03-059 03-029 03-009(a) 03-014(r)

03-1528 03-2291 03-2292 03-271 03-2318 03-1408 03-1406 03-2237 03-1389

03-608429
RE03-09-14300 3-4 ft ALLH
Cobalt 11.4

03-608430
RE03-09-14306 3-4 ft ALLH
Barium 554
Beryllium 2.06
Calcium 6630 (J+)
Cobalt 20.9
Nickel 16

03-608432
RE03-09-14318 3-4 ft ALLH
Antimony 1.14 (J)
Calcium 7520
Lead 27.6
Thallium 1.27
RE03-09-14319 5-6 ft Qbt 3
Barium 83.3
Iron 25600
RE03-09-14322 11-12 ft Qbt 3
Antimony 1.15
RE03-09-14323 14-15 ft Qbt 3
Antimony 0.506 (J)

03-14481
RC03-01-0041 0.5-1 ft FILL
Calcium 7850 (J)

03-608347
RE03-09-13992 0-1 ft ALLH
Calcium 8900 (J)
RE03-09-13993 1-2 ft ALLH
Antimony 0.901 (J)
Lead 32.2
Zinc 58.2

03-608368 **03-608369** **03-608370** **03-608371**

03-14484
RC03-01-0044 0.5-1 ft FILL
Calcium 10400 (J)
03-608350

03-14482
RC03-01-0042 0.5-1 ft FILL
Calcium 6750 (J)

03-608348
RE03-09-13994 0-1 ft ALLH
Calcium 6300 (J)

03-14483
RC03-01-0043 0.5-1 ft FILL
Calcium 11500 (J)
Silver 1.6
Zinc 89.8

03-608349
RE03-09-13996 0-1 ft ALLH
Calcium 9990 (J)
Cobalt 14.7

03-608431
RE03-09-14312 3-4 ft ALLH
Calcium 6960
RE03-09-14313 5-6 ft ALLH
Beryllium 1.84
RE03-09-14314 7-8 ft ALLH
Barium 992
Beryllium 2.16
RE03-09-14316 11-12 ft Qbt 3
Aluminum 11200
Barium 99.2
Beryllium 1.26
Calcium 2220
Copper 5.98
RE03-09-14317 14-15 ft Qbt 3
Aluminum 10300
Antimony 0.861 (J)
Barium 66.8
Calcium 2890
Copper 6.05
Magnesium 1860

03-608433
RE03-09-14324 3-4 ft ALLH
Antimony 0.92 (J)
Lead 23.1
RE03-09-14325 5-6 ft ALLH
Antimony 1.75
Beryllium 2.22
Calcium 13100
Cobalt 11.2
Lead 22.8
Nickel 19.8
Thallium 1.09
RE03-09-14326 7-8 ft Qbt 3
Aluminum 19900
Antimony 1.2 (J)
Arsenic 4.61 (J-)
Barium 288
Beryllium 1.83
Calcium 6350
Chromium 13.5
Cobalt 5.69
Copper 14
Iron 19800
Lead 19.4
Magnesium 4430
Mercury 0.121
Nickel 17.6
Vanadium 26.4
RE03-09-14327 9-10 ft Qbt 3
Antimony 1.54
Barium 181
Calcium 10200
Mercury 0.123
Nickel 7.31
RE03-09-14328 11-12 ft Qbt 3
Antimony 0.514 (J)
Barium 59.9
Calcium 3220
Iron 23900
RE03-09-14329 14-15 ft Qbt 3
Antimony 0.603 (J)
Barium 76.7
Beryllium 1.25
Calcium 3320
Copper 4.77
Nickel 8.4

03-608380
RE03-09-14065 0-1 ft ALLH
Calcium 9400
RE03-09-14064 2-3 ft ALLH
Nitrate 1.06 (J-)

03-608378
RE03-09-14060 0-1 ft ALLH
Antimony 1.22
Zinc 49.6

03-608379
RE03-09-14063 0-1 ft ALLH
Nitrate 1.26 (J-)
RE03-09-14062 2-3 ft ALLH
Nitrate 1.07 (J-)

03-608372
RE03-09-14048 0-1 ft ALLH
Antimony 2.23
Cadmium 1.62
Copper 16.2
Lead 48.1
Mercury 0.168
Zinc 133
RE03-10-2707 2-3 ft ALLH
Perchlorate 0.00171 (J)

03-608373
RE03-09-14050 0-1 ft ALLH
Antimony 0.984 (J)
Lead 25.6
RE03-10-2708 2-3 ft ALLH
Perchlorate 0.000602 (J)

03-608381
RE03-09-14066 0-1 ft ALLH
Nitrate 1.55 (J-)
RE03-09-14067 2-3 ft ALLH
Calcium 8900
Lead 23.6
Nitrate 1.14 (J-)

03-608387
RE03-09-14079 0-1 ft ALLH
Cadmium 2.64
Chromium 26.5
Copper 29.3
Lead 37.9
Mercury 0.339
Nitrate 0.87 (J-)
Zinc 133
RE03-09-14078 2-3 ft ALLH
Nitrate 1.98 (J-)

03-608388
RE03-09-14080 0-1 ft ALLH
Lead 39.6
Nitrate 1.21 (J-)
Zinc 71
RE03-09-14081 2-3 ft ALLH
Nitrate 1.14 (J-)

03-608377
RE03-09-14058 0-1 ft ALLH
Antimony 1.13
Perchlorate 0.00104 (J)

03-608374
RE03-09-14053 0-1 ft ALLH
Antimony 1.17
Cadmium 0.847
Copper 15.2
Mercury 0.653
Zinc 58.3
RE03-10-2710 2-3 ft ALLH
Mercury 0.295

03-608384
RE03-09-14073 0-1 ft ALLH
Nitrate 0.862 (J-)

03-608383
RE03-09-14070 0-1 ft ALLH
Calcium 6410
Nitrate 0.816 (J-)

03-608375

03-608184
RE03-09-13445 1.5-2 ft ALLH
Iron 34900

03-608376
RE03-09-14056 0-1 ft ALLH
Antimony 1.21
Calcium 13100
Cobalt 21.8
RE03-09-14057 2-3 ft ALLH
Antimony 1.2

03-608183

03-608385
RE03-09-14074 0-1 ft ALLH
Cobalt 15.4
Nitrate 0.85 (J-)
RE03-09-14075 2-3 ft ALLH
Lead 26.6
Nitrate 1 (J-)

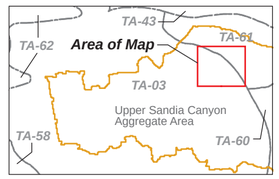
03-608386
RE03-09-14076 0-1 ft ALLH
Nitrate 1.1
RE03-09-14077 2-3 ft ALLH
Nitrate 1.81

03-608382
RE03-09-14068 0-1 ft ALLH
Lead 27.6
Thallium 1.73
RE03-09-14069 2-3 ft ALLH
Nitrate 0.975 (J-)

03-608183
RE03-09-13444 9-10 ft ALLH
Chromium 19.6

03-608185
RE03-09-13448 0-1 ft ALLH
Arsenic 8.7
Calcium 12200
Copper 18.9
RE03-09-13449 1-2 ft ALLH
Copper 40.5

03-608186
RE03-09-13450 0-1 ft Qbt 3
Chromium 11.2
RE03-09-13451 1-2 ft Qbt 3
Chromium 22



This map was created for work processes associated with the Sandia Canyon Aggregate Area Investigation Report. All other uses for this map should be confirmed with the LANL EP-CAP Division.

0 10 20 40 60 80 100 Feet

contour interval = 2 ft

New Mexico State Plane Coordinates - Central Zone FT, North American Datum 1983, NGVD 1929

- Sampling location
- Historical sampling location
- SWMU or AOC (*AOC noted*)
- Former structure
- LANL structure
- Fence
- Paved road/parking
- Dirt road
- Inferred drainage
- LANL TA boundary
- 2 ft contour

Location ID (*2009/10* - red or underlined, *historical* - black or not underlined)

Sample description (sample ID, depth (ft), media)

49-608402
RE10-07-5304 0.00-0.50 SOIL
Copper 5.5
Selenium 0.5 (J)

Analyte data (analyte, result, optional qualifier code)

Result Qualifiers:
J = Estimated value
J+= Estimated value biased high
J- = Estimated value biased low

Note: All analytical results reported in milligrams per kilogram (mg/kg) or in picocuries per gram (pCi/g) except as noted.

PLATE 3
Inorganic chemical concentrations detected or detected above BVs at SWMUs 03-029, 03-059, and 03-056(a) and AOCs 03-003(n) and C-61-002

Map Number:TPMC_040610A
Date: April 6, 2010 Rev:May 14, 2010
DraftedBy:TPMC File Name: USCAA_HITS_MapE

Photo 1: Berm, spillway and sampler

Photo 2: Sampler intake

Photo 3: Sampler intake at base of spillway

Photo 1: LID near parking garage at TA-3

Photo 2: Looking up stream at outfall location for SWMU 03-013(a) and 03-052(f)

Photo 3: Sampler with intake

Photo 4: Sampler intake located in channel

Photo 1: Outfall at SWMUs 03-012(b) and 03-045(b), outfall located to left of photo

Photo 2: Construction activities at SWMU 03-056(c), preparing for drop inlet installation

Photo 3: Construction activities at SWMU 03-056(c), preparing for drop inlet installation

Photo 4: Preparation for new drop inlet, new outfall location is visible

Photo 5: new outfall location

Photo 6: New outfall location at base of SWMU 03-056(c)

Photo 1: SWMU 03-014(b2) slope below former outfall

Photo 2: SWMU 03-014(b2) slope below former outfall with sampler

Photo 3: sampler below former outfall

Photo 1: View of former outfall location looking back at parking lot

Photo 2: Approximate location of former septic tank

Photo 3: Former outfall location

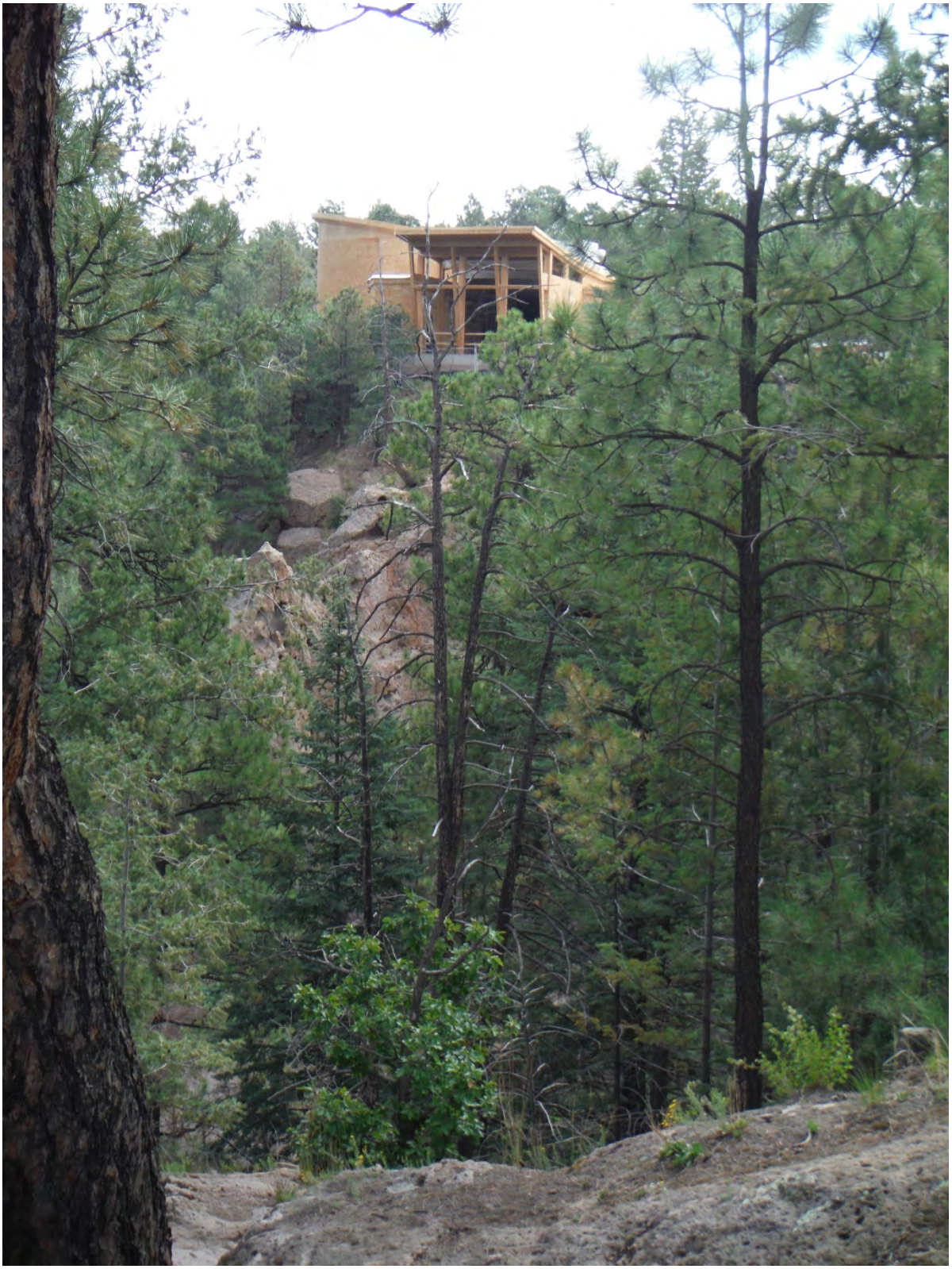


Photo 1: View east across Acid Canyon at the Pajarito Environmental Education Center (former TA-45)

Photo 2: SWMU 01-002(b)-00 channel within Acid Canyon, looking south towards former outfall area

Photo 3: Gage E055.5

Photo 4: Gage E055.5 and ACID-SMA-2 sampler location

Photo 5: Hill slope below former TA-45

Photo 6: SWMU 01-002(b)-00 view south at former outfall location

Photo 1: Drop inlet draining private property onto SWMU 01-003(a)

Photo 2: Drop inlet outfall onto SWMU 01-003(a) push pile slope

Photo 3: concrete debris on slope

Photo 1: SWMU 01-003(a) looking back at push pile area (Baileys bridge), note condo on top

Photo 2: LAC outfall pipes draining into canyon

Photo 3: SWMU 01-003(a) sampler location at base of push pile

Photo 4: SWMU 01-003(a) sampler location at base of push pile

Photo 1: SWMU 01-001(f) slope below outfall with matting, log check dams, wattles and sampler

Photo 2: SWMU 01-001(f) slope below outfall

Photo 3: Upper drainage channel

Photo 4: LA Ponds looking east (pond #1 in foreground)

Photo 5: Pond #2

Photo 6: Small wetlands below pond #2

Photo 1: Base course berm L00503020009 looking southwest

Photo 2: Base course berm L00503020009 looking southwest

Photo 3: Established vegetation L00502040008 looking northwest

Photo 4: Earthen berm L00503010007 looking east

Photo 5: Sampler identification stake

Photo 6: Upstream face run-on berm

Photo 7: Downstream channel view below culvert outlet and mesa top sampler

Photo 8: Downstream view runoff berm

Photo 1: Southern portion of SWMU 00-011(d), former bazooka firing area, looking north/northwest and established vegetation B00202040008

Photo 2: Northern portion of SWMU 00-011(d), former bazooka firing area, looking north/northwest

Photo 3: Cliff face on eastern boundary of 00-011(d)

Photo 4: Rock check dam B00206010003 looking north

Photo 5: Rock check dam B00206010004 looking north

Photo 6: Rock check dam B00206010006 looking northwest

Photo 7: Rock check dam B00206010007 looking northwest

Photo 8: Rock check dam B00206010005 and sampler location looking southeast

Photo 9: Sampler identification tag

Photo 1: Middle sediment basin

Photo 2: Western sediment basin

Photo 3: Eastern sediment basin

Photo 4: Downstream view of berm

Photo 5: Sampler location and riprap

Photo 1: Looking east towards Pratt Canyon from TA-35

Photo 2: Looking west towards SWMUs 35-003(p) and 35-004(h)

Photo 3: Berm at bottom of Pratt Canyon, sampler just to left of fols on the berm

Photo 4: PRATT-SMA-1.05 sampler

Photo 5: view upstream from lower berm and sampler

Photo 6: Rock check dam located mid canyon, looking upstream

Photo 7: Rock check dam located mid canyon, looking upstream

Photo 8: Looking upstream from mid-canyon earth berm

Photo 1: View downstream of berm and spillway

Photo 2: View upstream of sampler, berm and spillway

Photo 3: Sampler intake

Photo 4: Sampler intake

Photo 5: View downstream

Photo 6: View upstream of sampler, berm and spillway

Photo 1: View of berm and spillway looking south

Photo 2: Looking back at former outfall locations behind TA-46

Photo 3: Vegetative cover behind TA-46

Photo 4: Sample identifier stake,

Photo 5: Looking back at former outfall locations at TA-46, berms and spillway. Sample location is at base of spillway.

Photo 1: Looking west at TA-54 domes and concrete pad, sampler near middle of photograph

Photo 2: TA-54 domes with sampler in foreground p

Photo 1: SWMU 73-002, incinerator surface disposal, from the canyon edge looking north and down

Photo 2: View west up Pueblo Canyon

Photo 3: Former incinerator building. Currently owned and used by LAC.

Photo 1: SWMU 33-007(c) concrete pad and backstop area SWMU

Photo 2: SWMU 33-007(c) backstop area

Photo 3: SWMU 33-009 push pile in foreground (cinder cone in background)

Photo 4: SWMU 33-004(g) outfall location and 33-007(c) in background

Photo 5: CHQ-SMA-0.5 sampler location

Photo 6: CHQ-SMA-0.5 identifier stake

Photo 7: SWMU 33-009 looking up slope

Photo 8: SWMU 33-009 box on lower slope

Photo 9: Historical signage

Photo 10: SWMU 33-009 vegetated push pile location

Photo 1: Sandia canyon channel upstream at shooting range

Photo 2: Sandia canyon channel downstream at shooting range

Photo 3: Back berm

Photo 4: Back berm

Photo 5: Back berm and channel from shooting house looking east downstream

Photo 1: SWMU 53-001(b) former storage area

Photo 2: View behind storage area

Photo 3: Current Hazardous waste storage area

Photo 4: Roof drain to right of former storage area

Photo 5: Rock check dam to direct run-off

Photo 6: Rock check dam with former storage area in background

Photo 7: View south of controls (vegetated run-on berm, small basin with spillway) and sampler

Photo 8: Storm water controls with sampler location below berm

Photo 9: Bottle configuration in ISCO

Photo 10: Sampler

Photo 1: Looking west at drainage swale construction.

Photo 1: Sampler behind berm / bar ditch.

Photo 2: Looking west at berm along bottom of slope. Outfalls were located towards top of slope.

Photo 3: Berm below former outfall locations.

Photo 4: Vegetated slope below former outfall locations.

Photo 5: looking downslope towards DP canyon drainage.

SUSANA MARTINEZ
Governor

JOHN A. SANCHEZ
Lieutenant Governor

NEW MEXICO ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Phone (505) 476-6000 Fax (505) 476-6030
www.nmenv.state.nm.us

DAVE MARTIN
Cabinet Secretary

RAJ SOLOMON, P.E.
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

June 3, 2011

George J. Rael, Assistant Manager
Environmental Projects Office
Department of Energy/National
Nuclear Security Administration
Los Alamos Site Office
3747 West Jemez Road, MS A316
Los Alamos, NM 87544

Michael J. Graham, Associate Director
Environmental Programs
Los Alamos National Security, LLC
P.O. Box 1663, MS M991
Los Alamos, NM 87545

RE: **CERTIFICATES OF COMPLETION**
MATERIAL DISPOSAL AREA V, TECHNICAL AREA 21
LOS ALAMOS NATIONAL LABORATORY
EPA ID #NM0890010515
HWB-LANL-11-030

Dear Messrs. Rael and Graham:

The New Mexico Environment Department (NMED) has received the United States Department of Energy (DOE) and the Los Alamos National Security L.L.C.'s (LANS) (collectively, the Permittees) *Request for Certificates of Completion for Four Solid Waste Management Units and One Area of Concern at Material Disposal Area V, Technical Area 21* (Request), dated May 13, 2011 and referenced by EP2011-0138. Results of the site investigations were presented in the *Investigation Report for Consolidated Unit 21-018(a)-99, Material Disposal Area V, at Technical Area 21, Revision 1,* dated July 2007 and the *Supplemental Investigation Report for Consolidated Unit 21-018(a)-99, Material Disposal Area V, at Technical Area 21, Revision 1,* dated April 2008.

To determine extent of subsurface tritium contamination, the Permittees implemented the *Vadose Zone Subsurface Characterization and Vapor-Monitoring Well Installation Work Plan for Material Disposal Area V, Consolidated Unit 21-018(a)-99, Revision 1*, dated August 2009. Four rounds of quarterly sampling were conducted and periodic monitoring reports were submitted to

NMED in December 2009, March 2010, June 2010, and October 2010. The Permittees have satisfied the requirements of the March 1, 2005 Consent Order for corrective action at the following Solid Waste Management Units/Areas of Concern (SWMUs/AOCs).

SWMU 21-013(b) is the location of a former surface debris disposal site located immediately south of MDA V on the south-facing slope leading into BV Canyon. It is not known how long this site received building debris; however, it did not receive waste after 1994. SWMU 21-013(b) contained the external concrete piers, the concrete building foundations, and other building debris derived from the 1965 demolition of the laundry facility (building 21-20 [SWMU 21-018(b)]) and a waste treatment laboratory (building 21-33 [AOC 21-009]). The debris was removed in 2005 and investigations were conducted between 2005 and 2007 to define the nature and extent of contamination. Evaluation of both human health and ecological risk indicates that there is no potential unacceptable risk posed at the site. However, storm water discharge may mobilize residual contamination from the site. The Permittees must monitor storm water discharge for potential off-site transport of residual contamination. This is currently being accomplished under the National Pollutant Discharge Elimination System (NPDES) "Stormwater" Permit. NMED hereby issues this Certificate of Completion for Corrective Action Complete with Controls for SWMU 21-013(b) pursuant to Section VII.E.6.b of the Consent Order.

SWMU 21-018(a), more commonly referred to as Material Disposal Area (MDA) V, is an approximately 1-acre site located immediately south of the former laundry facility [building 21-20; SWMU 21-018(b)]. The SWMU consists of three interconnected liquid waste absorption beds. MDA V was constructed to receive radioactive liquid wastewater from the laundry facility and was designed to enhance the infiltration of liquids into the tuff bedrock. The absorption beds were constructed in 1945 and operated until 1961. They remained on stand-by status until September 1963 when they were permanently removed from service. All absorption bed material and associated piping was removed and investigations were conducted between 2005 and 2007 to define the nature and extent of contamination. Evaluation of both human health and ecological risk indicates that there is no potential unacceptable risk posed at the site. However, storm water discharge may mobilize residual contamination from the site. The Permittees must monitor storm water discharge for potential off-site transport of residual contamination. This is currently being accomplished under the National Pollutant Discharge Elimination System (NPDES) "Stormwater" Permit. In addition, in the letter entitled *Extended Tritium Sampling at Material Disposal Area V*, dated February 15, 2011 and referenced by EP2011-0058, the Permittees commit to continue quarterly vapor monitoring at MDA V in connection with remedial actions currently in progress at MDA B. The need for continued vapor monitoring at MDA V will be reconsidered upon completion of the review of the final report detailing remedial actions at MDA B. NMED hereby issues this Certificate of Completion for Corrective Action Complete with Controls for SWMU 21-018(a) pursuant to Section VII.E.6.b of the Consent Order.

SWMU 21-018(b) is a former laundry facility (building 21-20) located at the eastern end and south of DP Road, immediately west of the security fence that encloses other former TA-21 facilities. Operational from 1945 to 1961, the laundry facility was used to wash personal protective clothing and other reusable cloth items used in both research and production operations involving radioactive materials at TA-21. It is estimated that the laundry facility

generated approximately two million gallons of effluent annually, which was discharged to MDA V. The laundry facility was a wood-frame structure with both concrete slab and wood-framing-on-pier floors. The wood portions of the building were decommissioned and demolished in 1965 and taken to MDA G where the debris was burned. The concrete foundation and associated piping were bulldozed over the edge of DP Mesa onto the south-facing slope of BV Canyon. Investigations were conducted between 2005 and 2007 to define the nature and extent of contamination. Evaluation of both human health and ecological risk indicates that there is no potential unacceptable risk posed at the site. NMED hereby issues this Certificate of Completion for SWMU 21-018(b) pursuant to Section VII.E.6.b of the Consent Order. Based on the information provided, no controls are necessary for this site.

SWMU 21-023(c) is a former septic system that consisted of a tank, inlet and outlet lines, and an outfall that served a waste treatment laboratory (building 21-33 [AOC 21-009]). The septic tank was located immediately west of the MDA V absorption beds and was constructed of reinforced concrete. The inlet and outlet lines were 4-inch vitrified clay pipe (VCP); the outlet line surfaced 40 feet southwest from the tank, approximately 30 feet from the canyon edge above BV Canyon. The outfall area extended south into BV Canyon. The waste treatment laboratory septic system was put into service in 1948. Wastewater was pumped from a sump in building 21-33 through the septic system. The tank was removed in 1965 and taken to MDA G. Investigations were conducted between 2005 and 2007 to define the nature and extent of contamination. Evaluation of both human health and ecological risk indicates that there is no potential unacceptable risk posed at the site. However, storm water discharge may mobilize residual contamination from the site. The Permittees must monitor storm water discharge for potential off-site transport of residual contamination. This is currently being accomplished under the National Pollutant Discharge Elimination System (NPDES) "Stormwater" Permit. NMED hereby issues this Certificate of Completion for Corrective Action Complete with Controls for SWMU 21-023(c) pursuant to Section VII.E.6.b of the Consent Order.

AOC 21-013(g) is located immediately south of MDA V on the south-facing slope leading into BV Canyon and has historically been described as a surface debris disposal site. It is not known how long the site received building debris; however, it did not receive waste after 1994. AOC 21-013(g) consisted of two discarded drainlines and miscellaneous building materials of unknown origin. The debris was removed in 2005 and investigations were conducted between 2005 and 2007 to define the nature and extent of contamination. Evaluation of both human health and ecological risk indicates that there is no potential unacceptable risk posed at the site. However, storm water discharge may mobilize residual contamination from the site. The Permittees must monitor storm water discharge for potential off-site transport of residual contamination. This is currently being accomplished under the National Pollutant Discharge Elimination System (NPDES) "Stormwater" Permit. NMED hereby issues this Certificate of Completion for Corrective Action Complete with Controls for SWMU 21-013(g) pursuant to Section VII.E.6.b of the Consent Order.

If new information becomes available that indicates that these sites pose a potential risk to human health or the environment, NMED may require the Permittees to conduct additional corrective action at these sites in the future.

Please contact Ben Wear at (505) 476-6041, if you have any questions.

Sincerely,

John E. Kieling
Acting Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
N. Dhawan, NMED HWB
S. Yanicak, NMED DOE OB, MS J993
T. Skibitski, NMED DOE OB
L. King, EPA 6PD-N
W. Woodworth, DOE LASO, MS A316
A. Russell, DOE-LASO
B. Wedgeworth, EP-TA-21 Closure Project, MS M992
D. McInroy, EP-CAP, MS M992
W. Alexander, EP-BPS, MS M992

File: 2011 LANL, Certificates of Completion, MDA V, TA-21 SWMUs/AOCs

Natural Radioactivity in Northern New Mexico Water

Michael W McNaughton, William F Eisele Jr, David Englert, Ralph Ford-Schmid, Jeffrey Whicker

LA-UR-12-26061

Introduction

We discuss the natural radionuclides in northern New Mexico waters. The predominant materials are uranium, thorium, and potassium-40, together with the radionuclides of the natural uranium and thorium decay chains. The radionuclides of the decay chains are used to distinguish natural materials from LANL materials.

We also discuss gross alpha and beta data. High values usually indicate natural materials rather than LANL materials. We discuss why gross alpha data are higher than predicted by simple models of the uranium and thorium decay chains.

Uranium

Natural uranium is prevalent throughout the US and the world. In the soil, the typical concentrations of U238, U235, and U234 are on the order of 1 pCi/g, 0.05 pCi/g, and 1 pCi/g, respectively, and the isotopic ratios, 1:0.05:1, indicate natural uranium. In water, the activity concentration of U234 is often greater than that of U238. For example, Kraig and Gladney (2001) measured 13 ± 1 pCi/L for U238, 0.6 ± 0.1 pCi/L for U235, and 20 ± 1 pCi/L for U234 in a sample of Santa Fe municipal tap water. The higher concentration of U234 occurs because the process of decay from U238 to U234 dislodges the atom from the lattice and makes it more soluble.

Higher concentrations are measured in the Santa Fe Buckman wells; in the following table, we list the mean, the standard deviation, and the regional statistical reference level, RSRL, which is the mean plus 3 standard deviations.

Nuclide	mean	standard deviation	RSRL
units	pCi/L	pCi/L	pCi/L
U234	20	27	101
U238	14	24	86

Table 1: Uranium concentrations in the Santa Fe Buckman wells.

For natural uranium, the U235 concentrations are 4.6% of the U238 concentrations (Kraig and Gladney 2001) which in this case is 86 × 0.046 = 4 pCi/L.

Even higher concentrations are found in unfiltered water. These concentrations can be understood by comparing the uranium concentrations with those of potassium-40 and the uranium decay chain, as discussed later.

Natural Decay Chains

The natural uranium decay chain includes 8 alpha decays and 6 beta decays, while the natural thorium decay chain includes 6 alpha decays and 4 beta decays.

The radionuclides in the decay chains are different for LANL materials because they have been refined to remove Th230, radium, polonium, bismuth, and lead. Th234 and Pa234m grow in during the first few

months, but Th230, Ra226, etc., require thousands of years to reach detectable concentrations. These decay products will not always be present in equal concentrations for two reasons: chemical processes cause some elements to go into solution more than others; and radon gas sometimes diffuses out of water. However, the presence of decay products such as Bi214 indicate that the material is natural and not from LANL. Similarly, high gross-alpha measurements are more likely indicators of natural uranium because LANL uranium includes few decay products.

The thorium decay products grow in more rapidly than the uranium decay products. However, at LANL thorium has been used only in small quantities and thorium contamination has not been found in the LANL environment.

Consider the following set of data, collected on July 18, 2002 by the New Mexico Environment Department, NMED Oversight Bureau, at location E055, upstream of LANL. The measured sediment load, 71 g/L, was used to convert from pCi/L to pCi/g. However, sediment loads vary among the samples and aliquots from a single storm event so this value should be treated with caution.

Nuclide	result	2s uncert	sediment
	pCi/L	pCi/L	pCi/g
K40	2550	430	36
U234	131	18	1.8
U238	130	17	1.8
Bi214	125	22	1.8
Pb214	142	24	2.0
Pb212	186	32	2.6
Bi212	206	57	2.9
Ac228	184	33	2.6
Pu239	3.4	1.3	0.05
Am241	0.9	0.5	0.01
Cs137	75	13	1.1
Gross α	3080	580	43
Gross β	3340	590	47

Table 2: Data for the July-18-2002 water sample at location E055.

The data indicate that the sediment contains about 2 pCi/g of uranium-238 in equilibrium with its decay products, and also 2-3 pCi/g of thorium-232 in equilibrium with its decay products. These concentrations are typical of natural soil and sediment in the mountains of northern New Mexico. Furthermore, the decay products demonstrate that the material is natural. The concentrations of Pu239, Am241, and Cs137 are typical of global fallout at high altitudes, especially if the surface contains ash from a wildfire, as is the case here. In this case it is likely that there is no measurable LANL contribution.

Gross alpha and gross beta

It is often assumed that the gross alpha and gross beta results should be the sum of the alpha and beta emissions of the radionuclides in the uranium and thorium decay chains. Arndt and West (2001) http://www.slh.wisc.edu/ehd/radiochem/dnr_reports/dnrfinal.pdf showed that this assumption is not accurate and in some cases may be low by a factor of two.

The uranium decay chain includes 8 alpha decays and 6 beta decays, and the thorium decay chain includes 6 alpha decays and 4 beta decays so for natural materials, but not for LANL materials, the gross alpha and gross beta results are much higher than the uranium and thorium concentrations.

For the data in Table 2, the decay chains are in secular equilibrium, so according to this simple model, the gross beta activity should consist of 36 pCi/g of K40, 6 × 1.9 = 11 pCi/g of uranium decay products, and 4 × 2.7 = 11 pCi/g of thorium decay products, for a total of 58 pCi/g. The measured result, 47 ± 8 pCi/g, is 1.4 standard deviations lower than the expected result. The accuracy of the gross beta measurement depends on the average beta energy of the calibration source compared with that of the radionuclides being measured. Gross-beta measurements are often calibrated with high-energy betas from Y90, which causes the measurements to be low, as observed. However, we have not investigated this in detail because we are more interested in understanding the gross-alpha measurements.

The gross alpha measurements are affected by the alpha energy of the calibration source compared with that of the uranium and thorium decay products. Often, the calibration source is Th230, which emits a 4.7 MeV alpha. As shown in Table 3, some radionuclides emit higher-energy alphas so they are detected with higher efficiency. This causes the gross alpha result to be biased high.

In principle, the gross alpha procedure, EPA Method 900.0, is as follows.
1. Transfer a measured volume of the water (an "aliquot") to a container (a "planchet").
2. Evaporate the water to leave a solid residue in the planchet.
3. Wait for the decay products to accumulate ("grow in").
4. Count the residue with an alpha counter.

The method is designed for drinking water, in which case the film of residue is thin, and most alpha particles have sufficient energy to reach the detector and trigger the counter. However, in the case of storm water, the residue often exceeds the range of the alpha particle so only alpha particles that originate near the surface with enough energy to escape will be counted.

To be counted, an alpha particle must emerge from the residue in the planchet, pass through the air and the window of the detector, and deposit sufficient energy in the detector to trigger the counter. If the alpha particle originates at the surface, this requires a minimum of 3 MeV. If the alpha particle has more than 3 MeV, it has enough energy to penetrate some amount of the residue, so it could originate below the surface and still trigger the counter. Higher energy alpha particles will penetrate more residue and therefore contribute more counts than lower energy alpha particles. As described in McNaughton 2009, the contribution of each type of nuclide to the gross-alpha count depends on the thickness of material that its alpha particles can penetrate.

For each nuclide in the natural decay chains, the following table lists the alpha energy, the total alpha-particle range, and the maximum thickness of residue that it can penetrate. If this value is less than the total thickness of the residue, then this value will be proportional to the count rate for that nuclide. The final column lists the relative count rate compared with that of the calibration standard, Th-230. For most nuclides, the relative count rate is greater than 1.0 so the gross alpha result will be biased high.

Nuclide	alpha energy	total alpha range	maximum residue thickness	Relative count rate
	MeV	mg/cm^2	mg/cm^2	
Th232	4	3.8	1.2	0.6
Th228	5.4	5.9	3.3	1.5
Ra224	5.7	6.3	3.7	1.7
Rn220	6.3	7.4	4.8	2.2
Po216	6.8	8.3	5.7	2.6
Po212,Bi212	7.1	8.9	6.3	2.9
U238	4.2	4.1	1.5	0.7
U234	4.8	4.9	2.3	1.1
Th230	4.7	4.8	2.2	1.0
Ra226	4.8	4.9	2.3	1.1
Rn222	5.5	6.0	3.4	1.6
Po218	6	6.8	4.2	1.9
Po214	7.7	10.0	7.4	3.4
Po210	5.3	5.7	3.1	1.4

Table 3: For each nuclide, the table lists the alpha energy, the total alpha range, the thickness of residue that can be penetrated by the alpha particle, and the resulting count rate relative to the calibration standard, Th-230.

The sum of the count rates for the Th232 decay chain is 11.5, and the sum for the U238 decay chain is 12.2. So according to this analysis, the gross alpha result could be 11.5 times the Th232 concentration plus 12.2 times the U238 concentration. For example, suppose that the concentrations of natural thorium and uranium are 2 pCi/g; and suppose the storm water contains 100 g/L of suspended sediment. Then the gross-alpha result will be

$$11.5(2\ pCi/g)(100\ g/L) + 12.2(2\ pCi/g)(100\ g/L) \approx 5{,}000\ pCi/L$$

On the other hand, suppose that the sediment is contaminated with depleted uranium, e.g., 2 pCi/g of U238 accompanied by 1 pCi/g of U234. Using the relative count rates listed in Table 3, the gross alpha result will be

$$0.7(2\ pCi/g)(100\ g/L) + 1.1(1\ pCi/g)(100\ g/L) \approx 250\ pCi/L$$

which is much smaller than the result from 2 pCi/g of natural uranium and thorium.

Conclusions

Natural radioactivity in northern New Mexico groundwater consists mostly of natural potassium, uranium, and thorium, together with their decay chains. High gross-alpha results are often caused by the high-energy alphas in the decay chains that accompany natural uranium but not LANL uranium. LANL contamination can be distinguished from natural radioactivity by the absence of these decay chains.

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A Study of the Factors Affecting the Gross Alpha Measurement, and a Radiochemical Analysis of some Groundwater Samples from the State of Wisconsin Exhibiting an Elevated Gross Alpha Activity.

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Abstract.

Ninety eight groundwater samples from water utilities from around the state of Wisconsin were analyzed for uranium activity (U-234, U-235, and U-238), thorium activity (Th-228, Th-230, Th-232), radium activity (Ra-226 and Ra-228), polonium-210 activity (Po-210), and gross alpha activity. The gross alpha activity was determined using EPA method 900.0. Many of these groundwater sources were known to have a combined Ra-226 and Ra-228 activity in excess of 5 pCi/L, which is a radium violation according to EPA regulations. Most of these samples contained insignificant amounts of thorium or Po-210. The activity of thorium found in the all of the samples was on the order of 0.1 pCi/L or less. Only two samples contained Po-210 at a level of 1 pCi/L or more. A model was developed to determine the contribution of each radionuclide to the gross alpha activity. An analysis of the factors affecting the gross alpha measurement was conducted using this model. The gross alpha activity depends appreciably on the radionuclide used as the calibration standard, the time between sample collection and sample preparation, and the time between sample preparation and sample analysis. The adjusted gross alpha activity, the gross alpha activity minus the total uranium activity, can depend appreciably on whether a radiochemical or a gravimetric method is used to determine the total uranium activity. This is important since according to EPA regulations an adjusted gross alpha activity exceeding 15 pCi/L is considered to be a gross alpha violation. Using the model, it is shown that for some water samples the value obtained for the adjusted gross alpha activity can range from being well within compliance to being well out of compliance as the parameters affecting the gross alpha activity are varied within the limits set forth by Method 900.0. In cases where a water sample was analyzed within a few days of collection, it was found that if the sample contained a significant amount of Ra-228, the measured gross alpha activity was significantly greater than the calculated gross alpha activity unless it was assumed that the sample also contained Ra-224 at a level approximately equal to the Ra-228 activity. This result is not unexpected since Ra-224 is in secular equilibrium with Ra-228. In many cases, the majority of the gross alpha activity of a sample was due to the alpha-emitting progeny of Ra-226 and to Ra-224 and its alpha-emitting progeny. This situation often leads to confusion about the gross alpha activity, since the activities of the progeny of Ra-226 and of Ra-224 and its progeny are never routinely measured in the laboratory. The use of the model developed in this work should be of assistance in helping a water utility with a gross alpha violation determine the reason for the violation, and, therefore, should be helpful in determining how to treat the gross alpha violation.

1. Introduction.

Many naturally occurring groundwaters contain measurable amounts of alpha-emitting radionuclides. The levels of some of these radionuclides, like Ra-226 and Ra-228, are regulated because there are groundwaters in which the levels of these radionuclides are sufficiently high to be deemed unsafe. Current United States Environmental Protection Agency (EPA) regulations[1] require that the combined activities of Ra-226 and Ra-228 be less than 5 pCi per liter. A measurement of the gross alpha activity of a water sample is usually performed before the water sample is tested for radium. The gross alpha activity of a water sample is an estimate of the actual alpha activity of the water sample. If the gross alpha activity is greater than 5 pCi/L but less than 15 pCi/L, then an analysis is performed to determine the Ra-226 and Ra-228 activities of the water sample. If the combined activities of the radium isotopes exceeds 5 pCi/L, then the sample has a radium violation. If the gross alpha exceeds 15 pCi/L, then, in addition to the Ra-226 and Ra-228 activities, the total uranium activity is determined. The total uranium activity is subtracted from the gross alpha activity to obtain the adjusted gross alpha activity. If the adjusted gross alpha activity exceeds 15 pCi/L, then the water sample has a gross alpha violation, even if there is no radium violation.

There are two types of methods available for the measuring the gross alpha activities of water samples: evaporative methods and precipitation methods. An example of an approved evaporative method is EPA Method 900.0.[2] In this method a water sample is evaporated, and the solid residue containing the radionuclides is analyzed for alpha activity. An example of a precipitation method is EPA Method 900.1.[3] In this method the radium isotopes are co-precipitated with barium sulfate, and the precipitate is analyzed for alpha activity. In general, an evaporative method is less costly and less time consuming to perform than a precipitation method. For this reason EPA Method 900.0 is the method used at the Wisconsin State Laboratory of Hygiene and many other laboratories. Thus, EPA Method 900.0 is analyzed in detail in this work, although the general principles involved would apply to any of the methods.

In EPA method 900.0, a water sample for gross alpha activity analysis is prepared using a small volume of water, typically 200 mL or less. Nitric acid is added to the sample and the sample is evaporated to near dryness. This step is repeated. The purpose of adding the nitric acid is to reduce the chloride content of the sample, thereby making the sample less corrosive to the stainless steel planchet in the next step. The sample is transferred to the planchet and is reduced to dryness. Then the resulting solid film in the planchet is heated to redness using a Meeker burner. The purpose of this step is to convert the nitrates in the film to oxides, and to reduce the mass of the film. The nonvolatile radionuclides that were originally in the water sample are now contained in the solid film of the planchet. Since radon is volatile, immediately after sample preparation, the solid film contains only a small fraction of the radon activity present in the original sample. The emission rate of alpha particles from the solid film is measured using a gas proportional counter. Then the gross alpha activity is calculated using the alpha-particle emission rate, the mass of the solid film, and an experimentally determined calibration curve.

The interpretation of the gross alpha measurement has been a source of much confusion among water utility operators and workers in the environmental and public health fields. As mentioned above, the gross alpha activity is an estimate of the actual alpha activity of a water sample (excluding radon, which was lost during the evaporation and heating processes). As will be seen below, the gross alpha activity is often a substantial overestimate of the actual alpha activity of the nonvolatile radionuclides of the water sample. Many think that the sum of the total uranium activity and the Ra-226 activity should equal the gross alpha activity. In general, this is not the case. Many other factors affect the gross alpha measurement. On the time scale of a typical gross-alpha measurement, Ra-226 decays into a series of alpha emitters that contribute to the gross alpha activity. Also, although Ra-228 is a beta emitter, the presence of Ra-228 in a water sample indicates the presence of its decay product Ra-224. The activity of Ra-224 in water samples is never routinely determined. Like Ra-226, Ra-224 decays into a series of alpha emitters that contribute to the gross alpha activity. Many other factors affect the gross alpha activity like the alpha-particle energy of a particular radionuclide; the radionuclide that is used as the calibration standard (natural uranium or Th-230); the uniformity of the film in the planchet; the time between sample collection and sample preparation; and the time between sample preparation and the gross-alpha measurement.

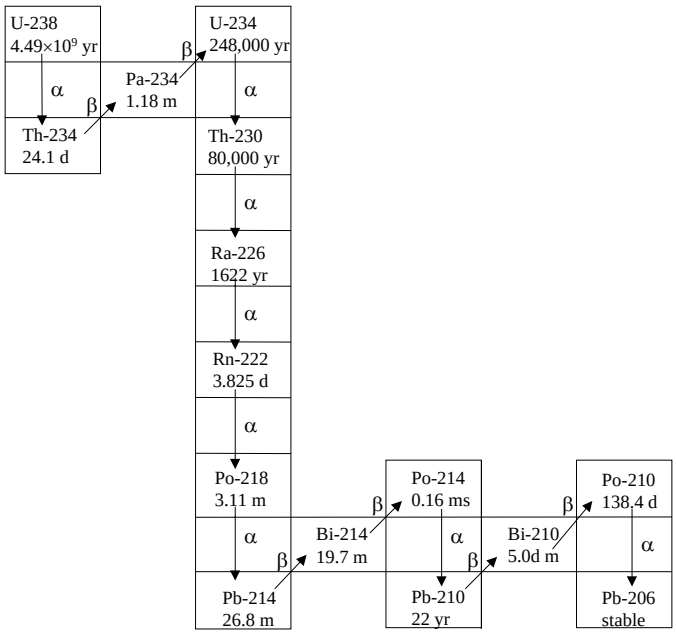

Figure 1. U-238 decay scheme.

The state of Wisconsin is known to have many public waterworks using groundwater in which the groundwater is known to be in violation of the current radiological standards. Consequently, these groundwaters provide a good source of samples for the current gross alpha study. Ninety eight groundwater samples from around the state of Wisconsin were collected, mostly from water supplies in which there were known radium or gross alpha

violations. A series of radiological tests were performed on these samples including a gross alpha analysis and analyses for the following radionuclides: Po-210, Rn-222, Ra-226, Ra-228, Th-228, Th-230, Th-232, U-234, U-235, and U-238. The purpose of this report is to quantify the effect of the various physical and radiological factors on the gross alpha activity measurement.

The main natural alpha emitters found in raw water samples are members of either the U-238, the U-235, or the Th-232 decay series. In radiological terms, the abundance of radionuclides belonging to the U-235 decay series is much less than the abundance of radionuclides belonging to either the U-238 or the Th-232 decay series. Consequently, the contribution of U-235 and its progeny to the gross alpha activity will be neglected. The U-238 and Th-232 decay series are shown in Figures 1 and 2, respectively. The presence of a radionuclide in groundwater depends on some complex chemical and geological phenomena. The ultimate source of a U-238 or Th-232 is an ore containing one or both of these radionuclides. Because groundwater often flows at a considerable rate, a radionuclide can be found far from its source. In this report we are not concerned with the ultimate source of a radionuclide, but are concerned with which radionuclides are actually found in the groundwater samples and how these radionuclides contribute to the gross alpha.

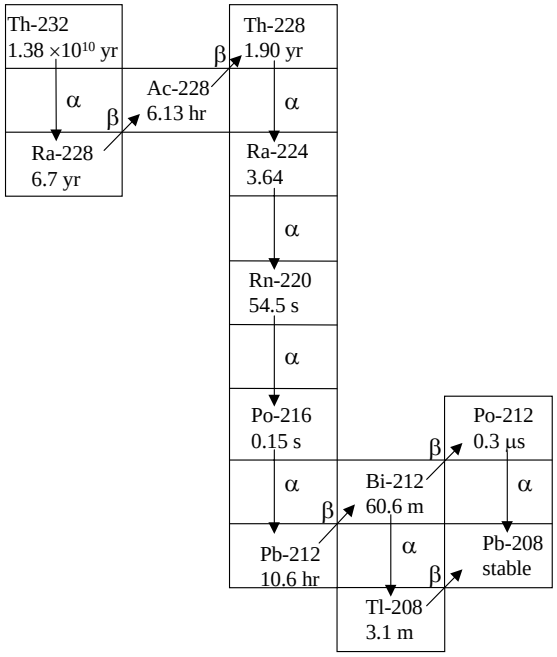

Figure 2. Th-232 decay scheme.

In general, radionuclides are distributed among various phases. A radionuclide can be part of a parent ore, dissolved in water, adsorbed to the surface of a solid, or part of a solid matrix that was created as matter that was dissolved in solution deposited from

solution. If one accounts for all of the activity of a radionuclide among these various phases, one finds that the activity of the radionuclide is approximately equal to the activity of the parent, either U-238 or Th-232. This phenomenon is known as secular equilibrium. Secular equilibrium occurs when the half-life of the parent nuclide is much longer than the half-life of any of the progeny nuclides. Inspection of Figures 1 and 2 shows that this is the case for both the U-238 and Th-232 decay series. A further example of secular equilibrium for Ra-226 will be given in Section 1.4.

1.1. Physical and chemical factors affecting the presence of radionuclides in groundwater. Although secular equilibrium exists in the U-238 and Th-232 decay series, the amount of a particular radionuclide found in water will depend to a large extent on some of the physical and chemical properties of the radionuclides. For example, when a radionuclide undergoes alpha decay, it emits an alpha particle with several million electron-volts of energy. To conserve momentum, the nucleus that emits the alpha particle will recoil in the direction opposite to the direction in which the alpha particle was emitted. If the parent nuclide started in the solid phase, the progeny nucleus may have recoiled far enough for it to have reached the aqueous phase. For example, suppose that in an aquifer U-238 is present in an ore, which may be a small grain of material. When the U-238 decays, the recoiling Th-234 nucleus may reach the aqueous phase and precipitate from solution. The Th-234 atom then undergoes two successive beta decays forming a U-234 atom, which readily goes into the aqueous phase. Without the recoil step, this atom of U-234 would have remained in the parent ore. This process tends to enrich the aqueous phase in U-234 relative to U-238. This phenomenon, known as disequilibrium,[4] can be seen in the U-234 and U-238 activity data collected in this study (see Appendix A).

Chemical properties tend to determine the amount of some of the radionuclides in water. For example, uranium has two common oxidation states, the +4 state and the +6 state. In the +6 oxidation state uranium is in the form of the soluble uranyl ion UO_2^{+2}; in the +4 oxidation state uranium is usually insoluble and precipitates from solution. The oxidation state that uranium is in usually depends on the amount of dissolved oxygen in the water. In water with high levels of dissolved oxygen, the uranyl ion forms and uranium is quite soluble; in anaerobic water, the uranium is reduced to the +4 state, and such waters are usually low in dissolved uranium.

The amount of radium in water is affected by other factors. Radium tends to adsorb onto the surfaces of solids in an aquifer. The amount of radium in the water would be expected to be relatively higher when the number of such adsorption sites is relatively low. In addition, radium competes with other metals— e.g., barium, calcium and magnesium — for these adsorption sites. This is known as the common-ion effect. Consequently, aquifers whose water contains relatively high dissolved solids tend to have correspondingly higher levels of radium.[5]

Thorium exists naturally in the +4 oxidation state only, so it is does not participate in any oxidation-reduction reactions. Thorium is soluble in acidic solutions, but thorium hydroxide, $Th(OH)_4$, begins to precipitate from solution at a pH of about 3. The solubility product constant of $Th(OH)_4$ is about 10^{-50}, so in near neutral solution, thorium

precipitates almost quantitatively from solution.[6] Very little thorium has been found in any of the groundwater samples tested in this study (see Appendix A).

Polonium is soluble in highly acidic solutions, but is relatively insoluble in neutral solutions. Polonium tends to absorb onto surfaces. It is sometimes found on colloids suspended in solution. These colloids are sometimes referred to as radiocolloids.[7] Most of the groundwater samples tested in this study had very little Po-210. However, there were two water samples (samples 80732 and 80743 in Appendix A and B) that contained a substantial amount of Po-210. The origin of Po-210 in these two samples is not clear. These samples where not characterized chemically or analyzed for colloidal matter.

Radon gas is relatively soluble in water.[8] It is not unusual for a water sample to contain several thousand pCi of Rn-222 activity. However, such high levels of radon are never observed in samples prepared for a gross alpha-measurement. The reason for this is due to the volatility of radon. During the phases of sample preparation in which the sample is evaporated and in which the solid film is heated with a Meeker burner, most of the radon originally present in the sample is driven off . This does not mean that Rn-222 is not present in the solid film. Rn-222 is continually being produced by the decay of Ra-226, and once the film solidifies, the Rn-222 atoms produced by Ra-226 decay are trapped in the solid film.

None of the water samples were tested for any isotopes of bismuth or lead. From Figures 1 and 2 it is seen that all of the isotopes of bismuth have relatively short half-lives and would be expected to decay away rather quickly. Most of the lead isotopes in these two figures are either stable (at the end of the decay series) or have relatively short half-lives. The exception is Pb-210, which has a half-life of 22 years. Although Pb-210 is not an alpha emitter, it undergoes two successive beta decays to form Po-210, an alpha emitter.

1.2. Relevant time scale and significance of radionuclide levels. In this study the water samples were processed for gross alpha activity relatively soon after sample collection, usually within one week. In some cases the sample batch did not meet quality control standards, and were reanalyzed. Consequently, a few samples were reanalyzed one or two months after sample collection. Thus, in the following discussion we will be concerned with radioactive transformations that occur on a time scale of about one month or less.

Many of the most abundant radionuclides found in the water samples in this study occurred at a level of 1 pCi/L or more. Thus, for our purposes an activity on the order of 1 pCi/L will be assumed to be substantial, and an activity on the order of one-tenth of a pCi/L or less will assumed to be negligible.

1.3. Supported and unsupported activity. In general, to account for the alpha activity in a water sample, one must know the activities of all of the radionuclides that are present in the sample, and one must determine how the activities of these radionuclides change with time. Before going into greater detail, some definitions are in order. With the exception of the radionuclides at the beginning and end of each series, a radionuclide is both being produced by the decay of its parent and being consumed by its own decay into its progeny. Conceptually, the activity of any radionuclide can be divided into two categories: supported activity and unsupported activity. The activity of a radionuclide in a water sample is unsupported if the radionuclide has no parent, or if the parent is not

present in the sample and is not being produced by decay processes in significant amounts over the time scale of interest. Thus, the activity of an unsupported radionuclide will decay away with its characteristic half-life. Examples of radionuclides that are unsupported are U-238 and Th-232. Since these radionuclides are at the beginning of their respective decay series, they cannot be produced, and, therefore, all of their activity is unsupported. Another example of unsupported activity is that of Ra-226. Th-230, the parent of Ra-226, is highly insoluble in water, and was not present in significant amounts in any of the water samples in this study. It is possible that U-234 could decay to Th-230 and then to Ra-226, but on a time scale of one month, the amount of Ra-226 produced by this process is negligible. Thus, for the present purposes, the activity of Ra-226 is unsupported.

At the other extreme are radionuclides whose activities are completely supported. The activity of a radionuclide is completely supported if the existence of its activity is due only to the decay of its parent. In the solid film the Rn-222 activity is completely supported by the decay of Ra-226. As discussed in Section 1.1, Rn-222 is driven off of the solid film during the evaporation and heating processes. After the heating step, as time progresses, Rn-222 is produced by the decay of Ra-226. Consequently, the existence of Rn-222 activity in the sample is completely due to the decay of its parent, Ra-226.

There can be cases of an intermediate nature, where the activity of a radionuclide is neither completely supported nor completely unsupported. That is, a water sample may contain a radionuclide and its parent, but the activity of the radionuclide may be in excess of what the decay of the parent in the water sample could have produced. In such cases, for accounting purposes, the activity of the radionuclide can be arbitrarily divided into supported and unsupported activity. One may classify the original activity of the radionuclide in the water sample as unsupported and classify the activity that arises due to the parent decay as supported. The unsupported activity of the radionuclide will decline with a time constant that is characteristic of the half-life of the radionuclide. Simultaneously, the supported activity, which is initially zero, will increase as the parent decays, possibly going through a maximum and then decreasing as the parent decays away.

In the case of the U-238 and Th-232 decay series there are numerous considerations that allow us to focus on subsections of these decay series, rather than considering the decay series as a whole. These subsections consist either of a single radionuclide or of a sequence of radionuclides, the first member of which supports the activities of the subsequent members. This is the subject of the next two sections.

1.4. Subsections of the U-238 decay series. The activity of U-238 is assumed to be constant, since its activity is unsupported and its lifetime is 4.49 billion years. Before defining other subsections, it is helpful to use U-238 as an example to estimate how the activity of a parent affects the activities of its progeny. In general, to determine the effect that the decay of a parent radionuclide will have on the activities of its progeny, one must solve of system of coupled differential equations. However, for the radionuclides at the beginning of the U-238 decay series, some approximate calculations are sufficient.

It should be noted that the lifetimes of the radionuclides in each series range over many orders of magnitude. For example, in the U-238 series, the half-life of U-238 is 4.49 billion years, whereas the half-life of Po-214 is 0.16 ms. This is a range over almost 21 orders of magnitude. The activity, *A*, of a given radionuclide is given by

$$A = \frac{\ln(2)}{t_{1/2}} N, \tag{1}$$

where $t_{1/2}$ is the half-life of the radionuclide and N is the number of atoms of the radionuclide. This formula has been used to obtain the results in Table 1.[9] In this table for a selection of radionuclides, the half-life is given in seconds, and the corresponding number of atoms required to produce 1 pCi of activity is given. Again, it is seen that the number of atoms required to produce 1 pCi of activity ranges over almost 21 orders of magnitude.

Table 1. Number of atoms required to produce 1 pCi of activity.

Nuclide	Half-life (s)	No. atoms to produce 1 pCi.
U-238	1.42×10^{17}	7.56×10^{15}
Th-234	2.08×10^{6}	1.11×10^{5}
Pa-234	70.8	3.78
U-234	7.80×10^{12}	4.17×10^{11}
Th-230	2.52×10^{12}	1.35×10^{11}
Ra-226	5.112×10^{10}	2.73×10^{9}
Rn-222	330,000	17600
Po-214	1.6×10^{-4}	8.54×10^{-6}
Pb-210	6.94×10^{8}	3.71×10^{7}
Bi-210	432,000	23,000
Po-210	12,000,000	638,000

One pCi of activity is about 0.037 decays per second, or about 1 decay every 27 seconds. Thus, a decay rate of 1 pCi corresponds to about 96,000 disintegrations in 30 days. In one month, 1 pCi of U-238 will undergo about 96,000 disintegrations and produce 96,000 atoms of Th-234. The addition of 96,000 atoms to either of the beta emitters Th-234 or Pa-234 will be substantial, but the addition of 96,000 atoms to 1 pCi of the alpha-emitter U-234 only amounts to about 2.3×10^{-5} % of the U-234 atoms. Consequently, on a time scale of about one month, an activity of 1 pCi of either U-238, or Th-234, or Pa-234 will have virtually no effect on the U-234 activity. And because U-234 has a half-life of 248,000 years, its activity can be assumed to be constant.

The next subsection in the U-238 series starts with Ra-226. The Ra-226 activity is unsupported because its parent, Th-230, is highly insoluble, so that the activity of Th-230 in the water samples amounts, at most, to a few tenths of a pCi. The decay of 0.1 pCi of Th-230 in one month produces about 9,600 Ra-226 atoms, which is about 3.5×10^{-4} % of the Ra-226 atoms in 1 pCi of Ra-226. One might be concerned with the amount of Ra-226 that is produced indirectly by the decay of U-234. If a sample contains 1 pCi of U-

234, then 96,000 atoms of its progeny, Th-230, would be produced in 30 days. From Equation (1) the activity of 96,000 atoms of Th-230, the parent of Ra-226, is only 0.83 decays per year. Consequently, on a time scale of one month, the Ra-226 activity can be assumed to be unsupported.

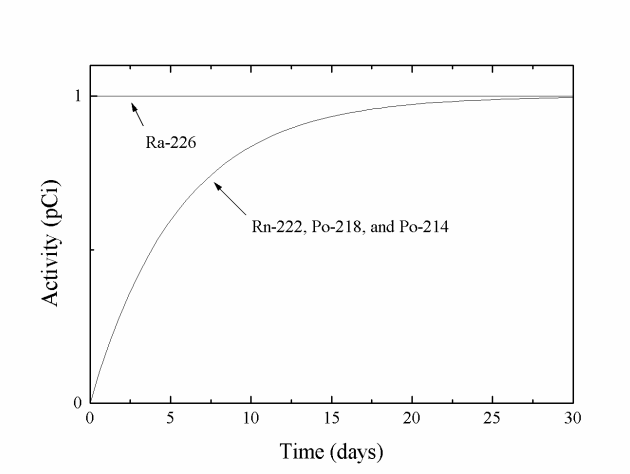

Figure 3. Ra-226 and progeny.

From Figure 1, it is seen that the five radionuclides—Rn-222, Po-218, Pb-214, Bi-214 and Po214— following Ra-226 have relatively short half-lives as compared to Ra-226 (on the order of milliseconds to a few days). If these progeny were unsupported, their activities would tend to decay away rather quickly. However, these progeny are supported by the decay of Ra-226, and it is clear that the decay of Ra-226 over a period of days will have a substantial effect on the activities of these progeny. Three of the progeny are alpha-emitters—Rn-222, Po-218, Po214—and their activities must be determined in order to account for the gross alpha activity results. Such a calculation is readily performed using the Bateman equations. The Bateman equations are the solutions of a series of coupled linear differential equations governing the decay of a series of radionuclides. Figure 3 shows the result of a calculation in which the activity of the three alpha-emitting progeny (Rn-222, Po-218, and Po-214) of Ra-226 are determined as a function of time. On the time scale in the figure the activities of Rn-222, Po-218, and Po-214 are virtually equal.

The plot in Figure 3 demonstrates a phenomenon known as secular equilibrium. If the half-life of the parent radionuclide, Ra-226, is much longer than the time scale of interest, (30 days), then the activity of the parent will be virtually constant over the time scales of interest. If the half-lives of the progeny (Rn-222, Po-218, Pb-214, Bi-214, and Po-214) are short compared to the time scale of interest (30 days), then the activities of the progeny will closely approach the activity of the parent over the duration of the time scale of interest. The reason for this is relatively simple. Each of the progeny is being produced by the decay of its immediate parent and is being consumed by its own decay. The decay of a radionuclide is a first order process. In a first order process, the probability per unit time, λ, that an atom will decay is independent of the presence of other atoms. In a population of atoms, all of the atoms have the same probability of decaying, so that if there a N atoms in the population, then the instantaneous rate of decay

of atoms is just λN. Thus, if the population of a particular radionuclide is doubled, then the decay rate of that population is doubled. Initially, the number of Rn-222 atoms is zero, but as Ra-226 decays, Rn-222 atoms are being created at a constant rate, which is just the decay rate of Ra-226. Some of these Rn-222 atoms decay, but, initially, they tend to accumulate. As the Rn-222 atoms accumulate, their decay rate increases (remember more atoms lead to a higher decay rate). The Rn-222 population increases until the Rn-222 decay rate equals the rate at which Rn-222 is produced, which is equal to the decay rate of Ra-226. At this point, the population of Rn-222 has stabilized. Now the stable population of Rn-222 atoms is producing Po-218 atoms at a constant rate (the decay rate of Ra-226), and the Po-218 population will build until the decay rate of Po-218 equals its rate of production (the decay rate of Ra-226). The process of building radionuclide populations whose activities equal the activity of Ra-226 will keep occurring for each radionuclide along the decay series, as long as the Ra-226 half-life is long compared to the half-life of the radionuclide of interest, and as long as the half-life of the radionuclide is short compared to the time scale of interest. Further down the decay series Pb-210 is encountered with a 22 year half-life. On our time scale of interest (30 days), 22 years is a long time, and the Pb-210 population will not have built to a large enough number and have stabilized such that the decay rate of Pb-210 equals the decay rate of Ra-226. The next alpha-emitting radionuclide after Po-214 is Po-210. If one uses the Bateman equations to determine the activity of Po-210 produced from Ra-226, one finds that it takes approximately 1440 days to produce 0.1 pCi of Po-210 from 1 pCi of Ra-226. The low production of Po-210 from Ra-226 is due to the relatively long half-life of Pb-210 (22 years). On a one-month time scale the Pb-210 population arising from the decay of Ra-226 gives rise to a negligible Pb-210 activity. In effect, on a one-month time scale the presence of Pb-210 in the decay chain acts as a "bottleneck" for the production of Po-210 from Ra-226.

Actually, in Figure 3 it is seen that the activities of Rn-222, Po-218, and Po-214 are virtually the same. This is because the half-lives of the progeny Po-218, Pb-214, Bi-214, and Po-214 are much less than the half-life of Rn-222. Consequently, these progeny species come into secular equilibrium with Rn-222 rather quickly on the time scale in Figure 3.

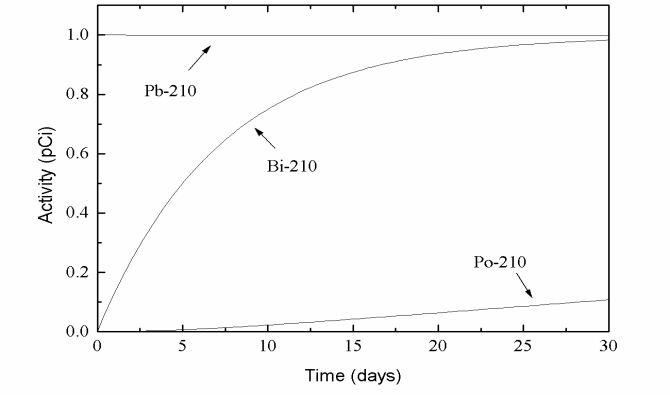

Figure 4. Pb-210 decay and Po-210 ingrowth.

As mentioned above the activity of Pb-210 was not determined in the samples. The amount of Pb-210 present in the water samples is of interest because it decays into the alpha-emitting Po-210. Figure 4 is a plot of the ingrowth of Bi-210 and Po-210 from 1 pCi of Pb-210 over a period of 30 days. After 30 days, Bi-210 is in secular equilibrium with Pb-210, but the activity of Po-210 produced is about 0.1 pCi. When one measures the activity of Po-210 in a sample, because of its relatively short half-life (134 days), one decay corrects the Po-210 activity to obtain the Po-210 activity in the sample at the time of collection. If 0.1 pCi is decay corrected backward 30 days, it is found that it results in an initial Po-210 activity of 0.12 pCi. Consequently, for the present purposes, it likely not necessary to measure the activity of Pb-210.

Another source of Po-210 is Bi-210. If 1 pCi of Bi-210 completely decays, then, from the data in Table 1, it is clear that this would amount to about 3.6 percent of the number of Po-210 atoms in 1 pCi of Po-210 activity. For the present purposes, this is insignificant.

To summarize, in considering the U-238 decay series, we need to consider only U-238; U-234; Ra-226 and its subsequent three alpha-emitting progeny (Rn-222 Po-218, and Po-214); and Po-210.

1.5. Subsections of the Th-232 decay series. The data in Appendix A show that the activities of Th-232 and Th-228 in all of the groundwater samples were insignificant. This is presumably due, in part, to the formation of insoluble $Th(OH)_4$. The activity of Ra-228 is of interest because its presence in a water sample is a certain indicator of the presence of Ra-224 in the water sample. In this project, the Ra-228 activity was measured, but not the Ra-224 activity. It is not difficult to show that, on a one-month time scale, the activities of the radionuclides preceding Ra-224 in the Th-232 decay series have a minor effect on the activity of Ra-224. As mentioned above, the thorium isotopes are not important because of their insolubility. The decay of Ra-228 and Ac-228 will not significantly alter the activity of Ra-224 because Th-228 has a half-life of 1.9 years. This is seen in the plot in Figure 5 where the ingrowth of Ra-224 from 1 pCi of Ra-228 is plotted. Thus, Th-228 acts as a "bottleneck" for the production of Ra-224, in the same way that Pb-210 acts as a "bottleneck" for the production of Po-210 from Ra-226. Although the presence of Th-228 limits the amount of Ra-224 produced over a one-month time scale, Figure 5 shows that there is significant ingrowth of Ra-224 from Ra-228 over a period of a few years, and, consequently, the presence of Ra-224 in aquifers containing high levels of Ra-228 should be expected. In fact, Ra-224 is in secular equilibrium with Ra-228. Moreover, because Th-228, an alpha emitter, is between Ra-228 and Ra-224 in the decay series, some water samples may actually be enriched in Ra-224 relative to Ra-228.[10]

The above considerations show that, in the Th-232 decay series, one only has to be concerned with the activity of Ra-224 and its progeny. From Figure 2 it is seen that all of the progeny of Ra-224 have relatively short half-lives. Thus, unless they are supported by Ra-224 decay, their activities would quickly decay away. Four of the Ra-224 progeny—Rn-220, Po-216, Bi-212, and Po-212—are alpha emitters, and their activities must be calculated in order to account for their effect on the gross alpha activity. Since the activity of Ra-224 was not determined, the Ra-224 activity will be estimated using the calculations outlined below. In general, the results of the calculations will show that the

ratio of the activity of Ra-224 to the activity of Ra-228 ranges from 1 to 2, which is in agreement with previous studies.[11]

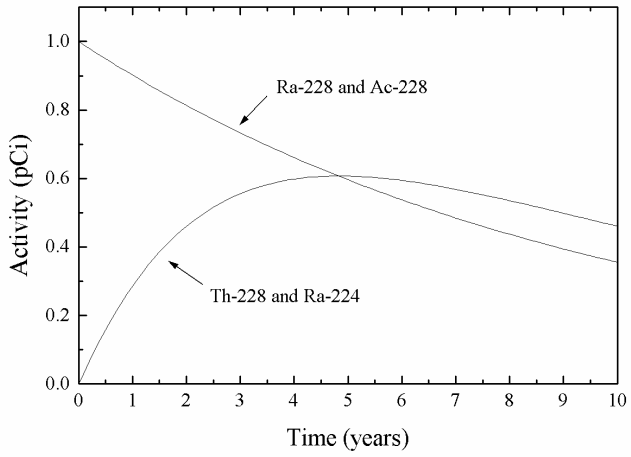

Figure 5. Ingrowth of Ra-224 .

From the discussion in the previous two sections, we know which radionuclides in our water samples will be important contributors to the gross alpha activity (U-238; U-234; Ra-226 and its subsequent three alpha-emitting progeny; Po-210; and Ra-224; and its four subsequent alpha-emitting progeny). The activities of U-238, U-234, and Ra-226 have been measured. The activity of Ra-224 can be estimated from the model discussed in Section 2. The activities of the alpha-emitting progeny of Ra-226 and Ra-224, although not measured, can be readily calculated using the Bateman equations.

1.6. Methods of Analysis. The gross alpha activities of the groundwater samples were determined using EPA Method 900.0[2] employing Th-230 as the calibration standard. Method 900.0 stipulates that the time between sample preparation and analysis should be three days or more, to allow for the ingrowth of the progeny of Ra-226. However, in this work the samples were analyzed as soon as possible after preparation in order that the contribution of the short-lived Ra-224 and Ra-224 progeny would be detected.

The Ra-226 and Ra-288 activities were determined using EPA Methods 903.1[12] and 904.0,[13] respectively. The Po-210 activity was determined using a modified version of Procedure Po-02-RC, the Environmental Measurements Laboratory, United States Department of Energy.[14] It was found that during volume reduction of the acidified sample by evaporation, silica gel formed from silicic acid present in the sample. This reaction is catalyzed by acids,[15,16] which are concentrated during the evaporation of the sample. To prevent the formation of silica gel, the acidified water samples were digested with hydrofluoric acid. A water sample was reduced in volume to about 200 mL, and transferred to a 400-mL Teflon beaker. Then 10 mL of 48% hydrofluoric acid was added to the beaker, and the contents of the beaker were evaporated to dryness. An acidic boric acid solution was added to the beaker, which dissolved the sample and reacted with any fluoride ion that was left. In Procedure Po-02-RC the sample is reduced in volume to 5 mL, not to dryness, and the polonium is co-precipitated with lead sulfide. However, in

this step, when the pH of the solution was adjusted to bring about the precipitation of lead sulfide, a large amount of another precipitate formed, which was probably one or more metal hydroxides. Consequently, the co-precipitation step was omitted. The acidic boric acid solution usually contained a small amount of insoluble white matter, so the solution was filtered, and the polonium in the filtered solution was deposited on a nickel disc, as in the original procedure.

The activities of the uranium isotopes were determined using alpha spectroscopy. The samples were prepared for analysis using Eichrom Method ACW02 [17]employing U-232 as the tracer. The activities of the thorium isotopes were determined using alpha spectroscopy. The samples were prepared using a modified version of Eichrom Method ACW10[18] employing Th-229 as the tracer. Initially, when Eichrom Method ACW10 was employed, the yield of the thorium tracer was low and somewhat variable. The cause of the low yields was traced to two steps in the procedure. First, there is a co-precipitation step in the procedure in which thorium purportedly co-precipitates with a calcium phosphate precipitate, which is formed when the acidic solution is made slightly basic. It was evident that the percentage of thorium that co-precipitated was usually quite low and variable. Experiments showed that the addition of magnesium to the solution before the co-precipitation step was performed greatly increased the amount of thorium in the precipitate. A molar ratio of magnesium to calcium of 5:1 was optimal. For practical purposes, since the amount of calcium in each sample was unknown, an amount of magnesium was added to the solution to assure that the magnesium to calcium ratio was 5:1 or greater. Also, adding sodium carbonate to the solution was found to increase the thorium yield in the precipitate. Thus, when the acidic solution was at or near neutral pH, just before precipitation occurred, about 1 g of sodium carbonate was added to the solution. It was also found that if fluoride was present at a level of about 1 ppm, the amount of thorium in the precipitate was usually low and somewhat variable. Consequently, prior to the co-precipitation step, boric acid was added to the solution, and the solution was heated for an hour so that the boric acid would react with the fluoride.

The second step affecting the Th-229 yield was the micro-precipitation step, in which the thorium was co-precipitated with cerium fluoride. Eichrom Method ACW10 calls for the use of 1 mL of 48% hydrofluoric acid in this step, which results in low Th-229 yields. The use of 5 mL of 48% hydrofluoric acid in this step increases the Th-229 yield to an acceptable level.

2. The Model.

2.1. Introduction. In the following sections the model used to calculate the gross alpha activities of the water samples is discussed. The use of such a model is important for several reasons. The model gives one a deeper insight into the physical and radiochemical processes that affect the gross alpha activity measurement; a successful model allows one to perform computer experiments, which are usually faster than performing experiments in the laboratory; and one can obtain results from the model that would be difficult at best to perform in the laboratory. As an example of this last point, many of the supported short-lived progeny of Ra-224 and Ra-226 have very high alpha-particle energies as compared to the alpha-particle energies of their parents. Consequently, the contribution

of one of the progeny to the gross alpha activity can be significantly greater than the contribution of its parent. It would be virtually impossible to isolate one of these progeny because of its short half-life and because it decays into other radioactive progeny relatively quickly. Thus, experimentally, it would be difficult to isolate the effect of one of these progeny on the gross alpha activity. However, using a model, the contribution of one of these short-lived progeny on the gross alpha activity can be readily determined. The discussion of the model will start with a discussion of the composition of the solid film in the planchet.

2.2. Solid film composition. Table 2 gives the average composition of a groundwater sample from a sandstone aquifer.[19] As discussed in the introduction, the chloride content of a water sample is reduced by alternately adding nitric acid to the sample and evaporating. Presumably, the bulk of the residue left in the planchet after this procedure is performed is a mixture of metal nitrates and sulfates [$NaNO_3$, Na_2SO_4, KNO_3, K_2SO_4, $Mg(NO_3)_2$, $MgSO_4$, $Ca(NO_3)_2$, $CaSO_4$,] and some silicic acid (SiO_4). Since silicic acid decomposes at 150 C, it will be assumed that any dissolved SiO_4 decomposes to amorphous SiO_2 upon heating. In general, the sulfate salts do not melt or decompose below 800 C, so it will be assumed that any sulfate salts present in the solid film are not altered by the heating process. An experiment was performed to determine the stability of nitrate salts during the heating process. When $Mg(NO_3)_2$ or $Ca(NO_3)_2$ is placed in a planchet and heated, it is observed that a brown gas is evolved, probably NO_2, and that the mass of the residue left in the planchet is consistent with the formation of the decomposition products MgO or CaO, respectively. When $NaNO_3$ or KNO_3 is heated in a planchet, the solid melts, but no brown gas is evolved, and the mass of the residue does not change indicating that neither $NaNO_3$ nor KNO_3 decompose.

Table 2. Average composition of groundwater.

Element	Concentration (ppm)
Na	$10^{-3.3}$
K	10^{-4}
Ca	10^{-3}
Mg	$10^{-3.5}$
H_4SiO_4	$10^{-3.9}$
SO_4	$10^{-3.2}$

In this work it is assumed that the film in the planchet after the heating step is performed is composed of $NaNO_3$, KNO_3, MgO, CaO, $MgSO_4$, $CaSO_4$, and SiO_2. However, some work must still be done to characterize the decomposition products for mixtures of salts. It is quite possible that, during the heating step, much of the sulfate becomes associated with sodium and potassium, and that most of the nitrate is associated with magnesium and calcium. If this is the case, then, after the heating process, the amount of nitrate salts left in the solid film may be negligible.

2.3. Energy and efficiency considerations. Before discussing the model in more detail, it is instructive to discuss qualitatively how the energy of an alpha particle affects the

gross alpha activity. When an alpha-emitting radionuclide decays, it emits an alpha particle at one or more characteristic energies. A schematic diagram of the sample and detection system is given in Figure 6. As discussed in Section 1.1, the radionuclides of a water sample, excluding radon, are contained in the solid film of the planchet. When an alpha-emitting atom of the film decays, it emits an alpha particle. The direction in which the alpha particle is emitted is completely random. As the alpha particle moves through matter, it continually loses energy, eventually coming to rest. Two conditions must hold for an alpha particle to cause a pulse in the detector. First, the alpha particle must have enough energy to reach the active region of the detector (P10 gas fills the active region of the detector and is 10% methane and 90% argon) and, once it reaches the active region, it must have enough residual energy to ionize enough molecules of the P10 gas to cause a measurable pulse in the detector. Second, the alpha particle must be emitted in a direction such that it will pass through the active region of the detector.

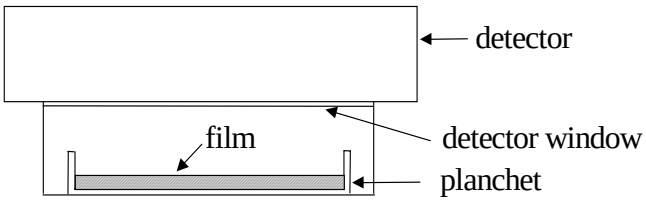

Figure 6. Schematic of the sample and detection system.

Alpha particles move in relatively straight lines. Alpha particles lose most of their energy in collisions with electrons. An alpha particle is about 8000 times more massive than an electron, so that a collision with an electron does not cause much of a deviation in the path of the alpha particle. As an alpha particle moves from the solid film to the P10 gas of the detector (traversing the film, about one centimeter of air, and the entrance window of the detector), it continually loses energy. Within a single medium, an alpha particle of a given energy has a relatively well-defined path length. Thus, for a given medium, one can construct plots of the alpha-particle range versus alpha-particle energy. One can then fit a function to these plots to obtain range-energy functions for that medium. The derivation of the range-energy functions for the various media will be discussed in the next section. These plots, or range-energy functions, can be used to determine the amount of energy lost by an alpha particle in traversing a given length of material. Thus, given these range-energy functions, it can be determined whether an alpha particle reaches the P10 gas and whether the alpha particle has enough residual energy to cause a pulse in the detector.

It often happens that an alpha particle loses all of its energy before reaching the detector. It is clear that the more energetic an alpha particle is, the more likely it is that the alpha particle will reach the detector, provided its trajectory has an suitable orientation. An alpha-emitting radionuclide is characterized by the efficiency with which its alpha particles reaches the detector. The efficiency of a particular radionuclide is just the ratio of the number of alpha particles reaching the detector and causing a measurable pulse to

the number of alpha particles emitted by the radionuclide in the solid film. It is clear that radionuclides with relatively high alpha-particle energies will have relatively high alpha-particle efficiencies.

Table 3. Alpha particle energies for selected radionuclides.

Nuclide	Half-life	Alpha energy (MeV)	Branching ratio
U-238	4.49×10^9 years	4.147	0.23
U-238		4.196	0.77
U-234	248,000 years	4.7231	0.275
U-234		4.776	0.725
Ra-226	1622 years	4.601	0.055
Ra-226		4.784	0.945
Rn-222	3.825 days	5.4897	1
Po-218	3.11 minutes	5.181	1
Po-214	0.163 ms	7.686	1
Ra-224	3.64 days	5.449	0.05
Ra-224		5.685	0.95
Rn-220	54.5 s	6.2883	1
Po-216	0.15 s	6.778	1
Bi-212	60.6 minutes	6.051	0.723
Bi-212		6.09	0.277
Po-212	0.3 μs	8.784	1
Po-210	138.4 days	5.305	1
Am-241	458 years	5.486	0.860
		5.443	0.127
Th-230	80,000 years	4.684	0.760
		4.617	0.240

In general, alpha particles from short-lived radionuclides are more energetic than alpha particles from longer-lived radionuclides. Table 3 shows the alpha-particle energies for a selection of alpha-emitters.[20] In the event that there are two energies, the branching ratio indicates the fraction of alpha particles emitted at that energy. The last two radionuclides in the table are or have been used to calibrate the detection system. Currently, natural uranium and Th-230 are the only two calibration standards that can be used in EPA Method 900.0. Prior to 1995 Am-241 was allowed to be used as a calibration standard in Method 900.0. As will be discussed in Section 2.8, the gross alpha method implicitly assumes that all of the radionuclides have the same efficiency as the calibration standard. As will be seen in Sections 3.3 and 3.6 , the effect of this assumption is that the gross alpha activity of a water sample often greatly exceeds the actual alpha activity of the water sample (excluding radon).

Inspection of the entries in Table 3, reveals that, qualitatively, there is an inverse relationship between the half-life of a radionuclide and the energy of the alpha particle that it emits. The shortest lived but highest energy alpha particles come from the progeny of Ra-224 and Ra-226. Because of their short half-lives, the activities of these progeny are never routinely measured; but because of the high energy of their alpha particles,

these short-lived progeny sometimes account for the bulk of the gross alpha activity. The calculations presented in Sections 3.3 and 3.6 demonstrate this phenomenon.

2.4. Range-energy functions. To determine whether an alpha particle of a given energy causes a measurable pulse in the detector, one must know how much energy the alpha particle losses before it enters the active region of the detector (the cylindrical space filled with P10 gas), and how much energy it dissipates in the active region of the detector. To determine how much energy the alpha particle losses on its way to the active region of the detector, one must determine the alpha-particle range-energy functions for the various materials—the solid film, the air layer, and the entrance window of the detector—that the alpha particle traverses on its way to the detector. To determine how much energy is dissipated in the active region of the detector, one must determine the range-energy function of an alpha particle in the P10 gas. The range-energy data for many materials can be obtained using the National Institute of Standards and Technology ASTAR program.[21] The range-energy plot for air is shown in Figure 7. The entrance window is a thin three-layer sheet composed of a thin polyester film with a thin film of aluminum evaporated on either side. The NIST web site has the range-energy functions for aluminum and Mylar, a polyester that will be used to model the polyester film of the window.

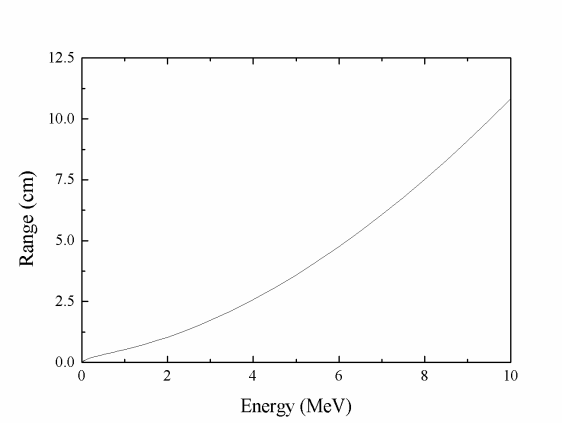

Figure 7. Range-Energy Plot for Air.

The composition of the solid film in the planchet is quite complex. The NIST database contains the range-energy relationship for oxygen, but not for any other element of the solid film. The range-energy function for any other element of the solid film can be estimated using the range-energy function of an element whose atomic weight is close to the atomic weight of the element of interest. This is done using the Bragg-Kleeman rule:

$$\frac{R_1}{R_0} = \frac{\rho_0 \sqrt{A_1}}{\rho_1 \sqrt{A_0}} .$$

Here R_0, ρ_0, and A_0 are, respectively, the range, the density, and the atomic weight of the known element; and R_1, ρ_1, and A_1 are, respectively, the range, the density, and the atomic weight of the element whose range is to be estimated. A range-energy function for each element of the solid film was estimated using one element whose atomic weight is

greater than the element of interest and one element whose atomic weight is less than the element of interest. The two estimates were averaged to arrive at the range-energy function for the element.

Once the range-energy functions for each of the constituent elements of the solid film were determined, the range *R* of an alpha particle in the solid film could be determined using another formula also called the Bragg-Kleeman rule:

$$R = \frac{1}{\sum_i x_i (A_i / R_i)} .$$

Here x_i A_i and *Ri* are the mole fraction, the atomic weight, and the range of the *i*th element in the solid film, respectively.

2.5. The detector. Initial attempts to model the detector resulted in calculated Th-230 efficiencies that far exceeded the experimentally determined Th-230 efficiencies. It became evident that not every alpha particle reaching the P10 gas caused a measurable pulse. A pulse is generated when electrons created by the ionization of P10 gas molecules are collected at the anode wires of the detector. In order to be counted, a pulse must exceed the discriminator level of the instrument. It may be that the residual energy of the alpha particle is so low that the number of electrons created by the ionization of the P10 gas is too small to generate a pulse that exceeds the discriminator level. However, attempts to model the detector by adjusting the discriminator level upward resulted in discriminator levels that were unreasonable high (they discriminated out pulses of 1 MeV or even more) and resulted in calculations that could not model the efficiencies of several radionuclides simultaneously. It was clear that another phenomenon was at work.

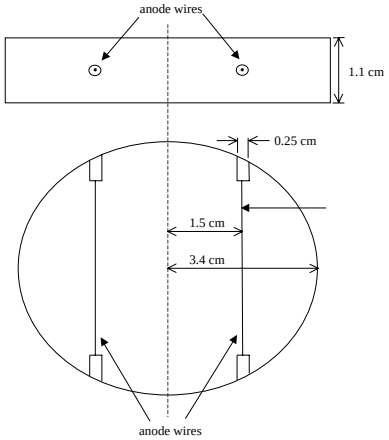

Figure 8. Schematic diagram of the detector.

To understand the reason for the lower efficiencies, one must understand the physics of the electron dynamics in the detector. A schematic diagram of the detector is given in Figure 8. The active region of a detector is a cylindrical region filled with P10 gas, a mixture of 10% methane and 90% argon. One face of the cylinder is covered with a thin

entrance window, which allows alpha particles to enter the active region. In the Berthold detection system, there are two wire anodes that traverse the active region. A potential of 1750 V is applied between the anodes and the detector housing. One must remember that an alpha particle ionizes molecules in the P10 gas leaving a trail of electrons and positively charged gas ions. Part of the reason for the potential applied to the anodes is to create an electric field inside the detector that separates the positively charged ions from the electrons before they can recombine. If recombination occurs, then a part of the signal is lost. Because of the design of the detector, there are regions within the detector where the electric field is relatively low and where recombination of ions and electrons is more likely to occur. In order to determine the portions of the detector where the electric field is low, and where recombination is most likely to occur, the electric field in the detector was determined numerically. This was done using a standard finite-difference method known as the Gauss-Seidel method with over-relaxation.

The problem can be simplified somewhat because the active region of the detector has three symmetry planes, each of which divides the detector in half. Taken together the three planes divide the detector into octants. If one obtains a solution in any one of the octants, the solution in any of the other seven octants is easily obtained by reflection of the solution through the symmetry planes. The solution of the finite-difference equations in one of the octants requires three types of boundary conditions. The first boundary condition is that the electrostatic potential must be zero at the boundary of the active region of the detector. The second boundary condition is that the electrostatic potential must be 1750 V at the surfaces of the anode wires. The third boundary condition is that on any of the symmetry planes the component of the electric field normal to the plane must vanish. In other words, the electric field vector on any of the symmetry planes must lie in the plane. If the normal component did not vanish, the solution of the electrostatic field at the symmetry plane would not be unique.

To implement the solution of the finite-difference equations, a Cartesian coordinate system was set up in the detector, and a rectangular array of points was defined inside the detector. Then, using the Gauss-Seidel method with the appropriate boundary conditions, the electrostatic potential was determined at all of the points of this array. Once the electrostatic potential ϕ was determined, the electric field **E** was determined from ϕ by differentiation; i.e.,

$$\mathbf{E} = -\frac{\partial \phi}{\partial x} n_1 - \frac{\partial \phi}{\partial y} n_2 - \frac{\partial \phi}{\partial z} n_3 ,$$

where n_1, n_2, and n_3 are unit vectors in the *x*-, *y*-, and *z*-directions, respectively. Actually, we are only interested in the magnitude of the electric field |**E**| and not its direction. The magnitude of the electric field is given by

$$|\mathbf{E}| = \sqrt{\left(\frac{\partial \phi}{\partial x}\right)^2 + \left(\frac{\partial \phi}{\partial y}\right)^2 + \left(\frac{\partial \phi}{\partial z}\right)^2} \ .$$

In the calculations of the radionuclide efficiencies, it was assumed that the detector can be divided into two regions. The two regions are separated by a surface defined by the equation $|\mathbf{E}| = E_c$, where E_c is called the cutoff field. In the first region, called the live region, $|\mathbf{E}|$ exceeds E_c and it is assumed that all of the electrons generated in this region are collected at the anode; in the second region, called the dead region, all of the electrons are assumed to recombine with ions and not to reach the anode. The surface between the live and dead regions was constructed using Lagrange basis functions between every set of eight data points that make up a rectangular cell in the finite-difference method.

The division of the detector volume into a live and a dead region is, of course, an approximation since some electrons in the dead region will reach the anode, and some of the electrons in the live region will recombine with ions. However, for our purposes, the division of the detector volume into these two regions gives reasonable results. Figure 9 depicts a cross section of the detector that is perpendicular to the anode wires and divides the detector in half. Figure 9 shows the live and the dead regions for a cutoff field of about 150 V/cm.

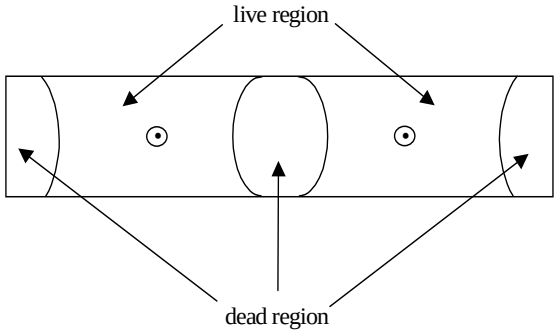

Figure 9. Schematic of detector dead and live regions.

From Figure 9 it is clear that there is a significant dead region between the two anodes. This is not unexpected because the three symmetry planes of the detector intersect at the point at the center of the detector. Since the normal component of the electric field vanishes on a symmetry plane, the only way that the normal component of the electric field can vanish on all three planes simultaneously is if the electric field is zero at the center point. There is also a significant dead region at the extremities of the detector. The magnitude of the electric field diminishes at distances far from either anode. In the calculations below, for a pulse to be registered, it is assumed that a certain threshold energy must be deposited in the live region of the detector. An alpha particle may cross from the dead region to the live region, or vice versa, in which case only that portion of the energy deposited in the live region is counted as contributing towards the generation of a pulse.

2.6. Solid film geometry. Inspection of a random selection of planchets from processed samples reveals that the solid films are usually not of uniform thickness, but that the

geometry of the films is quite complex. Before a planchet is heaed, the film is usually rough, and often not evenly dispersed over the surface of the planchet. When the planchet is heated, the film usually melts and often solidifies into a fairly thick patch, surrounded by a relatively thin film of material. The formation of the thick patch may be due to the surface tension of the melt, which tends to gather the melt together. The presence of these thick patches has a significant effect on the efficiencies of the radionuclides. For a given alpha-particle energy there is a maximum depth, z_{max}, within the solid film from which an alpha particle can be emitted and still cause a pulse in the detector. Alpha particles emitted from depths greater than z_{max} may reach the detector, but will not have enough energy to cause a pulse in the detector. For films of relatively low mass, if the film is uniform, the film thickness may be less than z_{max} for many of the radionuclides. In this case, alpha particles emitted from throughout the entire film can cause a pulse in the detector. However, when a thick patch exists, there are regions of the patch where alpha particles have no chance of causing a pulse in the detector because the thickness of the patch greatly exceeds z_{max} for many or all of the radionuclides. Consequently, the presence of these thick patches diminishes the radionuclide efficiency. In order to determine the radionuclide efficiencies with reasonable accuracy, it is important to characterize the geometry of the solid film with some degree of precision.

The thin portion of the film surrounding the thick patch, or patches, is usually non-uniform. For films in windowless 2π detectors (detectors that have no air layer or entrance window so that the P10 gas is in contact with the sample) where the film thickness does not exceed z_{max}, the radionuclide efficiency diminishes linearly with the standard deviation of the film thickness, regardless of the details of the film geometry. Consequently, the thin portion of the film will be modeled using a geometry in which it is relatively easy to alter the standard deviation of the film and in which it is relatively easy to perform efficiency calculations.

Let the probability of finding a patch of thickness t be $f(t)$. Then the fraction of the film between the thickness t and the thickness $t + dt$ is $f(t)dt$. An equation is needed for f. A function that satisfies the above requirements for ease of varying the standard deviation and ease of computation is given by

$$f = \begin{cases} 0 & \text{if} \quad t < t_1, \\ \dfrac{1}{t_2 - t_1} & \text{if} \quad t_1 \le t \le t_2, \\ 0 & \text{if} \quad t > t_2, \end{cases} \tag{2}$$

where t_1 is the minimum thickness of the film and t_2 is the maximum thickness of the film. Thus, f is constant for a film thickness between t_1 and t_2, and is zero elsewhere. The average thickness $\langle t \rangle$ and the standard deviation σ of the film thickness are given by

$$\langle t \rangle = \frac{1}{2}(t_1 + t_2) \quad \text{and} \quad \sigma = \frac{1}{2\sqrt{3}}(t_2 - t_1),$$

respectively.

The area of the thick patch usually increases with the mass of the film. It was found that if the total film mass m_F is expressed in grams, then assuming that the thick patch has a mass m_P of

$$m_P = 75 m_F^2 \tag{3}$$

and a thickness of 0.1 mm gave results in reasonable agreement with experiment as will be shown in Section 3.2. This equation is in reasonable agreement with visual observations of the films, although more work must be done to better quantify the relationship between m_P and m_F.

2.7. Monte-Carlo simulations. Monte-Carlo simulations are used to determine the efficiencies of the various alpha-emitting radionuclides. The idea behind Monte-Carlo simulations is relatively simple. In the present model it is assumed that each radionuclide is uniformly distributed in the solid film. Consequently, if some volume element ΔV_1 of the film is chosen at random, the probability of finding a given radionuclide in ΔV_1 will be the same as the probability of finding the same radionuclide in another volume element ΔV_2 of same size. In this simulation, a function called a random number generator is used to obtain three random numbers. Then an algorithm uses the three random numbers to pick a point in the solid film. The algorithm is such that if the film was partitioned into volume elements each of the same size, then the point determined by the algorithm and the three random numbers would have an equal probability of being placed within any of the volume elements of the partition. Thus, when the process of placing a radionuclide in the film, using the algorithm and the random number generator, is repeated a large number of times, one finds that the points representing the radionuclides are evenly dispersed throughout the volume of the solid film.

When a radionuclide emits an alpha particle, the alpha particle is emitted with equal probability in any direction. Once a radionuclide is located within the film, the random number generator is used to obtain two more numbers. A second algorithm uses these two numbers to fix a direction in which the alpha particle is emitted. Because the two numbers are picked at random, the alpha particle is equally likely to be emitted in any direction. Once the position of the alpha particle is fixed in the solid film and the direction in which the alpha particle is emitted is fixed, one can determine whether the trajectory of the alpha particle is oriented towards the detector, and, if it is, whether the alpha particle has enough energy to reach the detector. If the alpha particle has enough energy to reach the detector, one can determine whether the alpha particle deposits a sufficient amount of energy in the live region of the detector to cause a measurable pulse. If one repeats this process N_T times, then the radionuclide efficiency ε is given by

$$\varepsilon = N_D / N_T,$$

where N_D is the number of times that an alpha particle causes a pulse in the detector.

2.8. Contribution of a radionuclide activity to the gross alpha activity. The first step in the implementation of EPA Method 900.0 is to generate an efficiency, or calibration, curve. Water samples are spiked with a known activity of the calibration standard, either natural uranium or Th-230. The spiked sample is prepared and analyzed like any other sample tested for gross alpha activity. The amount of the calibration standard added to the sample is chosen such that the activity of the calibration standard far exceeds the alpha activity of any of the naturally occurring radionuclides in the sample. The efficiency ε_S of the calibration standard is defined as the ratio of the number of pulses N_S counted by the gas proportional counter per unit time to the activity A_S of the calibration standard added to the sample; i.e., $\varepsilon_S = N_S/A_S$ or

$$A_S = N_S/\varepsilon_S \, . \tag{4}$$

The efficiency of the calibration standard, ε_S, is determined for a range of water volumes to obtain a range of solid film masses. Then a calibration curve of the efficiency of the calibration standard versus the film mass is generated. When actual samples are analyzed, the mass of the solid film in the planchet is used to obtain an efficiency from the calibration curve. The method implicitly assumes that this efficiency is the same for all of the radionuclides in the solid film. From the discussion in Section 2.3, it is clear that this is not true. The radionuclides with the highest alpha-particle energies have the highest efficiencies.

Suppose that a given radionuclide has an efficiency ε_R and an activity A_R. Then the number of counts that it would generate in the gas proportional counter per unit time is just $\varepsilon_R A_R$. Using equation (4), the activity $A_{R,calc}$ that would be calculated for this radionuclide would be

$$A_{R,calc} = \frac{\varepsilon_R}{\varepsilon_S} A_R \, . \tag{5}$$

Thus, when $\varepsilon_R > \varepsilon_S$, the calculated activity exceeds the actual activity of the radionuclide in the sample by a factor of $\varepsilon_R/\varepsilon_S$. Consequently, in samples that contain Ra-224 and Ra-226, and their short-lived, high-energy progeny, the gross alpha activity often greatly exceeds the actual alpha activity of the sample. Equation (5) also shows that the measured gross alpha activity will depend on the calibration standard that is used. A calibration standard with a higher energy alpha particle will yield a lower gross alpha. Some specific examples will be given in Section 3.7.

2.9. Summary of model and calculations. First the electric field in the detector is calculated so that the live and dead regions of the detector can be determined. For a given film mass the characteristics of the thin portion of the film are given by equation (2) and the characteristics of the thick patch are given by equation (3). Next a Monte-Carlo simulation is performed to determine the efficiency of each radionuclide in the film. Once the efficiency of each radionuclide is determined, including the efficiency of the calibration standard, the amount of each radionuclide in the film is determined. It is assumed that at the time that the planchet is fired, the amounts of Rn-222 and Rn-220 in

the solid film are both zero, due to their volatility. The activites of U-234, U-238, Ra-226, and Po-210 in the film are determined from their measured activities in the groundwater samples. After the sample has been heated, the activities of the alpha-emitting Ra-226 progeny (Rn-222, Po-218, and Po-214) are determined using the Bateman equations. Once the activity and efficiency of the each radionuclide is determined, Equations (5) can be used to calculate the contribution of each radionuclide to the gross alpha activity of the water sample. If the water sample contains a significant amount of Ra-228, then one usually finds that the calculated gross alpha is significantly less than the measured gross alpha, unless the time between sample collection and analysis is long compared to the half-life of Ra-224. If not, the amount of Ra-224 required to elevate the calculated gross alpha activity to the measured gross alpha activity is determined. This requires that the efficiencies of Ra-224 and its alpha-emitting progeny (Rn-220, Po-216, Bi-212, and Po-212) be determined, and that the activities of the alpha-emitting progeny of Ra-224 be determined using the Bateman equations.

3. Results and Discussion.

3.1. Demonstration for the need of a cutoff field. Before proceeding to model the data, a demonstration of the necessity of having a cutoff field E_{cut} dividing the detector into a live region and a dead region is in order. Figure 10 shows simulated Th-230 calibration curves for four values of E_{cut}—0, 100, 150, and 200 V/cm. In these calculations it was assumed that the solid film was uniform and that the threshold energy required to be deposited in the live region was 0.5 MeV. A mesh spacing of 0.5 mm was used in the finite-difference method to determine the electric field in the detector. It should be noted that the finite-difference solution to the electric field more closely approaches the actual solution as the mesh-point spacing is reduced. It is observed that as the mesh point spacing is reduced, for a given value of E_{cut}, the efficiency decreases. Consequently, to obtain accurate results, reducing the mesh point spacing is important. However, reducing the spacing of the mesh points increases the number of mesh points. For example, if the spacing between mesh points is halved, the number of mesh points increases by about a factor of eight. Thus, more computing time is required. Future work involves reducing the mesh point spacing while keeping the computing time within manageable limits.

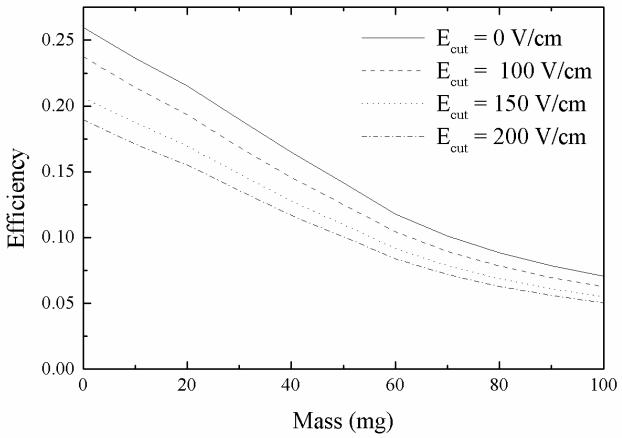

Figure 10. Graph of Th-230 calibration curve for various values of the cutoff field E_{cut}. The film is uniform, the mesh spacing is 0.5 mm, the required energy to be deposited in the live region is 0.5 MeV.

Figure 10 shows that at zero film mass the efficiency obtained when the cutoff field is zero is about 26% while the efficiency obtained when the cutoff field is 200 V/cm is about 18%, which is very close to the experimental value. Thus, not accounting for the dead region of the detector would introduce an error in the efficiency of about 40%.

3.2. Simulation of a calibration curve. Before any results can be calculated using the model, some of the parameters used by the model must be determined. For example, the cutoff field, E_{cut}, between the dead and the live regions of the detector, the minimum amount of energy E_{Trip} that must be deposited in the live region of the detector to cause a measurable pulse, and the characteristics of the film geometry must be determined before a simulation can be performed. These parameters are determined by comparing experimentally generated calibration curves for Th-230 and Am-241 to the corresponding calibration curves generated by the model. If the calibration curves generated by the model deviate too much from the experimental calibration curves, then one can adjust one or more of the parameters and generate a new set of calibration curves. This process is iterated until there is acceptable agreement between the experimental calibration curves and the calibration curves generated by the model. Figures 11 and 12 compare the experimental calibration curves to the calibration curves derived from the iterative process discussed above.

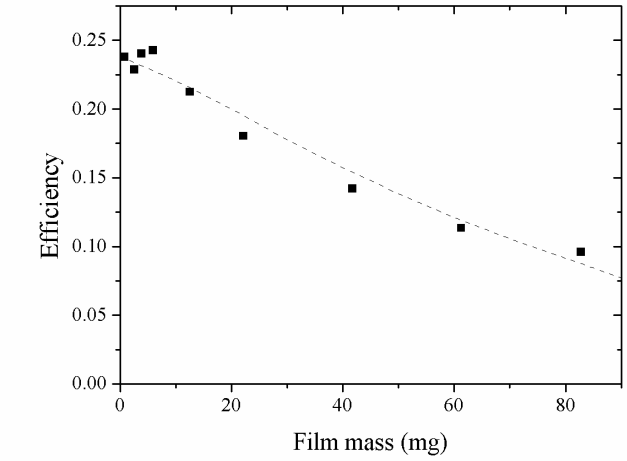

Figure 11. Fit to a Am-241 calibration curve. The squares represent the actual data points. The dashed line was calculated using the model.

The mass of the thick patch of the solid film was determined using Equation (3). This patch was assumed to have a thickness of 0.1 mm. The area of the planchet covered by the thick patch is just $m_P/(0.1\rho_F)$, where ρ_F is the density of the solid film. The solid film density was assumed to be 3.3 g/cm^3. (For thin films, i.e., films without a thick patch, the radionuclide efficiencies are nearly independent of the film density. The main effect of the film density is that it determines the size of thick patch.) Since the remaining area is covered by the thin film, and the mass of the thin film is just $m_F - m_P$, the average thickness $\langle t \rangle$ of the thin portion of the solid film is easily calculated. The choice of parameters used in Equation (2) are $t_1 = 0$, $t_2 = 2\langle t \rangle$, and $\sigma = \langle t \rangle/3^{1/2}$,which is the maximum allowable value of the standard deviation. The cutoff field, E_{cut}, that divides

the dead region of the detector from the live region is 150 V/cm. The threshold energy, E_{Trip}, required to be deposited in the live region of the detector is 0.5 MeV. This value of the threshold energy may be somewhat high, although it is found that the gross alpha activities calculated below are nearly constant for threshold energies ranging from 0.25 to 0.75 MeV.

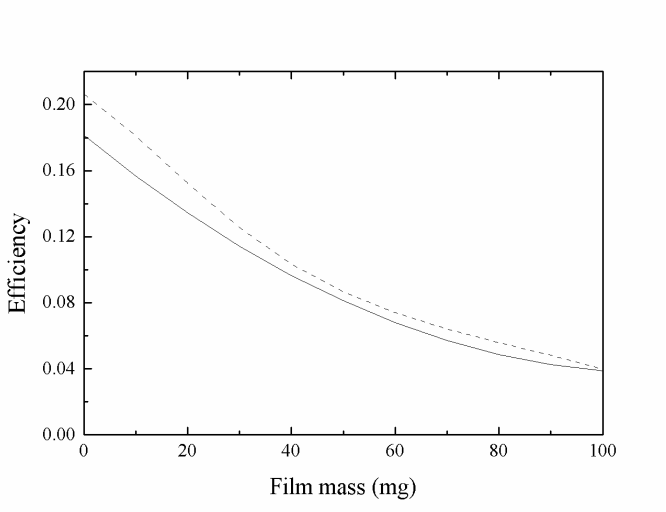

Figure 12. Fit to Th-230 calibration curve. The solid line represents the actual data. The dashed line was calculated using the model.

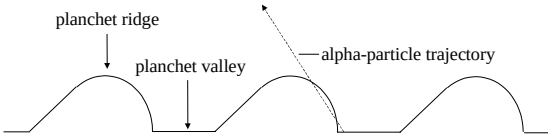

Figure 13. Schematic of the groove in the bottom of the planchet.

It is seen that the data models the Am-241 calibration curve rather well. The data for the Th-230 calibration curve is somewhat high. Reducing the mesh point spacing will yield more accurate results for the electric field in the detector and will reduce the efficiency somewhat. However, it is probable that there is another factor affecting the efficiency. It is seen that at zero mass the calculated efficiency is higher than the experimental efficiency. Since the mass at this point is virtually zero, the film mass and composition cannot be the cause of the elevated efficiency. In the model it is assumed that the bottom of the planchet is a flat. Actually, as shown in Figure 13, there are grooves on the bottom of the planchet. The purpose of the grooves is to distribute the sample more evenly in the planchet. The film in the planchet tends to sit in these grooves. When an alpha particle is emitted from the bottom of a groove, it is possible that the trajectory of the alpha particle is such that although it points towards the detector, it passes through a ridge of the

planchet where the alpha particle is either absorbed or losses enough energy such that it is absorbed before reaching the detector. Future refinements of the model involve taking the absorption of alpha particles by the planchet ridges into account. Unless specific mention is made to the contrary, the values of E_{cut}, E_{trip}, and the parameters of the film geometries used for the calibration curves in Figures 11 and 12 will be used in the calculations presented below.

3.3. Gross alpha simulation of an actual sample. The results of the gross alpha activity calculations of all of the samples analyzed in this study are given in Appendix B. The results of the gross alpha simulation of sample 78177 are given in Table 4. The film mass was 62.9 mg. The time between sample collection and the heating of the planchet was 22.56 hrs., and the time between the heating of the planchet and the gross alpha measurement was 4.8 hrs. (The heating of the planchet is the last step in the sample preparation process.) The measured gross alpha activity of this sample was 29 pCi/L. The activity of Ra-224 required to achieve a gross alpha of 29 pCi/L was 3.52 pCi/L. The measured Ra-228 activity for this sample was 3.1 pCi/L. Thus, the ratio of the calculated activity of Ra-224 to the measured activity of Ra-228 is 1.14. Since most values of this ratio fall between 1 and 2, a value of 1.14 pCi/L is quite reasonable.

Table 4. Gross alpha simulation for sample 78177.

Nuclide	Efficiency	Activity (pCi/L)	Gross Alpha Contribution (pCi/L)
Th-230 Standard	0.070		
U-234	0.075	2.13	2.28
U-238	0.047	0.16	0.11
Po-210	0.102	0.01	0.02
Ra-226	0.076	3.90	4.21
Rn-222	0.111	0.14	0.22
Po-218	0.096	0.14	0.19
Po-214	0.159	0.11	0.24
Ra-224	0.118	3.52	5.94
Rn-220	0.136	3.52	6.85
Po-216	0.146	3.52	7.34
Bi-212	0.131	0.24	0.45
Po-212	0.167	0.49	1.18
		Tot. activity = 17.89	Gross Alpha = 29.00

The results of the gross activity calculations for sample 78177 are given in Table 4. The data in this table show that the total alpha activity of the water sample is 17.89 pCi/L, whereas the gross alpha activity is 29 pCi per liter. Thus, in this sample, the gross alpha activity overestimates the actual alpha activity by about 62%. This data also shows that the alpha-emitting progeny of Ra-226 (Rn-222, Po-218, and Po214) and the alpha-emitting progeny of Ra-224 (Rn-220, Po-216, Bi-212 and Po212) account for 16.47 pCi/L of the gross alpha, or 57% of the gross alpha. Consequently, these short-lived progeny of Ra-226 and Ra-224, which are never quantified in the laboratory, account for the bulk of the gross alpha activity in this sample. As discussed in Section 2.3, this is because the alpha-particle energies of these short-lived progeny are relatively high so that

their corresponding efficiencies are relatively high. This is readily seen from the data in Table 4. The efficiency of the standard Th-230 is 7.0% whereas the efficiencies of the short-lived progeny range from 9.6% to 16.7%.

As mentioned in the Introduction, many water utility operators and public health workers believe that the gross alpha activity should be equal to the sum of the total uranium activity and the Ra-226 activity. From Table 4 it is clear that this only accounts for 6.59 pCi/L of the gross alpha activity, or just 22% of the gross alpha activity.

3.4. Effect of film roughness on the gross alpha. In this section the effect of the solid film geometry on the gross alpha activity will be investigated. As discussed in Section 2.6, when the solid film in the planchet has a significant amount of mass, usually one or more large patches form that are surrounded by a thin film. However, occasionally, it is observed that a solid film containing a substantial amount of mass does not have a large patch. Instead although it may be somewhat rough, the film is observed to cover the entire planchet with some degree of uniformity. In this section when the term rough film is used, it is understood that the same parameters are used in the calculations in this section that were used in Section 3.2. That is, the film has a one or more large patches surrounded by a thin film. When the term uniform film is used, it is understood that the film is of uniform thickness over the whole area of the planchet.

Table 5. Gross alpha simulation for rough and uniform film geometries.

Th-230 film geometry	Sample film geometry	Gross Alpha (pCi/L)
Rough	Rough	1.75
Uniform	Uniform	1.71
Rough	Uniform	2.17

Some calculations were performed to demonstrate how the geometry of the film affects the gross alpha activity. A summary of these results is given in Table 5 for a water sample containing 1 pCi of U-238 and 1 pCi of U-234 and having a film mass of 50 mg. In the first case, when both the film of the calibration standard and the film of the sample are rough, the gross alpha is 1.75 pCi/L. In the second case, when both the film of the calibration standard and the film of the sample are uniform, the gross alpha activity is nearly the same as in the first case. However, in the third case, when the film of the calibration standard is rough and the film of the sample is uniform, the gross alpha activity is 2.17 pCi/L. Thus, in the third case the gross alpha activity has increased by about 27% relative to the other two cases, and it is clear that the film geometry alone can have a substantial effect on the gross alpha activity.

3.5. Determination of uranium activity for the computation of the adjusted gross alpha activity. The adjusted gross alpha activity of a water sample is equal to the gross alpha activity of the water sample minus the total uranium activity of the water sample. In common practice there are two ways of determining the total uranium activity of a water sample. In the first method, the total uranium activity of the sample is measured directly by a radiochemical method. EPA Method 908.0[22] is one such method. In the second method, which will be referred to as the gravimetric method, the total uranium mass of the sample is measured, and, then, the total uranium mass is converted into a total

uranium activity. EPA Method 908.1[23] is gravimetric method in which the total uranium mass is determined fluorometrically. In order to convert the total uranium mass to a total uranium activity, one must make an assumption about the relative abundances of the uranium isotopes in the water sample. In general, it is assumed that the uranium isotopes are in natural abundance. Below, it is shown that a consequence of this assumption is that the total uranium activity of a water sample, using the gravimetric method, is approximately equal to twice the U-238 activity of the water sample, regardless of the U-234 activity.

There are three naturally occurring isotopes of uranium: U-234, U-235, and U-238. On a gravimetric basis the relative abundances of U-234, U-235, and U-238 are 0.0054%, 0.7110%, 99.2830%, respectively. Although the abundance of U-234 is much less than the abundance of U-238 on a gravimetric basis, U-234 is in secular equilibrium with U-238, so that when all of the media containing these isotopes is taken into account, the activity of U-234 must equal the activity of U-238. As was discussed in Section 1.1, it is known that groundwater samples are often enriched in U-234 relative to U-238. In such samples it is not unusual for the U-234 activity to exceed the U-238 activity by a factor of five (see data in Appendix A).

The alpha activity A of a particular uranium isotope is just λN, where λ is the decay constant of the uranium isotope and N is the number of atoms of the uranium isotope. Now $N = mN_0/W$, where m is the mass of the uranium isotope, N_0 is Avagodro's number, and W is the atomic weight of the uranium isotope. If m is the mass of the isotope, m_T is the total uranium mass, and f is the fractional abundance of the uranium isotope, then

$$A = \frac{\lambda}{W} N_0 m = \frac{\lambda}{W} f N_0 m_T . \tag{6}$$

The total uranium activity, A_T, is just the sum of three such terms, one for each uranium isotope:

$$A_T = \left(\frac{\lambda_{U\cdot234}}{W_{U\cdot234}} f_{U\cdot234} + \frac{\lambda_{U\cdot235}}{W_{U\cdot235}} f_{U\cdot235} + \frac{\lambda_{U\cdot238}}{W_{U\cdot238}} f_{U\cdot238} \right) N_0 m_T .$$

If U-234 and U-238 are in secular equilibrium, or in natural abundance, then the first and the third terms in the parentheses are equal. If one assumes that the three uranium isotopes are in natural abundance, then, for the purpose of making a calculation, the factor enclosed in parentheses is constant, and the only term that varies is m_T. That is,

$$A_T = k m_T = k(m_{U\cdot234} + m_{U\cdot235} + m_{U\cdot238}), \tag{7}$$

where $m_{U\text{-}234}$, $m_{U\text{-}235}$, and $m_{U\text{-}238}$ are the masses of U-234, U-235, and U-238, respectively; and the constant k is given by

$$k = \left(\frac{\lambda_{U\cdot234}}{W_{U\cdot234}} f_{U\cdot234} + \frac{\lambda_{U\cdot235}}{W_{U\cdot235}} f_{U\cdot235} + \frac{\lambda_{U\cdot238}}{W_{U\cdot238}} f_{U\cdot238} \right) N_0 .$$

A simple calculation shows that $k = 0.684$ pCi/μg.

Since U-238 accounts for most of the total uranium mass, it is seen that the total uranium activity calculated by Equation (7) would be rather insensitive to the mass of U-234. The following example demonstrates this point. Consider two water samples that are identical in all respects except for the amount of U-234 contained in them. Both samples contain 1 pCi of U-238 and that amount of U-235 that is in natural abundance with 1 pCi of U-238. The first sample contains that amount of U-234 that is in secular equilibrium with U-238; i.e., the first sample contains 1 pCi of U-234. The second sample is assumed to be enriched in U-234 and to contain 5 pCi of U-234. From Equation (6) it is found that both samples contain 3.00 μg of U-238. Assuming U-235 to be in natural abundance with U-238, both samples contain 0.0213 μg U-235, or, from Equation (6), 0.0017 pCi U-235, an activity which for our purposes is negligible. From Equation (6) it is found that the first sample contains 1.62×10^{-4} μg of U-234, and that the second sample contains 8.09×10^{-4} μg of U-234. Thus, both samples contain about 3.02 μg of total uranium. From Equation (7), the percent difference in activities between the two samples, using the gravimetric method, is

$$\frac{k(8.09\times10^{-4} - 1.62\times10^{-4})}{k3.02}\times100 \approx 0.02\% .$$

Consequently, using the gravimetric method, there is scarcely any difference between the total uranium activities of the two samples. The total uranium activity for either sample is approximately equal to twice the U-238 activity, and, using the gravimetric method, the calculated value of the total uranium activity for the second sample would be about 2 pCi when it is actually about 6 pCi. The error of 4 pCi for total uranium activity incurred using the gravimetric method could be the cause of a gross alpha violation when no gross alpha violation actually exists. Because of the large discrepancy between the U-234 and U-238 masses in most samples, the gravimetric method will almost always yield a total uranium activity that is just equal to twice the U-238 activity.

3.6. Effect of sample collection, preparation, and analysis time on gross alpha activity and sample compliance. In this laboratory it is not an uncommon occurrence that a sample is analyzed that has no radium violation but has a gross alpha violation. Such a situation may be due to the error inherent in the gross alpha measurement, but it is possible for such a situation to occur when no error has been committed. The example presented in this section will demonstrate such a case. This example will also demonstrate the inherent variability of the gross alpha activity with the sample collection, preparation, and analysis times. It is not uncommon for a customer to send a water sample for gross alpha analysis to several laboratories, and to find that there is widespread disagreement among the gross alpha activity results obtained by the various laboratories. Such differences are not unexpected when one takes into account all of the factors that affect the gross alpha measurement.

Consider a sample that contains 2 pCi/L of Ra-226, 2 pCi/L of Ra-228, 3 pCi/L of Ra-224, 1 pCi/L of U-238, and 5 pCi/L of U-234. Such a sample would have no radium violation since the sum of the Ra-226 and Ra-228 activities is 4 pCi/L. If this sample is

prepared one day after collection, and if the planchet is allowed to sit for three days before analysis, then a calculation (see Table 6) yields a gross alpha activity of 23.12 pCi/L and an adjusted gross alpha activity of 17.12 pCi/L. Thus, it is seen that, for regulatory purposes, there is no radium violation, but, due to the presence of Ra-224 and its short-lived progeny, there is a gross alpha violation. Such situations cause confusion among both chemists and clients because one is not able to identify the source of the gross alpha violation. Often the chemist will perform the measurement on the planchet again. In this example if the planchet is reanalyzed 7 days after it was prepared, one would obtain a gross alpha activity 20.38 pCi/L and an adjusted gross alpha activity 14.38 pCi/L. Now the sample is in compliance. The reduction in the gross alpha activity occurred because the increase in the part of the gross alpha activity due to the Ra-226 progeny is less than the decrease in the part of the gross alpha activity due to Ra-224 and its progeny. If one waits until all of the Ra-224 has decayed away and the progeny of Ra-226 have come into secular equilibrium with Ra-226, then the gross alpha activity would be 18.12 pCi/L and the adjusted gross alpha activity would be 12.12 pCi/L. In this example it has been assumed that the total uranium activity was determined directly. If the total uranium activity had been determined using a gravimetric method, then the total uranium activity would have been determined to be 2 pCi/L rather than 6 pCi/L, and the sample would have had a gross alpha violation regardless of how long it had sat before sample analysis.

Table 6. Gross alpha calculation for a sample that contains 2 pCi/L Ra-226, 2 pCi/L Ra-228, 3 pCi/L of Ra-224, 1 pCi/L U-238, and 5 pCi/L U-234.

Nuclide	Efficiency	Activity (pCi/L)	Gross Alpha (pCi/L)	Activity (pCi/L)	Gross Alpha (pCi/L)	Activity (pCi/L)	Gross Alpha (pCi/L)
Time delay (Days)		3	3	7	7	No Ra-224	No Ra-224
Th-230 Std	0.085						
U-234	0.091	5.00	5.33	5.00	5.33	5.00	5.33
U-238	0.058	1.00	0.68	1.00	0.68	1.00	0.68
Ra-226	0.092	2.00	2.15	2.00	2.15	2.00	2.15
Rn-222	0.132	0.84	1.29	1.44	2.21	2.00	3.08
Po-218	0.116	0.84	1.13	1.44	1.94	2.00	2.70
Po-214	0.179	0.83	1.73	1.43	3.00	2.00	4.18
Ra-224	0.139	1.40	2.28	0.65	1.06	0	0
Rn-220	0.157	1.40	2.57	0.65	1.20	0	0
Po-216	0.167	1.40	2.73	0.65	1.28	0	0
Bi-212	0.152	0.53	0.96	0.25	0.45	0	0
Po-212	0.185	1.05	2.27	0.50	1.08	0	0
Total (pCi/L)			23.12		20.38		18.12

Due to sample backlogs, it is not unusual for a sample to be in storage for a month before a gross alpha analysis is performed on it. Over this period of time most of the Ra-224 activity will have decayed away. Table 7 gives the results for a sample held for 30 days before processing and analyzed 3 days after firing. This sample has the same

radiochemical composition as the sample whose results are given in Table 6. For this sample the gross alpha activity is 12.36 pCi/L and the adjusted gross alpha 6.36 pCi/L. The results summarized in Tables 6 and 7 demonstrate that the time between sample collection and preparation and between sample preparation and analysis can determine whether a sample is in or out of compliance. These results also demonstrate the variability of the gross alpha activity as a function of sample collection, preparation, and analysis time. Even more variability among laboratories could occur if not all of the laboratories use the same calibration standard. The variability of the gross alpha activity as a function of the calibration standard is the topic of the next section.

Table 7. Gross alpha calculation for a sample prepared 30 days after collection.

Nuclide	Efficiency	Activity (pCi/L)	Gross Alpha (pCi/L)
Standard	0.085		
U-234	0.091	5.00	5.33
U-238	0.058	1.00	0.68
Ra-226	0.092	2.00	2.15
Rn-222	0.132	0.84	1.29
Po-218	0.116	0.84	1.13
Po-214	0.179	0.83	1.73
Ra-224	0.139	0.01	0.01
Rn-220	0.157	0.01	0.01
Po-216	0.167	0.01	0.01
Bi-212	0.152	0.00	0.00
Po-212	0.185	0.00	0.01
Total		10.53	12.36

3.7. Effect of the calibration standard on gross alpha activity. Since the various calibration standards have different efficiencies, and since it is implicitly assumed that the efficiencies of all of the radionuclides in the solid film have the same efficiency as the calibration standard, it is clear that the gross alpha activity of the sample will depend on the choice of calibration standard.

EPA Method 900.0[2] allows for the use of either natural uranium or Th-230 as the calibration standard. EPA Method 900.1[3] allows for the use of Th-230 or Am-241 as the calibration standard. Prior to 1995, EPA Method 900.0 allowed for the use of Am-241 as the calibration standard. Consequently, there may be some confusion over the use of Am-241 for Method 900.0, and it is possible that some laboratories may still be using Am-241 as the calibration standard for this method.

For a 50 mg solid film the efficiencies of natural uranium, Th-230, and Am-241 are 0.07462, 0.08557, 0.13109. respectively. From Equation (5) the percent change in the gross alpha activity in going from a calibration standard of efficiency $\varepsilon_{S,1}$ to a calibration standard of efficiency $\varepsilon_{S,2}$ is given by

$$\left(\frac{A_{\mathrm{R,calc,2}} - A_{\mathrm{R,calc,1}}}{A_{\mathrm{R,calc,1}}}\right)\times 100\% = \left(\frac{\varepsilon_{\mathrm{S,1}}}{\varepsilon_{\mathrm{S,2}}} - 1\right)\times 100\% . \qquad (4)$$

For a 50 mg solid film Table 8 shows the percent change in the gross alpha activity that is incurred in going from one calibration standard to another. From this data it is clear that the choice of a calibration standard can have an substantial effect on the gross alpha activity. Evidently, the choice of the calibration standard alone can determine whether a water sample has a gross alpha violation or not.

Table 8. Percent change in the gross alpha activity between two calibration standards for a 50 mg film.

		Second calibration standard.		
		Natural U	Th-230	Am-241
First calibration standard	Natural U	1	-12.8	-43.1
	Th-230	14.7	1	-34.7
	Am-241	75.7	53.2	1

With many methods available and a choice of calibration standards, one might wonder which method and which calibration standard will give the most accurate results. The fact is that it depends on which radionuclides are in the sample. Some water samples contain uranium and very little radium. If the uranium in the sample is present in natural abundance, then, of course, the use of natural uranium as the calibration standard would give the most accurate results. However, typically, the water sample is enriched in U-234 relative to U-238. Suppose the sample has 1 pCi/L of U-238 and 5 pCi/L of U-234. Then, for a 50 mg solid film, the gross alpha activities calculated using natural uranium, Th-230, and Am-241 as the calibration standards are 6.895, 6.013, and 3.925 pCi/L, respectively, as shown in Table 9. From Table 3 it is seen that the alpha-particle energies for U-234 and Th-230 are relatively close, and since most of the activity in the sample is from U-234, using Th-230 as the calibration standard gives the most accurate results.

Table 9. Affect of calibration standard on the gross alpha of a sample containing uranium.

Nuclide	**Efficiency**	**Activity (pCi/L)**	**Natural uranium Gross Alpha (pCi/L)**	**Th-230 Gross Alpha (pCi/L)**	**Am-241 Gross Alpha (pCi/L)**
U-234	0.09126	5.000	6.116	5.333	3.481
U-238	0.05815	1.000	0.779	0.680	0.444
	Total	6.000	6.895	6.013	3.925

Some samples contain radium and little uranium. Often water samples are stored for a period of time before the gross alpha procedure is performed on them. EPA Method 900.0 allows samples to be stored for a period of up to six months before sample preparation. Since Ra-224 has a half-life of 3.64 days, if a water sample is stored for a period of about a month or more, then most of the Ra-224 activity will have decayed

away. The gross alpha method stipulates that once the sample is prepared it should be stored for at least three days prior to measuring its gross alpha activity. This allows the progeny of Ra-226 to grow in, although, as Figure 3 shows, after three days they are not in secular equilibrium with Ra-226. Suppose that a water sample has 2 pCi/L of Ra-226, and that all of the Ra-224 has decayed away. Three days after sample preparation, the total alpha activity in the solid film is 4.487 pCi/L. For a 50 mg solid film the gross alpha activity calculated using natural uranium, Th-230, and Am-241 as the calibration standards is 7.230 pCi/L, 6.305 pCi/L, and 4.115 pCi/L, respectively, as shown in Table 10. Thus, although Th-230 gives the most accurate results for Ra-226 (2.151 pCi/L), Am-241 gives the gross alpha activity that is closest to the actual alpha activity of the sample. The reason for this is that the alpha-particle energy of Am-241 is closer to the alpha-particle energies of the Ra-226 progeny, which make up the bulk of the activity in the sample.

Table 10. Affect of calibration standard on the gross alpha of a sample containing Ra-226.

Nuclide	Efficiency	Activity (pCi/L)	Natural uranium Gross Alpha (pCi/L)	Th-230 Gross Alpha (pCi/L)	Am-241 Gross Alpha (pCi/L)
Ra-226	0.09201	2.000	2.466	2.151	1.404
Rn-222	0.13162	0.839	1.480	1.290	0.842
Po-218	0.11550	0.839	1.297	1.131	0.738
Po-214	0.17898	0.829	1.987	1.732	1.131
	Total	4.487	7.230	6.305	4.115

Table 11. Affect of calibration standard on the gross alpha of a sample containing Ra-224.

Nuclide	Efficiency	Activity (pCi/L)	Natural uranium Gross Alpha (pCi/L)	Th-230 Gross Alpha (pCi/L)	Am-241 Gross Alpha (pCi/L)
Ra-224	0.139008	1.401	2.609	2.275	1.485
Rn-220	0.1571527	1.401	2.950	2.573	1.679
Po-216	0.1669641	1.401	3.135	2.733	1.784
Bi-212	0.1517508	0.534	1.086	0.947	0.618
Po-212	0.1848945	1.051	2.604	2.270	1.482
	Total	5.788	12.384	10.799	7.049

Although it is unlikely that that a water sample would contain Ra-224 without containing Ra-226, it is informative to determine how well the use of each calibration standard approximates the activity of Ra-224 and its alpha-emitting progeny. It is assumed that a water sample contains 3 pCi/L of Ra-224, that there is one day between sample collection and sample preparation, and 3 days between sample preparation and sample analysis. The portion of the gross alpha activity due to Ra-224 and its progeny for the 3 calibration standards is given in Table 11. It is seen that each calibration standard overestimates the

alpha activity of the sample. Although Am-241 comes the closest to actual alpha activity of the sample, the alpha activity using Am-241 is still overestimated by 22%.

3.8. Discussion of data for the groundwater samples. Table 18 in Appendix B gives a summary of the gross alpha activity calculations for the 98 samples analyzed in this study. Included in the table for each sample is the solid film mass, the time between sample collection and sample preparation, the time between sample preparation and sample analysis, and the measured gross alpha activity. A calculated gross alpha activity is also included in which it was assumed that Ra-224 was in secular equilibrium with Ra-228 at the time of sample collection, i.e., that the Ra-224 activity equaled the Ra-228 activity. In general, it is found that the Ra-224 activity exceeds the Ra-228 activity. Consequently, the amount of Ra-224 required to be present in the original sample to attain the measured gross alpha activity was also determined and included in Table 18. This calculation was not performed for samples in which the gross alpha activity was determined 30 to 60 days after sample collection, since the Ra-224 activity would have decayed away by then. These include samples in which the first analysis did not meet quality control standards, so that they had to be reanalyzed. The measured value of the Ra-228 activity for each sample is included in Table 18, and the ratio of the calculated Ra-224 activity to the measured Ra-228 activity is also included. This ratio is referred to as the Ra-224/Ra-228 ratio below.

It is seen that 71 samples have radium violations; i.e., the combined activity of Ra-226 and Ra-228 exceeds 5 pCi/L. Eight of the samples had a gross alpha violation when there was no radium violation. These are samples in which the adjusted gross alpha exceeds 15 pCi/L, but the combined activity of Ra-226 and Ra-228 is less than 5 pCi/L. In addition, if a gravimetric method were used to determine the total uranium activity, there would be an additional 5 samples which would have a gross alpha violation but no radium violation. In this study the samples were analyzed soon after sample preparation, rather than the requisite 3 days required by Method 900.0, in order to observe the effect Ra-224 and its progeny on the gross alpha activity. Undoubtedly, some of the samples having gross alpha violations would not have gross alpha violations if the samples were allowed to sit long enough for the Ra-224 to decay away.

Out of the 98 samples that were analyzed, 78 were analyzed within about 15 days of sample collection. Out of the 78 samples, 5 samples had negative Ra-224/Ra-228 ratios, and sample 80732 had a Ra-224/Ra-228 ratio of 71.82. The Ra-224/Ra-228 ratios for the remaining 72 samples are plotted as a histogram in Figure 14. In Figure 14 the *x*-axis is divided into segments of 0.25 units, and the y-axis gives the number of samples falling within a given 0.25 unit range. Most of the Ra-224/Ra-226 ratios fall within the 0.50 to 3.50 range with 43 samples falling within the 1.00 to 2.00 range. The Ra-224/Ra-228 ratio exceeded 3.5 for three of these samples (samples 80737, 80743, 80264). Some data for these three samples and sample 80732 are summarized in Table 12. The data in this table includes the error in the experimentally determined gross alpha activities. Errors in the calculated gross alpha activities were not determined, although such an error analysis will be performed in future work. From the table it is seen that the experimental gross alpha activity for sample 80737 agrees with the calculated gross alpha activity to within the experimental error. The calculated gross alpha activities for the other 3 samples are

not within the error of the experimentally determined gross alpha activities. Although a complete error analysis was not performed for the calculated Ra-224/Ra-228 ratios, some simple error estimates will demonstrate whether the Ra-224/Ra228 ratios for the other samples are within acceptable error limits.

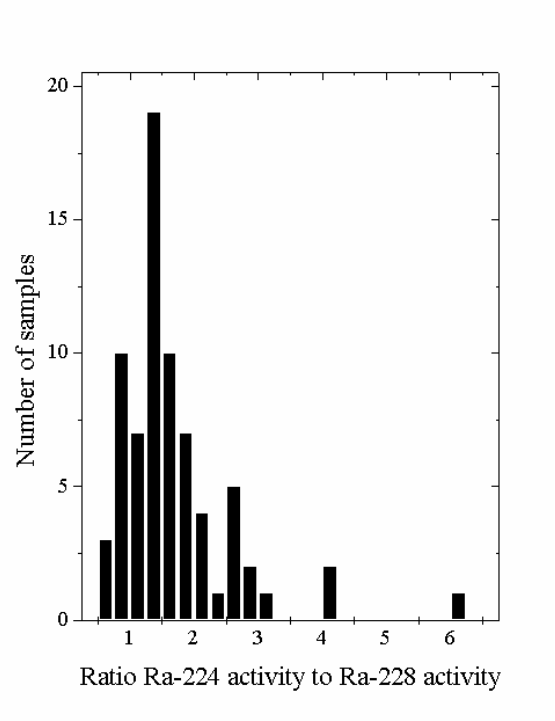

Figure 14. Histogram of Ra-224/Ra-228 ratios.

In section 3.4 it was shown that if a 50 mg solid film is of uniform thickness, i.e., if the film is smooth, the corresponding gross alpha activity of the sample can be elevated by about 27% relative to the case in which the solid film is rough. The data in Table 12 show that when the calculated gross alpha activities are increased by 27%, the experimental and calculated gross alpha activities are in agreement for samples 80737 and 80743. If the experimental Ra-228 activity error is taken into account, then it is seen that the Ra-224/Ra-228 ratios for the samples 80737 and 84264 are can be as low as 1.67 and 2.66 respectively. Consequently, when a full error analysis is performed, it is likely that the Ra-224/Ra-228 ratios for samples 80737, 80743, and 84264 will, within experimental error, fall within the normal range of 1 to 2.

Sample 80732 seems to be an exception. This sample contained 6.17 pCi/L of Po-210. It is known that Po-210 is not very stable in many solutions and begins to hydrolyze at a pH of about 2.5. Consequently, it can be difficult to keep Po-210 in solution. In general, the samples were prepared for gross alpha analysis within a few days of arrival at the laboratory, whereas analysis for Po-210 could take weeks. It is possible that some of the Po-210 originally in the solution precipitated from solution and was lost. From Table 3 it is seen that the alpha-particle energy of Po-210 is significantly larger than the alpha-particle energy of Th-230. For a 44.7 mg solid film the Th-230 efficiency is 0.09369 and the Po-210 efficiency is 0.13151. The difference between the measured and the calculated

gross alpha activities is about 68 pCi/L, so the amount of Po-210 required to make up this deficit would be (68 × 0.0937)/ 0.132 = 48 pCi/L. It is difficult to determine whether this is a reasonable number since so few studies have quantified the Po-210 activity in groundwater samples.

Data for the five samples in which the Ra-224/Ra-228 ratios were negative are shown in Table 13. When the error in the measured gross alpha activity is taken into account, it is seen that the measured and calculated gross alpha activities for samples 80736 and 84675 are in agreement. Samples 84271 and 84522 had negative Ra-224/Ra-228 ratios because the measured values of the Ra-228 activities were both –0.1 pCi/L. If the Ra-228 activity error is taken into account, then the minimum Ra-224/Ra-228 ratios for samples 84271 and 84522 are 2.49 and 3.02, respectively. Consequently, when a complete error analysis for these samples is completed, the Ra-224/Ra-228 ratios may very well fall within the acceptable range of 1 to 2. For sample 80354 the calculated gross alpha overestimates the measured gross alpha, and, as a consequence, the calculated Ra-224 activity is negative. For this sample the gross alpha and the measured activities of the various radionuclides are relatively low and have rather high relative uncertainties; consequently, it is likely that when an error analysis is completed, it will be found that the measured and the calculated gross alpha activities agree within experimental error.

Table 12. Samples with Ra-224/Ra-228 ratios exceeding 3.5.

Sample ID	Gross alpha activity (pCi/L)	Gross alpha activity error (pCi/L)	Calc. gross alpha activity (pCi/L)	Smooth film gross alpha activity (pCi/L)	Calculated activity of Ra-224 (pCi/L)	Ra-228 activity (pCi/L)	Ra-228 activity error (pCi/L)	Ratio of Ra-224 to Ra-228	Po-210 activity (pCi/L)	Adjusted Ra-224 to Ra-228 ratio
80732	183	8	115.08	146.00	15.08	0.21	0.44	71.82	6.18	23.20
80737	62	6	56.13	71.30	2.33	0.56	0.84	4.17	0.05	1.67
80743	143.8	6.8	115.87	147.00	8.65	1.43	0.64	6.05	4.60	4.18
84264	16	4	7.09	9.00	3.72	0.9	0.5	4.14	0.03	2.66

Table 13. Samples with negative Ra-224/Ra-228 ratios.

Sample ID	Gross Alpha (pCi/L)	Gross alpha error (pCi/L)	Calc. gross alpha (pCi/L)	Solid film weight (mg)	Calculated Ra-224 activity (pCi/L)	Ra-228 activity (pCi/L)	Ra-228 Activity error (pCi/L)	Ratio of Ra-224 to Ra-228	Adjusted ratio of Ra-224 to Ra-228
80354	1	2	4.32	49.0	-0.13	0.7	0.7	-0.19	-0.09
80736	78	7	84.32	13.2	-0.65	1.26	0.73	-0.52	-0.33
84271	3	2	0.02	15.4	0.99	-0.1	0.5	-9.95	2.49
84522	4.2	1.5	0.78	36.6	0.91	-0.1	0.4	-9.06	3.02
84675	41	5	44.65	36.3	-4.18	6.1	0.8	-0.68	-0.61

In general, the Ra-224/Ra-228 ratios are close to the expected range of 1 to 2. It is likely that when a complete error analysis is performed, the majority of the Ra-224/Ra-228 ratios will, within experimental error, fall within the range from 1 to 2.

4. Summary and Conclusions.

Several steps must be taken to prepare this report for publication. The electric field in the detector should be determined with a greater degree of accuracy. This involves decreasing the mesh point spacing in the detector, and making a better initial guess of the solution to Laplace's equation. Currently, if the mesh point spacing is made too small, the solution oscillates and does not converge to the final solution in a timely manner. The calculated calibration curve for Th-230 exceeds the actual one. It is probable that the ridges in the planchet are at least partially responsible for this. Consequently, the model will be altered to take the effect of these ridges into account. Some work should be done to further characterize the geometry of the solid film, so that the calculated calibration curves for Th-230 and Am-240 are more accurate. The composition of the solid film in the planchet should be studied in order to determine whether the sulfates preferentially combine with sodium and potassium, and whether the nitrates associated with calcium and magnesium are completely decomposed to the oxides when the planchet is heated.

Figure 14 shows that most of the data for the Ra-224/Ra-228 ratios fall in or near the range from 1 to 2 as expected, demonstrating that Ra-224 is present in most of the samples at the expected levels. However, an error analysis must be made on the Ra-224/Ra-228 ratio data, and a statistical analysis must performed to determine whether experimental error can account for the data that fall outside of the range from 1 to 2.

There is often much confusion over the meaning of the gross alpha activity. The gross alpha activity contains contributions from U-234, U-238, and Ra-226. If Th-230 is used as the calibration standard, the contributions of these radionuclides to the gross alpha activity are approximately equal to the sum of their activities, because of the closeness of their alpha-particle energies to the alpha-particle energy of Th-230. If Ra-228 is present in the sample, then the sample will contain Ra-224, unless sufficient time has passed so that it has decayed away. In general, the gross alpha activity contains contributions from the progeny of Ra-226 and Ra-224 and its progeny. In fact, because the progeny of Ra-226 and Ra-224 and its progeny have high alpha-particle energies, they can be responsible for the majority of the gross alpha activity of a sample.

This work shows that the value obtained for the gross alpha activity of a groundwater sample using EPA Method 900.0 is a function of many factors. These factors include the time between sample collection and sample preparation; the time between sample preparation and sample analysis; the radionuclide used as the calibration standard; the geometry of the solid film in the planchet; and, if the adjusted gross alpha activity must be determined, whether a radiochemical or gravimetric method is used to determine the total uranium activity. Although it was not investigated specifically in this work, the composition of the solid film probably affects the gross alpha activity as well.

It was seen that it is possible for a water sample to have a gross alpha violation (even though there is no radium violation) when prepared one way, but not to have a gross

alpha violation when prepared in another way, even though both ways of preparing the sample are within acceptable parameters set by EPA Method 900.0. In the example in Section 3.6, the cause of the gross alpha violation was due to the presence of Ra-224, a radionuclide whose activity is not routinely measured in the laboratory. This situation can be a point of frustration between a chemist and client, since the chemist often cannot attribute the gross alpha violation to a known cause. The presence of a significant level of Po-210 can also give an adjusted gross alpha activity that exceeds 15 pCi/L when no radium violation exist. In general, laboratories do not routinely test for Po-210.

There is often much confusion over the meaning of the gross alpha activity. It is often wrongly assumed that the sum of the total uranium activity and the Ra-226 activity should equal the gross alpha activity. In general, this is not the case because the alpha-emitting progeny of Ra-226 and Ra-224 and its alpha-emitting progeny contribute to the gross alpha activity also. The contribution of one of the progeny to the gross alpha activity usually exceeds its own activity, because the efficiency of the progeny significantly exceeds the efficiency of the calibration standard. With the model developed in this work, it is possible to determine the contribution of each radionuclide to the gross alpha activity. In water samples where there is gross alpha violation but no radium violation, the model could be used to determine whether the gross alpha violation could be due to the presence of Ra-224, or if some other cause should be investigated. In cases where public water supplies must be treated because of radium or gross alpha violations, such a calculation could be a valuable tool in pinning down the exact cause of the violation, and, therefore, a valuable tool in determining how the water should be treated to bring it within acceptable radiochemical limits.

It is often observed that when a sample is sent to several laboratories, one obtains widely disparate values of the gross alpha activity. This is not surprising. The higher the alpha-particle energy of the radionuclide used as the calibration standard, the lower is the measured gross alpha activity. Thus, EPA Method 900.1, in which the calibration standard Am-241 is used, would, in general, be expected to yield lower gross alpha activities than EPA Method 900.0, in which the use of Am-241 is not allowed. If there is much radium in a water sample, either Method 900.0 or Method 900.1 will yield a lower gross alpha activity if the sample is allowed to sit long enough for most of the Ra-224 to decay away. This is not only due to the decay of the Ra-224, but is due also to the disappearance of the alpha-emitting progeny of Ra-224. For example, since Ra-224 has a half-life of 3.64 days, after 30 days only about 0.33% of the original Ra-224 activity remains. Method 900.0 stipulates that once the planchet is heated, one must wait at least three days before analyzing the planchet, to allow for the ingrowth of the Ra-226 progeny. If the Ra-224 has decayed away, then to achieve the lowest gross alpha activity, the sample should be analyzed promptly after three days, because the activities of the Ra-226 progeny, and, therefore the gross alpha activity, continue to grow until secular equilibrium is reached after about 30 days. Thus, to achieve the lowest gross alpha activity one should use the calibration standard with the highest alpha-particle energy allowed (Th-230 for Method 900.0 and Am-241 for Method 900.1); one should allow the sample to sit for about 30 days before preparation, so that the Ra-224 decays away; and one should measure the alpha activity of the planchet promptly three days after sample preparation. If, alternatively, one prepares the sample soon after collection and allows the

sample to sit for 30 days, Ra-224 and its progeny will have decayed away, but the progeny of Ra-226 will have come into secular equilibrium with Ra-226. This may cause a gross alpha violation. Since the treatment of a gross alpha violation can be costly, there is undoubtedly pressure for laboratories to achieve the lowest gross alpha activities possible. Thus, in an attempt to satisfy a customer, a laboratory could easily manipulate the gross alpha analysis of a water sample, within the parameters set forth by the method, to achieve the lowest possible value for the gross alpha activity. This minimum value may be well within regulatory limits, even though other acceptable ways of sample preparation may lead to a gross alpha violation.

To achieve a higher degree of uniformity among the various laboratories, it would seem sensible to place further restrictions on the range of parameters allowed by the various methods. For example, one might require that all of the methods use the same calibration standard, that a sample be analyzed within a certain time period after collection (below, it is argued that a time period of 10 days is satisfactory), and that, for the purpose of computing the adjusted gross alpha activity, a radiochemical method be used to determine the uranium activity.

Ultimately, the purpose of a gross alpha test is to ensure that a water supply is safe from a radiological perspective, not to justify the avoidance of water treatment by manipulating the test to obtain the lowest gross alpha activity possible. Clearly, the value obtained for the adjusted gross alpha depends on many factors. Since the activity of Ra-224 and its progeny decline at a predictable rate, and since the progeny of Ra-226 grow in at a predictable rate once the sample is prepared, it is, in principle, possible to use the model outlined in this work to determine the amount of Ra-224 and Ra-226 in a sample. This might require the measurement of the gross alpha activity of the sample at several points in time. However, the calculations would be rather complicated and would probably be subject to relatively large errors. In the final analysis, it would seem that the gross alpha test is best used as a screening tool to determine whether a water sample has an uranium or a radium violation. Ra-228 is not an alpha emitter, but its activity is highly correlated with the activity of Ra-224. In the analysis that follows, it will be assumed that at the time of sample collection the Ra-224 activity, $A_{\text{Ra-224,0}}$, equals the Ra-228 activity.

If the sample is prepared just after collection, the total activity of Ra-224 and its progeny would significantly exceed the activity of Ra-228, and, therefore, the part of the gross alpha activity due to Ra-224 and its progeny, $G_{\text{Ra-224}}$, would be an upper bound for the Ra-228 activity. It is clear that to a first approximation, $G_{\text{Ra-224}}$ decays away with a half-life equal to the half-life of Ra-224, i.e., 3.64 days. It is of interest to know for what period of time after sample collection that $G_{\text{Ra-224}}$ remains an upper bound for the original Ra-228 activity of the sample. Let this time period be denoted by Δt. To estimate Δt, an example is in order. If Th-230 is used as the calibration standard, and one has a 50 mg solid film, then, the example in Section 3.6 shows that the ratio of $G_{\text{Ra-224}}$ to the activity of Ra-224, $A_{\text{Ra-224}}$, is about 7.7; i.e., $G_{\text{Ra-224}} = 7.7A_{\text{Ra-224}}$. Since

$$A_{\text{Ra-224}} = A_{\text{Ra-224,0}}\exp[\ln(2)t/3.64],$$

and it is desired to know the value of t when $G_{\text{Ra-224}} = A_{\text{Ra-224,0}}$, it is clear that

$$A_{\text{Ra-224,0}} \approx 7.7 A_{\text{Ra-224,0}} \exp[\ln(2)\Delta t/3.64].$$

Consequently, $\Delta t \approx 10.7$ days. Thus, given the assumptions made above, if a water sample is processed and analyzed within about 10 days of collection, then $G_{\text{Ra-224}}$ would be an upper bound on the Ra-228 activity. Moreover, since the portion of the gross alpha activity due to Ra-226 is slightly greater than the activity of Ra-226, when Th-230 is used as the calibration standard, it is clear that if the water sample is processed and analyzed within about 10 days of sample collection, the gross alpha activity will be an upper bound for the sum of the Ra-226 and Ra-228 activities. As the example in Section 3.6 shows, it is possible that processing the sample soon after collection will yield a gross alpha violation when there is no radium violation.

Current EPA regulations do not provide much guidance on how to proceed when one encounters a gross alpha violation. If the gross alpha activity is to be retained as a regulatory device, some plan of action should be set forth in the EPA regulations to try to identify the source of a gross alpha violation. If a sample with a gross alpha violation was processed soon after collection, the planchet could be recounted or the sample could be reanalyzed at a later time, when the Ra-224 activity has decayed away, in order to determine whether the gross alpha violation is related to the amount of Ra-224 in the sample. If the adjusted gross alpha was computed using a uranium activity determined using a gravimetric method, it could be recalculated using a uranium activity determined by a radiochemical method. Another step may be to determine whether a calculation of the gross alpha activity, based on the known activities of the most commonly measured radionuclides (U-234, U-235, U-238, Ra-226, and Ra-228) is consistent with the experimental gross alpha activity. If not, then it may be necessary to test the water for other radionuclides. In this study and others, the levels of thorium isotopes found in all of the water samples were not significant. In this study two samples had significant levels of Po-210. Consequently, when an unexplained gross alpha violation persists, a Po-210 determination may be in order. If the gross alpha violation persists, it may be necessary to test for radionuclides whose origin is due to human activity.

Appendix A. Radiochemical Data.

This appendix has four tables containing the radiochemical data for each of the samples in this study. Each sample is characterized by a sample identification number (sample ID), a location, a public water system identification number (PWSID), and a well number. Only the sample identification number is used in the other three tables. Included with each data point is an error, based on a 95% confidence level, and a minimum detectable activity (MDA). All error estimates were determined using counting statistics only. Table 14 is a summary of the gross alpha and the gross beta activity data. Table 15 is a summary of the isotopic uranium data. Table 16 is a summary of the isotopic thorium data. There is no data for sample 78260. Table 17 is a summary of Ra-226, Ra-228, and Po-210 data. There are no Po-210 data for samples 78112, 78148, and 78325.

Table 14. Gross alpha activity and gross beta activity data.

				Gross Alpha			Gross Beta		
Sample ID	Location	PWSID	Well no.	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)
78109	Lake Mills	128010850	6	11	2	2	6.2	1.4	2.2
78110	Johnson Creek	128010740	2	13	2	2	6	1.3	2.2
78111	Johnson Creek	128010740	3	22	3	1	12	2	2
78112	Lake Mills	128010850	5	14	2	2	8.3	1.6	2.5
78113	Lake Mills	128010850	4	13	2	1	5.9	1.5	2.6
78147	Hustiford Waterworks	114014890	2	19	3	2	12	2	2
78148	Hustiford Waterworks	114014890	3	40	4	2	20	2	3
78149	Reeseville Waterworks	114015330	1	5	2	2	4.4	1.3	2.3
78150	Reeseville Waterworks	114015330	2	22	3	2	9.5	1.6	2.6
78173	Pell Lake Sanitary District No. 1	265146970	1	64	4	1	29	2	2
78174	Country Estates Community Assoc.	265012770	4	15	2	1	9.9	1.1	1.4
78175	Union Grove Waterworks	252020010	4	30	3	1	15	1	2
78176	Union Grove Waterworks	252020010	5	23	3	1	14	1	2
78177	Southern Wisconsin Center	252019900	3	29	3	1	15	1	2
78178	Waterford Waterworks	252020230	2	34	3	1	19	1.4	1.5
78254	Winneconne Waterworks	471035400	1	48	3	1	16	1	1
78255	Winneconne Waterworks	471035400	2	30	3	1	12	1	1
78256	Berlin Waterworks	424021620	4	24	2	1	12	1	2
78257	Berlin Waterworks	424021620	5	20	2	1	9.6	1	1.5
78258	Berlin Waterworks	424021620	6	18	2	1	6.9	0.9	1.3
78259	Princeton Waterworks	424021950	1	33	2	1	12	1	1
78260	Princeton Waterworks	424021950	2	28	2	1	14	1	1
78319	Bellevue TN Sanitary District No. 1	405045960	1	39	4	3	25	1.4	1.7
78320	Bellevue TN Sanitary District No. 1	405045960	2	36	3	2	20.3	1.4	1.9
78321	Bellevue TN Sanitary District No. 1	405045960	3	66	4	2	29.5	1.4	1.7
78322	Bellevue TN Sanitary District No. 1	405045960	4	68	5	2	32.3	1.5	1.7
78323	Allouez Waterworks	405045520	1	21	3	2	16	1	2
78324	Allouez Waterworks	405045520	2	18	3	2	13	1	1
78325	Allouez Waterworks	405045520	5	13	2	1	12	1	1
78326	Allouez Waterworks	405045520	6	44	5	2	22.1	1.4	1.5

(Table 14 continued.)

				Gross alpha			Gross Beta		
Sample ID	Location	PWSID	Well no.	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)
78327	Allouez Waterworks	405045520	7	51	4	2	20.5	1.3	1.4
79933	Waukesha Water Utility	268023800	9	19	3	2	28	2	2
79934	Waukesha Water Utility	268023800	8	11	2	2	17	2	2
79935	Waukesha Water Utility	268023800	7	9	2	2	9	2	3
79936	Waukesha Water Utility	268023800	6	13	3	2	25	2	2
79937	Waukesha Water Utility	268023800	5	12	2	2	16.8	1.6	2.2
79938	Waukesha Water Utility	268023800	10	26	4	2	16	2	2
79939	City of Pewaukee Water & Sewer Utility	268023800	1	17	2	2	14	1	1
79940	City of Pewaukee Water & Sewer Utility	268023800	2	22	3	2	11	2	2
79941	City of Pewaukee Water & Sewer Utility	268023800	5	12	3	2	8.1	1.5	2.4
79942	City of Pewaukee Water & Sewer Utility	268023800	6	11	3	2	10	2	2
80348	Squires Grove	268020170	2	53	5	2	19.1	1.6	2.3
80349	New Berlin Water Utility	268021710	1	26	3	2	14	1	2
80350	New Berlin Water Utility	268021710	3	27	3	2	13	1	2
80351	New Berlin Water Utility	268021710	4	20	3	2	9.9	1.4	2.3
80352	New Berlin Water Utility	268021710	7	42	4	2	17.6	1.6	2.3
80353	New Berlin Water Utility	268021710	8	49	4	3	46	2	2
80354	Brookfield Water Utility	268025340	6	1	2	3	2.5	1.5	2.8
80355	Brookfield Water Utility	268025340	15	27	5	3	12	2	3
80356	Brookfield Water Utility	268025340	22	18	4	3	10	2	3
80357	Brookfield Water Utility	268025340	29	28	5	3	15	2	3
80507	Menomonee Falls	268574900	7	45	6	2	14	1	2
80508	Mukwonago	268020940	3	19	3	1	8.2	1	1.3
80509	Muskego	260228100	2	34	4	1	16	1	2
80510	Eagle	268019840	1	35	4	1	14	1	2
80511	Menomonee Falls	268574900	3	96	7	2	30	2	2
80512	Mukwonago	268020940	4	34	2	1	14.6	0.9	0.9
80513	Eagle	268019840	2	29	2	1	12.9	0.9	0.9
80514	Hales Corners	268027650	1	55	4	2	18.1	1.1	1.2
80515	Menomonee Falls	268574900	5	75	5	2	22.3	1.2	1.3
80516	Hales Corners-Lake Lore	268021050		38	4	1	16	1	1
80730	Gresham Waterworks	459045400	1	11	3	3	9	2	3
80731	Gresham Waterworks	459045400	2	32	4	2	8	2	4
80732	Gresham Waterworks	459045400	3	183	8	2	52	2	2
80733	Kaukauna Electric and Water Dept.	445033600	4	78	7	3	24	2	2
80734	Kaukauna Electric and Water Dept.	445033600	5	53	6	4	20.5	1.6	2.1
80735	Kaukauna Electric and Water Dept.	445033600	10	37	4	2	16.2	1.6	2.4
80736	Shawano Municipal Utilities	459045620	2	78	7	2	13	2	4
80737	Shawano Municipal Utilities	459045620	3	62	6	2	11	2	3
80742	Thorp Waterworks	610033710	9	24.8	2.8	0.9	13.3	1.3	1.6
80743	Thorp Waterworks	610033710	12	143.8	6.8	1	19	1.4	1.3
84263	Ledgeview TN Sanitary Dist #2	405141880	1	22	4	2	13	2	2
84264	De Pere Water Department	405045300	1	16	4	3	12	2	3
84265	De Pere Water Department	405045300	4	31	5	2	16	2	2
84266	De Pere Water Department	405045300	2	24	5	3	17	2	2

(Table 14 continued.)

				Gross alpha			Gross beta		
Sample ID	Location	PWSID	Well no.	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)
84267	De Pere Water Department	405045300	5	34	5	2	20	3	2
84268	Scott TN Sanitary Dist #1	405007130	1	34	3	2	20.5	1.5	1.5
84269	Darboy Sanitary Dist. #1	445011710	1	27	3	2	13	1	1
84270	Rustic Acres MHP	443049420	1	2	1	1.3	1.7	0.9	1.4
84271	Rustic Acres MHP	443049420	2	3	2	3	3	2	3
84272	Peshtigo Waterworks	438044200	2	14	3	2	12	2	2
84273	Peshtigo Waterworks	438044200	3	16	3	2	9	2	2
84521	Campbellsport Waterworks	420046110	3	36	3	2	17.4	1.5	1.5
84522	North Fond Du Lac Waterworks	420040500	3	4.2	1.5	1.8	3.8	1	1.4
84523	Mary Hill Park Sanitary Dist.	420046550	1	34	3	2	19.4	1.5	1.3
84524	Fond Du Lac Waterworks	420046990	11	28	3	2	13	1	2
84525	Fond Du Lac Waterworks	420046990	15	19	2	1	9.6	1.2	1.5
84526	Fond Du Lac Waterworks	420046990	17	42	4	2	18.8	1.5	1.3
84527	Fond Du Lac Waterworks	420046990	13	36	3	2	18.7	1.5	1.4
84528	Fond Du Lac Waterworks	420046990	19	38	4	2	18.2	1.5	1.5
84529	Fond Du Lac Waterworks	420046990	21	48	5	2	19	2	2
84530	North Fond Du Lac Waterworks	420040500	3	37	4	2	17	2	2
84669	Germantown Water Utility	267010590	3	37	4	3	18	2	2
84670	Sussex Village Hall & Water Utility	268023360	1	22	4	3	11	2	2
84671	Sussex Village Hall & Water Utility	268023360	2	25	4	1	15	2	2
84672	Sussex Village Hall & Water Utility	268023360	3	18	3	3	11	2	2
84675	Downsville Sanitary District	617026300	1	41	5	2	30	3	3
84677	Sussex Village Hall & Water Utility	268023360	4	17	4	3	14	2	2

Table 15. Uranium data.

		U-234			U-235			U-238	
Sample ID	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)
78109	1.67	0.067	0.00036	0.01	0.009	0.0002.5	0.31	0.040	0.00023
78110	1.42	0.102	0.00031	0.02	0.012	0.00011	0.20	0.039	0.00042
78111	0.30	0.038	0.00019	0.01	0.005	0.000077	0.04	0.014	0.00021
78112	2.40	0.119	0.00015	0.01	0.008	0.00015	0.21	0.032	0.00015
78113	2.53	0.123	0.00036	0.02	0.011	0.00025	0.32	0.040	0.00023
78147	0.84	0.046	0.00035	0.01	0.005	0.00025	0.09	0.022	0.00030
78148	1.31	0.083	0.00036	0.01	0.007	0.00025	0.30	0.039	0.00022
78149	1.70	0.094	0.00022	0.01	0.007	0.000074	0.21	0.032	0.00029
78150	3.20	0.142	0.00036	0.02	0.011	0.00026	0.46	0.049	0.00023
78173	0.10	0.016	0.00035	0.00	0.003	0.00025	0.02	0.010	0.00022
78174	0.04	0.014	0.00022	0.00	0.003	0.000076	0.01	0.012	0.00030
78175	2.58	0.127	0.00020	0.02	0.010	0.000081	0.17	0.030	0.00022
78176	2.50	0.124	0.00015	0.01	0.007	0.00015	0.18	0.031	0.00015
78177	2.13	0.113	0.00038	0.01	0.010	0.00027	0.16	0.029	0.00024
78178	2.61	0.125	0.00019	0.01	0.006	0.000078	0.22	0.033	0.00021

(Table 15 continued.)

		U-234			U-235			U-238	
Sample ID	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)
78254	15.69	0.438	0.00014	0.09	0.021	0.00014	1.83	0.101	0.00014
78255	10.29	0.321	0.00037	0.07	0.020	0.00026	1.24	0.083	0.00023
78256	2.05	0.078	0.00023	0.02	0.010	0.000082	0.32	0.041	0.00031
78257	1.61	0.094	0.00014	0.02	0.009	0.00015	0.23	0.034	0.00015
78258	4.62	0.177	0.00035	0.04	0.014	0.00025	0.69	0.059	0.00022
78259	1.62	0.092	0.00019	0.01	0.007	0.000074	0.23	0.033	0.00020
78260	1.92	0.105	0.00019	0.02	0.009	0.000078	0.31	0.040	0.00021
78319	4.86	0.144	0.00049	0.03	0.014	0.00034	0.32	0.045	0.00015
78320	4.47	0.174	0.00022	0.02	0.010	0.000076	0.28	0.038	0.00030
78321	6.34	0.103	0.00011	0.03	0.004	0.000026	0.33	0.014	0.00013
78322	5.21	0.092	0.00014	0.03	0.004	0.000026	0.43	0.016	0.00020
78323	3.64	0.156	0.00020	0.01	0.008	0.000080	0.21	0.033	0.00022
78324	2.18	0.113	0.00015	0.02	0.009	0.00015	0.12	0.024	0.00015
78325	2.28	0.115	0.00036	0.01	0.008	0.00025	0.11	0.024	0.00022
78326	3.64	0.154	0.00019	0.01	0.008	0.000078	0.19	0.031	0.00021
78327	4.53	0.186	0.00021	0.02	0.011	0.000085	0.23	0.036	0.00023
79933	1.17	0.052	0.00010	0.02	0.004	0.00010	0.15	0.012	0.00010
79934	1.03	0.048	0.00030	0.01	0.004	0.00020	0.08	0.009	0.00017
79935	0.78	0.042	0.00014	0.01	0.002	0.000036	0.07	0.008	0.00016
79936	0.97	0.105	0.00033	0.02	0.015	0.000033	0.09	0.030	0.00033
79937	2.01	0.117	0.00018	0.02	0.010	0.00018	0.13	0.027	0.00018
79938	1.96	0.108	0.00040	0.01	0.010	0.00028	0.11	0.024	0.00025
79939	2.42	0.123	0.00022	0.01	0.009	0.000086	0.17	0.031	0.00024
79940	1.53	0.099	0.00024	0.01	0.006	0.000095	0.14	0.029	0.00026
79941	5.54	0.218	0.00045	0.04	0.017	0.00032	0.68	0.065	0.00028
79942	2.90	0.103	0.00025	0.02	0.007	0.000098	0.26	0.028	0.00027
80348	5.66	0.095	0.00012	0.02	0.003	0.000025	0.13	0.008	0.00014
80349	3.74	0.074	0.00076	0.02	0.003	0.000076	0.16	0.008	0.000076
80350	3.85	0.076	0.00026	0.02	0.003	0.00017	0.19	0.009	0.00015
80351	3.80	0.076	0.00012	0.02	0.003	0.000025	0.14	0.008	0.00014
80352	2.84	0.132	0.00015	0.02	0.010	0.00015	0.16	0.028	0.00015
80353	4.05	0.168	0.00040	0.03	0.014	0.00028	0.21	0.033	0.00025
80354	0.29	0.038	0.00021	0.01	0.007	0.000082	0.23	0.034	0.00023
80355	4.44	0.139	0.00013	0.02	0.006	0.00013	0.18	0.021	0.00013
80356	3.42	0.116	0.00034	0.01	0.007	0.00023	0.11	0.016	0.00021
80357	2.77	0.077	0.00020	0.01	0.004	0.000066	0.09	0.011	0.00022
80507	2.44	0.092	0.00022	0.02	0.007	0.019	0.08	0.016	0.00024
80508	0.62	0.061	0.00041	0.02	0.007	0.0054	0.04	0.017	0.00026
80509	3.58	0.088	0.00013	0.01	0.009	0.019	0.19	0.013	0.00015
80510	0.11	0.025	0.00017	0.02	0.004	0.0039	0.02	0.011	0.00017
80511	6.30	0.249	0.00042	0.02	0.010	0.016	0.21	0.037	0.00026
80512	1.77	0.108	0.00022	0.03	0.014	0.0085	0.09	0.025	0.00024
80513	0.13	0.028	0.00024	0.01	0.007	0.0047	0.00	-0.005	0.00026
80514	4.28	0.153	0.00036	0.02	0.006	0.016	0.19	0.027	0.00022
80515	6.17	0.194	0.00019	0.01	0.007	0.026	0.27	0.032	0.00021

(continued.)

		U-234			U-235			U-238	
Sample ID	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)
80516	2.55	0.118	0.00022	0.01	0.006	0.0089	0.13	0.024	0.00024
80730	3.11	0.142	0.00016	0.08	0.020	0.00016	2.11	0.113	0.00016
80731	17.29	0.327	0.00035	0.26	0.017	0.00025	5.73	0.094	0.00023
80732	82.74	2.061	0.00025	1.12	0.086	0.00010	24.26	0.685	0.00028
80733	2.14	0.118	0.00017	0.00	0.006	0.00017	0.13	0.026	0.00017
80734	2.27	0.116	0.00039	0.01	0.011	0.00027	0.15	0.028	0.00024
80735	1.65	0.097	0.00021	0.01	0.007	0.000082	0.12	0.025	0.00023
80736	63.11	1.591	0.00025	0.73	0.068	0.000099	16.23	0.489	0.00027
80737	42.70	0.370	0.000089	0.53	0.021	0.000089	10.69	0.099	0.000089
80742	2.04	0.066	0.00014	0.03	0.005	0.000035	0.62	0.023	0.00015
80743	78.21	0.612	0.00015	1.15	0.032	0.000037	25.32	0.176	0.00017
84263	2.36	0.127	0.00040	0.03	0.013	0.00028	0.20	0.033	0.00028
84264	2.07	0.118	0.00040	0.02	0.012	0.00022	0.12	0.026	0.00029
84265	3.13	0.153	0.00027	0.01	0.009	0.00020	0.20	0.033	0.00025
84266	2.97	0.143	0.00039	0.01	0.009	0.00021	0.19	0.032	0.00029
84267	3.21	0.153	0.00040	0.03	0.014	0.00028	0.20	0.034	0.00028
84268	2.85	0.154	0.00031	0.03	0.013	0.00018	0.22	0.036	0.00031
84269	1.22	0.086	0.00039	0.02	0.010	0.00021	0.12	0.026	0.00029
84270	0.17	0.032	0.00041	0.00	0.006	0.00028	0.05	0.017	0.00028
84271	0.07	0.022	0.00032	0.00	0.004	0.00023	0.02	0.014	0.00029
84272	0.22	0.038	0.00037	0.01	0.008	0.00027	0.03	0.014	0.00024
84273	0.60	0.062	0.00043	0.01	0.008	0.00024	0.04	0.017	0.00032
84521	7.50	0.267	0.00023	0.02	0.011	0.00019	0.30	0.040	0.00025
84522	0.20	0.033	0.00032	0.01	0.007	0.000084	0.06	0.018	0.00029
84523	0.73	0.064	0.00021	0.00	0.005	0.00015	0.05	0.017	0.00022
84524	2.76	0.138	0.00043	0.03	0.013	0.00027	0.27	0.039	0.00035
84525	1.22	0.090	0.00024	0.02	0.010	0.00017	0.15	0.030	0.00025
84526	7.67	0.270	0.00023	0.02	0.011	0.00019	0.51	0.052	0.00024
84527	3.09	0.146	0.00041	0.02	0.011	0.00026	0.24	0.036	0.00034
84528	5.64	0.220	0.00021	0.03	0.012	0.00015	0.58	0.057	0.00022
84529	3.88	0.170	0.00024	0.01	0.009	0.00019	0.38	0.045	0.00025
84530	2.20	0.123	0.00034	0.12	0.025	0.00091	0.37	0.046	0.00032
84669	2.16	0.121	0.00022	0.04	0.015	0.00015	0.11	0.025	0.00023
84670	2.32	0.124	0.00033	0.01	0.008	0.000087	0.13	0.027	0.00030
84671	3.24	0.152	0.00042	0.06	0.019	0.00027	0.29	0.040	0.00035
84672	1.05	0.077	0.00021	0.01	0.006	0.00015	0.07	0.019	0.00035
84675	0.50	0.055	0.00026	0.06	0.018	0.00021	0.12	0.026	0.00027
84677	2.98	0.147	0.00044	0.12	0.026	0.00028	0.34	0.045	0.00036

Table 16. Thorium data.

		Th-228			Th-230			Th-232	
Sample ID	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)
78109	0.0154	0.0109	0.00019	0.0155	0.0072	0.00011	0.0027	0.0031	0.000093
78110	-0.0039	0.0116	0.00041	0.0300	0.0147	0.00037	0.0033	0.0053	0.00020
78111	0.0082	0.0115	0.00014	0.0251	0.0097	0.00013	0.0000	0.0029	0.00015
78112	0.0128	0.0106	0.00021	0.0118	0.0066	0.00012	0.0038	0.0038	0.00010
78113	-0.0040	0.0498	0.00014	0.0193	0.0063	0.00013	0.0011	0.0024	0.000093
78147	-0.0022	0.0063	0.00014	0.0200	0.0055	0.00075	0.0027	0.0022	0.000059
78148	-0.0084	0.0061	0.000067	0.0191	0.0048	0.000060	0.0022	0.0024	0.000078
78149	0.0092	0.0046	0.000087	0.0087	0.0037	0.000087	-0.0030	0.0023	0.00012
78150	-0.0037	0.0050	0.00012	0.0123	0.0040	0.000063	0.0022	0.0018	0.000050
78173	-0.0047	0.0056	0.00015	0.0157	0.0045	0.000076	0.0011	0.0017	0.000059
78174	-0.0250	0.0245	0.0019	0.0310	0.0251	0.0016	0.0100	0.0121	0.00078
78175	0.0011	0.0070	0.00022	0.0252	0.0074	0.00011	0.0044	0.0033	0.000089
78176	0.0005	0.0093	0.00032	0.0103	0.0087	0.00028	0.0030	0.0040	0.00014
78177	0.0445	0.0103	0.00017	0.0133	0.0049	0.000091	0.0040	0.0028	0.000072
78178	0.0071	0.0066	0.00015	0.0425	0.0102	0.00013	0.0016	0.0045	0.00017
78254	-0.0011	0.0052	0.00013	0.0160	0.0064	0.00013	-0.0024	0.0037	0.00018
78255	-0.0012	0.0049	0.00016	0.0208	0.0084	0.00014	0.0008	0.0043	0.00018
78256	-0.0165	0.0558	0.00012	0.0120	0.0046	0.00011	0.0003	0.0019	0.000076
78257	0.0013	0.0039	0.000095	0.0101	0.0041	0.000095	-0.0010	0.0031	0.00013
78258	0.0016	0.0053	0.00017	0.0099	0.0059	0.00015	0.0011	0.0048	0.00019
78259	0.0183	0.0651	0.00020	0.0172	0.0065	0.00017	-0.0026	0.0029	0.00014
78260	—	—	—	—	—	—	—	—	—
78319	0.1393	0.0197	0.00011	0.0303	0.0029	0.00010	0.0039	0.0015	0.00011
78320	0.0962	0.0170	0.00012	0.0108	0.0020	0.00011	-0.0005	-0.0006	0.000074
78321	0.1427	0.0296	0.00025	0.0150	0.0080	0.00023	-0.0037	0.0059	0.00025
78322	0.2211	0.0320	0.00014	0.0233	0.0066	0.00014	0.0005	0.0034	0.00013
78323	0.0967	0.0284	0.00053	0.0210	0.0141	0.00044	-0.0053	0.0090	0.00036
78324	0.0150	0.0183	0.00038	0.0244	0.0066	0.00034	0.0117	0.0037	0.00016
78325	0.0780	0.0182	0.00020	0.0162	0.0063	0.00017	0.0000	0.0036	0.00014
78326	0.1286	0.0252	0.00018	0.0152	0.0068	0.00018	0.0015	0.0045	0.00017
78327	0.0307	0.0201	0.00019	0.0347	0.0044	0.000097	0.0078	0.0021	0.000076
79933	0.0154	0.0457	0.00042	0.2036	0.0293	0.00042	0.0082	0.0113	0.00039
79934	0.0142	0.0304	0.00046	0.2444	0.0296	0.00039	0.0070	0.0093	0.00032
79935	0.0053	0.0260	0.00042	0.1210	0.0246	0.00038	-0.0016	0.0105	0.00042
79936	0.1063	0.0399	0.00035	1.3546	0.0933	0.00032	0.0212	0.0090	0.00022
79937	0.0746	0.0558	0.00086	0.1316	0.0427	0.00086	0.0012	0.0199	0.00080
79938	0.0017	0.0291	0.00037	0.9995	0.0744	0.00031	0.0080	0.0078	0.00026
79939	0.0018	0.0198	0.00026	0.1605	0.0242	0.00024	0.0041	0.0072	0.00026
79940	0.0176	0.0213	0.00030	0.4424	0.0459	0.00027	0.0095	0.0069	0.00019
79941	-0.0002	0.0127	0.00036	0.5375	0.0413	0.00033	0.0140	0.0071	0.00036
79942	0.0232	0.0261	0.00053	0.4803	0.0662	0.00053	0.0136	0.0149	0.00050
80348	0.0086	0.0275	0.00023	0.0700	0.0138	0.00021	0.0108	0.0076	0.00023
80349	0.0187	0.0258	0.00025	0.0589	0.0149	0.00023	0.0092	0.0081	0.00025
80350	0.0036	0.0262	0.00038	0.0692	0.0166	0.00032	0.0043	0.0074	0.00026

(Table 16 continued.)

		Th-228			Th-230			Th-232	
Sample ID	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)
80351	-0.0201	0.1918	0.00022	0.0733	0.0789	0.00020	0.0164	0.0186	0.00014
80352	0.0367	0.0291	0.00023	0.0688	0.0153	0.00021	0.0091	0.0075	0.00023
80353	0.0585	0.0674	0.00037	0.0694	0.0165	0.00031	0.0062	0.0077	0.00026
80354	-0.0055	0.0158	0.00036	0.0991	0.0236	0.00033	-0.0016	0.0085	0.00036
80355	0.0254	0.0249	0.00024	0.0640	0.0151	0.00022	0.0047	0.0069	0.00024
80356	0.0127	0.0340	0.00072	0.0676	0.0253	0.00061	0.0099	0.0145	0.00050
80357	0.0028	0.0252	0.00025	0.0756	0.0168	0.00023	0.0049	0.0072	0.00025
80507	-0.0063	0.0881	0.00023	0.0743	0.0473	0.00021	0.0005	0.0061	0.00023
80508	-0.0355	0.0339	0.00028	0.0573	0.0263	0.00024	0.0080	0.0056	0.00020
80509	-0.0448	0.0799	0.00021	0.0609	0.0388	0.00019	0.0107	0.0082	0.00013
80510	-0.0675	0.0627	0.00049	0.0501	0.0567	0.00041	0.0116	0.0164	0.00034
80511	-0.0236	0.4068	0.00025	0.0677	0.0734	0.00023	0.0097	0.0131	0.00025
80512	-0.0493	0.1403	0.00029	0.0858	0.0926	0.00027	0.0175	0.0204	0.00019
80513	-0.0497	0.0783	0.00078	0.0787	0.0764	0.00066	0.0069	0.0164	0.00054
80514	0.0264	0.1452	0.00020	0.0695	0.0625	0.00019	0.0074	0.0091	0.00020
80515	-0.1144	0.3631	0.0017	0.0632	0.0512	0.0016	0.0074	0.0273	0.00011
80516	-0.1146	0.3810	0.00025	0.0923	0.0178	0.00023	0.0074	0.0057	0.00016
80730	0.0704	0.0293	0.00024	0.0561	0.0128	0.00022	0.0144	0.0066	0.00015
80731	0.0079	0.1023	0.00046	0.0800	0.0200	0.00039	0.0110	0.0101	0.00032
80732	0.1453	0.0262	0.00023	0.0721	0.0139	0.00021	0.0146	0.0064	0.00014
80733	0.0944	0.1725	0.00033	0.0646	0.0179	0.00030	0.0081	0.0097	0.00033
80734	0.0125	0.0357	0.00034	0.0565	0.0143	0.00029	0.0108	0.0079	0.00024
80735	0.1716	0.1327	0.00033	0.0585	0.0167	0.00031	0.0035	0.0059	0.00021
80736	-0.1119	0.1142	0.00030	0.0715	0.0134	0.00025	0.0136	0.0072	0.00021
80737	0.3002	0.1339	0.00022	0.5089	0.0443	0.00020	0.0536	0.0109	0.00014
80742	-0.0380	0.0293	0.00024	0.0584	0.0139	0.00022	0.0131	0.0067	0.00016
80743	0.1048	0.1019	0.00020	0.4895	0.0433	0.00019	0.0457	0.0109	0.00020
84263	0.0112	0.0108	0.00027	0.0463	0.0125	0.00021	0.0078	0.0055	0.00015
84264	0.0037	0.0099	0.00031	0.0407	0.0116	0.00021	0.0001	0.0043	0.00019
84265	0.0045	0.0130	0.00039	0.0316	0.0120	0.00030	0.0061	0.0049	0.00014
84266	0.0181	0.0136	0.00027	0.0361	0.0113	0.00021	0.0052	0.0049	0.00015
84267	-0.0380	0.0509	0.0021	0.0248	0.0445	0.00016	-0.0127	0.0189	0.0011
84268	0.0039	0.0145	0.00039	0.0265	0.0111	0.00025	-0.0031	0.0044	0.00023
84269	0.0020	0.0135	0.00040	0.0364	0.0126	0.00030	0.0088	0.0056	0.00014
84270	0.0082	0.0113	0.00033	0.0640	0.0166	0.00026	0.0072	0.0063	0.00019
84271	0.0104	0.0162	0.00054	0.0582	0.0188	0.00035	-0.0043	0.0061	0.00032
84272	0.0634	0.0157	0.00025	0.0411	0.0107	0.00020	0.0045	0.0044	0.00014
84273	0.0040	0.0127	0.00036	0.0368	0.0113	0.00023	0.0029	0.0057	0.00021
84521	0.0616	0.0359	0.00036	0.1449	0.0237	0.00029	0.0294	0.0105	0.00021
84522	0.0064	0.0083	0.00028	0.0459	0.0115	0.00014	0.0082	0.0054	0.00014
84523	0.0011	0.0169	0.00039	0.0255	0.0127	0.00037	0.0011	0.0068	0.00026
84524	0.0149	0.0161	0.00036	0.0647	0.0149	0.00021	0.0047	0.0055	0.00019
84525	0.1840	0.0291	0.00034	0.0548	0.0144	0.00028	0.0047	0.0061	0.00021
84526	-0.0002	0.0151	0.00033	0.0347	0.0122	0.00031	0.0010	0.0059	0.00023
84527	-0.1359	0.0519	0.00013	0.0946	0.0449	0.00012	0.0146	0.0249	0.00088

(Table 16 continued.)									
		Th-228			Th-230			Th-232	
Sample ID	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)
84528	0.0201	0.0384	0.00026	0.0409	0.0104	0.00013	0.0029	0.0037	0.00013
84529	0.0096	0.0176	0.00036	0.0310	0.0126	0.00034	0.0029	0.0067	0.00024
84530	0.0255	0.0173	0.00029	0.0336	0.0107	0.00023	0.0034	0.0050	0.00017
84669	0.0127	0.0152	0.00031	0.0284	0.0093	0.00018	0.0046	0.0049	0.00016
84670	0.0063	0.0153	0.00039	0.0557	0.0156	0.00036	0.0043	0.0073	0.00026
84671	0.0244	0.0146	0.00031	0.0882	0.0170	0.00015	0.0179	0.0077	0.00015
84672	0.1546	0.0269	0.00028	0.0543	0.0124	0.00013	0.0087	0.0054	0.00013
84675	0.0219	0.0214	0.00031	0.0675	0.0141	0.00018	0.0125	0.0066	0.00016
84677	0.1014	0.0224	0.00033	0.0279	0.0115	0.00031	0.0026	0.0061	0.00022

Table 17. Po-210, Ra-226, and Ra-228 data.

		Po-210			Ra-226			Ra-228	
Sample ID	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)
78109	0.0305	0.0395	0.0072	1.87	0.15	0.03	2.1	0.6	0.7
78110	0.1372	0.0378	0.0032	2.08	0.15	0.03	1.5	0.5	0.6
78111	0.0280	0.0391	0.0069	4.5	0.2	0.1	3.6	0.7	0.8
78112	—	—	—	3.0	0.2	0.1	1.8	0.6	0.7
78113	0.1637	0.0224	0.0020	1.2	0.1	0.1	1.1	0.5	0.8
78147	-0.0089	0.0060	0.0016	3.7	0.2	0.1	3.8	0.7	0.8
78148	—	—	—	7.1	0.2	0.1	6.7	0.9	0.7
78149	0.0160	0.0060	0.0098	0.92	0.10	0.06	0.5	0.5	0.8
78150	0.0214	0.0061	0.0087	4.4	0.2	0.1	2.5	0.7	0.9
78173	0.0068	0.0111	0.0016	13.5	0.4	0.1	7.7	0.9	0.7
78174	0.0036	0.0103	0.00056	3.0	0.2	0.1	1.8	0.6	0.8
78175	0.0062	0.0096	0.00055	5.8	0.2	0.1	3.2	0.9	1.1
78176	0.0241	0.0110	0.0015	3.7	0.2	0.1	2.1	0.7	0.9
78177	0.0108	0.0107	0.0015	3.9	0.2	0.1	3.1	0.8	0.9
78178	0.0042	0.0156	0.0019	7.1	0.2	0.1	3.1	0.8	1.0
78254	0.0164	0.0073	0.0011	5.5	0.2	0.1	4.3	0.9	1.0
78255	0.0304	0.0064	0.0014	2.34	0.15	0.06	2.1	0.8	1.0
78256	0.1070	0.0118	0.00076	2.9	0.2	0.1	3.1	0.8	0.9
78257	0.0743	0.0079	0.00069	2.29	0.16	0.04	2.5	0.8	1.1
78258	0.0174	0.0120	0.0013	2.80	0.16	0.04	1.4	0.7	1.0
78259	0.0174	0.0120	0.0013	5.1	0.2	0.1	4.1	0.9	1.0
78260	0.0143	0.0081	0.0013	5.6	0.2	0.1	3.8	0.9	1.1
78319	0.0111	0.0122	0.0022	8.6	0.3	0.1	6.0	1.0	0.8
78320	0.1021	0.0223	0.0042	7.4	0.3	0.1	4.9	0.9	0.8
78321	0.0228	0.0206	0.0030	15.2	0.4	0.1	5.3	1.1	1.0
78322	0.0111	0.0124	0.0029	17.0	0.4	0.1	9.0	1.2	1.0
78323	0.1590	0.0192	0.0029	5.1	0.2	0.1	3.4	0.8	0.9
78324	0.2081	0.0167	0.0011	3.7	0.2	0.1	3.1	0.8	1.0
78325	—	—	—	2.3	0.2	0.1	2.2	0.9	1.2
78326	0.1611	0.0177	0.0010	9.2	0.3	0.1	4.6	1.0	1.1

(Table 17 continued.)

		Po-210			Ra-226			Ra-228	
sample ID	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)
78327	0.1456	0.0123	0.0016	9.3	0.3	0.1	4.5	1.2	1.4
79933	0.2218	0.0186	0.0015	4.9	0.3	0.1	18.1	1.6	1.1
79934	0.0209	0.0162	0.0013	3.2	0.2	0.1	10	1	1
79935	0.0229	0.0160	0.00091	2.8	0.2	0.1	4.5	1.0	1.1
79936	0.0372	0.0159	0.0027	3.6	0.2	0.1	16	1	1
79937	0.0349	0.0233	0.0046	3.2	0.2	0.1	8.4	1.1	0.9
79938	0.0351	0.0114	0.0023	5.7	0.3	0.1	8.4	1.2	1.1
79939	0.0340	0.0164	0.0025	2.3	0.2	0.1	3.8	0.8	1.0
79940	0.0398	0.0150	0.0024	5.4	0.3	0.1	3.4	0.8	1.0
79941	0.0610	0.0166	0.0025	1.93	0.16	0.06	1.5	0.8	1.2
79942	0.0448	0.0168	0.0010	2.8	0.2	0.1	2.5	0.7	0.8
80348	0.0068	0.0106	0.0029	8.5	0.3	0.1	5.0	0.7	0.5
80349	0.0031	0.0142	0.00087	4.2	0.2	0.1	3.3	0.6	0.6
80350	0.0097	0.0163	0.0016	4.0	0.2	0.1	3.8	0.6	0.6
80351	0.0037	0.0151	0.0021	3.5	0.2	0.1	3.7	0.7	0.7
80352	0.0087	0.0152	0.0022	3.8	0.2	0.1	3.8	0.7	0.7
80353	0.0090	0.0252	0.0023	5.4	0.3	0.1	19.8	1.2	0.6
80354	0.0990	0.0167	0.0014	0.39	0.09	0.08	0.7	0.4	0.6
80355	0.0106	0.0170	0.0026	4.5	0.2	0.1	2.8	0.6	0.6
80356	0.0102	0.0169	0.0026	3.0	0.2	0.1	2.9	0.6	0.6
80357	0.0144	0.0316	0.0035	1.85	0.15	0.05	2.8	0.7	0.8
80507	0.0068	0.0116	0.0030	2.9	0.2	0.1	4.2	0.7	0.6
80508	0.0282	0.0140	0.0019	3.7	0.2	0.1	3.0	0.7	0.8
80509	0.0044	0.0159	0.00093	5.6	0.2	0.1	4.9	0.8	0.8
80510	0.0072	0.0145	0.00080	5.2	0.2	0.1	3.5	0.8	1
80511	0.0080	0.0224	0.0015	5.4	0.2	0.1	12	1	1
80512	0.0103	0.0138	0.0010	5.8	0.2	0.1	5.3	0.8	0.7
80513	0.0052	0.0147	0.0020	5.89	0.27	0.06	3.73	0.84	0.91
80514	0.0066	0.0144	0.0013	6.28	0.28	0.09	3.99	0.75	0.75
80515	0.0099	0.0196	0.0016	6.74	0.29	0.06	8.59	1.00	0.78
80516	0.0055	0.0162	0.0014	4.20	0.27	0.15	3.86	1.07	2.45
80730	0.1518	0.0190	0.0028	0.65	0.11	0.05	0.95	0.63	0.93
80731	0.1657	0.0099	0.0023	0.64	0.10	0.06	1.15	0.57	0.81
80732	6.1809	0.4229	0.0018	0.59	0.11	0.10	0.21	0.44	0.71
80733	0.0287	0.0325	0.0092	3.26	0.21	0.06	4.58	0.86	0.94
80734	0.0052	0.0250	0.0043	2.96	0.2	0.05	3.37	0.74	0.86
80735	0.0068	0.0154	0.00095	3.06	0.22	0.12	2.71	0.72	0.84
80736	0.3744	0.0236	0.0011	1.12	0.14	0.10	1.26	0.73	1.03
80737	0.0499	0.0147	0.0011	0.94	0.13	0.08	0.56	0.84	1.33
80742	0.0784	0.0151	0.0025	0.89	0.12	0.06	2.19	0.66	0.8
80743	4.5960	0.2578	0.00098	3.54	0.23	0.10	1.43	0.64	0.87
84263	0.0167	0.0474	0.0098	2.9	0.2	0.1	1.8	0.6	0.6
84264	0.0332	0.0518	0.0074	1.65	0.15	0.1	0.9	0.5	0.7
84265	0.0038	0.0476	0.0080	3.8	0.2	0.1	2.2	0.6	0.6
84266	0.0846	0.0482	0.010	3.8	0.2	0.1	3.6	0.8	0.8

(Table 17 continued.)

		Po-210			Ra-226			Ra-228	
sample ID	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)	Activity (pC/L)	95% error (pCi/L)	MDA (pCi/L)
84267	0.0191	0.0449	0.0055	4.8	0.3	0.1	5	0.8	0.7
84268	0.0110	0.0506	0.0070	5.2	0.2	0.1	2.9	0.7	0.7
84269	0.0055	0.0467	0.0078	3.6	0.2	0.1	2.4	0.6	0.7
84270	0.0054	0.0493	0.011	0.76	0.11	0.09	0.3	0.6	0.9
84271	0.0105	0.0466	0.0059	0.17	0.06	0.06	-0.1	0.5	0.9
84272	0.1883	0.0488	0.0081	3.2	0.2	0.1	1.4	0.6	0.8
84273	0.0084	0.0479	0.010	3.6	0.3	0.2	1.6	0.7	0.9
84521	-0.0014	0.0500	0.0074	5.2	0.2	0.1	3	0.6	0.6
84522	0.0165	0.0508	0.0076	0.42	0.08	0.07	-0.1	0.4	0.7
84523	0.0043	0.0464	0.0073	5.2	0.2	0.1	5	0.8	0.6
84524	0.1065	0.0481	0.0067	5.8	0.2	0.1	2.6	0.7	0.9
84525	0.0106	0.0526	0.0093	3	0.2	0.1	1	0.6	0.9
84526	0.0039	0.0464	0.0052	6.2	0.2	0.1	3.6	0.8	0.8
84527	0.0258	0.0471	0.0044	5.2	0.2	0.1	4.9	0.8	0.8
84528	0.0228	0.0494	0.0071	9.5	0.4	0.1	3.5	0.8	0.7
84529	0.0136	0.0456	0.0051	7.6	0.3	0.1	4.8	0.8	0.7
84530	0.0326	0.0479	0.0045	6.1	0.2	0.1	3.6	0.9	0.9
84669	0.0166	0.0516	0.0064	5.6	0.3	0.1	4.6	0.5	0.4
84670	0.0000	0.0495	0.0072	3.4	0.2	0.1	3.5	0.5	0.5
84671	0.0156	0.0513	0.0052	4.5	0.2	0.1	2.5	0.4	0.5
84672	0.0085	0.0488	0.0070	4.2	0.2	0.1	1.7	0.6	0.7
84675	0.0367	0.0468	0.0074	10.6	0.4	0.1	6.1	0.8	0.6
84677	0.0044	0.0491	0.0058	2.6	0.2	0.1	2.6	0.5	0.5

Appendix B. Gross Alpha Calculations.

This table in this appendix gives a summary of some of the data from Appendix A and gives the results of the gross alpha calculations. The first entry is the sample identification number. The second entry is the solid film weight in the planchet. The third entry is the time between sample collection and sample preparation. The fourth entry is the time between sample preparation and sample analysis. The fifth entry is the gross alpha activity of the sample measured in the laboratory. The sixth entry is the calculated gross alpha activity, assuming that Ra-224 is in secular equilibrium with Ra-228, i.e., assuming that the activity of Ra-224 equals the activity of Ra-228. The seventh entry is the value of the Ra-224 activity required to make the calculated gross alpha activity equal the measured gross alpha activity. The eighth entry of the table is the measured Ra-228 activity. The last entry of the table is the ratio of the calculated Ra-224 activity to the measured Ra-228 activity

Table 18. Results of gross alpha simulations for water samples.

Sample ID	Solid film weight (mg)	Time between sample coll. and prep. (days)	Time between sample prep. and anal. (days)	Gross alpha activity (pCi/L)	Calculated gross alpha activity (pCi/L)	Calculated Value of Ra-224 activity (pCi/L)	Ra-228 activity (pCi/L)	Ratio of Ra-224 to Ra-228
78109	19.4	0.96	1.40	11	12.78	1.59	2.1	0.75
78110	19.9	1.02	1.40	13	10.74	2.16	1.5	1.44
78111	18.4	1.04	1.40	22	20.94	3.91	3.6	1.09
78112	20.1	0.94	1.40	14	14.65	1.61	1.8	0.90
78113	20.8	0.95	1.40	13	9.03	2.23	1.1	2.03
78147	26.9	1.13	0.59	19	20.90	3.30	3.8	0.87
78148	20.7	1.12	0.59	40	35.74	7.89	6.7	1.18
78149	20.5	1.08	0.59	5	5.04	0.49	0.5	0.98
78150	17.8	1.09	0.59	22	18.62	3.47	2.5	1.39
78173	26.7	1.06	0.20	64	44.69	12.90	7.7	1.68
78174	29.6	1.06	0.20	15	10.53	2.97	1.8	1.65
78175	32.4	0.97	0.20	30	22.65	5.03	3.2	1.57
78176	34.0	0.96	0.20	23	15.83	3.85	2.1	1.84
78177	62.9	0.94	0.20	29	22.65	4.38	3.1	1.41
78178	61.6	0.92	0.20	34	27.19	4.47	3.1	1.44
78254	34.3	1.02	0.33	48	42.90	5.53	4.3	1.29
78255	34.6	1.04	0.33	30	23.52	3.66	2.1	1.74
78256	27.6	0.94	0.33	24	18.22	4.58	3.1	1.48
78257	31.8	0.93	0.33	20	15.12	3.69	2.5	1.47
78258	23.9	0.96	0.33	18	14.13	2.43	1.4	1.74
78259	24.7	0.89	0.33	33	24.05	6.44	4.1	1.57
78260	25.9	0.89	0.33	28	24.14	4.79	3.8	1.26
78319	55.5	30.08	3.17	39	33.85	—	6	—
78320	48.7	30.06	3.17	36	28.90	—	4.9	—

(Table 18 continued)

Sample ID	Solid film weight (mg)	Time between sample coll. and prep. (days)	Time between sample prep. and anal. (days)	Gross alpha activity (pCi/L)	Calculated gross alpha activity (pCi/L)	Calculated value of Ra-224 activity (pCi/L)	Ra-228 activity (pCi/L)	Ratio of Ra-224 to Ra-228
78321	51.3	30.07	3.17	66	56.55	—	5.3	—
78322	67.7	30.04	3.17	68	63.29	—	9	—
78323	91.1	29.94	2.50	21	19.05	—	3.4	—
78324	81.0	29.97	2.94	18	14.48	—	3.1	—
78325	50.3	29.91	2.94	13	9.73	—	2.2	—
78326	88.2	29.99	2.94	44	33.64	—	4.6	—
78327	70.1	30.01	2.94	51	35.30	—	4.5	—
79933	66.6	64.81	2.46	19	15.83	—	18.1	—
79934	48.4	64.12	2.60	11	10.48	—	10	—
79935	33.3	64.09	2.70	9	8.59	—	4.5	—
79936	47.3	64.10	2.84	13	12.02	—	16	—
79937	71.8	64.14	3.01	12	12.77	—	8.4	—
79938	51.7	64.16	3.15	26	20.69	—	8.4	—
79939	56.9	59.07	11.41	17	15.47	—	3.8	—
79940	47.2	64.05	3.40	22	19.64	—	3.4	—
79941	62.4	64.02	3.53	12	13.20	—	1.5	—
79942	59.2	64.04	3.67	11	13.30	—	2.5	—
80348	42.4	1.04	2.40	53	48.11	6.30	5	1.26
80349	41.2	0.91	1.31	26	27.49	2.97	3.3	0.90
80350	44.0	0.90	1.31	27	30.02	3.14	3.8	0.83
80351	36.2	0.92	1.31	20	26.90	2.08	3.7	0.56
80352	43.5	0.95	1.31	42	28.24	6.83	3.8	1.80
80353	68.9	34.93	4.50	49	26.23	—	19.8	—
80354	49.0	1.13	2.24	1	4.32	-0.13	0.7	-0.19
80355	52.8	1.11	2.24	27	28.73	2.38	2.8	0.85
80356	42.0	1.09	2.24	18	22.66	1.67	2.9	0.58
80357	52.3	1.07	2.24	28	19.63	4.83	2.8	1.73
80507	80.9	1.16	0.25	45	26.81	7.95	4.2	1.89
80508	38.7	0.92	0.25	19	18.42	3.13	3	1.04
80509	46.8	1.08	0.25	34	33.21	5.07	4.9	1.04
80510	35.4	0.88	0.25	35	21.50	6.67	3.5	1.91
80511	67.7	2.13	0.34	96	63.76	19.82	12	1.65
80512	38.8	0.93	0.53	34	34.43	5.20	5.3	0.98
80513	33.3	0.90	0.53	29	24.70	4.73	3.73	1.27
80514	77.6	1.00	0.53	55	35.37	7.73	3.99	1.94
80515	87.7	1.14	0.53	75	59.91	11.62	8.59	1.35
80516	78.6	1.03	0.53	38	29.42	5.51	3.86	1.43
80730	28.9	1.06	1.05	11	9.66	1.29	0.95	1.36
80731	15.5	1.08	1.05	32	27.39	2.53	1.15	2.20
80732	44.7	1.07	0.40	183	115.08	15.08	0.21	71.82
80733	85.6	0.91	0.40	78	30.67	13.74	4.58	3.00
80734	88.1	0.92	0.40	53	23.93	9.06	3.37	2.69
80735	52.2	0.93	0.40	37	19.54	6.24	2.71	2.30

(Table 18 continued)								
sample ID	Solid film weight (mg)	Time between sample coll. and prep. (days)	Time between sample prep. and anal. (days)	Gross alpha activity (pCi/L)	Calculated gross alpha activity (pCi/L)	Calculated Value of Ra-224 activity (pCi/L)	Ra-228 activity (pCi/L)	Ratio of Ra-224 to Ra-228
80736	13.2	1.01	1.05	78	84.32	-0.65	1.26	-0.52
80737	13.5	1.02	1.05	62	56.13	2.33	0.56	4.17
80742	31.8	1.03	0.05	24.8	11.91	5.57	2.19	2.54
80743	33.0	1.03	0.05	143.8	115.87	8.65	1.43	6.05
84263	33.9	1.98	0.24	22	12.33	4.65	1.8	2.59
84264	25.6	1.89	0.24	16	7.09	3.72	0.9	4.14
84265	38.0	1.92	0.24	31	16.08	6.37	2.2	2.90
84266	33.3	1.90	0.24	24	20.29	4.68	3.6	1.30
84267	28.3	1.93	0.24	34	25.47	7.65	5	1.53
84268	59.9	2.04	0.43	34	22.79	5.59	2.9	1.93
84269	71.6	1.85	0.43	27	17.23	4.61	2.4	1.92
84270	13.7	2.10	0.43	2	2.01	0.29	0.3	0.98
84271	15.4	2.08	0.25	3	0.02	0.99	-0.1	-9.95
84272	17.1	2.16	0.25	14	7.89	3.64	1.4	2.60
84273	18.0	2.18	0.25	16	9.35	4.02	1.6	2.51
84521	47.9	1.90	1.39	36	31.07	4.27	3	1.42
84522	36.6	2.08	1.39	4.2	0.78	0.91	-0.1	-9.06
84523	42.4	1.94	1.39	34	30.24	6.02	5	1.20
84524	48.9	2.05	1.39	28	25.56	3.24	2.6	1.25
84525	42.3	2.02	1.39	19	11.37	3.10	1	3.10
84526	54.5	1.98	1.39	42	36.48	4.98	3.6	1.38
84527	51.3	2.04	1.39	36	33.73	5.49	4.9	1.12
84528	61.2	2.00	1.07	38	40.01	3.02	3.5	0.86
84529	53.3	2.01	1.07	48	38.77	7.07	4.8	1.47
84530	26.0	2.09	1.07	37	24.52	7.62	3.6	2.12
84669	32.2	3.10	4.24	37	28.82	9.65	4.6	2.10
84670	30.9	3.05	4.24	22	19.62	4.97	3.5	1.42
84671	34.6	3.05	4.24	25	23.35	3.48	2.5	1.39
84672	30.8	3.03	4.35	18	18.13	1.62	1.7	0.95
84675	36.3	9.96	5.61	41	44.65	-4.18	6.1	-0.68
84677	79.1	10.19	5.95	17	16.29	4.43	2.6	1.70

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SMA	Certify Baseline Controls (deadline May 1, 2011)	Initiation of Corrective Action	Completion of Corrective Action (Due November 1, 2013 for HPS Due November 1, 2015 for MPS)	Priority[1]	Site Number
R-SMA-0.5	16-Dec-10	12-Sep-12	29-Nov-12	MPS	C-00-020
R-SMA-1	16-May-11	13-Oct-11	—	MPS	C-00-041
R-SMA-1.95	16-Dec-10	1-May-12	—	MPS	00-015
R-SMA-2.05	1-Dec-10	—	—	MPS	00-011(c)
R-SMA-2.3	1-Dec-10	**<TAL**	—	MPS	00-011(e)
R-SMA-2.5	16-Dec-10	—	—	MPS	00-011(a)
B-SMA-0.5	16-Dec-10	30-Oct-13	—	MPS	10-001(a)
			—	MPS	10-001(b)
			—	MPS	10-001(c)
			—	MPS	10-001(d)
			—	MPS	10-004(a)
			—	MPS	10-004(b)
			—	MPS	10-008
			—	MPS	10-009
B-SMA-1	16-Dec-10	22-Oct-13	—	MPS	00-011(d)
ACID-SMA-1.05	1-Dec-10	**<TAL**	—	MPS	00-030(g)
ACID-SMA-2	1-Dec-10	3-Nov-11		MPS	01-002(b)-00
			7-Mar-13	MPS	45-001
			7-Mar-13	MPS	45-002
			7-Mar-13	MPS	45-004
ACID-SMA-2.01	16-Dec-10	—	—	MPS	00-030(f)
ACID-SMA-2.1	1-Dec-10	7-Sep-12	—	MPS	01-002(b)-00
P-SMA-0.3	16-Dec-10	5-Sep-13	16-Sep-13	MPS	00-018(b)
P-SMA-1	1-Dec-10	—	—	**HPS**	73-001(a)
			---	**HPS**	73-004(d)
P-SMA-2	1-Dec-10	---	---	MPS	73-002

[1] Red highlighted priority sites are High Priority Sites that did not meet the corrective action deadline – November 1, 2013

			---	MPS	73-006
P-SMA-2.15	16-Dec-10	---	---	**HPS**	31-001
P-SMA-2.2	16-May-11	---	---	MPS	00-019
P-SMA-3.05	16-Dec-10	22-Oct-13	---	MPS	00-018(a)
LA-SMA-0.85	1-DEC-10	7-OCT-11	---	MPS	03-055(c)
		24-Jun-13	---	MPS	03-055(c)
LA-SMA-0.9	16-Dec-10	---	---	MPS	00-017
			---	MPS	C-00-044
LA-SMA-1	16-Dec-10	30-Apr-12	---	MPS	00-017
			---	MPS	C-00-044
LA-SMA-1.1	16-Dec-10	11-Oct-11	29-Nov-12	MPS	43-001(b2)
LA-SMA-1.25	1-Dec-10	27-Oct-11	---	MPS	C-43-001
		15-Nov-12	---	MPS	C-43-001
LA-SMA-2.1	16-May-11	3-Nov-13	---	**HPS**	01-001(f)
LA-SMA-2.3	16-Dec-10	1-May-12	29-Nov-12	MPS	01-001(b)
LA-SMA-3.1	1-Dec-10	---	---	**HPS**	01-001(e)
			---	**HPS**	01-003(a)
LA-SMA-3.9	16-Dec-10	---	---	**HPS**	01-001(g)
			---	MPS	01-006(a)
LA-SMA-4.1	1-Dec-10	8-Nov-11	---	MPS	01-003(b)
			---	MPS	01-006(b)
LA-SMA-4.2	1-Dec-10	---	---	MPS	01-001(c)
			---	MPS	01-006(c)
			---	MPS	01-006(d)
LA-SMA-5.01	16-Dec-10	—	—	**HPS**	01-001(d)
			—	**HPS**	01-006(h)
LA-SMA-5.02	16-May-11	25-Oct-11	29-Nov-12	HPS	01-003(e)
LA-SMA-5.2	16-May-11	—	—	MPS	01-003(d)
LA-SMA-5.31	16-Dec-10	30-Apr-12	—	MPS	41-002(c)
LA-SMA-5.33	16-Dec-10	30-Apr-12	7-Mar-13	MPS	32-004
LA-SMA-5.35	1-Dec-10	27-Oct-11	—	MPS	C-41-004
LA-SMA-5.361	28-Apr-11	—	—	MPS	32-002(b1) 32-002(b)
			—	MPS	32-002(b2) 32-002(b)

LA-SMA-5.362	28-Apr-11	—	—	MPS	32-003
LA-SMA-5.51	28-Apr-11	21-Aug-13	—	HPS	02-003(a)
			—	HPS	02-003(e)
			—	HPS	02-004(a)
			—	HPS	02-005
			—	HPS	02-006(b)
			—	HPS	02-006(c)
			—	HPS	02-006(d)
			—	HPS	02-006(e)
			—	HPS	02-008(a)
			—	HPS	02-009(b)
			—	HPS	02-011(a)
LA-SMA-5.51	28-Apr-11	21-Aug-13	—	HPS	02-011(b)
			—	HPS	02-011(c)
			—	HPS	02-011(d)
LA-SMA-5.52	28-Apr-11	—	—	HPS	02-003(b)
			—	HPS	02-007
			—	HPS	02-008(c)
LA-SMA-5.53	28-Apr-11	—	—	HPS	02-009(a)
LA-SMA-5.54	28-Apr-11	3-Nov-13	—	HPS	02-009(c)
LA-SMA-5.91	1-Dec-10	31-Oct-11	—	MPS	21-009
			—	MPS	21-021
			29-Nov-12	MPS	21-023(c)
			—	MPS	21-027(d)
LA-SMA-5.92	1-Dec-10	27-Aug-13	—	MPS	21-013(b)
			—	MPS	21-013(g)
			—	MPS	21-018(a)
			—	MPS	21-021
LA-SMA-6.25	1-Dec-10	—	—	MPS	21-021

			—	MPS	21-024(d)
			—	MPS	21-027(c)
LA-SMA-6.27	1-Dec-10	—	—	MPS	21-021
			—	MPS	21-027(c)
LA-SMA-6.3	16-Dec-10	—	—	MPS	21-006(b)
LA-SMA-6.31	16-Dec-10	—	—	MPS	21-027(a)
LA-SMA-6.32	16-Dec-10	—	—	MPS	21-021
LA-SMA-6.34	16-Dec-10	—	—	MPS	21-021
			—	MPS	21-022(h)
LA-SMA-6.36	16-Dec-10	—	—	MPS	21-021
			—	MPS	21-024(a)
LA-SMA-6.38	16-Dec-10	—	—	MPS	21-021
			—	MPS	21-024(c)
LA-SMA-6.395	16-Dec-10	25-Oct-13	—	MPS	21-021
			—	MPS	21-024(j)
LA-SMA-6.5	16-Dec-10	—	—	MPS	21-021
			—	**HPS**	21-024(i)
LA-SMA-9	28-Apr-11	—	—	MPS	26-001
			—	MPS	26-002(a)
			—	MPS	26-002(b)
			—	MPS	26-003
LA-SMA-10.11	16-Dec-10	—	—	MPS	53-002(a)
LA-SMA-10.12	16-May-11	1-May-12	—	MPS	53-008
DP-SMA-0.3	28-Apr-11	1-May-12	—	MPS	21-029
		30-Oct-13	—	MPS	21-029
DP-SMA-0.4	16-Dec-10	26-Oct-13	—	MPS	21-021
DP-SMA-0.6	28-Apr-11	—	—	MPS	21-021
			—	MPS	21-024(l)
DP-SMA-1	16-Dec-10	—	—	MPS	21-011(k)
			—	MPS	21-021
DP-SMA-2	1-Dec-10	—	—	MPS	21-021

			—	MPS	21-024(h)
DP-SMA-2.35	16-Dec-10	30-Oct-13	—	MPS	21-021
			—	MPS	21-024(n)
DP-SMA-3	11-Feb-11	1-May-12	—	MPS	21-013(c)
			—	MPS	21-021
DP-SMA-4	16-Dec-10	—	—	MPS	21-021
S-SMA-0.25	1-Dec-10	20-Oct-11	—	HPS	03-013(a)
			—	HPS	03-052(f)
S-SMA-1.1	16-May-11	2-Nov-11	—	HPS	03-029
S-SMA-2	1-Dec-10	20-Oct-11	—	HPS	03-012(b)
			—	HPS	03-045(b)
			—	HPS	03-045(c)
			29-Nov-12	HPS	03-056(c)
		10-Sep-13	—	HPS	03-012(b)
			—	HPS	03-045(b)
			—	HPS	03-045(c)
			29-Nov-12	HPS	03-056(c)
		—	—	HPS	03-012(b)
			—	HPS	03-045(b)
			—	HPS	03-045(c)
			—	HPS	03-056(c)
S-SMA-2.01	16-Dec-10	2-Nov-11	—	HPS	03-052(b)
		—	—	HPS	03-052(b)
S-SMA-2.8	16-Dec-10	—	—	MPS	03-014(c2)
S-SMA-3.51	16-Dec-10	—	—	HPS	03-009(i)
S-SMA-3.52	16-Dec-10	—	—	HPS	03-021
S-SMA-3.53	16-Dec-10	30-Apr-12	—	HPS	03-014(b2)
		—	—	HPS	03-014(b2)
S-SMA-3.6	1-Dec-10	20-Oct-11	—	HPS	60-007(b)
		13-Aug-13	—	HPS	60-007(b)

S-SMA-3.7	16-Dec-10	—	—	MPS	53-012(e)
S-SMA-3.71	16-Dec-10	—	—	MPS	53-001(a)
S-SMA-3.72	16-Dec-10	—	—	MPS	53-001(b)
S-SMA-3.95	16-May-11	25-Oct-13	—	MPS	20-002(a)
S-SMA-4.1	16-Dec-10	2-Nov-11	20-Aug-13	HPS	53-014
S-SMA-4.5	16-May-11	—	—	MPS	20-002(d)
S-SMA-5	16-May-11	—	—	**HPS**	20-002(c)
S-SMA-5.2	16-Dec-10	—	—	MPS	20-003(c)
S-SMA-5.5	16-May-11	—	—	MPS	20-005
S-SMA-6	16-May-11	2-Nov-11	—	**HPS**	72-001
CDB-SMA-0.15	1-Dec-10	—	—	MPS	04-003(a)
			—	MPS	04-004
CDB-SMA-0.25	1-Dec-10	2-Nov-11	—	MPS	46-004(c2)
			—	MPS	46-004(e2)
		22-Oct-13	—	MPS	46-004(c2)
			—	MPS	46-004(e2)
CDB-SMA-0.55	12-Jan-11	25-Oct-13	—	MPS	46-004(g)
			—	MPS	46-004(m)
			—	MPS	46-004(s)
			—	MPS	46-006(f)
CDB-SMA-1	12-Jan-11	30-Apr-12	—	MPS	46-003(c)
			—	MPS	46-004(d2)
			—	MPS	46-004(f)
			—	MPS	46-004(t)
			—	MPS	46-004(w)
			—	MPS	46-008(g)
			—	MPS	46-009(a)
			29-Nov-12	MPS	C-46-001
CDB-SMA-1.15	1-Dec-10	—	—	MPS	46-004(b)
			—	MPS	46-004(y)
			—	MPS	46-004(z)

			—	MPS	46-006(d)
CDB-SMA-1.35	1-Dec-10	—	—	MPS	46-004(a2)
			—	MPS	46-004(u)
			—	MPS	46-004(v)
			—	MPS	46-004(x)
			—	MPS	46-006(d)
			—	MPS	46-008(f)
CDB-SMA-1.54	1-Dec-10	—	—	MPS	46-004(h)
			—	MPS	46-004(q)
			—	MPS	46-006(d)
CDB-SMA-1.55	1-Dec-10	—	—	MPS	46-003(e)
CDB-SMA-1.65	1-Dec-10	—	—	MPS	46-003(b)
CDB-SMA-4	16-Dec-10	27-Aug-13	—	**HPS**	54-017
			—	**HPS**	54-018
			—	**HPS**	54-020
M-SMA-1	1-Dec-10	2-Nov-11	—	MPS	03-050(a)
			—	MPS	03-054(e)
		13-Aug-13	—	MPS	03-050(a)
			—	MPS	03-054(e)
M-SMA-1.2	16-Dec-10	30-Oct-13	—	MPS	03-049(a)
M-SMA-1.21	16-Dec-10	—	—	MPS	03-049(e)
M-SMA-1.22	11-Feb-11	1-May-12	—	MPS	03-045(h)
M-SMA-3	16-May-11	13-Aug-13	—	MPS	48-001
			—	MPS	48-005
			—	MPS	48-007(c)
M-SMA-3.1	16-Dec-10	—	—	MPS	48-001
			—	MPS	48-007(b)
M-SMA-3.5	16-May-11	—	—	MPS	48-001
			—	**HPS**	48-003
M-SMA-4	1-Dec-10	31-Oct-11	—	MPS	48-001

			—	MPS	48-005
			29-Nov-12	MPS	48-007(a)
			29-Nov-12	MPS	48-007(d)
			29-Nov-12	MPS	48-010
M-SMA-5	16-May-11	—	—	MPS	42-001(a)
			—	MPS	42-001(b)
			—	MPS	42-001(c)
			—	MPS	42-002(a)
			—	MPS	42-002(b)
M-SMA-6	16-Dec-10	15-Nov-12	—	MPS	35-016(h)
M-SMA-7	16-Dec-10	22-Aug-12	—	MPS	35-016(g)
M-SMA-7.9	16-Dec-10	25-Oct-13	—	**HPS**	50-006(d)
M-SMA-9.1	11-Feb-11	—	—	MPS	35-016(f)
M-SMA-10	16-Dec-10	13-Aug-13	—	MPS	35-008
			—	MPS	35-014(e)
M-SMA-10.01	16-Dec-10	15-Nov-11	—	MPS	35-016(e)
M-SMA-10.3	16-May-11	24-Oct-11	30-Oct-13	HPS	35-014(e2)
			30-Oct-13	HPS	35-016(i)
M-SMA-11.1	16-Dec-10	—	—	MPS	35-016(o)
M-SMA-12	28-Apr-11	—	—	MPS	35-016(p)
M-SMA-12.5	1-Dec-10	—	—	MPS	05-005(b)
			—	MPS	05-006(c)
M-SMA-12.6	16-May-11	22-Oct-13	—	MPS	05-004
M-SMA-12.7	16-Dec-10	—	—	MPS	05-002
			—	MPS	05-005(a)
			—	MPS	05-006(b)
			—	MPS	05-006(e)
M-SMA-12.8	16-Dec-10	—	—	MPS	05-001(a)
			—	MPS	05-002
M-SMA-12.9	16-Dec-10	—	—	MPS	05-001(b)
			—	MPS	05-002

M-SMA-12.92	1-Dec-10	—	—	MPS	00-001
M-SMA-13	16-Dec-10	<TAL	—	MPS	05-001(c)
Pratt-SMA-1.05	16-Dec-10	30-Oct-13	—	**HPS**	35-003(h)
			—	**HPS**	35-003(p)
			—	**HPS**	35-003(r)
			—	**HPS**	35-004(h)
			—	**HPS**	35-009(d)
			—	**HPS**	35-016(k)
			—	**HPS**	35-016(l)
			—	**HPS**	35-016(m)
T-SMA-1	16-Dec-10	21-Oct-11	—	**HPS**	50-006(a)
			—	**HPS**	50-009
		—	—	**HPS**	50-006(a)
		—	31-Oct-13	HPS	50-009
T-SMA-2.5	16-Dec-10	—	—	MPS	35-014(g3)
T-SMA-2.85	16-Dec-10	21-Aug-13	—	MPS	35-014(g)
			—	MPS	35-016(n)
T-SMA-3	16-Dec-10	19-Oct-12	—	MPS	35-016(b)
T-SMA-4	16-Dec-10	25-Oct-13	—	MPS	35-004(a)
			—	MPS	35-009(a)
			—	MPS	35-016(c)
			—	MPS	35-016(d)
T-SMA-5	16-Dec-10	—	—	MPS	35-004(a)
			—	MPS	35-009(a)
			—	MPS	35-016(a)
			—	MPS	35-016(q)
T-SMA-6.8	16-Dec-10	—	—	MPS	35-010(e)
T-SMA-7	16-Dec-10	—	—	MPS	04-003(b)
T-SMA-7.1	16-Dec-10	—	—	MPS	04-001
			—	MPS	04-002

2M-SMA-1	1-Dec-10	18-Oct-11	—	MPS	03-010(a)
		19-Oct-12	—	MPS	03-010(a)
2M-SMA-1.42	12-Jan-11	10-Nov-11	—	MPS	06-001(a)
2M-SMA-1.43	1-Dec-10	21-Aug-13	—	MPS	22-014(a)
			—	MPS	22-015(a)
2M-SMA-1.44	12-Jan-11	30-Apr-12	—	MPS	06-001(b)
2M-SMA-1.45	12-Jan-11	1-May-12	—	MPS	06-006
2M-SMA-1.5	1-Dec-10	—	—	MPS	22-014(b)
2M-SMA-1.65	12-Jan-11	1-May-12	—	MPS	40-005
2M-SMA-1.67	28-Apr-11	—	—	MPS	06-003(h)
2M-SMA-1.7	12-Jan-11	3-Nov-11	—	MPS	03-055(a)
2M-SMA-1.8	12-Jan-11	3-Nov-11	—	MPS	03-001(k)
2M-SMA-1.9	12-Jan-11	23-Aug-12	—	MPS	03-003(a)
2M-SMA-2	12-Jan-11	3-Nov-11	—	MPS	03-050(d)
			—	MPS	03-054(b)
		24-Sep-13	—	MPS	03-050(d)
			—	MPS	03-054(b)
2M-SMA-2.2	1-Dec-10	3-Nov-11	—	MPS	03-003(k)
2M-SMA-3	12-Jan-11	16-Aug-13	—	MPS	07-001(a)
			—	MPS	07-001(b)
			—	MPS	07-001(c)
			—	MPS	07-001(d)
2M-SMA-2.5	12-Jan-11	<TAL	—	MPS	40-001(c)
3M-SMA-0.2	1-Dec-10	—	—	MPS	15-010(b)
3M-SMA-0.4	12-Jan-11	27-Aug-13	—	MPS	15-006(b)
3M-SMA-0.5	12-Jan-11	—	—	MPS	15-006(c)
			—	MPS	15-009(c)
3M-SMA-0.6	12-Jan-11	—	—	MPS	15-008(b)
3M-SMA-2.6	28-Apr-11	—	—	MPS	36-008
			—	MPS	C-36-003
3M-SMA-4	12-Jan-11	—	—	MPS	18-002(b)
			—	MPS	18-003(c)

			—	MPS	18-010(f)
PJ-SMA-1.05	1-Dec-10	3-Nov-13	—	MPS	09-013
PJ-SMA-2	1-Dec-10	—	—	MPS	09-009
PJ-SMA-3.05	11-Feb-11	30-Apr-12	—	MPS	09-004(o)
PJ-SMA-4.05	1-Dec-10	30-Oct-13	—	MPS	09-004(g)
PJ-SMA-5	1-Dec-10	15-Nov-12	—	MPS	22-015(c)
PJ-SMA-5.1	12-Jan-11	31-Oct-11	—	MPS	22-010(b)
			—	MPS	22-016
PJ-SMA-6	1-Dec-10	—	—	MPS	40-010
PJ-SMA-7	1-Dec-10	—	—	MPS	40-006(c)
PJ-SMA-8	1-Dec-10	—	—	MPS	40-006(b)
PJ-SMA-9	1-Dec-10	—	—	MPS	40-009
PJ-SMA-10	12-Jan-11	—	—	MPS	40-006(a)
PJ-SMA-11	12-Jan-11	30-Oct-13	—	MPS	40-003(a)
PJ-SMA-11.1	12-Jan-11	30-Oct-13	—	MPS	40-003(b)
PJ-SMA-13	28-Apr-11	—	—	MPS	18-002(a)
PJ-SMA-13.7	12-Jan-11	1-May-12	—	MPS	18-010(b)
PJ-SMA-14	28-Apr-11	—	—	MPS	54-004
PJ-SMA-14.2	1-Dec-10	—	—	MPS	18-012(b)
PJ-SMA-14.3	1-Dec-10	—	—	MPS	18-003(e)
PJ-SMA-14.4	28-Apr-11	—	—	MPS	18-010(d)
PJ-SMA-14.6	1-Dec-10	—	—	MPS	18-010(e)
PJ-SMA-14.8	12-Jan-11	<TAL	—	MPS	18-012(a)
PJ-SMA-16	1-Dec-10	<TAL	—	MPS	27-002
PJ-SMA-17	1-Dec-10	5-Sep-13	—	HPS	54-018
PJ-SMA-18	1-Dec-10	3-Sep-13	—	MPS	54-014(d)
			—	**HPS**	54-017
PJ-SMA-19	1-Dec-10	12-Sep-13	—	**HPS**	54-013(b)
			—	**HPS**	54-017
			—	**HPS**	54-020
PJ-SMA-20	16-Dec-10	1-May-12	25-Oct-13	HPS	54-017
STRM-SMA-1.05	1-Dec-10	17-Oct-11	—	MPS	08-009(f)
		10-Sep-13	—	MPS	08-009(f)

STRM-SMA-1.5	1-Dec-10	27-Aug-12	—	MPS	08-009(d)
STRM-SMA-4.2	1-Dec-10	10-Nov-11	—	MPS	09-008(b)
STRM-SMA-5.05	1-Dec-10	31-Oct-11	—	MPS	09-013
CDV-SMA-1.2	12-Jan-11	**<TAL**	—	MPS	16-017(b)-99
			—	MPS	16-029(k)
CDV-SMA-1.3	12-Jan-11	25-Oct-13	—	MPS	16-017(a)-99
			—	MPS	16-026(m)
CDV-SMA-1.4	12-Jan-11	18-Oct-12	—	MPS	16-020
			—	MPS	16-026(l)
			—	MPS	16-028(c)
			29-Nov-12	MPS	16-030(c)
CDV-SMA-1.45	12-Jan-11	30-Apr-12	—	MPS	16-026(i)
CDV-SMA-1.7	12-Jan-11	25-Oct-13	—	MPS	16-019
CDV-SMA-2	16-May-11	20-Aug-13	—	MPS	16-021(c)
CDV-SMA-2.3	12-Jan-11	—	—	MPS	13-001
			—	MPS	13-002
			—	MPS	16-003(n)
			—	MPS	16-003(o)
			—	MPS	16-029(h)
			—	MPS	16-031(h)
CDV-SMA-2.41	12-Jan-11	1-May-12	—	MPS	16-018
CDV-SMA-2.42	12-Jan-11	26-Aug-13	—	MPS	16-010(b)
CDV-SMA-2.5	12-Jan-11	<TAL	—	MPS	16-010(c)
			—	MPS	16-010(d)
			—	MPS	16-028(a)
CDV-SMA-2.51	12-Jan-11	25-Oct-13	—	MPS	16-010(i)
CDV-SMA-3	11-Feb-11	30-Apr-12	—	MPS	14-009
CDV-SMA-4	11-Feb-11	—	—	MPS	14-010
CDV-SMA-6.01	11-Feb-11	—	—	MPS	14-001(g)
			—	MPS	14-006
CDV-SMA-6.02	11-Feb-11	31-Oct-11	—	MPS	14-002(c)

			—	MPS	14-002(d)
			—	MPS	14-002(e)
CDV-SMA-7	12-Jan-11	30-Oct-13	—	MPS	15-008(d)
CDV-SMA-8	12-Jan-11	—	—	MPS	15-011(c)
CDV-SMA-8.5	12-Jan-11	—	—	MPS	15-014(a)
CDV-SMA-9.05	12-Jan-11	—	—	MPS	15-007(b)
F-SMA-2	12-Jan-11	1-May-12	—	MPS	36-004(c)
PT-SMA-0.5	28-Apr-11	1-May-12	—	MPS	15-009(e)
			—	MPS	C-15-004
PT-SMA-1	28-Apr-11	30-Apr-12	—	MPS	15-004(f)
			—	MPS	15-008(a)
PT-SMA-1.7	28-Apr-11	18-Oct-12	—	MPS	15-006(a)
PT-SMA-2	28-Apr-11	—	—	MPS	15-008(f)
			—	MPS	36-003(b)
			—	MPS	36-004(e)
PT-SMA-2.01	28-Apr-11	30-Apr-12	—	MPS	C-36-001
			—	MPS	C-36-006(e)
PT-SMA-3	1-Dec-10	—	—	MPS	36-004(a)
			—	MPS	36-006
PT-SMA-4.2	1-Dec-10	—	—	MPS	36-004(d)
W-SMA-1	1-Dec-10	8-Nov-11	—	MPS	16-017(j)-99
			—	MPS	16-026(c2)
			—	MPS	16-026(v)
W-SMA-1.5	12-Jan-11	8-Nov-11	—	MPS	16-026(b2)
			—	MPS	16-028(d)
W-SMA-2.05	12-Jan-11	1-May-12	—	MPS	16-028(e)
W-SMA-3.5	12-Jan-11	—	—	MPS	16-026(y)
W-SMA-4.1	12-Jan-11	—	—	MPS	16-003(a)
W-SMA-5	12-Jan-11	18-Sep-12	—	MPS	16-001(e)
			—	MPS	16-003(f)
			—	MPS	16-026(b)

			—	MPS	16-026(c)
			—	MPS	16-026(d)
			—	MPS	16-026(e)
W-SMA-6	12-Jan-11	—	—	MPS	11-001(c)
W-SMA-7	12-Jan-11	—	—	MPS	16-029(e) 16-026(h2)
W-SMA-7.8	12-Jan-11	—	—	MPS	16-031(a)
W-SMA-7.9	12-Jan-11	—	—	MPS	16-006(c)
W-SMA-8	12-Jan-11	25-Oct-13	—	MPS	16-016(g)
			—	MPS	16-028(b)
W-SMA-8.7	12-Jan-11	25-Oct-13	—	MPS	13-001
			—	MPS	13-002
			—	MPS	16-004(a)
			—	MPS	16-026(j2)
			—	MPS	16-029(h)
			—	MPS	16-035
W-SMA-8.71	12-Jan-11	1-May-12	—	MPS	16-004(c)
W-SMA-9.05	12-Jan-11	**<TAL**	—	MPS	16-030(g)
W-SMA-9.5	1-Dec-10	—	—	MPS	11-012(c)
W-SMA-9.7	12-Jan-11	30-Oct-13	—	MPS	11-011(a)
			—	MPS	11-011(b)
W-SMA-9.8	12-Jan-11	—	—	MPS	11-005(c)
W-SMA-9.9	12-Jan-11	30-Apr-12	—	MPS	11-006(b)
W-SMA-10	12-Jan-11	1-May-12	—	MPS	11-002
			—	MPS	11-003(b)
			—	MPS	11-005(a)
			—	MPS	11-005(b)
			—	MPS	11-006(c)
			—	MPS	11-006(d)
			—	MPS	11-011(d)
W-SMA-11.7	12-Jan-11	1-May-12	—	MPS	49-008(c)

W-SMA-12.05	12-Jan-11	—	—	MPS	49-001(g)
W-SMA-14.1	28-Apr-11	17-Oct-11	—	MPS	15-004(h)
			—	MPS	15-014(l)
W-SMA-15.1	12-Jan-11	1-May-12	—	MPS	49-005(a)
A-SMA-1.1	1-Dec-10	—	—	MPS	39-004(a)
			—	MPS	39-004(d)
A-SMA-2	11-Feb-11	22-Oct-13	—	MPS	39-004(b)
			—	MPS	39-004(e)
A-SMA-2.5	11-Feb-11	—	—	MPS	39-010
A-SMA-2.7	11-Feb-11	27-Oct-11	29-Nov-12	MPS	39-002(c)
			—	MPS	39-008
A-SMA-2.8	11-Feb-11	—	—	MPS	39-001(b)
A-SMA-3	1-Dec-10	29-Aug-13	—	MPS	39-002(b)
			—	MPS	39-004(c)
A-SMA-3.5	11-Feb-11	<TAL	—	MPS	39-006(a)
A-SMA-4	11-Feb-11	—	—	MPS	33-010(d)
A-SMA-6	11-Feb-11	4-Sep-13	—	MPS	33-004(k)
			—	MPS	33-007(a)
			—	MPS	33-010(a)
CHQ-SMA-0.5	11-Feb-11	—	—	MPS	33-004(g)
			—	MPS	33-007(c)
			—	MPS	33-009
CHQ-SMA-1.01	11-Feb-11	—	—	MPS	33-002(d)
CHQ-SMA-1.02	11-Feb-11	1-May-12	—	MPS	33-004(h)
			—	MPS	33-008(c)
			—	MPS	33-011(d)
			—	MPS	33-015
		3-Nov-13	—	MPS	33-004(h)
			—	MPS	33-008(c)
			—	MPS	33-011(d)
			—	MPS	33-015

CHQ-SMA-1.03	11-Feb-11	27-Aug-12	—	MPS	33-008(c)
			—	MPS	33-012(a)
			—	MPS	33-017
			—	MPS	C-33-001
			—	MPS	C-33-003
CHQ-SMA-2	11-Feb-11	27-Aug-12	—	MPS	33-004(d)
			—	MPS	33-007(c)
			—	MPS	C-33-003
CHQ-SMA-3.05	11-Feb-11	23-Oct-13	—	MPS	33-010(f)
CHQ-SMA-4	11-Feb-11	—	—	MPS	33-011(e)
CHQ-SMA-4.1	11-Feb-11	22-Oct-13	—	MPS	33-016
CHQ-SMA-4.5	11-Feb-11	5-Sep-13	—	MPS	33-011(b)
CHQ-SMA-5.05	1-Dec-10	—	—	MPS	33-007(b)
CHQ-SMA-6	11-Feb-11	29-Aug-13	—	MPS	33-004(j)
			—	MPS	33-006(a)
			—	MPS	33-007(b)
			—	MPS	33-010(c)
			—	MPS	33-010(g)
			—	MPS	33-010(h)
			—	MPS	33-014
CHQ-SMA-7.1	11-Feb-11	—	—	MPS	33-010(g)

2014 IP Stormwater Monitoring Implementation Plan

The IP monitoring year will be from April 1, 2014 to November 30, 2014.

Work Orders

a) Sampler activation will be conducted so that samplers will be activated starting in March, 2014.
b) Weather permitting; samplers will be stood-down for the winter beginning min-November, 2014, to be completed by the end of December 2014.
c) Work orders authorize and document all activities conducted to fulfill requirements of the IP and will be issued only by Associate Directorate for Environmental Programs (ADEP).
d) Work orders for routine monitoring activities are generated with a blanket field team lead (FTL) memo authorizing work orders at the beginning of the monitoring year. These include:
    a. Sampler inspections based on triggering precipitation and flow potential at each SMA - Table-1
    b. Sampler inspections based on time period with no inspections
    c. Sampler inspections during battery preventative maintenance
    d. Sampler inspections to investigate samplers that attempt but fail to collect water.
    e. Sampler inspections following storms with more than 1.5" precipitation in 24 hours that do not generate measurable discharge at SMAs with high flow potential
    f. Approximately 100 solar panels will be installed on SMA samplers to boast battery voltage and perhaps reduce battery replacement times during the year.

Precipitation

a) Samplers are associated to rain gages (RG) using the Thiessen polygon method – Table-1
b) Precipitation measurements (along with flow potential at a sampler described below) at the RG for each Thiessen polygon will be used to determine if samplers within that polygon require inspection based on a rain event.

> Part I.D.3 The Permittees may take meteorological information from the nearest meteorological tower or automated rain gage.

Routes

a) Each Sampler is assigned to a "Route" by the subcontractor – Table-1
b) Work orders include the Route to facilitate efficient distribution of work orders, efficient travel within a route, and equitable distribution of work between crews.

Expected Discharge

a) A flow potential is assigned to each Site Monitoring Area (SMA) based on its potential to generate measurable discharge
b) Samplers are inspected based on precipitation at the associated RG and flow potential.
c) Samplers at all SMAs are inspected if rainfall at the associated RG exceeds 0.25"/30min intensity.

Sampler Activation

a) Sampler Installation, Activation, and Verification at all SMAs in corrective action monitoring (CAM) and extended baseline monitoring (MEx) by April 30, 2014, on a schedule determined by the subcontractor.
    a. SMAs in baseline monitoring as of April 1, 2014, are identified in Table-1: SMA Stage = MEx

b. SMAs in corrective action monitoring as of April 1, 2014, are identified in Table-1: SMA Stage = CAM3 (for High Priority Sites (HPS)) or CAM5 (for Moderate Priority Sites (MPS)).
c. SMAs in sampling for No-Exposure as of April 1, 2014, are identified in Table 1: SMA Stage = Corrective Action Complete with certificate of no-exposure (CACompC)

b) SMA in corrective action planning as of April 1, 2014, are identified in Table -1 where the SMA Stage = CAI or CAI2. Following certification of installation of corrective action controls or measures during the monitoring year, the SMA stage will be updated to CAM3, CAM5, or CACompC on a case by case basis. Monitoring plans for these SMAs will be entered into EIM and samplers will be installed and activated.
c) Samplers will not be installed or activated at SMAs where sampling is complete and no further monitoring is required. These SMAs will be identified as being in one of four stages:
    a. where corrective action is complete through certification of results below TALs after installation of enhanced controls (CACompA),
    b. total retention (CACompB),
    c. corrective action complete under the consent order (CACompD), or
    d. results below TALs during baseline monitoring (BCComp).
d) Each type of SMA compliance stage is identified and described in Table-2.

Sampler Inspection Frequency

Routine sampler inspections will occur for the following reasons:

a) Rain event exceeding the 24-hour precipitation total or 30-minute maximum intensity triggering threshold given in Table-1,
b) Storm with more than 1.5" precipitation in 24 hours that do not generate measurable discharge at SMAs with high flow potential,
c) Preventative maintenance battery replacement every 90 days , unless newly installed solar panels allow for longer replacement time intervals.
d) Sampler is triggered without measurable discharge, or
e) No inspection within last 30 days.

To ensure inspections are performed at least monthly, once an inspection is performed, a new inspection work order is generated with a due date 30 days later. When any of reasons a – d occur, a list of locations requiring inspections is provided to notify the field crew to use the outstanding work order.

Number of samples to fulfill monitoring requirements

a) Collect 1 confirmation sample to fulfill baseline confirmation monitoring at locations where no samples have been collected (Sampling Event = MEx).
b) Collect 2 confirmation samples to fulfill Corrective Action following certification of installation of enhanced corrective action controls (Sampling Event = CAM3/5 Sample 1 &CAM3/5 Sample 2).
c) Collect 1 informational sample to fulfill Corrective Action following certification of installation of measures to totally eliminate exposure of pollutants to stormwater (Sampling Event = CACompC)

Part I.E.5(d) If, during any period in which 2 confirmation samples are required, only one confirmation sample could be collected from a measurable storm event, compliance with applicable target action levels for that particular Site or Sites will be determined by the single confirmation sample result.

d) Collect 0 confirmation samples to fulfill Corrective Action following certification of installation of measures to totally retain discharges of stormwater.
e) Collect 0 confirmation samples to fulfill Corrective Action following receipt of Certificate of Completion under NMED's Consent Order.
f) Collect 2 confirmation samples if Sites for which monitoring has ceased exhibit signs of contaminated runoff.

Removing Samplers following sample collection

a) Remove sampler after first set of validated "fully-compliant" analytical results are received at locations in baseline monitoring
b) Remove sampler after second set of validated "fully-compliant" analytical results received at locations in corrective action confirmation monitoring of enhanced controls.
c) Remove sampler after first informational sample collected.
d) Remove sampler if Certificate of Completion received from NMED for all sites within an SMA

Analytes Monitored

a) Monitor all IP Appendix B suites during baseline monitoring. Table-8 includes all applicable Parameters and Analysis Groups
b) Monitor only analytes with TAL exceedances following installation of enhanced CA controls unless erosion is occurring at the SMA. If erosion is occurring then reinitiate monitoring all IP Appendix B suites.
c) Monitor only analytes with TAL exceedances following installation of measures to totally eliminate exposure of pollutants to stormwater for 1 informational sample unless erosion is occurring at the SMA. If erosion is occurring then reinitiate monitoring all IP Appendix B suites.
d) If copper or zinc is monitored then include the BLM suite listed in Table-8 in the EIM Sampling Plan.
e) The BLM suite will include temperature using the Hobo data logger in a sacrificial sample bottle in selected sampling locations.

> Part I.E.5.(a) If installation of control measures at a particular Site does not involve soil disturbance, the Permittees may choose to monitor only those pollutants for which previous monitoring data, including samples collected under the 2005 Federal Facility Compliance Agreement (FFCA), demonstrates an exceedance of the applicable target action levels as listed in Section C of this Permit.

HPS SMAs

a) SMAs associated with High Priority Sites are provided in Table-3
b) If a sample at a HPS SMA was collected prior to September 30, 2012 then per E.1(d) Permittee must certify completion of corrective action at the HPS by October 31, 2014
c) If a sample collects at a HPS SMA after September 30, 2012 then per E.1(d) Permittee must certify completion of corrective action within 1 year of the first successful confirmation sampling event.
d) Deadlines for completion of corrective action are listed in Table-3.

Establishing Sample Collection Date

a) Confirmation samples are collected on day 0
b) The first day eligible for collection of a 2nd confirmation sample is day 15, and is noted on the work order.

c) Table-4 provides recommended actions for delaying or shutting down samplers following the collection of the 1st confirmation sample when 2 confirmation samples are required.
d) Samplers collecting analytes with 7-day holding time are noted on work order

Establishing Minimum/Maximum Volumes for Confirmation Sample

a) Minimum volumes are volumes for each analytical suite sufficient to perform all required analyses and obtain detection limits below Permit required minimum quantification levels (MQLs) or Target Action Levels (TALs)
b) Maximum volumes are volumes for each analytical suite to prevent generation of waste.
c) Table-5 provides maximum and minimum volumes for each IP analytical suite.

Part III.C. 5: Monitoring must be conducted according to test procedures approved under 40 CFR Part 136.

Establish Bottle Configuration

a) Allowed bottle types in Table-5
b) Allowed lid types in Table-5
c) Bottle configuration in 12-bottle carousel (12c) and 24-bottle carousel (24c) samplers
    a. "12c- 6 glass/6 poly" if analysis of organic compounds including dioxins, semivolatile compounds, pesticides PCBs or high explosives is required
    b. "24c- 24 1L poly wedge" if analysis of inorganic compounds including radionuclides, metals, and cyanide is required.

Establish ISCO Programming and Configuration

a) Work orders indicate "Time with Toggle and Reset"
b) ISCO setup (3700) and operation is presented in EP-DIV-SOP-10008
c) Configuration (3700) Table-6
d) Program (3700) Table-7

Sampler Maintenance

a) Follow-on maintenance following inspection in presented in EP-DIV-SOP-10008
b) Maintenance during inspection is presented inEP-DIV-SOP-10013

Part 1.G.2 Adverse weather events shall be documented and maintained with the SDPPP. Adverse weather conditions include dangerous weather-related events (e.g., flooding, wildfires,

Documenting inspection delays

a) Red flag conditions
b) Access denied
c) Adverse weather
d) Lightening stand-down
e) Endangered species restrictions

Training for inspectors for ISCO Operation, Inspection and Sample Retrieval will take place in June

Establish ISCO actuator trip level

a) Trip level set by field crew during ISCO Setup EP-DIV-SOP-10008
b) Trip level verified by second party during ISCO Verification EP-DIV-SOP-10008
c) Verified trip levels published on each work order

Documentation of Preservation and Filtration

a) Date/time/initials of initiation of cooling EP-DIV-SOP-10013
b) Date/time/initials of initiation of filtration EP-DIV-SOP-10013
c) Date/time/initials of initiation of chemical preservation EP-DIV-SOP-10013

Condition Resulting in Update of Sample Usage Code from compliance (COMP) to investigation (INV)

a. Holding time exceeded
b. Incomplete sample volume
c. Non-representative sample
d. Sample collected less than 15 days after last confirmation sample
e. Sample collected >1 hr following beginning of discharge

Part I.D.3. Grab samples shall be taken when discharge occurs. Samples must be collected beginning within the first 30 minutes of (or as soon after as practical, but beginning no later than 1 hour after) a measurable storm event. Samples shall not be used if the collected volume of sample is insufficient to perform all required analyses. Samples from the same SMA shall be at least 15 days apart.

Table-1

SMA Flow Potential and Triggers for Sampler Inspection

SMA	Flow Potential	24Hr Precip Trigger	30 Min Max Intensity Trigger	Rain Gage	Route	Monitoring Status	SMA Stage
2M-SMA-1	RG121.9	H	0.25	0.1	2	n/a	CAI2
2M-SMA-1.42	RG-TA-06	NF-L	1.5	0.25	5	Collect 2 Samples	CAM5
2M-SMA-1.43	RG-TA-06	NF	1.5	0.25	5	n/a	CAI
2M-SMA-1.44	RG-TA-06	NF	1.5	0.25	5	Collect Sample 2	CAM5
2M-SMA-1.45	RG-TA-06	L-M	1.0	0.25	5	Collect 2 Samples	CAM5
2M-SMA-1.5	RG-TA-06	L	1.0	0.25	5	Collect 1 Sample	MEx
2M-SMA-1.65	RG-TA-06	NF	1.5	0.25	5	Collect Sample 2	CAM5
2M-SMA-1.67	RG-TA-06	L	1.0	0.25	5	Collect 1 Sample	MEx
2M-SMA-1.7	RG-TA-06	H	0.25	0.1	2	Collect 2 Samples	CAM5
2M-SMA-1.8	RG-TA-06	H	0.25	0.1	2	n/a	CAI
2M-SMA-1.9	RG121.9	M	0.75	0.2	2	n/a	CAI
2M-SMA-2	RG121.9	H	0.25	0.1	2	n/a	CAI2
2M-SMA-2.2	RG121.9	H	0.25	0.1	2	n/a	CAI
2M-SMA-2.5	RG-TA-06	NF	1.5	0.25	5	n/a	BCComp
2M-SMA-3	RG-TA-06	M	0.75	0.2	5	n/a	CAI
3M-SMA-0.2	RG-TA-06	NF	1.5	0.25	5	Collect 1 Sample	MEx
3M-SMA-0.4	RG262.4	L	1.0	0.25	5	n/a	CAI
3M-SMA-0.5	RG262.4	M	0.75	0.2	5	Collect 1 Sample	MEx
3M-SMA-0.6	RG245.5	M	0.75	0.2	5	Collect 1 Sample	MEx
3M-SMA-2.6	RG245.5	L-M	1.0	0.25	2	Collect 1 Sample	MEx
3M-SMA-4	RG245.5	M	0.75	0.2	2	Collect 1 Sample	MEx
ACID-SMA-1.05	RG055.5	L	1.0	0.25	2	n/a	BCComp
ACID-SMA-2	RG055.5	H	0.25	0.1	2	n/a	CAI
ACID-SMA-2.01	RG055.5	NF-L	1.5	0.25	2	Collect 1 Sample	MEx
ACID-SMA-2.1	RG055.5	H	0.25	0.1	2	n/a	CAI
A-SMA-1.1	RG267.4	M	0.75	0.2	4	Collect 1 Sample	MEx
A-SMA-2	RG267.4	M	0.75	0.2	4	n/a	CAI
A-SMA-2.5	RG265	NF	1.5	0.25	4	Collect 1 Sample	MEx
A-SMA-2.7	RG265	NF-L	1.5	0.25	4	Collect Sample 2	CAM5
A-SMA-2.8	RG265	NF	1.5	0.25	4	Collect 1 Sample	MEx
A-SMA-3	RG265	H	0.25	0.1	4	n/a	CAI
A-SMA-3.5	RG340	NF	1.5	0.25	4	n/a	BCComp
A-SMA-4	RG340	L	1.0	0.25	4	Collect 1 Sample	MEx
A-SMA-6	RG340	M	0.75	0.2	4	n/a	CAI
B-SMA-0.5	RG-TA-53	L	1.0	0.25	2	n/a	CAI
B-SMA-1	RG055.5	M	0.75	0.2	2	n/a	CAI
CDB-SMA-0.15	RG200.5	L-M	1.0	0.25	3	Collect 1 Sample	MEx
CDB-SMA-0.25	RG245.5	L	1.0	0.25	3	n/a	CAI2
CDB-SMA-0.55	RG245.5	L	1.0	0.25	3	n/a	CAI
CDB-SMA-1	RG245.5	L	1.0	0.25	3	Collect Sample 2	CAM5
CDB-SMA-1.15	RG245.5	L	1.0	0.25	3	Collect 1 Sample	MEx
CDB-SMA-1.35	RG245.5	L	1.0	0.25	3	Collect 1 Sample	MEx
CDB-SMA-1.54	RG245.5	M	0.75	0.2	3	Collect 1 Sample	MEx
CDB-SMA-1.55	RG245.5	NF	1.5	0.25	3	Collect 1 Sample	MEx

SMA	Flow Potential	24Hr Precip Trigger	30 Min Max Intensity Trigger	Rain Gage	Route	Monitoring Status	SMA Stage
CDB-SMA-1.65	RG245.5	L	1.0	0.25	3	Collect 1 Sample	MEx
CDB-SMA-4	RG-TA-54	H	0.25	0.1	3	n/a	CAI
CDV-SMA-1.2	RG253	L	1.0	0.25	4	n/a	BCComp
CDV-SMA-1.3	RG253	L	1.0	0.25	4	n/a	CAI
CDV-SMA-1.4	RG253	M	0.75	0.2	4	n/a	CAI
CDV-SMA-1.45	RG253	L	1.0	0.25	4	Collect 2 Samples	CAM5
CDV-SMA-1.7	RG253	L-M	1.0	0.25	4	n/a	CAI
CDV-SMA-2	RG257	L-M	1.0	0.25	4	n/a	CAI
CDV-SMA-2.3	RG257	H	0.25	0.1	4	Collect 1 Sample	MEx
CDV-SMA-2.41	RG257	L	1.0	0.25	4	n/a	CAI
CDV-SMA-2.42	RG257	M	0.75	0.2	4	n/a	CAI
CDV-SMA-2.5	RG257	H	0.25	0.1	4	n/a	BCComp
CDV-SMA-2.51	RG257	M	0.75	0.2	4	n/a	CAI
CDV-SMA-3	RG257	NF-L	1.5	0.25	5	Collect 2 Samples	CAM5
CDV-SMA-4	RG257	L	1.0	0.25	5	Collect 1 Sample	MEx
CDV-SMA-6.01	RG257	L-M	1.0	0.25	5	Collect 1 Sample	MEx
CDV-SMA-6.02	RG257	NF	1.5	0.25	5	Collect Sample 2	CAM5
CDV-SMA-7	RG257	M	0.75	0.2	5	n/a	CAI
CDV-SMA-8	RG262.4	M	0.75	0.2	5	Collect 1 Sample	MEx
CDV-SMA-8.5	RG262.4	NF	1.5	0.25	5	Collect 1 Sample	MEx
CDV-SMA-9.05	RG262.4	NF-L	1.5	0.25	5	Collect 1 Sample	MEx
CHQ-SMA-0.5	RG340	L-M	1.0	0.25	4	Collect 1 Sample	MEx
CHQ-SMA-1.01	RG340	NF	1.5	0.25	4	Collect 1 Sample	MEx
CHQ-SMA-1.02	RG340	L-M	1.0	0.25	4	n/a	CAI2
CHQ-SMA-1.03	RG340	NF	1.5	0.25	4	n/a	CAI
CHQ-SMA-2	RG340	L	1.0	0.25	4	n/a	CAI
CHQ-SMA-3.05	RG340	L-M	1.0	0.25	4	n/a	CAI
CHQ-SMA-4	RG340	L	1.0	0.25	4	Collect 1 Sample	MEx
CHQ-SMA-4.1	RG340	M	0.75	0.2	4	n/a	CAI
CHQ-SMA-4.5	RG340	L-M	1.0	0.25	4	n/a	CAI
CHQ-SMA-5.05	RG340	M	0.75	0.2	4	Collect 1 Sample	MEx
CHQ-SMA-6	RG340	M	0.75	0.2	4	n/a	CAI
CHQ-SMA-7.1	RG340	L	1.0	0.25	4	Collect 1 Sample	MEx
DP-SMA-0.3	RG038	M	0.75	0.2	1	n/a	CAI2
DP-SMA-0.4	RG038	L	1.0	0.25	1	n/a	CAI
DP-SMA-0.6	RG038	L	1.0	0.25	1	Collect 1 Sample	MEx
DP-SMA-1	RG038	L	1.0	0.25	1	Collect 1 Sample	MEx
DP-SMA-2	RG038	L	1.0	0.25	1	Collect 1 Sample	MEx
DP-SMA-2.35	RG038	L	1.0	0.25	1	n/a	CAI
DP-SMA-3	RG038	L	1.0	0.25	1	Collect 2 Samples	CAM5
DP-SMA-4	RG-TA-53	L	1.0	0.25	1	Collect 1 Sample	MEx
F-SMA-2	RG267.4	L	1.0	0.25	5	n/a	CAI
LA-SMA-0.85	RG121.9	H	0.25	0.1	2	n/a	CAI2
LA-SMA-0.9	RG121.9	L	1.0	0.25	1	Collect 1 Sample	MEx
LA-SMA-1	RG121.9	L	1.0	0.25	1	Collect Sample 2	CAM5
LA-SMA-1.1	RG121.9	H	0.25	0.1	2	n/a	CACompD
LA-SMA-1.25	RG121.9	H	0.25	0.1	2	n/a	CAI2

SMA	Flow Potential	24Hr Precip Trigger	30 Min Max Intensity Trigger	Rain Gage	Route	Monitoring Status	SMA Stage
LA-SMA-10.11	RG-TA-53	NF-L	1.5	0.25	3	Collect 1 Sample	MEx
LA-SMA-10.12	RG-TA-53	M	0.75	0.2	3	Collect Sample 2	CAM5
LA-SMA-2.1	RG055.5	L	1.0	0.25	1	n/a	CAI
LA-SMA-2.3	RG055.5	NF	1.5	0.25	1	n/a	CACompD
LA-SMA-3.1	RG055.5	NF	1.5	0.25	1	Collect 1 Sample	MEx
LA-SMA-3.9	RG055.5	L	1.0	0.25	1	Collect 1 Sample	MEx
LA-SMA-4.1	RG055.5	H	0.25	0.1	1	n/a	CAI
LA-SMA-4.2	RG055.5	L	1.0	0.25	1	Collect 1 Sample	MEx
LA-SMA-5.01	RG055.5	NF	1.5	0.25	1	Collect 1 Sample	MEx
LA-SMA-5.02	RG055.5	M	0.75	0.2	1	n/a	CACompD
LA-SMA-5.2	RG055.5	L	1.0	0.25	1	Collect 1 Sample	MEx
LA-SMA-5.31	RG038	L	1.0	0.25	1	Collect 2 Samples	CAM5
LA-SMA-5.33	RG038	NF-L	1.5	0.25	1	n/a	CACompD
LA-SMA-5.35	RG055.5	L	1.0	0.25	1	Collect 2 Samples	CAM5
LA-SMA-5.361	RG038	L	1.0	0.25	1	Collect 1 Sample	MEx
LA-SMA-5.362	RG038	L	1.0	0.25	1	Collect 1 Sample	MEx
LA-SMA-5.51	RG038	M	0.75	0.2	1	n/a	CAI
LA-SMA-5.52	RG038	M	0.75	0.2	1	Collect 1 Sample	MEx
LA-SMA-5.53	RG038	NF	1.5	0.25	1	Collect 1 Sample	MEx
LA-SMA-5.54	RG038	M	0.75	0.2	1	n/a	CAI
LA-SMA-5.91	RG038	M	0.75	0.2	1	Collect Sample 2	CAM5
LA-SMA-5.92	RG038	NF	1.5	0.25	1	n/a	CAI
LA-SMA-6.25	RG038	L	1.0	0.25	1	Collect 1 Sample	MEx
LA-SMA-6.27	RG038	M	0.75	0.2	1	Collect 1 Sample	MEx
LA-SMA-6.3	RG038	L	1.0	0.25	1	Collect 1 Sample	MEx
LA-SMA-6.31	RG038	M	0.75	0.2	1	Collect 1 Sample	MEx
LA-SMA-6.32	RG038	NF	1.5	0.25	1	Collect 1 Sample	MEx
LA-SMA-6.34	RG038	L	1.0	0.25	1	Collect 1 Sample	MEx
LA-SMA-6.36	RG038	L	1.0	0.25	1	Collect 1 Sample	MEx
LA-SMA-6.38	RG038	L	1.0	0.25	1	Collect 1 Sample	MEx
LA-SMA-6.395	RG038	L	1.0	0.25	1	n/a	CAI
LA-SMA-6.5	RG038	L	1.0	0.25	1	Collect 1 Sample	MEx
LA-SMA-9	RG-TA-53	L	1.0	0.25	1	Collect 1 Sample	MEx
M-SMA-1	RG121.9	H	0.25	0.1	2	n/a	CAI2
M-SMA-1.2	RG121.9	M	0.75	0.2	2	n/a	CAI
M-SMA-1.21	RG121.9	M	0.75	0.2	2	Collect 1 Sample	MEx
M-SMA-1.22	RG121.9	M	0.75	0.2	2	Collect Sample 2	CAM5
M-SMA-10	RG200.5	M-H	0.5	0.15	3	n/a	CAI
M-SMA-10.01	RG200.5	M	0.75	0.2	3	Collect Sample 2	CAM5
M-SMA-10.3	RG200.5	H	0.25	0.1	3	n/a	CACompD
M-SMA-11.1	RG200.5	NF	1.5	0.25	3	Collect 1 Sample	MEx
M-SMA-12	RG200.5	L	1.0	0.25	3	Collect 1 Sample	MEx
M-SMA-12.5	RG203	L	1.0	0.25	1	Collect 1 Sample	MEx
M-SMA-12.6	RG203	M	0.75	0.2	1	n/a	CAI
M-SMA-12.7	RG203	L	1.0	0.25	1	Collect 1 Sample	MEx
M-SMA-12.8	RG203	L	1.0	0.25	1	Collect 1 Sample	MEx
M-SMA-12.9	RG203	L	1.0	0.25	1	Collect 1 Sample	MEx

SMA	Flow Potential	24Hr Precip Trigger	30 Min Max Intensity Trigger	Rain Gage	Route	Monitoring Status	SMA Stage
M-SMA-12.92	RG203	L	1.0	0.25	1	Collect 1 Sample	MEx
M-SMA-13	RG203	M	0.75	0.2	1	n/a	BCComp
M-SMA-3	RG-TA-06	M	0.75	0.2	3	n/a	CAI
M-SMA-3.1	RG-TA-06	L-M	1.0	0.25	3	Collect 1 Sample	MEx
M-SMA-3.5	RG200.5	M	0.75	0.2	3	Collect 1 Sample	MEx
M-SMA-4	RG200.5	H	0.25	0.1	3	n/a	CAI
M-SMA-5	RG200.5	L-M	1.0	0.25	3	Collect 1 Sample	MEx
M-SMA-6	RG200.5	H	0.25	0.1	3	n/a	CAI
M-SMA-7	RG200.5	L	1.0	0.25	3	n/a	CAI
M-SMA-7.9	RG200.5	L	1.0	0.25	3	n/a	CAI
M-SMA-9.1	RG200.5	NF	1.5	0.25	3	Collect 1 Sample	MEx
PJ-SMA-1.05	RG240	M	0.75	0.2	5	n/a	CAI
PJ-SMA-10	RG-TA-06	L	1.0	0.25	5	Collect 1 Sample	MEx
PJ-SMA-11	RG-TA-06	L-M	1.0	0.25	5	n/a	CAI
PJ-SMA-11.1	RG-TA-06	L-M	1.0	0.25	5	n/a	CAI
PJ-SMA-13	RG245.5	NF-L	1.5	0.25	2	Collect 1 Sample	MEx
PJ-SMA-13.7	RG245.5	NF	1.5	0.25	2	Collect 2 Samples	CAM5
PJ-SMA-14	RG245.5	L	1.0	0.25	2	Collect 1 Sample	MEx
PJ-SMA-14.2	RG245.5	M	0.75	0.2	2	Collect 1 Sample	MEx
PJ-SMA-14.3	RG245.5	L	1.0	0.25	2	Collect 1 Sample	MEx
PJ-SMA-14.4	RG245.5	NF-L	1.5	0.25	2	Collect 1 Sample	MEx
PJ-SMA-14.6	RG245.5	NF	1.5	0.25	2	Collect 1 Sample	MEx
PJ-SMA-14.8	RG245.5	NF	1.5	0.25	2	n/a	BCComp
PJ-SMA-16	RG-TA-54	NF	1.5	0.25	3	n/a	BCComp
PJ-SMA-17	RG-TA-54	H	0.25	0.1	3	n/a	CAI
PJ-SMA-18	RG-TA-54	M	0.75	0.2	3	n/a	CAI
PJ-SMA-19	RG-TA-54	H	0.25	0.1	3	n/a	CAI
PJ-SMA-2	RG253	NF-L	1.5	0.25	5	Collect 1 Sample	MEx
PJ-SMA-20	RG-TA-54	H	0.25	0.1	3	Collect 1 Sample	CACompC
PJ-SMA-3.05	RG257	NF-L	1.5	0.25	5	Collect 2 Samples	CAM5
PJ-SMA-4.05	RG257	L	1.0	0.25	5	n/a	CAI
PJ-SMA-5	RG-TA-06	L	1.0	0.25	5	n/a	CAI
PJ-SMA-5.1	RG-TA-06	NF	1.5	0.25	5	Collect 2 Samples	CAM5
PJ-SMA-6	RG-TA-06	L	1.0	0.25	5	Collect 1 Sample	MEx
PJ-SMA-7	RG-TA-06	NF-L	1.5	0.25	5	Collect 1 Sample	MEx
PJ-SMA-8	RG-TA-06	L	1.0	0.25	5	Collect 1 Sample	MEx
PJ-SMA-9	RG-TA-06	L	1.0	0.25	5	Collect 1 Sample	MEx
Pratt-SMA-1.05	RG200.5	NF	1.5	0.25	1	n/a	CAI
P-SMA-0.3	RG-TA-53	L	1.0	0.25	2	n/a	CACompD
P-SMA-1	RG038	H	0.25	0.1	2	Collect 1 Sample	MEx
P-SMA-2	RG038	M	0.75	0.2	2	Collect 1 Sample	MEx
P-SMA-2.15	RG038	L	1.0	0.25	2	Collect 1 Sample	MEx
P-SMA-2.2	RG038	M	0.75	0.2	2	Collect 1 Sample	MEx
P-SMA-3.05	RG055.5	L	1.0	0.25	2	n/a	CAI
PT-SMA-0.5	RG262.4	NF	1.5	0.25	5	Collect 2 Samples	CAM5
PT-SMA-1	RG262.4	M	0.75	0.2	5	Collect 2 Samples	CAM5
PT-SMA-1.7	RG262.4	NF	1.5	0.25	5	n/a	CAI

SMA	Flow Potential	24Hr Precip Trigger	30 Min Max Intensity Trigger	Rain Gage	Route	Monitoring Status	SMA Stage
PT-SMA-2	RG262.4	L	1.0	0.25	5	Collect 1 Sample	MEx
PT-SMA-2.01	RG262.4	NF	1.5	0.25	5	Collect 2 Samples	CAM5
PT-SMA-3	RG267.4	H	0.25	0.1	5	Collect 1 Sample	MEx
PT-SMA-4.2	RG267.4	L-M	1.0	0.25	5	Collect 1 Sample	MEx
R-SMA-0.5	RG-NCOM	L	1.0	0.25	2	n/a	CACompD
R-SMA-1	RG-NCOM	H	0.25	0.1	2	n/a	CAI
R-SMA-1.95	RG038	L	1.0	0.25	2	n/a	CAI
R-SMA-2.05	RG-NCOM	L	1.0	0.25	2	Collect 1 Sample	MEx
R-SMA-2.3	RG038	L	1.0	0.25	2	n/a	BCComp
R-SMA-2.5	RG038	L	1.0	0.25	2	Collect 1 Sample	MEx
S-SMA-0.25	RG121.9	H	0.25	0.1	2	n/a (Construction in progress)	AltCompR
S-SMA-1.1	RG121.9	NF	1.5	0.25	2	Collect 2 Samples	CAM3
S-SMA-2	RG121.9	H	0.25	0.1	2	n/a (2 samples collected)	AltCompR
S-SMA-2.01	RG121.9	L	1.0	0.25	2	Collect Sample 2	CAM3
S-SMA-2.8	RG121.9	L	1.0	0.25	2	Collect 1 Sample	MEx
S-SMA-3.51	RG121.9	M	0.75	0.2	2	Collect 1 Sample	MEx
S-SMA-3.52	RG121.9	M	0.75	0.2	2	Collect 1 Sample	MEx
S-SMA-3.53	RG121.9	M	0.75	0.2	2	Collect 2 Samples	CAM3
S-SMA-3.6	RG121.9	H	0.25	0.1	2	n/a	CAI2
S-SMA-3.7	RG203	NF	1.5	0.25	3	Collect 1 Sample	MEx
S-SMA-3.71	RG203	L	1.0	0.25	3	Collect 1 Sample	MEx
S-SMA-3.72	RG203	L	1.0	0.25	3	Collect 1 Sample	MEx
S-SMA-3.95	RG203	L	1.0	0.25	3	n/a	CAI
S-SMA-4.1	RG-TA-53	L	1.0	0.25	3	n/a	CACompD
S-SMA-4.5	RG203	NF	1.5	0.25	3	Collect 1 Sample	MEx
S-SMA-5	RG-TA-53	NF	1.5	0.25	3	Collect 1 Sample	MEx
S-SMA-5.2	RG-TA-53	NF	1.5	0.25	3	Collect 1 Sample	MEx
S-SMA-5.5	RG-TA-53	L	1.0	0.25	3	Collect 1 Sample	MEx
S-SMA-6	RG-TA-53	H	0.25	0.1	3	n/a	CAI
STRM-SMA-1.05	RG240	H	0.25	0.1	5	n/a	CAI2
STRM-SMA-1.5	RG240	NF	1.5	0.25	5	Collect Sample 2	CAM5
STRM-SMA-4.2	RG240	NF	1.5	0.25	5	Collect 2 Samples	CAM5
STRM-SMA-5.05	RG240	L	1.0	0.25	5	Collect 2 Samples	CAM5
T-SMA-1	RG200.5	H	0.25	0.1	3	Collect 1 Sample	CAI/CACompC
T-SMA-2.5	RG200.5	M	0.75	0.2	3	Collect 1 Sample	MEx
T-SMA-2.85	RG200.5	M	0.75	0.2	3	n/a	CAI
T-SMA-3	RG200.5	H	0.25	0.1	3	n/a	CAI
T-SMA-4	RG200.5	M	0.75	0.2	3	n/a	CAI
T-SMA-5	RG200.5	L	1.0	0.25	3	Collect 1 Sample	MEx
T-SMA-6.8	RG200.5	NF	1.5	0.25	1	Collect 1 Sample	MEx
T-SMA-7	RG200.5	M	0.75	0.2	1	Collect 1 Sample	MEx
T-SMA-7.1	RG200.5	L	1.0	0.25	1	Collect 1 Sample	MEx
W-SMA-1	RG253	M	0.75	0.2	4	Collect Sample 2	CAM5
W-SMA-1.5	RG253	M	0.75	0.2	4	Collect 2 Samples	CAM5
W-SMA-10	RG257	L	1.0	0.25	4	Collect 2 Samples	CAM5

SMA	Flow Potential	24Hr Precip Trigger	30 Min Max Intensity Trigger	Rain Gage	Route	Monitoring Status	SMA Stage
W-SMA-11.7	RG262.4	M	0.75	0.2	4	Collect Sample 2	CAM5
W-SMA-12.05	RG262.4	L	1.0	0.25	4	Collect 1 Sample	MEx
W-SMA-14.1	RG262.4	M	0.75	0.2	5	Collect Sample 2	CAM5
W-SMA-15.1	RG262.4	NF	1.5	0.25	4	Collect 2 Samples	CAM5
W-SMA-2.05	RG253	L-M	1.0	0.25	4	Collect 2 Samples	CAM5
W-SMA-3.5	RG257	L	1.0	0.25	4	Collect 1 Sample	MEx
W-SMA-4.1	RG257	L	1.0	0.25	4	Collect 1 Sample	MEx
W-SMA-5	RG257	H	0.25	0.1	4	n/a	CAI
W-SMA-6	RG257	L	1.0	0.25	4	Collect 1 Sample	MEx
W-SMA-7	RG257	L-M	1.0	0.25	4	Collect 1 Sample	MEx
W-SMA-7.8	RG257	L	1.0	0.25	4	Collect 1 Sample	MEx
W-SMA-7.9	RG257	L	1.0	0.25	4	Collect 1 Sample	MEx
W-SMA-8	RG257	L-M	1.0	0.25	4	n/a	CAI
W-SMA-8.7	RG257	L	1.0	0.25	4	n/a	CAI
W-SMA-8.71	RG257	NF	1.5	0.25	4	Collect Sample 2	CAM5
W-SMA-9.05	RG257	L-M	1.0	0.25	4	n/a	BCComp
W-SMA-9.5	RG257	NF	1.5	0.25	4	Collect 1 Sample	MEx
W-SMA-9.7	RG257	L	1.0	0.25	4	n/a	CAI
W-SMA-9.8	RG257	L	1.0	0.25	4	Collect 1 Sample	MEx
W-SMA-9.9	RG257	L	1.0	0.25	4	Collect Sample 2	CAM5

Table-2

SMA Compliance Stages

SMA Stage	Stage Short Description	Stage Description
AltCompR	Alt Comp Requested	IP E.3(b) Alternative Compliance requested
BCComp	BC Complete	IP D4(b) All results for all pollutants of concern at SMA are at or below the TALs no further sampling is required at the SMA.
CACompC	CA Complete NoExp	IP E.2(c) Control measures installed to totally eliminate exposure of pollutants to storm water. Collect 1 informational sample.
CACompD	CA Complete COC	IP E.2(d) Site has achieved RCRA "corrective action complete" status or a Certificate of Completion under NMED's Consent Order. Collect no sample.
CAI	CA Init	IP E.1(a) Confirmation monitoring has exceeded a Target Action Level.
CAI2	CA Init 2	IP E.1(a) Confirmation monitoring has exceeded a Target Action Level. 2nd go-around.
CAM3	CA Mon 3	IP E.1(a)(b) Collect 1+ sample after completion of CA control measures at HPS site within 3 yrs of effective date of permit.
CAM5	CA Mon 5	IP E.1(a)(b) Collect 1+ sample following completion of CA control measures at MPS site within 5 years of effective date of permit.
MEx	Mon Ext	IP E.5(e) Confirmation monitoring will continue until 1 sample is collected.

Table-3

SMAs Associated with High Priority Sites (HPS)

SMA Number	Corrective Action Completion Date
CDB-SMA-4	8/27/2014
LA-SMA-2.1	10/24/2014
LA-SMA-3.1	n/a
LA-SMA-5.01	n/a
LA-SMA-5.02	11/29/2013
LA-SMA-5.51	8/21/2014
LA-SMA-5.52	n/a
LA-SMA-5.53	n/a
LA-SMA-5.54	10/24/2014
LA-SMA-6.5	n/a
M-SMA-10.3	10/30/2013
M-SMA-3.5	na
M-SMA-7.9	10/22/2014
PJ-SMA-17	9/4/2014
PJ-SMA-18	8/29/2014
PJ-SMA-19	9/11/2014
PJ-SMA-20	10/25/2013

SMA Number	Corrective Action Completion Date
Pratt-SMA-1.05	10/24/2014
P-SMA-1	n/a
P-SMA-2.2	n/a
P-SMA-3.05	10/21/2014
S-SMA-0.25	n/a
S-SMA-1.1	n/a
S-SMA-2	n/a
S-SMA-2.01	
S-SMA-3.51	n/a
S-SMA-3.52	n/a
S-SMA-3.53	n/a
S-SMA-3.6	
S-SMA-4.1	8/20/2013
S-SMA-5	n/a
S-SMA-6	
T-SMA-1	10/31/2013

Table-4
Start Time Delay for IP Confirmation Monitoring

Week #	Interval in days since the preceding sampled storm event	Days to next eligible storm event	Recommended action after retrieval of sample for IP confirmation monitoring
1	0	15	stand-down sampler
	1	14	stand-down sampler
	2	13	stand-down sampler
	3	12	stand-down sampler
	4	11	stand-down sampler
	5	10	stand-down sampler
	6	9	stand-down sampler
2	7	8	stand-down sampler
	8	7	Set 9999 Minute Delay to Start
	9	6	Set 8640 Minute Delay to Start
	10	5	Set 7200 Minute Delay to Start
	11	4	Set 5760 Minute Delay to Start
	12	3	Set 4320 Minute Delay to Start
	13	2	Set 2880 Minute Delay to Start
3	14	1	Set 1440 Minute Delay to Start
	15	0	Set 0 Minute Delay to Start

Table-5
Maximum and Minimum Sample Volumes

Analytical Suite	Minimum Volume (L)	Maximum Volume (L)	Container	Maximum Holding Time
Gross Alpha	1	2	P, FP, G	6 months
Radium-226 and Radium-228	2	4	P, FP, G	6 months
Metals incl. Mercury	0.5	1	P, FP	6 months 28 days Mercury
Cyanide, weak acid dissociable	0.5	1	P, FP, G	14 days
Total PCBs	1	3	G, FP-lined cap	1 year to extraction
Dioxin	1	3	G	1 year
Semivolatile Compounds	1	3	G, FP-lined cap	7 days to extraction
Pesticides	1	3	G, FP-lined cap	7 days to extraction
High Explosives	0.77	2.5	G, FP-lined cap	7 days to extraction
BLM(F) DOC	0.5	1	P, FP, G	28 days
BLM(F) SO4+Cl	0.5	1	P, FP, G	28 days / 28 days
BLM(UF) Alk+pH	0.5	1	P, FP, G	14 days / 15 minutes pH

Table-6
ISCO 3700 Configuration Sequence

Select Option	**Parameter**	**Time Sampling**
Set Clock	Time/ Date	[Set to MST]
Bottles and Sizes	(Portable, Refrig) Sampler	Portable
	(1,4,12,24) Bottles	12 or 24
	Bottle Volume Is	950 ml
Suction Line	Suction Line I.D. Is	3/8 inch
	Suction Line Is (Vinyl, Teflon)	Teflon
	Suction Line Length Is	X feet
Liquid Detector	(Enable, Disable) Liquid Detector	Enable
	Rinse Cycles	1
	Enter Head Manually?	No
	Retry Up To X Times When Sampling	1
Programming Mode	(Basic, Extended) Program Mode	Basic
Load Stored Program	Load Program	n/a
Save Current Program	Save Program As	n/a
Flow Mode Sampling	Take Sample At Start Time?	n/a
	Take Sample At Time Switch?	n/a
Nonuniform Time	Enter Intervals In (Clock Time, Minutes)	n/a
Calibrate Sampler	(Enable, Disable) Calibrate Sampler	Disable
Sampling Stop/Resume	(Enable, Disable) Sampling Stop/Resume	n/a
Start Time Delay	X Minute Delay To Start	(0-9999)
Enable Pin	Master/Slave Mode?	No
	Sample Upon Disable?	No
	Sample Upon Enable?	Yes
	Reset Sample Interval?	Yes
Event Mark	(Continuous Signal, Pulse)	Pulse
	At The Beginning Of (Purge, Fwd Pumping)	Purge
Purge Counts	Pre-Sample Counts	150?
	Post Sample Counts	150?
Tubing Life	# Pump Counts, Warning at #	(enter)
	Reset Pump Counter?	No
	X Pump Counts To Warning	500,000
Program Lock	(Enable, Disable) Program Lock	Disable
Sampler ID	Sampler ID Number Is	[leave blank]
Run Diagnostics (Software Revision 4.6)	Run Diagnostics	Yes
	Test distributor	Yes
	Re-initialize	No
Exit Configuration	(enter)	…Standby…

Table-7

ISCO 3700 Programming Sequence

Parameter	Time Sampling
[Switch on liquid actuator]	Reset to "Toggle/Reset"
Paced Sampling	Time
Sample Every	0 Hours, 1 Min
Multiplex Samples?	Yes
(Bottles Per Sample, Samples Per Bottle)	Bottles Per Sample
X Bottles Per Sample Event	1
Sample Volumes Of	950 ml
Enter Start Time	No
[Programming Sequence Complete]	…Standby…

Table-8

Suites, Analytical Group Names, Methods, Parameters for IP Monitoring

Suite	Analytical Group Name	Analytical Method	Parameter Code	Parameter Name
Radioactivities	SW-Ra226/Ra228	EPA:903.1	Radium-226	Ra-226
	SW-Ra226/Ra228	Generic:Radium by Calculation	Radium-226 and Radium-228	Ra-226+228
	SW-Ra226/Ra228	EPA:904	Radium-228	Ra-228
	SW-IP-Gross Alpha	EPA:900	GROSSA	Gross alpha
Metals	SW-Metals-Dissolved	EPA:200.8	Ag	Silver
	SW-Metals-Dissolved	EPA:200.8	Al	Aluminum
	SW-Metals-Dissolved	EPA:200.8	As	Arsenic
	SW-Metals-Dissolved	EPA:200.7	B	Boron
	SW-Metals-Dissolved	EPA:200.7	Ca	Calcium
	SW-Metals-Dissolved	EPA:200.8	Cd	Cadmium
	SW-Metals-Dissolved	EPA:200.8	Co	Cobalt
	SW-Metals-Dissolved	EPA:200.8	Cr	Chromium
	SW-Metals-Dissolved	EPA:200.8	Cu	Copper
	SW-Metals-Dissolved	SM:A2340B	HARDNESS	Hardness
	SW-Metals-Dissolved	EPA:200.7	Mg	Magnesium
	SW-Metals-Dissolved	EPA:200.8	Ni	Nickel
	SW-Metals-Dissolved	EPA:200.8	Pb	Lead
	SW-Metals-Dissolved	EPA:200.8	Sb	Antimony
	SW-Metals-Dissolved	EPA:200.8	Tl	Thallium
	SW-Metals-Dissolved	EPA:200.8	V	Vanadium
	SW-Metals-Dissolved	EPA:200.8	Zn	Zinc
	SW-Metals-Total	EPA:245.2	Hg	Mercury

Suite	Analytical Group Name	Analytical Method	Parameter Code	Parameter Name
	SW-Metals-Total	EPA:200.8	Se	Selenium
Cyanide	SW-IP-Cyanide	ASTM:D2036	CN(WAD)	Cyanide, weak acid dissociable
Dioxin	SW-IP-D/F-1613B	EPA:1613B	1746-01-6	Tetrachlorodibenzodioxin[2,3,7,8-]
Semivolatile Compounds	SW-SVOC-625	EPA:625	118-74-1	Hexachlorobenzene
		EPA:625	50-32-8	Benzo(a)pyrene
		EPA:625	87-86-5	Pentachlorophenol
Pesticides	SW-Pesticides	EPA:608	1024-57-3	Heptachlor Epoxide
		EPA:608	309-00-2	Aldrin
		EPA:608	33213-65-9	Endosulfan II
		EPA:608	50-29-3	DDT[4,4'-]
		EPA:608	5103-71-9	Chlordane[alpha-]
		EPA:608	5103-74-2	Chlordane[gamma-]
		EPA:608	57-74-9	Chlordane(alpha/gamma)
		EPA:608	58-89-9	BHC[gamma-]
		EPA:608	60-57-1	Dieldrin
		EPA:608	72-20-8	Endrin
		EPA:608	72-54-8	DDD[4,4'-]
		EPA:608	72-55-9	DDE[4,4'-]
		EPA:608	76-44-8	Heptachlor
		EPA:608	8001-35-2	Toxaphene (Technical Grade)
		EPA:608	959-98-8	Endosulfan I
PCBs	SW-PCB-1668A-PQL	EPA:1668A	1336-36-3	Total PCB
High Explosives	SW-IP-HEXP	SW-846:8321A_MOD	118-96-7	Trinitrotoluene[2,4,6-]
		SW-846:8321A_MOD	121-82-4	RDX
BLM	SW-DOC	SW-346-9060	DOC	Dissolved Organic Carbon
	SW-SO4+Cl	EPA:300.0	Cl(-1)	Chloride
		EPA:300.0	SO4(-2)	Sulfate
	SW-IP-Ca+K+Mg+Na+Hardness	EPA:200.7	K	Potassium
		EPA:200.7	Na	Sodium
	SW-ALK+pH	EPA:310.1	ALK-CO3	Alkalinity-CO3
		EPA-310.1	ALK-CO3+HCO3	Alkalinity-CO3+HCO3
		EPA:150.1	pH	Acidity or Alkalinity of a solution
	Temperature	?	?	?