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Investigation Report for Bayo Canyon Aggregate Area, Revision 1

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Responsible project leader:

Printed Name	Signature	Title	Organization	Date
Becky Coel-Roback		Project Leader	Environmental Programs	5/14/08

Responsible LANS representative:

Printed Name	Signature	Title	Organization	Date
Susan G. Stiger		Associate Director	Environmental Programs	5/14/08

Responsible DOE representative:

Printed Name	Signature	Title	Organization	Date
David R. Gregory		Project Director	DOE-LASO	5/15/08

EXECUTIVE SUMMARY

The Los Alamos National Laboratory (LANL or the Laboratory) Environmental Programs Directorate–Corrective Action Projects has investigated the Bayo Canyon Aggregate Area, located on Los Alamos County property adjacent to the Laboratory. The Bayo Canyon Aggregate Area includes Consolidated Units 10-001(a)-99 and 10-002(a)-99, Solid Waste Management Units (SWMUs) 10-004(a) and 10-006, and Areas of Concern (AOCs) C-10-001 and 10-009. Investigation activities were conducted between June 2007 and December 2007. In addition, historical data from previous investigations completed between 1994 and 1996 are incorporated in this investigation report.

During its operational history, the Bayo Canyon Aggregate Area was known as Technical Area (TA) 10 and included facilities that supported the development of nuclear weapons. Between 1943 and 1961, TA-10 was used primarily as a firing site to test assemblies containing conventional high explosives, including components made from depleted or natural uranium, and radiochemistry and liquid waste processing facilities used in the production of lanthanum-140. Between 1960 and 1963, TA-10 underwent decontamination and decommissioning (D&D), including the razing of all structures. The site remains under U.S. Department of Energy (DOE) administrative control and is located on Los Alamos County property; most areas are currently accessible by the public.

The 2007 investigation was primarily a drilling campaign: 55 boreholes were drilled for a total of more than 2500 linear ft. Surface and shallow subsurface sampling was also conducted using hand methods. A total of approximately 200 surface and subsurface samples were collected for analysis. Sampling locations were based on the specific data requirements identified in the approved Bayo Canyon Aggregate Area investigation work plan; these locations were selected to complete site characterization and support corrective measures decisions. In addition to sampling, surface radiological and geophysical surveys were conducted, and test pits were excavated in areas of known and suspected subsurface disposal.

The results of the geophysical surveys indicated that all subsurface structures in former TA-10 have been removed. There were no anomalies indicating the presence of drainlines or other pipes associated with SWMUs 10-004(a) and 10-004(b). A small segment of pipe visible at the surface near SWMU 10-002(b) was determined to be surface debris and was removed. SWMU 10-007, a building debris landfill, produced an anomaly indicating the area of the debris to be approximately 6000 ft^2. AOC 10-009, a suspected debris landfill, produced no geophysical anomaly indicative of subsurface disposal. The results of the geophysical survey at AOC 10-009 were confirmed by drilling and excavation of test pits. Lastly, the geophysical surveys resulted in the determination of the extent of shrapnel in the shallow subsurface (up to approximately 1 ft below ground surface) at Consolidated Unit 10-001(a)-99.

The radiological surveys indicated the presence of small areas of elevated activity resulting from strontium-90 at Consolidated Unit 10-002(a)-99 and uranium-238 at Consolidated Unit 10-001(a)-99 and AOC 10-009. Little or no correlation was found between the results of the radiological survey and the geophysical survey for shrapnel, indicating the remaining shrapnel is not radioactive.

The principal chemical of potential concern (COPC) for the Bayo Canyon Aggregate Area is strontium-90; however, a total of 24 inorganic, 42 organic, and 6 radionuclide COPCs were identified in solid media at the site. The distributions of most inorganic, organic, and radionuclide COPCs had been defined during previous investigations. The specific concerns about contaminant distribution identified in the investigation work plan have been addressed by the 2007 investigation, and the nature and extent of site COPCs are defined. In general, the concentrations of inorganic and organic COPCs at all former TA-10 sites are low and do not exhibit marked concentration trends or strong correlation that would indicate a

release. The 2007 data confirm the extent of the strontium-90 contamination associated with historical operations.

The estimated total excess lifetime cancer risk from chemical exposures is below the New Mexico Environment Department (NMED) target level of 1×10^{-5} for recreational, construction worker, and residential scenarios for all former TA-10 sites.

The hazard indexes (HIs) for the recreational and residential scenarios were less than the NMED target HI of 1.0 for all sites. Consolidated Units 10-001(a)-99 and 10-002(a)-99 and SWMU 10-004(a) had HIs greater than the NMED target HI of 1.0 for the construction worker scenario. The three HIs for the construction worker scenario are approximately 2, primarily from the detection of manganese. However, the exposure point concentrations for manganese are similar to soil and tuff background concentrations, indicating that exposures would be similar to background levels. The HIs without manganese are below 1.0, indicating no potential for unacceptable risk to the construction worker at any of the former TA-10 sites.

The doses for the recreational and construction worker scenarios were below the DOE target of 15 millirem per year (mrem/yr) for all areas. The dose for the residential scenario was below 15 mrem/yr at Consolidated Unit 10-001(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001. The estimated residential dose was greater than 15 mrem/yr at Consolidated Unit 10-002(a)-99.

Potential ecological risk was evaluated for several receptors using minimum ecological screening level comparisons, HI analyses, comparisons to background, potential effects to populations (individuals for threatened and endangered species), the relative toxicity of related compounds, and the infrequency of detection. The lines of evidence for each receptor support the conclusion that no potential ecological risk exists within the Bayo Canyon Aggregate Area.

The following recommendations are made for Consolidated Unit 10-001(a)-99, SWMUs 10-004(a) and 10-006, and AOCs C-10-001 and 10-009 based on the results of sampling and analysis, evaluation of nature and extent of contamination, and the assessment of potential risk and dose.

- Consolidated Unit 10-001(a)-99—The nature and extent of contamination are defined, and residual shrapnel does not pose a physical hazard or radiological risk; therefore, the SWMUs and AOCs within Consolidated Unit 10-001(a)-99 [SWMUs 10-001(a–d) and 10-005 and AOCs 10-001(e) and 10-008] are proposed as corrective actions complete without controls.
- SWMU 10-004(a)—The nature and extent of contamination are defined, and no cleanup is warranted; therefore, SWMU 10-004(a) is proposed as corrective actions complete without controls.
- AOC 10-009—The nature and extent of contamination are defined, and no cleanup is warranted; therefore, AOC 10-009 is proposed as corrective actions complete without controls.
- AOC C-10-001—The nature and extent of contamination are defined, and no further cleanup is warranted; therefore, AOC C-10-001 is proposed as corrective actions complete without controls.
- SWMU 10-006—Efforts were made to locate this SWMU, but it could not be found. There is no indication that it exists and may have been cleaned up during D&D of former TA-10. Therefore, SWMU 10-006 is proposed for corrective actions complete without controls.

Pending DOE and Los Alamos County approval, the following actions are being planned for Consolidated Unit 10-002(a)-99.

- Maintain the Central Area under DOE administrative control, implement institutional controls to limit site access and potential strontium-90 mobilization, and negotiate additional actions, if needed, between DOE and the property owner (Los Alamos County).
- Remove two isolated areas of elevated strontium-90 activity identified outside of the Central Area within Consolidated Unit 10-002(a)-99 as a good stewardship practice.

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1.0 INTRODUCTION

This investigation report discusses the 2007 investigation of the Bayo Canyon Aggregate Area (formerly designated as Technical Area [TA] 10) at Los Alamos National Laboratory (LANL or the Laboratory) and presents a comprehensive assessment of current site conditions based on the results of the 2007 and previous investigations.

The Laboratory is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by Los Alamos National Security, LLC. The Laboratory is located in north central New Mexico, approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe (Figure 1.0-1). The Laboratory site covers 40 mi^2 of the Pajarito Plateau, which consists of a series of fingerlike mesas that are separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 ft to 7800 ft. The eastern portion of the plateau stands 300 ft to 1000 ft above the Rio Grande.

The Environmental Programs (EP) Directorate is leading the Laboratory's participation in a national DOE effort to clean up sites and facilities formerly involved in weapons research and development. The EP Directorate's goal is to ensure that past operations do not threaten human or environmental health and safety in and around Los Alamos County. To achieve this goal, the Laboratory is currently investigating sites potentially contaminated by past operations; the sites under investigation are designated as consolidated units, solid waste management units (SWMUs), or areas of concern (AOCs).

As a result of its operational history, the Bayo Canyon Aggregate Area contains both radioactive and hazardous components. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the New Mexico Environment Department (NMED) in accordance with DOE policy.

Corrective actions at the Laboratory are subject to the March 1, 2005 Compliance Order on Consent (the Consent Order). The Consent Order was issued pursuant to the New Mexico Hazardous Waste Act, New Mexico Statutes Annotated (NMSA) 1978 §74-4-10, and the New Mexico Solid Waste Act, NMSA 1978, §74-9-36(D).

The Bayo Canyon Aggregate Area consists of two Consolidated Units [10-001(a)-99 and 10-002(a)-99], two SWMUs [10-004(a) and 10-006], and two AOCs [C-10-001 and 10-009] (Figure 1.0-2). The Bayo Canyon Aggregate Area investigation was conducted in accordance with the approved investigation work plan (LANL 2005, 092083) and was performed to satisfy the specific requirements contained in the Consent Order's section IV.C.5.c, "Technical Area 10 Investigation."

1.1 Investigation Overview

The purpose of the 2007 investigation was to complete the characterization of the nature and extent of contamination from historical TA-10 facility operations and to support future corrective actions for the site. The approved Bayo Canyon Aggregate Area investigation work plan (LANL 2005, 092083, pp. 4-6, 4-7) identified the following data needs for the investigation:

- nature and extent of surface and subsurface contamination across the site
- nature and extent of remaining surface shrapnel and/or radiologically contaminated shrapnel across Consolidated Unit 10-001(a)-99
- presence and distribution of perchlorate and cyanide across the site

- confirmation of the highest strontium-90 concentrations at Consolidated Unit 10-002(a)-99
- extent of subsurface strontium-90 contamination at Consolidated Unit 10-002(a)-99
- physical extent of the SWMU 10-007 debris landfill
- physical location (if present) of the SWMU 10-003(n) leach field, the SMWU 10-002(b) pit, and the SWMU 10-004(b) drainline
- exact location (if present) and physical extent of SWMU 10-006
- nature and extent of subsurface contamination at AOC 10-009 and physical extent (if present) of the debris landfill

Specific details of the data requirements identified for this investigation are provided in the discussion of previous investigation results in section 2.

1.2 Document Organization

This investigation report is organized in seven sections, including this introduction, with multiple supporting appendixes. Section 2 presents an overview of the site operational history, the results of previous investigations, and details on additional investigation data requirements. Section 3 discusses the scope of investigation activities, and section 4 presents field investigation results, including physical and observational data, as well as survey results and field-screening data. Section 5 summarizes the regulatory criteria governing the evaluation of results. Section 6 summarizes site contamination based on the analytical results, the identification of chemicals of potential concern (COPCs), and the distribution of contamination. Section 7 presents conclusions based on applicable historical data as well as the 2007 investigation data and summarizes the risk screening assessments performed. Section 8 discusses recommendations for additional actions, when warranted, based on applicable data and the risk screening assessments. Section 9 includes a list of references cited in this report and the map data sources.

Appendixes A through G present field documentation and associated information, the analytical data (on DVD), a quality assurance/quality control (QA/QC) review of analytical data, and supplemental reports. Appendix H presents a detailed analysis of the analytical data and discusses the COPC identification process and presents an analysis of the nature and extent of contamination at Bayo Canyon. Appendix I details the risk screening assessments and interpretation of the results. Appendix J includes an evaluation of preliminary corrective action alternatives for areas of former TA-10 requiring further action. Appendixes K, L, and M provide more detailed results for the geophysical and radiological surveys conducted in Bayo Canyon during 2007.

2.0 BACKGROUND

This section provides a detailed description of former TA-10 and its operational history and includes a description of Bayo Canyon's physical and operational relationship to other SWMUs, AOCs, and consolidated units. This section also summarizes the history of investigation activities conducted at the site, including the pre-Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) and activities performed to satisfy the specific requirements for the investigation of Bayo Canyon contained in the Consent Order's section IV.C.5.c, "Technical Area 10 Investigation." Finally, this section summarizes historical information on the nature and extent of contamination at the site based on previous investigations and, most importantly, summarizes the additional data requirements specified in the approved Bayo Canyon Aggregate Area investigation work plan (LANL 2005, 092083) to complete the characterization of the site.

2.1 Site Description and Operational History

2.1.1 Description of TA-10

Former TA-10 is located in the central portion of Bayo Canyon, situated between Kwage Mesa to the south and Otowi Mesa to the north, approximately 0.5 mi west of the Los Alamos County Sewage Treatment Plant (Figure 1.0-2). Bayo Canyon is located at an elevation of approximately 6000 to 6740 ft above sea level and slopes to the southeast at an approximate 3% grade. TA-10 is at an elevation of approximately 6600 to 6700 ft above sea level and the elevations of adjacent mesa tops range from about 7000 to 7100 ft above sea level. The upper portions of the canyon walls are vertical to near-vertical cliffs cut into the upper Tshirege Member of the Bandelier Tuff. The canyon has cut into the lower Otowi Member of the Bandelier Tuff with a colluvial wedge near the cliffs that thins towards the center of the canyon. A narrow, braided ephemeral stream channel with low banks is present in the center of the canyon and is underlain with Quaternary stream alluvium (LANL 1996, 054491, p. 3). According to data from boreholes drilled in 1994, the alluvium ranges from approximately 30 to 45 ft below ground surface (bgs). In selected areas, the upper 5 to 15 ft of alluvium has been reworked, displaced, backfilled, and mixed with construction debris from the construction, decontamination, and decommissioning activities that occurred when TA-10 was operational (LANL 1996, 054491, p. 36). Vegetation in Bayo Canyon is a mixture of grasses, sagebrush, chamisa, smaller trees and shrubs, and large ponderosa pine.

Surface water flow in the canyon is ephemeral; runoff from heavy thunderstorms occurs over a period of several hours during the summer months (July through August). Individual flooding events can be severe and may cause realignment of the main channel. No perched or alluvial groundwater was encountered during subsurface investigations conducted at TA-10 in 1961–1962, 1973, 1974–1975, 1980, 1994, and 2007. The elevation of the regional aquifer in the vicinity of TA-10 is 6000 ft above sea level, or approximately 600 ft below the level of Bayo Canyon (LANL 1997, 056660.423, p. 6).

Former TA-10 underwent extensive decontamination and decommissioning (D&D), including razing all structures, from 1960 to 1963. All explosives testing ceased in 1961. The site was released to Los Alamos County in 1967 but has remained under the administrative control of DOE. Bayo Canyon is currently open to the public and used for recreational activities. The area encompassing the central liquid waste disposal complex [SWMUs 10-003(a–o)] was posted with monuments to prohibit excavation before the year 2142. A chainlink fence surrounds a debris landfill (SWMU 10-007) in the lower canyon and a suspected debris landfill (AOC 10-009) in the upper canyon. The chainlink fence that surrounds SWMU 10-007 is posted as a radiological contamination area (RCA). Recreation is the current and reasonably foreseeable future land use within Bayo Canyon, including the entire former TA-10 area.

2.1.2 Operational History of TA-10 and Subsequent Decommissioning

TA-10 was used as a firing test site from 1943 to 1961, and the area and all related structures were constructed to test assemblies that contained conventional high explosives (HE), including components made from depleted or natural uranium. The principal structures associated with TA-10 were a radiochemistry laboratory (TA-10-1), an assembly building (TA-10-12), inspection buildings (TA-10-8 and TA-10-9), a personnel building (TA-10-21), structures at two detonation-control complexes (TA-10-15 and TA-10-13), and adjacent firing pads. Formerly, TA-10 also included various ancillary facilities associated with waste disposal, particularly for the radiochemistry laboratory. Associated facilities included sanitary and radioactive liquid waste sewage lines, manholes, septic tanks, seepage pits, and solid radioactive waste disposal pits (Mayfield et al. 1979, 011717, p. 12).

TA-10 now consists of two Consolidated Units [10-001(a)-99 and 10-002(a)-99], two SWMUs [10-004(a) and 10-006], and two AOCs [C-10-001 and 10-009] (Figure 1.0-2). The consolidation of individual SWMUs and AOCs into Consolidated Units 10-001(a)-99 and 10-002(a)-99 was based on similarities in operational history, waste streams, geographical location, and transport mechanisms as well as the investigation required to assess contamination (LANL 1999, 063175).

The following sections describe each consolidated unit, SWMU, and AOC along with the operational history. The SWMUs and AOCs that make up TA-10 are presented in Table 2.1-1.

Consolidated Unit 10-001(a)-99 includes SWMUs 10-001(a)–(d) and 10-005 and AOCs 10-001(e) and 10-008 (Figure 1.0-2). SWMUs 10-001(a)–(d) are the former shot pads that made up two firing sites located in the western third of former TA-10. SWMUs 10-001(a)–(d) each consisted of five structures: a battery building (power source), a fire control building, an electronics chamber, an X-unit chamber, and an inspection building. SWMU 10-005 is a former open disposal pit approximately 62 ft west of the northwest firing point on the south side of the road. The exact dimensions of the pit are unknown (LANL 1990, 007512, p. 4). AOC 10-001(e) is a suspected sandpile detonation site adjacent to the TA-10 firing sites. The exact location of the site is not known; it was never documented on any original maps of the area. This site was approved for no further action by the U.S. Environmental Protection Agency (EPA) (EPA 2005, 088464). AOC 10-008 is a former satellite firing site located approximately 1400 ft northwest of the primary firing sites. During the 1994 interim action (IA), shrapnel was found embedded in the northwestern sides of trees in this area (opposite the known primary firing sites) (LANL 1997, 056660.423, p. 1).

Consolidated Unit 10-002(a)-99 includes SWMUs 10-002(a) and (b), 10-003(a)–(o), and 10-004(b), all of which were once part of a liquid waste disposal complex, and SWMU 10-007 (Figure 2.1-1). The liquid waste disposal complex served the radiochemistry laboratory (building TA-10-01) at TA-10, and waste was discharged to leach fields and pits. SWMUs 10-002(a) and (b) are former waste disposal pits used during radiochemistry laboratory operations. SWMUs 10-003(a–o) represent the majority of the liquid disposal complex, which consisted of liquid disposal pits, industrial waste manholes and septic tanks, industrial waste lines, and a leach field that served the radiochemistry laboratory. SWMU 10-004(b) was a reinforced-concrete sanitary septic tank that served the radiochemistry laboratory between 1944 and 1963 and may have also received liquid waste from radiochemistry laboratory operations. The entire area underwent D&D in 1963 (Blackwell and Babich 1963, 004751), and SWMU 10-007 was created as a building debris landfill where any remaining materials from the D&D activity were placed. SWMU 10-007 is in the footprint created by the excavation of solid waste disposal pits (containing radioactive, inorganic, and organic chemicals) used by the radiochemistry laboratory from 1945 to 1950. The wastes were removed, and the pits were backfilled with the uncontaminated shot pad building debris and site soil during the 1963 D&D activities. For SWMUs 10-003(a) and 10-007, the RFI results indicated the need for an IA. The IA was conducted in February 1997 and included sample collection, installation of stormwater control measures, and the construction of a fenced exclusion zone to minimize the potential for exposure to humans and animals (LANL 1997, 056358). This fenced zone is currently referred to as the Central Area and comprises all the SWMUs mentioned above, except SWMUs 10-002(a) and (b) and SWMU 10-003(h) (Figure 2.1-1).

SWMU 10-004(a) was a former 1060-gal. septic tank (structure TA-10-40) that discharged to a pit with associated lines and to an outfall located in a stream channel northeast of SWMU 10-002(a) (Figure 1.0-2). The tank served the personnel building (TA-10-21) from 1949 to 1963 and was removed during the 1963 D&D activities. No information is available regarding the removal of the 4-in.-diameter tile drain or the soil surrounding the outfall.

SWMU 10-006 is believed to consist of multiple locations where burning operations at TA-10 were conducted, primarily in the 1950s and early 1960s; however, the exact location of this SMWU is not known. Uranium-238 solutions were deposited on plywood and burned in 1955; the fate of the resultant ash is not known. Open-burning records are incomplete and lack details about location, type of materials, and ash disposition. The ash was probably transported either to Material Disposal Area (MDA) C at TA-50 or to MDA G at TA-54. Contaminants associated with open burning could have included uranium, strontium-90, and HE.

AOC C-10-001 is located within the fenced area that encompasses AOC 10-009 and consists of two former radioactive (strontium-90) soil contamination areas (Figure 1.0-2). These areas were bulldozed during 1963 D&D activities but were rediscovered during shrapnel-removal operations in 1994 (LANL 1996, 054617). A voluntary corrective action (VCA) was conducted in 1995 to excavate the radioactive soil and restore the site with clean fill material (LANL 1995, 049710).

AOC 10-009 is a suspected former landfill area that may have contained materials such as building debris, heavy-gauge and coaxial cable, glass laboratory equipment, and other debris (Figure 1.0-2). The EPA was notified of this SWMU in June 1995 shortly after it was identified, and the site was fenced off pending further investigation.

Further detail and description of the TA-10 sites and their history is presented in the historical investigation report (HIR) (LANL 2005, 089658).

2.2 Historical Characterization and Remediation Efforts

The majority of sites at TA-10 have undergone characterization and remediation efforts before 2007, including several investigations conducted between 1954 and 1992, and RFIs that are described in detail in the HIR (LANL 2005, 089658). Summary descriptions of the characterization and remediation investigations performed at TA-10 are presented below.

2.2.1 Pre-RFIs

The subsections below summarize the historical investigations conducted at TA-10 between 1954 and 1992.

2.2.1.1 1954 Radiological Survey, Firing Sites

A radiological survey (radioassay) of surface sediment was conducted during the summer of 1954 at the TA-10 shot pads [Consolidated Unit 10-001(a)-99] and the radiochemical laboratory (former building TA-10-01). Twenty-four samples were collected and analyzed for plutonium, polonium, strontium, and uranium. Strontium-90 was detected at 5000 disintegrations per minute per gram (dpm/g) of soil gross-beta activity in a small area adjacent to the radiochemical laboratory, which was no longer in use at the time of the survey. A gross-beta/-gamma activity of 15,000 dpm/g was recorded in a soil sample taken from the same area. Results from the shot pads indicated that sediment contained gross beta/gamma activity ranging from 36 to 125 dpm/g (Dodd 1956, 004695, pp. 4, 10).

2.2.1.2 1956 Investigation of TA-10 Disposal Pits

The U.S. Geological Survey, in conjunction with the Los Alamos Scientific Laboratory (LASL), conducted a reconnaissance investigation of TA-10 in July 1956. The report noted, “Several concrete disposal pits were located but the location of the buried stainless-steel tanks, believed to contain radioactive material, was not determined” (Abrahams 1962, 001306). Soil samples were collected near the former radiochemistry laboratory and analyzed for radioactivity. The results indicated that radioactivity in soil and alluvial samples decreased with depth. The results are documented in a report titled “Radioactive Waste Disposal at Los Alamos, New Mexico” (Abrahams 1962, 001306).

2.2.1.3 1957 Remediation

SWMU 10-005, a disposal pit for residual shot material, was excavated. The wastes were burned on-site and the ash taken to MDA C at TA-50 (LANL 1990, 007512, p. 4).

2.2.1.4 1960 to 1963 Shrapnel Removal and D&D

Decommissioning of TA-10 began in 1960 and was completed in 1963. Most of the buildings were burned in place, and any remaining debris and/or ash was disposed of at MDA G at TA-54 (Mayfield 1979, 011717, p. 24). During cleanup activities in June 1963, 90 truckloads of debris, shrapnel, and explosive material were removed within a 2500-ft radius centered on the detonation control buildings and firing sites [Consolidated Unit 10-001(a)-99] and transported to MDA C at TA-50 and MDA G at TA-54. All structures were removed, with the exception of the concrete floor and foundation of the uncontaminated machine shop (building TA-10-20). More than 550 dump-truck loads of underground piping, contaminated waste, and burial pits were excavated and the material removed to TA-54 and disposed of at MDA G. All excavations were backfilled and the site graded. All concrete structures connected with the firing pads were demolished using dynamite (LASL 1963, 004771, pp. 19-20). A detailed account of structure and pit material removal is reported in Blackwell (1963, 004751) .

2.2.1.5 1961 to 1962 Subsurface Sampling and Radiation Surveys

Test holes were drilled at TA-10 to determine if perched water was present at the contact between the Bandelier Tuff and Puye Formation. No indication of perched water or any “excessive” moisture in the tuff was observed above the Puye Formation, and no sample analyses were performed (Mayfield et al. 1979, 011717, pp. 50-54). An Aerial Radiological Measuring Survey (ARMS II) was conducted between 1961 and 1962. This survey was part of a nationwide program designed to measure current environmental gamma radiation levels by conducting aerial surveys using a thallium-activated sodium iodide detector to count activity at specific altitudes. The survey concluded that “no unique observations were noted for Bayo Canyon itself” (Mayfield 1979, 011717, p. 14).

2.2.1.6 1965 and 1970 Sediment Sampling

In 1965 and 1970, sediment samples were collected in the channel downstream from TA-10. Radiological analyses (gross alpha, gross beta, gross gamma, and plutonium-238/239) showed no indication of contamination from the site (Mayfield 1979, 011717, p. 14).

2.2.1.7 1966 to 1976 Annual Inspections

From July 1966 to February 1976, Laboratory safety engineers conducted surveys and inspections of Bayo Canyon debris. During these surveys, additional surface debris was located, some of which was contaminated with strontium-90 and uranium. However, grass cover was considered excellent in the area visited by the general public, and former structures were no longer visible or easy to locate (Drake et al. 1976, 002078).

2.2.1.8 1973 Subsurface Sampling and Radiation Surveys

In 1973, the LASL Health Division began additional survey work in Bayo Canyon to assess the extent of radiological material remaining on-site. The survey was necessary to provide a basis for estimating potential exposures under conditions of continued recreational use, during light construction, and as an occupied residential area. Sediment samples were collected from various locations along the streambed present through Bayo Canyon and TA-10. The sediment samples were analyzed for strontium-90 and the results indicated that detected concentrations of strontium-90 were within the range attributable to worldwide fallout (Mayfield 1979, 011717, p. 14). In addition to the sediment sampling, three boreholes were drilled to approximately 20 ft bgs around the former radiochemistry laboratory (building TA-10-01). Several samples were collected from the boreholes and analyzed for plutonium isotopes and strontium-90. The results indicated that plutonium concentrations were within background, but concentrations of strontium-90 were slightly elevated with respect to background (Mayfield 1979, 011717, p. 51).

2.2.1.9 1974 to 1975 Additional Subsurface Sampling and Aerial Survey

In 1974, 11 additional boreholes were drilled to investigate the extent of elevated strontium-90 identified in subsurface samples collected around the radiochemistry laboratory. These boreholes were drilled in the vicinity of the former radiochemistry laboratory and were analyzed for gross-alpha and gross-beta activity. Analytical results from samples collected north and west of SWMU 10-002(b), north of the acid leaching field [SWMU 10-003(n)], and at the sanitary outfall [SWMU 10-004(b)] indicated that “no migration had occurred” (Mayfield 1979, 011717, p. 14). Elevated (3 to 20 times local background) beta activity was reported in samples collected from 0 to 4.0 ft bgs near the sanitary outfall. Sampling results north of the former industrial acid waste pits [SWMUs 10-003(a) and (b)] indicated both gross-alpha and gross-beta activity in tuff to a depth of 33 ft bgs.

In October 1975, ARMS II performed a second aerial survey that included flights over Bayo Canyon. As in 1962, exact mapping of radioactivity proved difficult, and the results showed no measurable quantity of yttrium-90 or depleted uranium (DU) in the vicinity of TA-10 (Mayfield 1979, 011717, p. 15). Yttrium-90 is a short-lived (64-h half-life) daughter product of strontium-90 that was widely dispersed during the firing site operations.

2.2.1.10 1976 to 1977 Formerly Utilized Sites Remedial Action Program Survey

In 1976, a radiological resurvey of Bayo Canyon was conducted under the Formerly Utilized Sites Remedial Action Program (FUSRAP) to determine whether any further corrective action was necessary. Surface and subsurface sampling was conducted using a variety of sampling methods (drive samples, hand auger, borehole samples, trench samples, etc.) near former structures, in the canyon bottom, at the former firing sites, and in the stream channel (Mayfield 1979, 011717, p. 25). A detailed description of these sampling techniques can be found in Appendix C of the Mayfield report (Mayfield 1979, 011717). The results indicated that residual strontium-90 surface contamination averaged about 1.4 pCi/g (approximately 3 times the level attributable to worldwide fallout), surface uranium averaged about 4.9 µg/g (approximately 1.5 times the amount naturally present in the native soil), and subsurface contamination associated with the former waste disposal locations was largely confined within a total area of about 10,000 m^2 to a depth of about 16.4 ft. Of the 378 subsurface samples collected, fewer than 12%

exceeded 13 pCi/g of gross-beta activity, which is comparable to the upper range of activities for uncontaminated local soil (Mayfield 1979, 011717).

2.2.1.11 1980 Additional Surface and Subsurface Sampling

Following the FUSRAP survey (Mayfield 1979, 011717), an additional 14 locations were selected for surface and subsurface sample collection. Six surface soil samples were collected from the firing sites [Consolidated Unit 10-001(a)-99], the canyon floor, and the natural drainage. Eight boreholes were drilled near the former waste pits and radiochemistry laboratory [part of Consolidated Unit 10-002(a)-99]. The results from the 1976–1977 FUSRAP survey and the additional 1980 investigation indicated that the extent of contamination was limited to a small area near the former solid waste pits [SWMU 10-002(b) and SWMU 10-003(m)], and that the contamination was more extensive around SWMU 10-003(b) (Ford et al. 1981, 008032, pp. 2-5).

2.2.1.12 1986 Comprehensive Environmental Assessment and Response Program Field Survey

A Comprehensive Environmental Assessment and Response Program (CEARP) field survey was conducted around the firing sites [Consolidated Unit 10-001(a)-99] that identified the presence of metal cable and small pieces of shrapnel. The shrapnel consisted of aluminum and steel with small amounts of lead, wood, and other shot residue (DOE 1986, 036442, p. 2). During the survey, six survey monuments and associated guard posts were installed in an area that roughly encompasses the old liquid waste disposal complex, radiochemistry laboratory (building TA-10-01), and the area of the waste disposal pit (TA-10-48). The monuments are marked “buried radioactive material no excavation prior to 2142 AD see county records” (DOE 1986, 036442, p. 4). A depression in the ground surface at SWMU 10-005 was observed 100 ft west of firing point 3 (LANL 1990, 007512, p. 4).

2.2.2 RFIs

The RFI activities conducted after 1992 were performed in accordance with the process specified in Module VIII (EPA 1994, 044146). A summary of the activities is presented below.

2.2.2.1 1993 Geomorphic Survey and 1994, 1995 Interim Action (Shrapnel Removal)

In September 1993, geomorphic mapping identified various types of radioactively contaminated shrapnel in the TA-10 area (Drake and Inoué 1993, 053456, p. 1). These results prompted an IA to remove shrapnel from Bayo Canyon (LANL 1996, 054491, p. 36). Shrapnel removal began in September 1994 and was completed by January 1995. More than 19,000 pieces of shrapnel were collected during the surface shrapnel removal operation. A total of 458 pieces (2.4%) were found to emit radioactivity levels that exceeded local background levels. The IA report concluded “that the measurements suggested that strontium-90/yttrium-90 was present as surface contamination, and uranium was present as an embedded mass” (LANL 1996, 054491). This observation is consistent with the current understanding of the test assembly construction. Some test assembly components were manufactured from uranium, but strontium-90/yttrium-90 were present in the assembly associated with the lanthanum-140 tracer (LANL 1996, 054491, p. 10).

Results of the IA indicated that there was a considerable variation in shrapnel distribution density. A 75-acre area had shrapnel densities ranging from 5000 to over 2 million pieces per acre, with the highest densities occurring near the shot pads. A majority (65%) of the shrapnel occurs in the top 3 in. of soil, and 68% of the shrapnel was found within the top 6 in. of soil. Less than 4% of the shrapnel occurs at depths greater than 1 ft. Approximately 1% of the 8513 shrapnel pieces collected near the shot pads had radioactive contamination levels of ≥200 counts per minute (cpm) (beta/gamma) (LANL 1996, 054491, pp. 5, 11). Geophysical surveys identified additional pieces of shrapnel in the active channel that runs through Bayo Canyon, in the remote firing site (AOC 10-008), and in the former landfill (AOC 10-009) (LANL 1996, 054491, pp. 8, 11).

2.2.2.2 1994 RFI Surface and Subsurface Sampling

The objective of the Phase I RFI was to determine if residual RCRA chemicals—particularly barium, beryllium, or lead—exist in surficial deposits near the firing pads [SWMUs 10-001(a)-(d)] and to confirm no human health or ecological risks were associated with the radiological constituents found in previous investigations (LANL 1995, 049974, p. v). The objective of the Phase I RFI associated with the subsurface disposal aggregate SWMUs 10-002(a) and (b), 10-003(a)–(o), 10-004(a) and (b), 10-005, and 10-007 “was to characterize the nature, concentrations, and lateral and vertical extent of potential subsurface contamination related to historic activities at the site” (LANL 1996, 054617, p. 4).

Surface Sampling

Seventy-eight surface soil samples were collected on a grid with 500-ft intervals over 400 acres along the length of Bayo Canyon in areas suspected to be influenced by testing operations. The surface soil samples were analyzed for gross-alpha, -beta, and -gamma radiation by a mobile radiological analytical laboratory (MRAL) and for total uranium, strontium-90, beryllium, barium, lead, target analyte list (TAL) metals, and HE by an approved analytical laboratory (LANL 1995, 049974, p. 23).

Thirty-two sediment samples were collected from the stream channel. These samples were analyzed for gross-alpha, -beta, and -gamma radiation by the MRAL and for total uranium, strontium-90, beryllium, barium, lead, and other TAL metals including cadmium, antimony, nickel, chromium, manganese, magnesium, cobalt, copper, and zinc by an approved laboratory. Six samples were analyzed for semivolatile organic compounds (SVOCs). Results of the MRAL gross radiation analyses showed no values above background levels (LANL 1995, 049974, p. 23). A detailed description of the surface sampling results is available in the HIR (LANL 2005, 089658).

Subsurface Sampling

Subsurface sampling was conducted to address potential contaminant releases from SWMUs 10-002(a)-(b), 10-003 (a)–(o), 10-004(a) and (b), 10-005, and 10-007. A pre-drilling beta and gamma radiological survey around the drilling and support areas indicated that chamisa plants exhibited beta radiation levels from approximately 190 to 10,000 cpm in several locations (ERM/Golder 1995, 049073, p. 4-1). The vegetation with elevated radiation levels was cut to ground level, containerized in lined 55-gal. drums, and removed to MDA G. A total of 93 boreholes in 11 drilling arrays were drilled in the vicinity of the former radiochemistry laboratory. Two boreholes were completed as monitoring wells: BCO-1 (total depth [TD] 67.9 ft bgs) and BCM-1 (TD 68.0 ft bgs). BCO-1 was a shallow observation well and BCM-1 was cased with a 2-in.-diameter aluminum pipe intended for logging in situ moisture measurements. Both wells were dry at the time of installation, and the wells have not been monitored since 1995 (LANL 2001, 071060, pp. 2-8, 3-24).

Radiological field-screening data collected during the investigation identified the presence of subsurface beta contamination in the alluvium from 5 ft bgs to 32 ft bgs. Field screening for volatile organic compounds (VOCs) using a photoionization detector (PID) identified 15 boreholes with VOC concentrations above 2.0 parts per million (ppm). The analytical data indicated that no TAL metals or SVOCs were detected above 1995 screening action levels (SALs). Analytical and field-screening data indicated no radioactivity above local background levels in boreholes targeting SWMU 10-005, former disposal pit TA-10-44, former septic tank TA-10-40, or in drilling arrays 4, 5, 6, and 7. Radioactivity above background levels was detected in boreholes drilled near TA-10-48 (ERM/Golder 1995, 049073, p. 7-1). Radionuclides were retained as COPCs at SWMUs 10-003(a)–(o), 10-007, and 10-002(b), and an IA was recommended to remove chamisa containing elevated levels of strontium-90 (LANL 1996, 054617, pp. ii, 64).

2.2.2.3 1995 VCA at AOC C-10-001

A VCA including a beta/gamma radiological survey, surface sampling, and removal of radioactive material was conducted at AOC C-10-001, an area with two known locations of radiologically contaminated soil. The radiological survey showed that the shrapnel removal activity conducted as part of the 1994 IA effectively removed the field-detectable radioactivity from one of the areas. The second site showed elevated levels of radioactivity, and soil samples were collected and analyzed for radionuclides. Results from the analysis indicated that strontium-90 was present at an activity of 3.518 pCi/g (LANL 1995, 049710, p. 1).

Subsurface samples were collected to evaluate the extent of contamination and the appropriate mode of removal. The results indicated that the area affected by the strontium-90 contamination was approximately 3.28 ft in diameter and 11.8 in. in depth (LANL 1995, 049710, p. 1). As a result, approximately 35.3 ft^3 of soil was removed from AOC C-10-001, and confirmation samples were collected. The confirmation samples indicated that radioactivity in soil was well below the cleanup level. The excavation was backfilled with clean fill material and covered with pine needles.

2.2.2.4 1996 IA: Soil and Vegetation Sampling

An IA was conducted to address radioactive contamination of vegetation in the Central Area [part of Consolidated Unit 10-002(a)-99] in Bayo Canyon. Surface and subsurface soil and vegetation samples were collected. Soil samples were analyzed for beta and gamma radioactivity using an Eberline ESP-1. Eight confirmation soil samples were submitted to a fixed analytical laboratory and analyzed for strontium-90. The results indicated that the screening data correlate well with the analytical strontium-90 data (LANL 1997, 056358, p. 2). To control access to the area, a fenced exclusion zone was constructed and the area was posted as an RCA. Stormwater control measures, including silt fences and straw waddles, were emplaced along the northern and eastern parts of the site to capture runoff. Straw bales were placed along the edge of a channel that emerges from a culvert along the western part of the site to prevent run-on (LANL 1997, 056358, p. 12). After a final inspection on July 5, 2001, the Laboratory's Water Quality and Hydrology Group determined the area was stabilized and no further inspections were necessary (Veenis 2005, 088799).

2.3 Relationship to Other SWMUs/AOCs

Bayo Canyon is relatively isolated. No other SWMUs are located near the TA-10 portion of Bayo Canyon (Figure 1.0-1). Upper portions of Bayo Canyon may be impacted by the northern portion of the Los Alamos townsite. These potential impacts will be addressed in the North Canyons investigation report. The work plan for North Canyons (LANL 2001, 071060) was submitted to NMED on September 21, 2001, and approved on July 19, 2005.

2.4 Additional Data Requirements for the Bayo Canyon Aggregate Area

During the development of the approved Bayo Canyon Aggregate Area investigation work plan (LANL 2005, 092083), fixed laboratory data collected from historical investigations were reviewed to assess the nature and extent of contamination at Bayo Canyon. This information was used to (1) identify additional data requirements necessary to complete nature and extent characterization of contamination associated with former TA-10, and (2) to collect the data necessary to support the selection of a corrective action. The work plan evaluated the nature and extent of contamination and identified data needs for Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMUs 10-004(a) and SWMU 10-006, and AOCs 10-009 and C-10-001. The subsections summarize the data needs identified in the work plan for each consolidated unit, SWMU, and AOC for the Bayo Canyon Aggregate Area. Details of the historical investigations and the data assessment are provided in the HIR (LANL 2005, 089658) and the approved work plan (LANL 2005, 092083).

2.4.1 Data Requirements Specific to Consolidated Unit 10-001(a)-99

Surface grid sampling (0 to 0.33 ft bgs) on a grid over Consolidated Unit 10-001(a)-99 conducted during the 1994 RFI identified isolated locations containing inorganic chemicals above background values (BVs), strontium-90 above the fallout value (FV), and organic chemicals. Samples were collected from one depth interval, and the vertical extent of contamination at several surface locations was not defined; therefore, the approved work plan specified the collection of surface and shallow-subsurface samples at locations where the vertical extent was not defined (LANL 2005, 092083, pp. 8-9).

In addition to the grid samples, four borehole locations (10-01281 through 10-01284) drilled to 50 ft bgs were sampled at Consolidated Unit 10-001(a)-99, specifically targeting SWMU 10-005. Samples from two boreholes contained elevated concentrations of cadmium and strontium-90. The vertical extent of cadmium and strontium-90 contamination was defined during this investigation; therefore, the approved work plan specified that two additional boreholes be drilled in the vicinity of SWMU 10-005 to define the lateral extent of cadmium and strontium-90.

Perchlorate and cyanide data have not been collected from Consolidated Unit 10-001(a)-99; the approved work plan specified that these compounds be characterized across the site (LANL 2005, 092083, p. 9).

During historical investigations, surface radiological data were not collected with adequate spatial density or areal coverage to support a complete assessment of the potential exposure to site users. Further, shrapnel is known to remain on the site, particularly within the TA-10 area, but it is not known what percentage of the remaining shrapnel is radioactively contaminated, to what degree shrapnel correlates with elevated surface radiation levels, or if it presents a physical hazard. To assess the distribution of the remaining shrapnel at Consolidated Unit 10-001(a)-99 and to determine whether or not the shrapnel is radiologically contaminated, the approved work plan specified that geophysical and radiological surveys be conducted across the firing sites (LANL 2005, 092083, p. 9).

2.4.2 Data Requirements Specific to Consolidated Unit 10-002(a)-99

Consolidated Unit 10-002(a)-99 covers a large area and consists of multiple sites, many of which are only indirectly related by historical process. Therefore, to facilitate the evaluation of contaminant distributions across the consolidated unit and to focus the identification of additional data required to complete site characterization, the Central Area, which includes the fenced area surrounding SWMU 10-007, is discussed separately from the remainder of Consolidated Unit 10-002(a)-99.

2.4.2.1 The Central Area

The Central Area (see HIR Figure 3.2.-3 [LANL 2005, 089658]) consists of multiple, now-removed liquid disposal pits and lines and the SWMU 10-007 debris landfill. During the 1994 RFI, several borehole arrays were drilled and sampled within the Central Area (LANL 1996, 054491). Borehole locations were centered on known contamination locations identified during the 1976–1977 FUSRAP investigation (Mayfield 1979, 011717). The results of the sampling indicated the presence of inorganic chemicals (antimony, beryllium, cadmium, mercury, and zinc) at concentrations above BVs and detected concentrations of organic chemicals (naphthalene, ethylbenzene, and xylene) in one or more boreholes at various depths. The 1994 RFI sampling campaign identified the presence of inorganic chemicals above BVs and detected organic chemicals in the subsurface, but the lateral and vertical extent of contamination was not defined; therefore, the work plan prescribed additional drilling and sampling in the Central Area to define the lateral and vertical extent of these contaminants (LANL 2005, 092083, pp. 10-11). In addition, the work plan specified that mercury data would be collected across the site to augment the existing mercury data (LANL 2005, 092083, p. 10).

The 1994 RFI determined that strontium-90 is present at activities greater than 100 pCi/g in samples collected throughout the Central Area, with samples from borehole location 10-02220 containing the highest activities of strontium-90 (up to approximately 40,000 pCi/g) (LANL 2005, 089658). Because of the significance and age of the existing strontium-90 data, the approved work plan specified additional drilling in the Central Area to confirm the highest strontium-90 concentration at borehole location 10-02220 and to define the lateral and vertical extent of strontium-90 contamination to the west and north of borehole location 10-02220 (LANL 2005, 092083, p. 11).

Several of the 1994 RFI boreholes planned for the Central Area were originally sited immediately over the SWMU 10-007 landfill location. The SWMU 10-007 debris landfill is collocated with the Central Area liquid waste disposal complex. During the 1994 RFI, landfill debris repeatedly prevented the array boreholes from being advanced to the planned TD, requiring many to be relocated (ERM/Golder 1995, 049073; LANL 2005, 089658). These borehole locations provide some information on the size and location of the landfill, but the full extent of the landfill was not well defined. The approved work plan specified that geophysical data be collected and test pits excavated to confirm the physical extent of SWMU 10-007 and to identify the type of debris present (LANL 2005, 092083, p. 11).

Perchlorate and cyanide data have not been collected from the Central Area; the approved work plan specified that these compounds be characterized at the site (LANL 2005, 092083, p. 11).

2.4.2.2 Outside the Central Area

The remainder of Consolidated Unit 10-002(a)-99 includes the liquid waste disposal system and septic system north-northeast of the former radiochemistry building [specifically SWMU 10-003(h)] as well as the SWMU 10-002(a) and 10-002(b) waste disposal pits.

Seven borehole arrays were drilled within Consolidated Unit 10-002(a)-99 exclusive of the Central Area (LANL 2005, 089658). Sampling results from these seven borehole arrays indicated the presence of inorganic chemicals (antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, and zinc) above BVs and detected organic chemicals [di-n-butylphthalate and bis(2-ethylhexyl)phthalate] in one or more boreholes at various depths. The 1994 RFI sampling campaign identified the presence of these contaminants in the shallow subsurface, and decreasing concentrations in the existing site data (Plates 1 and 2; LANL 2005, 089658) indicate that the vertical extent of these inorganic chemicals and organic chemicals was defined, but the lateral extent of contamination was not defined. To define the lateral extent of contamination, the approved work plan prescribed additional step-out boreholes to be drilled and sampled at Consolidated Unit 10-002(a)-99, outside the Central Area (LANL 2005, 092083, p. 12).

Strontium-90 was detected above FV in several surface samples collected from the borehole arrays around SWMU 10-002(b). The data collected from the 1994 sampling effort defined the vertical extent of strontium-90 contamination but not the lateral extent. The approved work plan prescribed additional step-out borings to be drilled and sampled at Consolidated Unit 10-002(a)-99 outside the Central Area to define the lateral extent of strontium-90 (LANL 2005, 092083, p. 12).

In addition, as identified in Section IV.C.5.iii of the Consent Order, the locations of the SWMU 10-002(b) pit and the SWMU 10-003(n) leach field are not known. Furthermore, it is not known if the SWMU 10-004(b) drainline remains buried in place. The Consent Order requires verification of the SWMU locations and data derived from the footprints of these SWMUs; the approved work plan prescribed that geophysical data be used to confirm if the SWMU 10-003(n) leach field, the SMWU 10-002(b) pit, and the SWMU 10-004(b) drainline remain in place.

Perchlorate and cyanide data have not been collected from the area outside the Central Area; the approved work plan specified that these chemicals be characterized across the area (LANL 2005, 092083).

2.4.3 Data Requirements Related to SWMU 10-004(a)

A single array consisting of eight boreholes was drilled at SWMU 10-004(a) (LANL 2005, 089658). The results of the borehole sampling indicated the presence of inorganic chemicals (beryllium, cadmium, lead, mercury, and zinc) at concentrations above BVs and detected bis(2-ethylhexyl)phthalate at various depths in one or more boreholes across SWMU 10-004(a). The 1994 RFI sampling campaign identified the presence of these contaminants in the subsurface, but did not bound either the lateral and/or vertical extent of these contaminants (LANL 2005, 089658). The work plan specified that additional boreholes be drilled to define the lateral and vertical extent of inorganic and organic contamination in the subsurface at SWMU 10-004(a). Perchlorate and cyanide data have not been collected from SWMU 10-004(a); the approved work plan specified that these compounds be characterized across the site (LANL 2005, 092083, p. 13).

2.4.4 Data Requirements Related to SWMU 10-006

The exact location of SWMU 10-006 is not known. The approved work plan required that if observations made during field work (e.g., geophysical and radiological surveys) at Consolidated Unit 10-001(a)-99 identified the location of SWMU 10-006 or indicated the possibility of a release associated with this SWMU, additional samples specifically targeting SWMU 10-006 would be collected (LANL 2005, 092083, p. 2).

2.4.5 Data Requirements Related to AOC C-10-001

Previous investigations identified strontium-90 activities up to 3518 pCi/g at AOC C-10-001 before the VCA implementation at the site (LANL 1995, 049710). The maximum activity of strontium-90 in the samples collected after the cleanup excavation was 12.8 pCi/g (LANL 1995, 049710, p. 1-2). The existing site data collected during the VCA defined the extent of residual strontium-90. No data have been collected from the site for hazardous constituents, perchlorate, or cyanide; therefore, the approved work plan specified that surface and shallow-subsurface samples be collected to characterize the site for these chemicals (LANL 2005, 092083, p. 13).

2.4.6 Data Requirements Related to AOC 10-009

No previous investigations have been conducted at AOC 10-009. Therefore, the approved work plan specified the use of geophysical surveys and the excavation of test pits to characterize the physical extent and location of the suspected debris landfill (LANL 2005, 092083). Additionally, the work plan specified subsurface sampling to evaluate the presence and distribution of inorganic chemicals (including perchlorate and cyanide), organic chemicals, and radionuclides (LANL 2005, 092083).

3.0 SCOPE OF ACTIVITIES

This section presents an overview of preliminary activities and the field activities performed during the implementation of the Bayo Canyon Aggregate Area investigation; the field-investigation results and observations obtained are presented in detail in sections 4.0 and 6.0 and in the appendixes. The scope of activities for the 2007 Bayo Canyon Aggregate Area investigation included site access and premobilization activities; geodetic, geophysical, and radiological surveys; surface and shallow-subsurface sampling; borehole drilling, sampling, and abandonment; test pit excavation and debris sampling; activities to identify the location of SWMU 10-006; health and safety monitoring; and waste management activities.

3.1 Site Access and Pre-mobilization Activities

The area encompassing former TA-10 was transferred to Los Alamos County in 1967 but remains under DOE administrative control and is currently open to the public for recreational activities such as hiking, mountain biking, and horseback riding. Before field mobilization, the issue of public access was reviewed and efforts were made to not only provide a secure and safe work area in Bayo Canyon but to lessen impact to recreational users. The details of the premobilization activities are summarized below.

3.1.1 Public Access Controls

The area around the central liquid disposal complex [SWMUs 10-003 (a–o), part of Consolidated Unit 10-002(a)-99], is posted with monuments to prohibit excavation before the year 2142, and the two debris landfills (SWMU 10-007 and AOC 10-009 [suspected landfill]) are fenced. However, a frequently used trail system exists in the canyon bottom and along the cliffs above Bayo Canyon, and a dirt road runs adjacent to and along the streambed. A barbed-wire fence extends along the northern, western, and eastern perimeters of Bayo Canyon and crosses the stream channel northwest of the former firing sites [Consolidated Unit 10-001(a)-99]. The fence has been washed out or cut in various places, allowing unobstructed access into the Bayo Canyon investigation work areas. The fence around the perimeter of the DOE administrative-control area was repaired, and signs reading “caution do not enter” were placed on the fence. In addition, a gate was placed across the unimproved dirt road at the western end of the firing sites. Access is also limited by a locked gate at the eastern boundary of the DOE administrative-control area. Los Alamos County constructed a trail detour 50 yd east of the newly installed gate that guides trail users north, away from the primary investigation areas, and also upgraded the established trail. Extra signs were also placed at the western edge of the trail. These efforts provided recreational users with safe, undisturbed access to the trail system during the 2007 investigation.

3.1.2 Vegetation Clearing of Survey Areas

The floor of Bayo Canyon is heavily vegetated with a mixture of grasses, various native shrubs and brushes, and small trees. In order to increase the resolution and enhance the data quality of the radiological and geophysical walk-over surveys, the former firing site [Consolidated Unit 10-001(a)-99] area was mowed. A radiological control technician (RCT) spot-checked the mowed cuttings for gross-alpha and -beta radioactivity and determined the cuttings could be left in place.

3.2 Field Activities

The following subsections describe the field activities—including surface surveys, field screening, surface and shallow-subsurface sampling, borehole drilling, sampling and abandonment, exploratory test pit excavation, and field work to locate SWMU 10-006—conducted during the 2007 investigation. Details regarding the field methods and procedures used to perform these field activities are presented in Appendix B.

3.2.1 Surface Surveys

Geodetic, geophysical, and radiological surveys were conducted over most of the Bayo Canyon investigation area, including Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001. Details of the surface surveys and survey activities are presented below.

3.2.1.1 Geodetic Survey

A geodetic survey was conducted during the 2007 Bayo Canyon investigation to identify historical surface and subsurface sampling locations. The boring locations for the 2007 investigation were determined based on the location and results of the historical borehole samples. Geodetic surveys were conducted at the completion of the drilling and sampling campaign to establish the spatial coordinates for all sampling locations, trenches, and boreholes. Geodetic surveys were conducted using a Trimble 5700 differential global positioning system (DGPS). The survey data were collected by a licensed surveyor and conform to Laboratory Information Architecture project standards IA-CB02, “GIS Horizontal Spatial Reference System,” and IA-D802, “Geospatial Positioning Accuracy Standard for A/E/C and Facility Management.” All coordinates are expressed as State Plane Coordinate System 83, New Mexico Central, U.S. ft coordinates and are presented in Appendix C.

3.2.1.2 Geophysical Surveys

The 2007 geophysical surveys were conducted from July 19 to August 22, 2007. The purpose of the surveys were (1) to investigate the distribution of shrapnel dispersed during explosive testing at Consolidated Unit 10-001(a)-99, (2) to confirm removal of underground structures and locate any possible remaining buried structures associated with Consolidated Unit 10-002(a)-99 and SWMU 10-004(b), (3) to investigate the presence of possible buried debris at AOC 10-009, and (4) to define the lateral extent and depth of debris buried at SWMU 10-007. The methodologies used to conduct the 2007 geophysical surveys are presented below. Full details of the geophysical surveys are presented in the geophysical survey reports in Appendixes K and L. Photographs of the geophysical survey equipment are presented in Appendix D.

Shrapnel Survey

The shrapnel survey was conducted around the two shot pads at Consolidated Unit 10-001(a)-99. This survey covered an area of 37 acres divided into 200-ft^2 grids. The shrapnel geophysical survey used a TM-5 electromagnetic unit (TM-5emu) coordinated with a DGPS. The TM-5emu geophysical survey system consists of a Norand 602 computer, a Minelab F1B2 electromagnetic sensor module, two 18-in.

sensor coils, and an EMUDAS program. The equipment is mounted to a polyvinyl chloride frame and manually walked across the survey area. The TM-5emu system was selected for the TA-10 shrapnel survey because it can detect smaller metallic items in a variety of geologic settings. The survey was used to delineate geophysical anomalies attributed to shallow subsurface metallic content. The anomalies are inferred to be shrapnel derived from firing site operations. For the Bayo Canyon survey, geodetic coordinates were acquired at 1-s intervals to allow for adequate spatial sampling relative to walking speed. All geographic data are presented in New Mexico State Plane Coordinate System, Central Zone, North American Datum 1983, U.S. survey feet. Results of the geophysical shrapnel survey are presented in section 4.2.1 and in Appendix K.

Landfill and Buried Structure Identification Surveys

The geophysical survey used to identify buried structures and/or debris at Consolidated Unit 10-002(a)-99, SWMU 10-004(a), and AOC 10-009 employed electromagnetic (EM) geophysical methods, including EM31 (terrain conductivity) and EM61 (high-sensitivity metal detector) instrumentation. Where necessary, ground-penetrating radar (GPR) and radio frequency pipe locater instruments were used to better define the extent and/or presence of anomalies identified with EM. All geophysical survey instruments were integrated with a DGPS to allow real-time navigation along planned survey routes.

The EM surveys were conducted using a hand-held, digital, broadband EM sensor that uses the relationship among electric fields, magnetic fields, and electrical current to detect changes in subsurface conductivity. EM31 and EM61 data were recorded at approximately 2-ft intervals along lines spaced approximately 10 ft apart. Higher resolution coverage was completed in selected target areas using 5-ft line spacing. Geodetic coordinates were recorded at 1-s intervals using an integrated DGPS.

GPR uses the transmission and reflection of radio waves to image objects beneath the ground surface. The radio waves respond to changes in the electrical properties of the earth or buried materials. Line locations were chosen based on historical locations of target features such as suspected buried tanks and pipes. Section 4.2.1 discusses the results of the landfill and buried structure survey. Appendix L presents the geophysical investigation report.

3.2.1.3 Radiological Survey

Radiological walk-over surveys were conducted between July 22 and October 10, 2007, at Consolidated Unit 10-001(a)-99, Consolidated Unit 10-002(a)-99, SWMU 10-004(a), and AOC 10-009 to determine if areas of elevated radiation correlated to locations with a high density of shrapnel. Radiological surveys were also conducted at Consolidated Unit 10-002(a)-99, SWMU 10-004(a), and AOC 10-009 to identify areas of elevated radiation attributable to structure locations or releases, to bound the extent of surface radiological contamination, and to guide placement of borehole or surface sample locations. The surveys were performed using a DGPS coupled to radiological instrumentation. A diamond shaped pancake Geiger-Mueller (G-M) detector array was used for the radiological surveys because strontium-90 (a high-energy beta emitter) and DU (an alpha, beta, and gamma emitter) were the target radionuclides at the Bayo Canyon Aggregate Area.

Each DGPS-radiological survey system consisted of a Ludlum Model 2221 rate meter/scaler with a Ludlum Model 44-94 G-M detector coupled to a Trimble ProXRS mapping-grade DGPS. The Ludlum Model 2221 was operated in fast response rate meter mode, allowing for count rates tagged with corresponding coordinates to be collected at 1-s intervals. The radiological survey systems were carried in backpacks with the detectors held approximately 6 in. above the ground surface. Each detector line spacing was approximately 5 ft, and the walking survey speed was approximately 2.5 ft/s. At the end of each survey day, the field data were downloaded to a laptop computer and processed on-site using a combination of Trimble Pathfinder Office and ESRI ArcView Geographic Information System (GIS) computer applications. Section 4.2.1 discusses the results of the radiological survey, and Appendix M presents the radiological survey report. Photographs of the radiological survey equipment are presented in Appendix D.

3.2.2 Field Screening

Core samples, cuttings, and excavated material were screened for gross-alpha and -beta radiation. Screening was performed using an Eberline E600 with either an 380AB or SHP360 probe (or equivalent) and an ESP-1 rate meter with a 210 probe (or equivalent) in accordance with the Laboratory's Standard Operating Procedure (SOP) 10.07, Field Monitoring for Surface and Volume Radioactivity Levels. The probe was held less than 1 in. away from the medium. Measurements were made by conducting a quick scan to find the location with the highest initial reading and then collecting a 1-min reading at that location to determine gross-alpha and -beta radiation levels. Soil and core material was sampled and logged only after radiological field-screening measurements were established so appropriate precautions could be taken before the sample was collected. Field personnel collected and recorded background measurements for gross-alpha and gross-beta radiation daily.

Before removing samples from the site for shipping, the samples were screened for radioactivity by an RCT. All samples were submitted to the American Radiation Services, Inc laboratory in White Rock, New Mexico for gross-alpha, -beta, and -gamma analyses prior to shipment by the Laboratory's Sample Management Office (SMO) to ensure compliance with U.S. Department of Transportation (DOT) requirements.

Immediately after sample retrieval organic vapor monitoring of surface and subsurface samples was performed using a MiniRae 2000, Model PGM-7600 PID with an 11.7-electron-volt (eV) bulb. In addition, headspace vapor screening for VOCs was performed on recovered surface and subsurface media in accordance with SOP-06.33, Headspace Vapor Screening with a Photoionization Detector. Samples were placed in a glass container and covered with aluminum foil. The container was sealed, shaken gently, and allowed to equilibrate for 5 min. The sample was screened by inserting the PID probe into the container and measuring and recording any detected vapors. The workers' breathing zone was also monitored using the MiniRae 2000.

Field-screening results were recorded on the borehole logs and/or corresponding sample collection logs, in the site safety officer field notebook, and in the RCT field notes (see Appendix C for boring logs). Field-screening results, along with the physical characteristics of the core (e.g., contacts, elevated moisture, or staining), were considered when sampling intervals were selected and are presented in section 4.0.

3.2.3 Surface and Shallow-Subsurface Soil Investigation

Sixty-six surface and shallow subsurface samples from 33 locations were collected in August, September, and December 2007. Surface samples were collected (1) at locations where the vertical nature and extent were not defined by historical sampling activities, (2) at AOC 10-009 to define the nature and extent of surface contamination in that area, and (3) at locations dictated by the results of the radiological survey.

Surface samples were collected from 0 to 0.5 ft using the spade-and-scoop method in accordance with SOP-06.09, Spade and Scoop Method for Collection of Soil Samples. The samples were collected using stainless-steel shovels or spoons and homogenized in stainless-steel bowls.

Shallow-subsurface samples were collected from 1.5 to 2.0 ft using the hand-auger method in accordance with SOP-06.10, Hand Auger and Thin-Wall Tube Sampler. The material was placed in stainless-steel bowls and handled in the same manner as surface soil samples.

All surface and shallow-subsurface samples were placed in appropriate sample containers and submitted for laboratory analysis of the following chemical suites: strontium-90, TAL metals, explosive compounds, pH, cyanide, perchlorate, VOCs, SVOCs, and gross-alpha, -beta, and -gamma radiation. A subset of the surface samples collected from Consolidated Unit 10-001(a)-99 was also submitted for isotopic uranium analysis, and all surface and shallow-subsurface samples collected from Consolidated Unit 10-002(a)-99 were also analyzed for isotopic uranium, gross-alpha and -beta, and -gamma spectroscopy. Standard QA/QC samples (field duplicates and rinsate samples) were also collected in accordance with SOP-01.05, Field Quality Control Samples.

All sample collection activities were coordinated with the SMO. Upon collection, samples remained in the controlled custody of the field team at all times until delivered to the SMO. Sample custody was then relinquished to the SMO for delivery to a preapproved off-site analytical laboratory (refer to Appendix G for analytical data on DVD and CD). Selected photographs of surface sampling are presented in Appendix D.

3.2.4 Subsurface Investigation

The subsurface investigation included the drilling and sampling of 55 boreholes across the site and the excavation of exploratory test pits at AOC 10-009 and SWMU 10-007 [within Consolidated Unit 10-002(a)-99]. In addition, test pits and exploratory hand auger borings were dug in an attempt to locate SWMU 10-006. The details of these subsurface investigations are discussed below.

3.2.4.1 Borehole Drilling and Subsurface Sampling

For the 2007 drilling investigation, 55 boreholes were drilled to depths ranging from 30 to 68.5 ft bgs, and soil samples were collected to further characterize the site.

- Twenty-three boreholes were drilled and sampled within the Central Area of Consolidated Unit 10-002(a)-99 to define the lateral and vertical extent of a small number of inorganic and organic chemicals and to confirm the extent of strontium-90 at depth beneath the Central Area.
- Twenty boreholes were drilled and sampled at Consolidated Unit 10-002(a)-99, outside the Central Area, primarily to define the lateral and vertical extent of a small number of inorganic and organic chemicals and to define the lateral and vertical extent of strontium-90 in the area of SWMU 10-002(b).
- Five boreholes were drilled and sampled at SWMU 10-004(a) to define the vertical and lateral extent of a small number of inorganic chemicals and the lateral extent of bis(2-ethylhexyl)phthalate.
- Five boreholes were drilled and sampled to establish the presence and distribution of inorganic and organic chemicals and radionuclides at AOC 10-009 and to evaluate the physical dimensions of the suspected debris landfill.
- Two boreholes were drilled and sampled to define the lateral extent of strontium-90 and the vertical extent of cadmium at SWMU 10-005 [part of Consolidated Unit 10-001(a)-99].

Samples were collected at target intervals based on criteria established in the approved work plan (LANL 2005, 092083). All sampled core material was placed in the appropriate sampling containers, labeled, documented, and preserved (as appropriate) for transport to the SMO. Samples were submitted for laboratory analysis of the following chemical suites: strontium-90, TAL metals, explosive compounds, pH, cyanide, perchlorate, VOCs, SVOCs, and gross-alpha, -beta, and -gamma radiation.

Field duplicates and rinsate blanks were submitted for the same suite of analyses as the investigation samples in accordance with SOP-01.05, Field Quality Control Samples. The drilling equipment was field-screened for alpha and beta radiation by a qualified RCT and decontaminated using dry methods following SOP-1.08, Field Decontamination of Drilling and Sampling Equipment, after each borehole was drilled or as necessary based on field-screening results.

3.2.4.2 Geotechnical Analysis

Geotechnical samples were collected as part of the evaluation to remove landfill material at SWMU 10-007 as presented in the approved work plan (LANL 2005, 092083). Samples were collected for geotechnical analyses by inserting a Lexan sleeve into the core barrel. The Lexan sleeve is used to preserve sample properties such as moisture. Geotechnical samples were analyzed for bulk density, saturated hydraulic conductivity, moisture content, and calculated total porosity.

3.2.4.3 Borehole Abandonment

Boreholes were abandoned in accordance with SOP-05.03, Monitoring Well and Borehole Abandonment. All boreholes were abandoned within 24 h of completion with bentonite grout by filling upward from the bottom via tremie pipe to within 2 ft of the surface. After 24 to 48 h, the backfilled level was checked for settling, and additional grout was added as necessary. The remainder of each boring was filled with Portland type I/II cement to surface grade.

3.2.4.4 Exploratory Test Pits

Exploratory test pits were excavated at AOC 10-009 to identify the location and physical extent of the suspected landfill and to characterize the type of debris.

Test pits at SWMU 10-007 were dug to confirm the physical extent of the debris landfill, to verify the depth to debris, and to characterize the physical, chemical, and radiological characteristics by sampling the debris.

Material debris collected and sampled was composed primarily of concrete and analyzed for VOCs (toxicity characteristic leaching procedure [TCLP]), SVOCs (TCLP), metals (TCLP), gross alpha, beta, and gamma, strontium-90, perchlorate, cyanide, and explosive compounds. Analytical data will be used to support corrective action measures and to finalize any future remedial efforts. The results of the trenching are discussed in section 4.0 and the preliminary measures evaluation for SMWU 10-007 is presented in Appendix J.

3.2.4.5 Investigation to Locate SWMU 10-006

SWMU 10-006 is thought to consist of various locations where burning operations were conducted, primarily in the 1950s and early 1960s. Open-burning records are incomplete, and details about location, type of materials, and ash disposition are unknown. Visual reconnaissance was conducted across Consolidated Unit 10-001(a)-99 to locate potential burn pits or debris that would indicate the location of

SWMU 10-006. In addition to the visual reconnaissance, historical aerial photographs from the consolidated unit were examined, and one suspect depression was identified and selected for further investigation. The suspect area was located, and test pits and hand-auger holes were excavated to look for evidence of burning, such as ash, charcoal, and charred debris. Selected photographs from the investigation to locate SWMU 10-006 are presented in Appendix D.

3.3 Health and Safety Measures

All 2007 investigation activities were conducted in accordance with a site-specific health and safety plan, an integrated work document, and two radiological work permits that detailed work steps, potential hazards, hazard controls, and required training to conduct work. These health and safety measures included the use of modified level-D personal protective equipment (PPE) in areas where elevated radiation was expected and field monitoring for VOCs, gross-alpha and -beta radiation, and dust particulate matter using both portable and personnel air monitoring systems.

The Bayo Canyon Aggregate Area is located on Los Alamos County property and is accessible to the public via a trail system. Before field activities began, a gate was installed upcanyon of the study area. The hiking trail was upgraded and the western portion relocated and posted to detour trail users away from the potential hazards associated with drilling and sampling in the investigation area (see section 3.1 for details).

3.4 Waste Management

All investigation-derived waste (IDW) generated during the Bayo Canyon investigation was managed in accordance with the IDW management plan in the approved work plan (LANL 2005, 092083) as well as applicable regulations and Laboratory SOPs. These SOPs incorporate the requirements of all applicable EPA and NMED regulations. SOPs applicable to the characterization and management of IDW are SOP-01.06, Management of Environmental Restoration Project Waste, and SOP-01.10, Waste Characterization.

The waste streams associated with the investigation included drill cuttings and core materials and contact IDW. Drill cuttings and discarded core from boreholes were collected and containerized in roll-off bins or waste bags in a fenced and locked less-than-90-d waste storage area pending characterization. This waste stream was characterized in accordance with the approved waste characterization strategy form (WCSF), which is included in Appendix E. The drill cutting and discarded core waste stream was classified as hazardous waste pending analysis.

Contact IDW included PPE (gloves, ear plugs, Tyvek coveralls, plastic booties), plastic bags and sheeting, disposable sampling supplies, decontamination towels, and other solid waste that may have come into contact with possibly contaminated environmental media. Such waste was stored in 55- or 30-gal. drums placed on pallets in the fenced and locked less-than-90-day waste storage area pending characterization. As described in the WCSF, the contact IDW was characterized using knowledge of the waste generating process and the levels of radioactive contamination encountered.

3.5 Deviations

Deviations from the scope of activities, as defined in the approved work plan (LANL 2005, 092083), occurred during the implementation of the Bayo Canyon investigation.

Borehole location 10-601177 was moved 30 ft west from its proposed location because of the presence of live overhead utilities. Borehole locations 10-601170 and 10-601171 were moved approximately 10 ft north to avoid low-lying potentially live power lines. Borehole location 10-601164 was moved approximately 4 ft east of the proposed location because auger refusal was encountered at 12 ft bgs and the boring could not be completed. Borehole location 10-601192 was not drilled to its proposed TD of 70 ft bgs because auger refusal was encountered at 68.5 ft bgs.

Two additional boreholes (locations 10-601182 and 10-601259) were added to the scope of this project. Borehole location 10-601182 was drilled to 60 ft bgs in the center of a possible geophysical anomaly identified near SWMU 10-002(b). Elevated beta radiation was encountered at borehole location 10-601163, and borehole location 10-601259 was drilled as a step-out boring to a depth of 50 ft bgs, to define the lateral extent of potential radiological contamination.

The geotechnical sampling intervals proposed in the work plan could not be collected from borehole location 10-601164 because radioactivity (based on field screening) was elevated at the targeted sample depths. Two deeper geotechnical samples were collected from borehole location 10-601164, and two additional geotechnical samples were collected from borehole location 10-601259 at the proposed depth intervals.

Historical surface sampling locations 10-01061 and 10-01062 were inaccessible for resampling because of steep terrain and were relocated 39 ft and 28 ft north, respectively. The 1994 coordinates placed the locations over the edge of a vertical cliff. The new coordinates for locations 10-01061 and 10-01062 are consistent with the location of other historical surface samples positioned along the cliff edge. Because of the inaccuracy of the historical coordinates and the possibility that locations 10-01061 and 10-01062 were not resampled from the exact historical location, both the historical data and the 2007 data are included in the reporting analytical data set and are presented for locations 10-01061 and 10-01062.

Surface sampling locations 10-01002 and 10-01003 were not sampled because new residential structures are situated atop these locations.

Finally, 20 of the surface samples collected from 10 locations at Consolidated Unit 10-001(a)-99 were analyzed for isotopic uranium. The isotopic uranium analysis was added to the sample suite because elevated beta radiation was observed during the walk-over radiological survey at Consolidated Unit 10-001(a)-99.

4.0 FIELD INVESTIGATION RESULTS

This section summarizes the results of the 2007 Bayo Canyon Aggregate Area field investigation conducted at Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMUs 10-004(a) and 10-006, and AOCs 10-009 and AOC C-10-001. As detailed above, the scope of field activities included radiological and geophysical surveys, surface-soil sampling, subsurface sampling of soil, tuff, and Quaternary alluvium, and the excavation of exploratory test pits.

4.1 Current Site Conditions

Bayo Canyon is currently open to the public for recreational activities. A well maintained hiking trail exists at the base of the cliff north of Consolidated Unit 10-002(a)-99 and a dirt road runs parallel to the firing sites [Consolidated Unit 10-001(a)-99] and ends in the stream channel near AOC 10-009. The area that made up the central liquid disposal complex [(SWMUs 10-003 (a-o)] has been posted to prohibit excavation before 2142.

The only "intact" SWMU is 10-007, a landfill containing the waste and building debris generated during D&D activities associated with the former liquid disposal complex [Consolidated Unit 10-002(a)-99] and the firing sites [Consolidated Unit 10-001(a)-99]. This landfill is located near the drainage channel north of the former radiochemical laboratory (building TA-10-01) and remains in place. The landfill is covered with soil and sparse vegetation and is enclosed by a posted fenced area with a wattle-bermed barrier.

All known excavated sites from the 1963 D&D operation were backfilled with clean soil from other parts of the canyon or clean building debris from D&D activities (LANL 1992, 007668, Chapter 3). Shrapnel remains in the firing site dispersal area [Consolidated Unit 10-001(a)-99], and four asphalt pads from a 1994 subsurface (drilling) investigation remain on the south side of the road between the former central complex and the firing shot pads. Also present are utility poles with outlet boxes located near the former radiochemistry building that provided power to the support trailers.

4.1.1 Surface Conditions

The surface of Bayo Canyon is located at an elevation of approximately 6000 to 6740 ft above sea level and slopes to the southeast at an approximate 3% grade. A narrow, braided stream channel with low banks runs through the center of the canyon and is underlain with Quaternary stream alluvium (LANL 1996, 054491, p. 3). Surface soil in Bayo Canyon consists of poorly developed, well-drained soil of the Totavi series. The soil is generally 2 to 4 in. thick. In many parts of Bayo Canyon, the soil has been disturbed by historical operations and previous remediation activities. Vegetation is a mix of grass, sagebrush, chamisa, and pine trees.

Historical sedimentation on the floor of Bayo Canyon is minimal. The channel is discontinuous, and precipitation runoff generally spreads out over the grassy valley bottom. These areas of unchanneled flow are potential areas of sediment deposition (Broxton and Eller 1995, 058207pp. 67-68).

4.1.2 Subsurface Conditions

The Bayo Canyon Aggregate Area consists of a canyon bottom situated between two mesa tops. The near vertical mesa tops range in approximate elevation from 7000 to 7100 ft above sea level. The upper portion of the canyon walls is vertical, cut into the upper (Tshirege) Member of Bandelier Tuff. From the base of the cliffs, steep slopes ranging from 10 to 30 degrees lead downward to a wide, flat canyon floor. The canyon floor is mainly cut into the (lower) Otowi Member of the Bandelier Tuff.

Bandelier Tuff (Qbt) is subdivided into two members, the Otowi (or Lower) Member, and the Tshirege (or Upper) Member. The Tshirege Member is divided into four distinct cooling units that are exposed in the canyon walls above TA-10. The four cooling units comprising the Tshirege Member are, in descending sequence, Qbt 3, Qbt 2, Qbt 1v, and Qbt 1g (Broxton and Eller 1995, 058207, pp. 45-51). The Otowi Member consists of a relatively homogenous unit made up of a succession of ash-flow tuff. The base of the Otowi Member includes the Guaje Pumice Bed, a stratified pumice fall deposit (Broxton and Reneau 1995, 049726, p. 10). Bedrock directly underlying the site is the Otowi Member of the Bandelier Tuff. The 1994 and 2007 drilling investigations indicated that if present, the Otowi Member is 20–30 ft bgs and ranges in thickness from a few inches to 20 ft. The basal Guaje Pumice Bed occurs under TA-10 at 35 to 40 ft bgs and is up to 20 ft thick. In Bayo Canyon, the Guaje Pumice Bed separates Bandelier Tuff from the underlying paleosol that rests atop the Cerros del Rio basalt. The Otowi Member is overlain by up to 40 ft of colluvium, Quaternary alluvium (Qal), and soil. In many areas, the upper 5 to 15 ft of alluvium has been reworked, displaced, filled, and mixed with construction debris during the construction and D&D activities that took place while the site was operational.

4.2 Surface Surveys and Sampling

The following subsections describe the results of the geophysical and radiological surveys and surface and shallow-subsurface sampling.

4.2.1 Geophysical Survey Results

As discussed above, two walk-over geophysical surveys were conducted at the Bayo Canyon Aggregate Area to investigate the distribution of shrapnel at Consolidated Unit 10-001(a)-99 and to locate buried debris and/or structures at Consolidated Unit 10-002(a)-99, SWMU 10-004(a), and AOC 10-009. A summary of the survey results is presented below. The methods used to collect the geophysical data are summarized in section 3.2.1 above and in Appendix B, and the full geophysical reports are presented in Appendices K and L.

4.2.1.1 Shrapnel Survey

A geophysical survey was conducted at Consolidated Unit 10-001(a)-99 to identify the extent of residual shrapnel within the area of the former firing sites. Refer to Appendix K for location maps, figures and details of methodology and findings. The results show a shrapnel density pattern consistent with central test explosions with the density of readings diminishing with distance from the source. The results also indicate that the shrapnel distribution is defined by the current survey boundary. Further, the shrapnel is primarily within the first few inches of the surface and consists of smaller items. These conclusions are consistent with field observations made during the walk over survey.

4.2.1.2 Landfill and Buried Structure Identification Surveys

GPR survey methods were used in an attempt to locate the former septic leach field, SWMU 10-004(b), east of the Central Area. Numerous GPR line surveys (Figure L-3.2-1 in Appendix L) were performed to identify any existing buried pipelines extending into the suspect area. Detailed computer analysis of the GPR data showed no anomalies that could be attributed to the alleged leach field.

EM and GPR techniques were used at SWMU 10-004(a) to detect buried structures. One anomaly was encountered near the center of the survey area attributed to the steel surface completion of a monitoring well. No other EM anomalies were observed (Figures L-3.4-1 and L-3.4-2 in Appendix L). GPR data were acquired over the area, but the results showed no evidence of buried features.

EM61 data were collected from the area around SWMU 10-002(b) to locate buried tanks or pipes. The only anomalies detected in this area were associated with surface interference from a pipe observed at the ground surface (Figure L-3.3-2 in Appendix L). The 3-ft-long piece of pipe protruding out of the ground near SWMU 10-002(b) was removed.

EM and GPR survey techniques were used to define the extent of the potential landfill at AOC 10-009. The data showed a halo of high conductivities associated with interference from the surrounding chainlink fence. Other than the anomaly caused by the fence, the EM (Figures L-3.5-1 and L-3.5-2 in Appendix L), and GPR data showed no evidence of buried debris at AOC 10-009. As a result, borehole and test pit placements were determined based on field observations such as the presence of surface debris and the lack of older trees that would be consistent with a recently disturbed area.

EM and GPR techniques were used to define the lateral extent of SWMU 10-007. The EM results showed a kidney-shaped anomaly interpreted as buried material and disturbed subsurface conditions. GPR data acquired over this same area identified various anomalous shapes, including tabular features interpreted as demolition debris. Based on the geophysical results, the interpreted area is approximately 6000 ft^2 (Figures L-3.1-1 and L-3.1-2 in Appendix L).

In conclusion, EM and GPR data showed no evidence of buried pipes or structures at SWMUs 10-004(b), 10-004(a), and 10-002(b) and no evidence of buried material or debris at AOC 10-009. EM and GPR data confirmed the presence of buried construction debris at SWMU 10-007 and better defined the lateral extent of the known landfill.

4.2.2 Radiological Survey Results

Walkover radiological surveys were conducted over 23 acres of Bayo Canyon from four areas: Consolidated Unit 10-001(a)-99, Consolidated Unit 10-002(a)-99, SWMU 10-004(a), and AOC 10-009. The methods used to collect the radiological data are summarized in section 3.2.1 and Appendix B, and the full radiological survey report is presented in Appendix M.

Results from the radiological surveys identified six areas of elevated radioactivity within the firing sites [Consolidated Unit 10-001(a)-99]. These locations are labeled locations 1–6 in Figure M-2.2-1 in the radiological survey report (Appendix M). Although elevated radiation levels were detected, the results of the radiological survey show no correlation between elevated radiological contamination and shrapnel distribution at the firing sites. Visual inspection revealed millimeter-size particles of yellow material on the ground surface in one of the areas where elevated radiation was observed. A screening sample was collected and submitted for gross-alpha and -beta analysis. The screening results indicated that uranium-238 or possibly DU was present in the surface soil sample.

Four areas of elevated radioactivity were observed in Consolidated Unit 10-002(a)-99: two near SWMU 10-007 within the Central Area and two on the hill slope south of the former radiochemistry building. These locations are labeled locations 8–11 in Figure M-2.2-3 of the radiological report (Appendix M) and are above the local background for Consolidated Unit 10-002(a)-99. The elevated readings at SMWU 10-007 are likely a result of strontium-90 contamination. Historical data indicate that strontium-90 is present in surface and subsurface media at SWMU 10-007. Eight surface and shallow-subsurface samples from four locations (10-601319, 10-603263, 10-603264, and 10-603265) were collected at the two localized areas of elevated radioactivity.

One area of elevated radioactivity above local background was observed in AOC 10-009 (Figure M-2.2-2 in Appendix M). Visual inspection also revealed millimeter-sized particles of yellow material, similar to those at Consolidated Unit 10-001(a)-99 in the area where elevated radiation was observed. The elevated radioactivity at AOC 10-009 may be related to the presence of uranium-238 (as DU) in soil.

In summary, Consolidated Units 10-001(a)-99 and 10-002(a)-99 and AOC 10-009 each have areas of elevated radioactivity. Surface sample results and visual inspection confirm the presence of possible DU in soil at Consolidated Unit 10-001(a)-99 and AOC 10-009. Historical data and surface sample results confirm the presence of strontium-90 in soil at near the former radiochemistry building and SWMU 10-007. The radiological survey results are reported in Appendix M. The analytical data referenced in this discussion are presented in Appendix G and discussed further in Appendix H.

4.2.3 Surface and Shallow-Subsurface Sampling

Sixty-six surface and shallow-subsurface samples from 33 locations were collected during the 2007 investigation. Surface and shallow-subsurface activities included sampling soil, tuff, or Quaternary alluvium to shallow depths (maximum of 3.2 ft bgs) using spade-and-scoop or hand-auger methods.

Samples from two depths (typically 0–0.5 ft bgs and 1.5–2.0 ft bgs) were collected from all 33 sampling locations.

Forty-eight surface and shallow-subsurface samples were collected from 24 historical sampling locations from Consolidated Unit 10-001(a)-99; 10 samples were collected from 5 locations were collected within AOC C-10-001; and 8 samples from 4 locations were collected near the former radiochemistry building [within Consolidated Unit 10-002(a)-99] at locations where elevated radiation was detected during the radiological survey. One surface sample was collected in September 2007 to confirm the results of the radiological survey and to characterize the nature of radiological contamination. In December 2007, seven additional surface and shallow-subsurface samples were collected to further characterize the nature and extent of strontium-90 and possible inorganic chemicals. The results of the seven samples collected in December 2007 are not included in the risk assessment, but no additional COPCs were identified. The results are presented in data tables and on maps and were used to determine the nature and extent of contamination at Consolidated Unit 10-002(a)-99.

A summary of the surface and shallow-subsurface samples collected as part of the 2007 investigation, and the requested chemical analyses are presented in Table 4.2-1. Figure 4.2-1 shows the location of the surface and shallow-subsurface samples collected in 2007.

4.2.4 Surface Soil Field-Screening Results

All samples were field screened for radioactivity and organic vapors. The instrumentation and methods used to collect field-screening data are discussed in section 3.2.2 and Appendix B. Background results for the PID instrument range from 0 ppm to 3.0 ppm because of the inherent sensitivity of the 11.7-eV bulb to moisture depending on a number of factors, including humidity, soil moisture of the sample, and ambient-air temperature.

Organic vapors were detected at several surface sample locations that were slightly moist and/or contained root material or pine needles. Detected organic vapor headspace concentrations ranged from 0.1–61.9 ppm in surface soil samples. Field screening for radioactivity produced no elevated readings for any surface and shallow-subsurface (0–2 ft) media sampled from Consolidated Unit 10-001(a)-99 and AOC C-10-001. Elevated radioactivity readings (>2 times local background) were recorded in only one surface sample (location 10-601319) collected from Consolidated Unit 10-002(a)-99; the maximum alpha and beta field-screening measurements recorded from this sample were 500 dpm and 15,000 dpm, respectively. The field-screening results are presented in Table 4.2-2.

4.3 Exploratory Characterization Drilling

This section provides results for all drilling, sampling, and related field screening, and geotechnical sampling activities performed within the Bayo Canyon Aggregate Area.

A total of 2563 vertical feet were drilled and sampled from 55 boreholes during the 2007 investigation using a Central Mine Equipment 85 hollow-stem auger (HSA) drill rig with 4.25-in.-inner-diameter (I.D.) and nominal 8.25-in.-outer-diameter (O.D.) augers. A hex-rod core retrieval system and 4-in.-O.D. stainless-steel core barrels were used for sampling. A nominal 9-in.-diameter drill bit was used for all borings. During HSA drilling, continuous core was recovered using stainless-steel core barrels through the center of the 4.25-in. drill string.

Forty-three boreholes were drilled to depths ranging from 30 to 63.5 ft bgs at Consolidated Unit 10-002(a)-99 (Figure 4.3-1). Borehole location 10-601259 was not identified in the approved work plan and was added as a “step-out” boring from location 10-601163 to bound the lateral extent of radiological contamination identified during field screening (see section 4.3.2 below). Five boreholes were drilled to depths ranging from 34–68.5 ft bgs at SWMU 10-004(a) (Figure 4.3-1). Five boreholes were drilled to 33 or 34 ft bgs at AOC 10-009 (Figure 4.3-2). No debris was encountered during drilling operations at AOC 10-009. Two boreholes were drilled to 34 ft bgs at SWMU 10-005 [part of Consolidated Unit 10-001(a)-99] (Figure 4.3-2).

Core from all boreholes was collected at 5-ft intervals. At the surface, cuttings and core were screened for radioactivity and VOCs (as described in section 3.2.2). At locations where elevated radiological contamination was expected (for example, borehole location10-601164), Lexan core-barrel liners were used to prevent contamination of the core barrel and cross-contamination at depth between samples.

All core material was photographed, visually inspected, and lithologically logged by a qualified geologist. The geologist noted variations and interpreted geologic contacts in the retrieved core and produced a written description in the field. Color of soil and core was determined using the Geological Society of America Munsell rock color chart. In addition, the geologist noted the results of field screening for VOCs and radiation; percent core recovery; relative moisture content and notations of odors, staining, fractures, water-bearing zones, and other features that could guide sample collection or interpretation of results.

The lithologic descriptions and geologic unit designations used are based on accepted terminology and stratigraphy for the Bandelier Tuff and associated units as outlined in reports of the geology of the Pajarito Plateau (Broxton and Eller 1995, 058207).

Boring logs are presented in Appendix C. Selected photographs from drilling operations and geologic units encountered during drilling are presented in Appendix D. Table 4.3-1 lists the 2007 borehole locations and TD drilled for each borehole. Figures 4.3-1 and 4.3-2 show the locations of the 55 boreholes.

4.3.1 Soil and Rock Characterization Sampling

A total of 117 soil, tuff, and Quaternary alluvium samples were collected during the 2007 drilling investigation. A minimum of two samples were collected for laboratory analyses from each of the boreholes drilled during the 2007 investigation. The sampling intervals were selected based on data requirements in the approved investigation work plan (LANL 2005, 092083) and/or

- the depth of the highest field-screening result, if applicable;
- the depth of geologically significant features; and
- the discretion of the field geologist.

Table 4.3-2 presents samples collected in the 2007 investigation from all boreholes and requested chemical analyses. A summary of all investigation samples collected in solid media by borehole location and corresponding sampled depths, media, and the analyses requested is presented in section 6 and Appendix G. A summary of all QA/QC samples collected in solid media by borehole location and corresponding depths (if applicable), sample type, media, and the analyses requested and chain of custody forms are also presented in Appendix G. The quality review of the analytical data is presented in Appendix F. Field-screening results are presented in Table 4.3-3.

Appendix H presents an analytical data review, the COPCs identified, and a discussion of a nature and extent of contamination from 2007 data as well as data from all relevant historical investigations.

4.3.2 Soil and Rock Field Screening

All samples were field screened for radioactivity and organic vapors. The methods used for screening of gross radiation and organic vapors are discussed in section 3.2.2 and Appendix B. Field-screening results were recorded on the borehole logs and/or corresponding sample collection logs in addition to a PID screening log and the RCT field logbook. Field-screening results are presented in Table 4.3-3.

Field screening during drilling within the Bayo Canyon Aggregate Area for gross-alpha and -beta radiation detected elevated radioactivity (>2 times local background) in two boreholes, at locations 10-601163 and 10-601164. At borehole location 10-601163, beta activity was measured at 44,000 dpm on retrieved core from the 13–14.8-ft interval in alluvium/fill material. At borehole location 10-601164, drilled at a location with known elevated strontium-90 activity, beta radiation was measured at 400,000 dpm on retrieved core from the 14–16 ft interval and also in alluvium/fill material. Analytical samples were collected from both intervals.

Radiological measurements immediately above and below these intervals were slightly elevated with respect to local background activities.

No organic vapors were detected in any of the headspace measurements collected from core samples.

4.3.3 Geotechnical Sampling

Four samples were collected for geotechnical analyses from borings drilled in SWMU 10-007, located within the Central Area of Consolidated Unit 10-002(a)-99. Two samples each were collected for geotechnical analyses from borehole locations 10-601164 and 10-601259. Samples were collected from 8–9.6 ft bgs and 23–24.2 ft bgs at borehole location 10-601259 and from 34–35.4 ft bgs and 40.5–41.5 ft bgs at borehole location 10-601164. The locations, sample IDs, and results of analyses performed (included averages for each parameter) are listed in Table 4.3-4. The samples from borehole location 10-601164 were collected because it was the area of highest strontium-90 contamination. Additional samples were collected from borehole location 10-601259 because elevated field screening at borehole location 10-601164 prevented the collection of geotechnical samples from the target depths specified in the approved work plan (LANL 2005, 092083).

The minimum bulk density of 0.91 g/cm^3 was measured at location 10-601164 at a depth of 40.5–41.5 ft bgs in the Guaje Pumice Bed. The maximum bulk density was 1.49 g/cm^3 at borehole location 10-601259 at a depth of 8–9.6 ft bgs in sandy alluvium. The average bulk density for all geologic units was 1.205 g/cm^3.

The minimum saturated hydraulic conductivity of 0.00029 cm/s was measured at borehole location 10-601164 at a depth of 40.5–41.5 ft bgs in the Guaje Pumice Bed. The maximum saturated hydraulic conductivity of 0.018 cm/s was at borehole location 10-601259 at a depth of 8–9.6 ft bgs in sandy alluvium. The average saturated hydraulic conductivity was 0.00503 cm/s.

The maximum moisture content value of 23.2% was measured at borehole location 10-601164 at a depth of 40.5–41.5 ft bgs in the Guaje Pumice Bed. The lowest moisture content of 8.5% was observed at borehole location 10-601164 at a depth of 34–35.4 ft bgs in alluvial sands. The average moisture content was 12.8%.

Porosity was lowest at borehole location 10-601259, with a value of 43.7% at 8–9.6 ft bgs in disturbed sands and silts. The maximum percent porosity calculated was 65.8% at borehole location 10-601164 at 40.5–41.5 ft bgs in the Guaje Pumice Bed. The average total porosity was 54.55%.

4.3.4 Exploratory Borehole Abandonment

All 55 boreholes have been abandoned by emplacement of a bentonite and cement mixture (grout) from the bottom of the boring to within 2 ft of the surface using the tremie pipe method. The top 2 ft were plugged with Portland type I/II cement.

4.4 Excavation of Exploratory Test Pits

Six test pits were excavated at AOC 10-009 to identify the location and physical extent of the AOC 10-009 landfill and to characterize the type of buried debris. Four test pits were excavated to 5 ft bgs and two were excavated to 12 ft bgs. No subsurface debris was encountered and no samples were collected from the test pits excavated at AOC 10-009. Figure 4.3-3 shows the location of the test pits excavated at AOC 10-009.

Seven exploratory test pits were excavated in the vicinity of SWMU 10-007 to confirm the physical extent of the debris landfill, to verify the depth to debris, and to characterize the physical, chemical, and radiological characteristics of the debris. Five test pits were excavated to 5 ft bgs, and two were excavated to 12 ft bgs or refusal; one of the proposed 12-ft test pits was excavated to 10.5 ft bgs because large concrete slabs prevented deeper excavation. Debris (including concrete, rebar, and asphalt) was encountered from 3 to 12 ft bgs, and three debris samples were collected for chemical analysis. One debris sample (a composite sample from test pits 1–5) was collected from the 5-ft-deep test pits, and one sample was collected from 10.5-ft- and 12-ft-deep test pits (test pits 6 and 7, respectively). Figure 4.3-4 shows the locations of the test pits excavated at SWMU 10-007.

4.5 Investigation to Locate SWMU 10-006

During 2007 field activities, portions of Consolidated Unit 10-002(a)-99 were mowed to facilitate survey operations; no unusual features (such as pits or suspicious depressions) were observed during mowing. During both the radiological and geophysical walk-over surveys at Consolidated Unit 10-002(a)-99, no anomalous features indicating the presence of SWMU 10-006, such as a former pit or depression or area of former burning activities, were observed.

An examination of historical aerial photos of Bayo Canyon revealed a suspected pit near the westernmost firing pad. The area of suspected pit is currently level, and no surface expression of a former pit is evident. The entire area was visually scrutinized, and a series of hand-auger holes and shallow pits were dug. Aside from the normal small chunks of debris, millimeter- to a few-centimeter-size shrapnel items, recent trash (aluminum cans, etc.), and pieces of wire common in the firing site area, nothing unusual was observed on the surface and no evidence of previous burning was found. Within an approximate 20 ft^2 area, six hand-auger borings were dug to a depth of 2.5 to 3 ft, and two small pits were excavated with a shovel to approximately 2 to 3 ft. Again, no chunks of charcoal, layers of charcoal, ash, or melted or fire-charred debris to indicate former burning activities were observed in any hand-augured boring or pit, so samples were not collected. All material examined was clean soil. Photographs of the hand-auger borings and pits are presented in Appendix D.

4.6 Groundwater Conditions

The top of regional groundwater beneath the Laboratory occurs at depths ranging from 600 ft to 1300 ft. In Bayo Canyon, the elevation of the regional aquifer is about 6000 ft above sea level or approximately 600 ft bgs (LANL 1997, 056660.423, p. 6). No perched or alluvial aquifers have been identified during any of the subsurface investigations conducted in 1961–1962, 1973, 1974–1975, 1980, 1994, and 2007 within Bayo Canyon. Per the approved investigation work plan (LANL 2005, 092083), no groundwater samples were collected as part of the 2007 investigation.

4.7 Surface Water Conditions

Surface water (stream) flow in the canyon is intermittent and rare, with runoff occurring primarily during the summer months (July through August) from heavy thunderstorms and confined to the upper canyon. The runoff is generally of short duration over a period of several hours. Stream flow can also occur as a result of spring snowmelt runoff. Individual flooding events may cause realignment of the main channel. No steam flow was observed during the 2007 investigation. Per the requirements specified in the approved work plan (LANL 2005, 092083), no surface water samples were collected as part of the 2007 investigation.

4.8 Surface Air and Subsurface Vapor Conditions

The approved investigation work plan (LANL 2005, 092083) did not require vapor sampling for the 2007 Bayo Canyon Aggregate Area investigation, and no vapor sampling was conducted.

4.9 Pilot Testing Results

The approved investigation work plan (LANL 2005, 092083) did not require pilot testing for the 2007 Bayo Canyon Aggregate Area investigation, and no pilot tests were conducted.

5.0 REGULATORY CRITERIA

This section describes the criteria used for screening COPCs and for evaluating potential risk to ecological and human receptors. Regulatory criteria identified by medium in the Consent Order include cleanup standards, risk-based screening levels, and risk-based cleanup goals. Table 5.0-1 presents a summary of applicable SSLs for inorganic and organic COPCs and SALs for radionuclide COPCs at Bayo Canyon Aggregate Area.

The objective of the current investigation is to complete the characterization of the nature and extent of contamination from historical TA-10 operations and to support any future corrective measures evaluations for the site. For each consolidated unit, SWMU, and AOC, the regulatory criteria and the data gathered during the investigation are used to identify COPCs (Appendix H), their distribution in the environment (section 6.0 and Appendix H), and the resulting potential human and ecological risks (section 7.0 and Appendix I). The results of the data assessment as well as the screening-level risk evaluations help to confirm the physical location and extent of specific sites, nature and extent of contamination, and the need for additional corrective actions at the site(s).

All analytical results obtained from samples collected during the 2007 investigation as well as relevant historical investigations are reviewed for quality (Appendix F), and all data found to be validated to current standards for data usability are regarded as “qualified data.” Only qualified data are included in the final data set used to characterize the nature and extent and evaluate potential risk associated with the Bayo Canyon consolidated units, SWMUs, or AOCs. Risk-screening evaluations are based on applicable exposure scenarios, as discussed below; thus, for Bayo Canyon, only qualified data obtained from samples collected from 0–1 ft, 0–5 ft, and 0–10 ft are used in the human health or ecological risk screening evaluations.

Human health risk screening evaluations were conducted for the Bayo Canyon Aggregate Area using the NMED and EPA Region 6 guidance (NMED 2006, 092513; EPA 2007, 095866). An ecological screening assessment was performed using the Laboratory's ecological screening methods (LANL 2004, 087630).

5.1 Current and Future Land Use

The specific screening levels used in the risk evaluation and corrective action decision process at a site depend on the current and reasonably foreseeable future land use. The current and reasonably foreseeable future land use for a site determines the receptors and exposure scenarios that are used to select screening and cleanup levels. The land use within and surrounding the Bayo Canyon Aggregate Area is currently recreational and is expected to remain recreational for the reasonably foreseeable future. A construction worker scenario is evaluated because underground sewer lines are present near or within the boundaries of the consolidated units, and maintenance or repair on these lines is a reasonable possibility in the foreseeable future. An industrial scenario is not assessed because it is not a foreseeable future land use for Bayo Canyon. Although the residential scenario is typically evaluated for comparison purposes per the Consent Order, it is the decision scenario for sites that do not pose a potential risk.

5.2 Screening Levels

Human health and ecological risk-screening evaluations were conducted for the solid media at the Bayo Canyon Aggregate Area. The human health screening assessment (Appendix I) was performed on inorganic and organic COPCs using NMED soil screening levels (SSLs) (NMED 2006, 092513) for the construction worker and residential scenarios. The recreational scenario was assessed using SSLs developed by the Laboratory (LANL 2007, 094496). Radionuclides were assessed using the Laboratory SALs (LANL 2005, 088493). When an NMED SSL was not available for a COPC for the construction worker and residential scenarios, the EPA Region 6 human health media-specific screening level (EPA 2007, 095866) was used (adjusted to a risk level of 10^{-5} for carcinogens). If an SSL is not available and if sufficient toxicity information was available, a SSL was calculated. A surrogate SSL is used for some COPCs based on structural similarity or breakdown products. Table 5.0-1 presents a summary of applicable SSLs for inorganic and organic COPCs and SALs for radionuclide COPCs at Bayo Canyon Aggregate Area.

The Laboratory's ecological screening guidance (LANL 2004, 087630) and ecological screening levels (ESLs) from the ECORISK Database, Version 2.2 (LANL 2005, 090032) were used to evaluate ecological receptors. Ecological risks are assessed in Appendix I.

5.3 Cleanup Goals

The cleanup goals specified in Section VIII of the Consent Order are a target risk of 10^{-5} for carcinogens or a hazard index (HI) of 1 for noncarcinogens. The screening levels described in section 5.2 are based on these cleanup levels and a dose of 15 mrem/yr for radionuclides. As specified in Section VIII.B.1 of the Consent Order, the screening levels will be used as cleanup levels unless determined to be impracticable or unless SSLs do not exist for current and reasonably foreseeable future land use. If appropriate, the cleanup levels to be used in the Bayo Canyon Aggregate Area will be determined during the corrective measures evaluation.

6.0 SITE CONTAMINATION

All site data representative of current conditions were reviewed to identify COPCs for Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001 and to establish the spatial distributions of site COPCs. Specifically, the site data set was evaluated to determine if the data requirements established in the approved Bayo Canyon Aggregate Area investigation work plan (LANL 2005, 092083) had been effectively addressed and if the data indicated the presence of a previously unidentified COPC.

The data included in this review were derived from multiple investigations, including a 1994 RFI (LANL 1995, 049974); a 1995 VCA at AOC C-10-001 (LANL 1995, 049710), a 1996 IA at Consolidated Unit 10-002(a)-99 (LANL 1997, 056358), and the 2007 investigation as prescribed in the approved investigation work plan (LANL 2005, 092083). Only data of acceptable quality from off-site analytical laboratories and accompanied by all supporting documentation were subjected to the review and used for decision making. A comprehensive discussion of the analyses performed, the quality of the analytical results, and the data meeting the requirements for inclusion in the data review is presented in Appendix F. Rejected analytical results are not included in the reporting data; data-quality issues, data qualifiers, and rejected analytical results are also discussed in Appendix F. Screening data were not included but were used to guide sample collection decisions and other elements of the investigations. The comprehensive data set used for this report is presented in Appendix G on DVD and CD.

It should be noted that historical data were revalidated to current data-quality standards for this report. Therefore, analytical results and qualifiers for historical data presented in this document are not identical to the analytical results and qualifiers for the historical data used to develop the approved investigation work plan (and HIR). Thus, some data results used in establishing data-quality requirements for the approved Bayo Canyon investigation work plan may now be excluded from the current data set (and will not be presented in plates and figures). But all previously established data requirements are discussed in the following sections for clarity and completeness. Appendix F provides a detailed discussion of rejected data, and Table F-2.1-1 presents a crosswalk between the data needs identified in the approved work plan, the historical data set, and the revalidated data set, where changes were made as a result of revalidation.

The COPCs are identified differently for inorganic chemicals, organic chemicals, and radionuclides. An inorganic chemical is initially identified as a COPC if at least one result or the analytical detection limit exceeds the BV. If additional comparisons with the background data set demonstrate that inorganic chemical concentrations are within the range of background concentrations, the inorganic chemical is eliminated as a COPC. If there is no associated BV, the inorganic chemical is a COPC if it is detected in site samples.

There are no BVs for organic chemicals, and therefore, any organic chemical detected in site samples is designated a COPC.

Radionuclides are divided into fallout radionuclides and naturally occurring radionuclides. The fallout radionuclides include tritium, strontium-90, cesium-137, plutonium-238, plutonium-239/240, and americium-241. FVs for the fallout radionuclides exist for the top 0–6 in. of soil and fill. If the activity of a fallout radionuclide exceeds the FV in a sample from the top 6 in., it is initially identified as a COPC. If additional comparisons with the background data set demonstrate that sample activities are within the range of background activities, the radionuclide is eliminated as a COPC. Fallout radionuclides detected in site samples collected below 6 in. or detected in tuff are designated as COPCs. Naturally occurring radionuclides (e.g., europium-152, uranium-234, uranium-235, and uranium-238) detected at activities above their respective BVs in sites samples are initially identified as COPCs. If additional comparisons with the background data set demonstrate that sample activities are within the range of background activities, the radionuclide is eliminated as a COPC. If there is no associated BV/FV for the radionuclide and it is detected in site samples, it is designated as a COPC.

Background data are available for soil (all soil horizons, designated by the media codes ALLH or SOIL), sediment (medium code SED), quaternary alluvium (medium code QAL), and several geologic units, including Bandelier Tuff (media codes QBT3, QBO, QBOF, and QBOG) (LANL 1998, 059730). QBOF is a media code used historically and is equivalent to the current QBO media code. QBOG is specific to the Guaje Pumice Bed in the Otowi Member (QBO) of the Bandelier Tuff and is compared with QBO for BVs (Broxton and Reneau 1995, 049726). Several other media codes and applicable BVs are defined for other media types identified at the Laboratory but were not observed within the Bayo Canyon Aggregate Area.

Appendix H discusses the method for identifying COPCs, including identification criteria in addition to those discussed above, and the application of these methods to the site data set, including definition of trace concentrations. Appendix F presents the definitions of estimated quantitation limit (EQL) and estimated detection limit (EDL).

Only the inorganic chemicals, organic chemicals, and radionuclides identified as COPCs were evaluated further to establish their spatial distribution within Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001.

The following sections summarize the COPCs identified at Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001 (which are combined for simplicity) and present an overview of the spatial distribution of COPCs with particular emphasis on addressing the investigation work plan data requirements; thus, not every COPC is discussed individually. The discussions presented in these sections are based on the analyses presented in Appendix H. The 2007 sampling locations for Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001 are shown in Figures 4.2-1, 4.3-1, and 4.3-2. Figure 6.0-1 is an index of plates and figures included in this investigation report.

6.1 Site Contamination at Consolidated Unit 10-001(a)-99

The subsections below summarize the results of laboratory analyses for soil, sediment, and tuff at Consolidated Unit 10-001(a)-99.

6.1.1 Soil and Rock Analytical Results

The data set reviewed for Consolidated Unit 10-001(a)-99 includes results from soil, sediment, and tuff samples collected during pre-2007 and the 2007 investigations. Samples were typically analyzed for pH (2007 only), TAL metals, perchlorate and cyanide (2007 only), total uranium (pre-2007 only), explosive compounds, SVOCs, VOCs, and strontium-90. A small subset of pre-2007 soil samples was analyzed by gamma spectroscopy for americium-241, cesium-137, cobalt-60, europium-152, ruthenium-106, and sodium-22. A smaller subset of 2007 samples was also analyzed for isotopic uranium.

Most of the 2007 samples were collected at existing sampling locations, primarily to define the vertical extent of previously identified contamination and to replace historical data that did not meet data-quality requirements. In general, only data from the 2007 investigation are included in the reporting data set for those locations and depth intervals sampled during both the previous and 2007 investigations because the newer data set is generally more comprehensive and representative of current site conditions. As a result, some historical data that led to the identification of the data requirements presented in the investigation work plan have been superseded and therefore do not appear in this investigation report. However, the samples proposed to fulfill the data requirements were collected and the data are included in the reporting data set, figures, and data tables. For completeness, the originally identified requirements are discussed below.

Twenty-three QC samples were collected in association with the samples. QC samples included 11 field duplicates, 6 rinsate samples, 5 trip blanks, and 1 field blank. For the 2007 investigation, QC samples were collected at the frequency specified in the approved investigation work plan (LANL 2005, 089331). The QC data are not included in the data set reviewed for COPC identification; QC data are discussed in Appendix F.

Twenty-three inorganic chemicals, 17 organic chemicals, and 1 radionuclide were identified and retained as COPCs at Consolidated Unit 10-001(a)-99.

6.1.1.1 Inorganic Chemicals

The inorganic COPCs identified in soil, sediment, and tuff at Consolidated Unit 10-001(a)-99 are summarized in Table 6.1-2.

6.1.1.2 Organic Chemicals

The organic COPCs identified in soil, sediment, and tuff at Consolidated Unit 10-001(a)-99 are summarized in Table 6.1-2.

6.1.1.3 Radionuclides

The radionuclide COPCs identified in soil, sediment, and tuff at Consolidated Unit 10-001(a)-99 are summarized in Table 6.1-2.

6.1.2 Spatial Distribution of COPCs at Consolidated Unit 10-001(a)-99

The inorganic chemical, organic chemical, and radionuclide distributions at Consolidated Unit 10-001(a)-99 (which includes SWMU 10-005) are described in the following sections. The Bayo Canyon Aggregate Area investigation work plan discussed in detail the data required to complete the characterization of inorganic, organic, and radionuclide COPCs at Consolidated Unit 10-001(a)-99; those data requirements are summarized in section 2.4. The nature and extent of site contamination are discussed in Appendix H. The discussion below summarizes the soil and rock analytical results for specific data requirements identified for the site.

6.1.2.1 Inorganic Chemicals

The distribution of inorganic COPCs at Consolidated Unit 10-001(a)-99 is shown in Plate 1 and Figure 6.1-1; the analytical results are presented in Table 6.1-3.

Concentration of cadmium decreases from the maximum (in the pre-2007 data set) of 1.1 mg/kg at location 10-01002 in a surface soil sample to below the BV at a depth of 1.5–2.0 ft at the same location. Cadmium was not detected at concentrations above the BV in any of the 2007 surface and shallow-subsurface samples.

The concentrations of cadmium (ranging from 0.63 mg/kg to 2.4 mg/kg) detected in borehole locations 10-01281 and 10-01282 at SWMU 10-005 during the pre-2007 investigation decrease to below the BV in 2007 borehole locations 10-601156 and 10-601157 located north and south of borehole locations 10-01281 and 10-01282. Cadmium is not detected above BVs at the other 2007 boreholes drilled at SWMU 10-005.

Copper decreases from the maximum concentration of 50.8 mg/kg detected at location 10-01034 in a surface soil sample to a concentration below the BV at a depth of 1.5–2.0 ft at the same location. Copper was not detected at a concentration above the BV in any of the 2007surface and shallow-subsurface samples.

Lead was observed at concentrations slightly above the BV at several pre-2007 surface sampling locations including 10-01002, 10-01003, 10-01004, 10-01022, 10-01041, 10-01061, 10-01062, and 10-01663. The maximum lead concentration (28.3 mg/kg) was detected in the surface soil sample collected at location 10-01002. This location and location 10-01003 could not be resampled during the 2007 investigation because of access issues. The location where the second highest lead concentration (26.7 mg/kg) was detected was resampled in 2007. Lead was not detected at concentrations above the BV in any of the 2007 surface and shallow-subsurface sampling locations.

Mercury was detected at a concentration of 0.52 mg/kg in a surface soil sample and was not detected in any other pre-2007 sample. The EDL for a few samples were at or slightly above the BV. Mercury was not detected above the BV in any of the 2007 samples.

Zinc was detected at concentrations above the BV at several pre-2007 surface sampling locations. The maximum zinc concentration in the pre-2007 data set was 668 mg/kg. Zinc was detected at a concentration above the range of BVs in only one of the 2007 samples.

Perchlorate was detected in a single sample at a low concentration (0.0023 mg/kg); cyanide was not detected at concentrations above the BV in any of the 2007 samples.

6.1.2.2 Organic Chemicals

A total of 17 organic COPCs are present in the soil, sediment, and tuff at Consolidated Unit 10-001(a)-99. The distribution of organic chemicals detected across all of Consolidated Unit 10-001(a)-99 is shown in Plate 2; the analytical results are presented in Table 6.1-4.

High-melting explosive (HMX) and nitrobenzene were detected infrequently and at low concentrations during pre-2007 investigations. Neither of these organic chemicals was detected in any of the 2007 samples.

Benzoic acid was detected in a single surface soil sample collected during the 2007 investigation at a concentration of 0.733 mg/kg. All other organic chemicals were detected infrequently and at trace concentrations.

6.1.2.3 Radionuclides

Uranium-238 is the only radiological COPC identified at Consolidated Unit 10-001(a)-99 in the reporting data set. The distribution of radionuclides detected across all of Consolidated Unit 10-001(a)-99 is shown in Plate 1; the analytical results are presented in Table 6.1-5.

Uranium-238 was detected at an activity above the BV in only one sample at Consolidated Unit 10-001(a)-99. The observed activity was 2.34 pCi/g and occurred in a surface soil sample; the activity decreased to below BV in the deeper subsurface sample collected at the same location.

6.2 Site Contamination at Consolidated Unit 10-002(a)-99

The sections below summarize the results of laboratory analyses for soil, alluvium, tuff, and biota (vegetation) at Consolidated Unit 10-002(a)-99.

6.2.1 Soil, Rock, and Biota Analytical Results

The data set reviewed for Consolidated Unit 10-002(a)-99 includes results from soil, alluvium, tuff, and biota samples collected during pre-2007 and 2007 investigations. Samples were typically analyzed for pH (2007 only),TAL metals, perchlorate and cyanide (2007 only), total uranium (pre-2007 only), HE, SVOCs, VOCs, and strontium-90. In addition, a suite of radionuclides including americium-241, cesium-134, cesium-137, cobalt-60, europium-152, ruthenium-106, and sodium-22 was analyzed for selected samples at localized areas of elevated radioactivity south of the former radiochemistry building. One pre-2007 sample was also analyzed for plutonium-238, -239 and -240. In addition, samples from chamisa plants within the Central Area were collected in 1996 and analyzed for strontium-90. Table 6.2-1 summarizes all samples collected and their associated analyses that are representative of current site conditions at Consolidated Unit 10-002(a)-99.

Eighty-one QC samples were collected in association with the samples included in the data review. QC samples included 33 field duplicates, 21 rinsate samples, 16 trip blanks, and 11 field blanks (historical samples only). For the 2007 investigation, QC samples were collected at the frequency specified in the approved work plan (LANL 2005, 089331). The QC data are not included in the data set reviewed for COPC identification; the QC data are discussed in Appendix F.

Twenty-two inorganic chemicals, 36 organic chemicals, and 6 radionuclides were identified and retained as COPCs at Consolidated Unit 10-002(a)-99.

6.2.1.1 Inorganic Chemicals

The inorganic COPCs identified in soil, alluvium, and tuff at Consolidated Unit 10-002(a)-99 are summarized in Table 6.2-2.

6.2.1.2 Organic Chemicals

The organic chemical COPCs identified in soil, alluvium, and tuff at Consolidated Unit 10-002(a)-99 are summarized in Table 6.2-2.

6.2.1.3 Radionuclides

The radionuclide COPCs identified in soil, alluvium, and tuff at Consolidated Unit 10-002(a)-99 are summarized in Table 6.2-2. Strontium-90 is the only radionuclide identified as a COPC in vegetation.

6.2.2 Spatial Distribution of COPCs at Consolidated Unit 10-002(a)-99

The inorganic chemical, organic chemical, and radionuclide distributions at Consolidated Unit 10-002(a)-99 are described in the following sections. Consolidated Unit 10-002(a)-99 covers a large geographic region and is complex. To facilitate the analysis of contaminant distributions and to focus defining the data requirements, the Bayo Canyon Aggregate Area investigation work plan divided the site into the Central Area and areas within Consolidated Unit 10-002(a)-99 exclusive of the Central Area. That division is retained below to further facilitate the analysis of COPC distributions at the site. The work plan also identified separately and discussed in detail the data required to complete the characterization of inorganic, organic, and radionuclide COPCs for the Central Area and those areas of Consolidated Unit 10-002(a)-99 outside of the Central Area. The data requirements are summarized in section 2.4 and are discussed in Appendix H. The discussion below summarizes the soil and rock analytical results for specific data requirements identified for the site.

6.2.2.1 Consolidated Unit 10-002(a)-99, Central Area

The spatial distribution of COPCs based on the data requirements specified in the approved investigation work plan for the Central Area are discussed in the following sections.

Inorganic Chemicals

The distribution of inorganic COPCs in the Central Area of Consolidated Unit 10-002(a)-99 is depicted in Plate 3; the analytical results are presented in Table 6.2-3.

Antimony and zinc concentrations above the BV of 10.4 mg/kg and 87.4 mg/kg (respectively) observed at the pre-2007 borehole location 10-01213 decrease laterally to the west to below the BV in samples collected from 2007 borehole locations 10-601241 and 10-601243.

Cadmium was detected at a concentration of 1.2 mg/kg at the TD (50 ft) in borehole location 10-01205 but was below the BV in samples collected from greater depths in the 2007 borehole location 10-601161, located near borehole location 10-01205. In addition, cadmium decreases to a concentration of 0.61 mg/kg in the surface sample collected at borehole location 10-601162, northwest of borehole location 10-01205, and to concentrations below the BV at depth.

Mercury was detected at borehole location 10-01294 during the pre-2007 investigation but was present at concentrations below the EDL in samples collected from 2007 borehole location 10-601160, located north of borehole location 10-01294. In addition, a significant number of pre-2007 mercury results was rejected because of analytical problems. During the 2007 investigation, 111 mercury samples were collected throughout Consolidated Unit 10-002(a)-99 inclusive of all locations in the Central Area at various depths and in all media. Mercury was not detected above the BV in any of the 2007 samples.

Beryllium decreases from 2.6 mg/kg at a depth of approximately 50 ft in pre-2007 borehole location 10-01294 to a level below the BV at a similar depth in borehole 10-601160, located to the north. Beryllium at concentrations of approximately 3 mg/kg in the range of 50 ft of depth in three neighboring borehole locations (10-02220, 10-601163, and 10-601164) decreased to concentrations similar to the BV in the suite of surrounding borehole locations and is not detected at depths greater than 50 ft.

Cyanide was detected at three scattered locations; the detections were estimated and were below the BV. All other sampling results were nondetects slightly above the BV. Perchlorate was also detected at three scattered locations at trace concentrations.

Organic Chemicals

The distribution of organic COPCs in the Central Area of Consolidated Unit 10-002(a)-99 is shown in Plate 4; the analytical results are presented in Table 6.2-4.

The pre-2007 data indicating that ethylbenzene and xylene were detected in samples from borehole location 10-01294 were rejected after data-quality revalidation for this report. Borehole location 10-601160, located near 10-01294, was sampled at 0.8–2.8 ft bgs, 42–44 ft bgs, and 59.0–60.8 ft bgs; neither ethylbenzene nor xylene was detected in any of the samples. Further, ethylbenzene was not detected in any of the other Central Area samples, and xylene was detected (at a level near the EQL) in only a single pre-2007 sample.

Naphthalene was detected in samples from multiple depths in pre-2007 borehole location 10-01201. Naphthalene was not detected in any sample collected from the group of pre-2007 and 2007 boreholes surrounding borehole location 10-01201. In addition, the pre-2007 data indicating that naphthalene was detected in a sample from borehole location 10-02221 was rejected after reevaluation and validation for this report. Naphthalene was not detected in 2007 borings located near borehole location 10-02221.

All other organic chemicals were detected infrequently and typically only at trace concentrations.

Radionuclides

The distribution of radionuclide COPCs in the Central Area of Consolidated Unit 10-002(a)-99 is shown in Plate 5; the analytical results are presented in Table 6.2-5.

Borehole location 10-601164 was drilled approximately 4 ft southeast of borehole location 10-02220 to confirm the high levels of strontium-90 observed previously at borehole location 10-02220. The strontium-90 activities observed at borehole location 10-02220 ranged up to 40,325.8 pCi/g. At a depth close to 20 ft bgs, the strontium-90 activity was above 15,000 pCi/g, but strontium-90 was not detected in a sample collected from a depth near 40 ft. The strontium-90 activities observed in the 2007 borehole location were 1310 pCi/g (the highest activity of strontium-90 in any of the 2007 samples) at a depth similar to the 40,325.8 pCi/g result (approximately 14 ft bgs), 86.2 pCi/g in the 19–21-ft interval, and 1.36 pCi/g in the 52–54-ft interval. In addition, strontium-90 was observed at an activity of 466 pCi/g (the second highest result in the 2007 data set) in the sample collected from approximately 14 ft bgs in borehole location 10-601163, located approximately 5 ft northeast of borehole location 10-02220, and was not detected at depths greater than 2 ft in borehole location 10-601162, located approximately 15 ft northwest of borehole location 10-02220.

Multiple samples collected from borehole location 10-01205 contained strontium-90 with activities greater than 2000 pCi/g. Strontium-90 activities decrease to levels slightly above the FV in a surface soil sample and is not detected in all other samples collected from three surrounding boreholes located north, west, and east of borehole location 10-01205. Elsewhere in the Central Area, strontium-90 activities range from nondetects to approximately 20 pCi/g, and decrease with depth and laterally from locations with elevated activities.

The average strontium-90 activity from biota (vegetation) samples from chamisa plants within the Central Area is 97.4 pCi/g.

6.2.2.2 Consolidated Unit 10-002(a)-99, Exclusive of the Central Area

The spatial distribution of COPCs in the context of the data requirements specified in the investigation work plan for Consolidated Unit 10-002(a)-99 outside of the Central Area is discussed in the following sections.

Inorganic Chemicals

The distribution of inorganic chemicals detected above BVs outside of the Central Area of Consolidated Unit 10-002(a)-99 is shown in Plates 3 and 6 and Figures 6.2-1 and 6.2-3; the analytical results are presented in Table 6.2-3.

Beryllium concentrations of 4.1 mg/kg and 2.8 mg/kg observed at depth in two neighboring pre-2007 boreholes decreased to concentrations slightly above the BV in 2007 boreholes sited to define the extent of beryllium laterally from the pre-2007 boreholes. In addition, beryllium concentrations (all less than 2.5 mg/kg) detected in neighboring boreholes in one of the historical sampling arrays decrease to below the BV in 2007 boreholes, located to the north, east, and south of the array boreholes.

Cadmium results for two pre-2007 samples were previously classified as analytical detections; the maximum detected concentration was 2.3 mg/kg. After data-quality revalidation for this report, the results were reclassified as nondetections. Further, cadmium was not detected (and analytical detection limits were below the BV) or was detected below the BV in neighboring 2007 borehole samples.

The concentrations of chromium (20.6 mg/kg), copper (9.1 mg/kg), and lead (28.6 mg/kg) above BVs are detected in one borehole (location 10-01242) but decrease to concentrations near BVs or to nondetects in a 2007 borehole located to the north. The mercury result for one pre-2007 sample was previously a detection (0.28 mg/kg). After data-quality revalidation for this report, the result was reclassified as rejected. Further, mercury was not detected above the BV in a neighboring 2007 borehole.

Elevated arsenic and antimony concentrations (1.4 mg/kg and 2.2 mg/kg, and 14.9 mg/kg and 18.8 mg/kg, respectively) detected in samples from three different pre-2007 boreholes decrease to nondetections in samples collected from multiple 2007 boreholes sited to define the lateral extent of these inorganic COPCs. Cyanide was detected at two locations at estimated concentrations below the BV; all other results were nondetects slightly above the BV. Perchlorate was detected at four scattered locations at trace concentrations.

Additional soil samples (not specified in the approved investigation work plan) were collected as part of the 2007 investigation to characterize two localized areas of elevated radiation, south of the former radiochemistry building, identified during the 2007 radiological surveys. Lead and mercury were detected above the BV in surface samples at locations 10-601319 and 10-603265 but decrease to less than BV at depth and are not detected above background concentrations at any other location. Perchlorate was detected in one surface sample (location 10-603265) at a trace concentration and was not detected at depth. These results are shown on the inset of Plate 6.

Organic Chemicals

The distribution of organic chemicals outside of the Central Area of Consolidated Unit 10-002(a)-99 is depicted on Plates 4 and 7 and Figures 6.2-2 and 6.2-4; the analytical results are presented in Table 6.2-4.

Bis(2-ethylhexyl)phthalate observed at the TD (approximately 50 ft) at borehole location 10-01251 but was not detected in samples collected from greater depths in two proximal boreholes sampled in 2007. Di-n-butylphthalate was detected in samples from borehole location 10-01271, but was not detected in samples collected from the 2007 borehole (location 10-6011257) sited (to the south) to define the lateral extent of di-n-butylphthalate.

All other organic chemicals were detected infrequently and typically only at trace concentrations.

Additional soil samples not specified in the approved investigation work plan were collected as part of the 2007 investigation in order to characterize two localized areas of elevated radiation, south of the former radiochemistry building, identified during the 2007 radiological surveys. Two organic chemicals (di-n-butylphthalate and xylene[1,3-]+xylene[1,4-]) were detected at trace concentrations, each from single locations (10-603265 and 10-601319, respectively) at single depths. These results are shown on the inset of Plate 7.

Radionuclides

The distribution of radionuclides detected above BVs or FVs outside of the Central Area of Consolidated Unit 10-002(a)-99 is shown in Plates 5 and 6 and Figures 6.2-1 and 6.2-3; the analytical results are presented in Table 6.2-5 and Table 6.2-6.

Strontium-90 was detected at 340.02 pCi/g in a sample from the pre-2007 borehole location 10-01257 but was not detected in samples collected from a neighboring 2007 borehole. One strontium-90 result in a pre-2007 sample (158 pCi/g) was rejected as a result of data revalidation. Further, strontium-90 was not detected in any sample collected from nearby 2007 boreholes located. Strontium-90 was detected at around 3 pCi/g at depths up to 50 ft bgs in samples from a borehole located close to the southern boundary of the pre-2007 sampling area but was not detected in samples collected from the surrounding 2007 boreholes at depths ranging from 19.8–64.0 ft bgs.

Additional soil samples (not specified in the approved investigation work plan) were collected as part of the 2007 investigation to characterize two localized areas of elevated radiation, south of the former radiochemistry building, identified during the 2007 radiological surveys. Two samples, from the surface and from a depth of approximately 1.5–3.0 ft (all in soil), were collected at four locations south of the former radiochemistry building area. The analytical result from a surface sample collected at 10-601319 had the highest strontium-90 activity of 193 pCi/g. A sample collected at this same location from 1.5–2.0 ft had a strontium-90 activity of 2.89 pCi/g. Strontium-90 background for soil is 1.31 pCi/g. At the second area of elevated radiation three locations were sampled (10-603263, 10-603264, and 10-603265). The surface samples (0.0–1.0 ft) at location 10-603263 and 10-603264 had strontium-90 activities of 15 pCi/g and 6.06 pCi/g respectively. Samples at depth (1.5–2.0 ft) had reported strontium-90 activities of 0.785 pCi/g and 0.221 pCi/g, respectively. Strontium-90 activities from two samples collected at location 10-603265 are 0.531 pCi/g from the surface sample and nondetect from the sample at depth. These results are shown on the inset of Plate 6.

6.3 Site Contamination at SWMU 10-004(a)

The subsections below summarize the results of laboratory analyses for soil, alluvium, and tuff at SWMU 10-004(a).

6.3.1 Soil and Rock Analytical Results

The data set reviewed for SWMU 10-004(a) includes results from soil, alluvium, and tuff samples collected during pre-2007 and the 2007 investigations. Samples were typically analyzed for pH (2007 only), TAL metals, perchlorate and cyanide (2007 only), total uranium (pre-2007 only), HE, SVOCs, VOCs, and strontium-90. Table 6.3-1 summarizes all samples collected and their associated analyses that are representative of current site conditions at SWMU 10-004(a).

Seven QC samples were collected in association with the samples included in the data review. QC samples included three field duplicates, two rinsate samples, one trip blank, and one field blank. For the 2007 investigation, QC samples were collected at the frequency specified in the approved investigation work plan (LANL 2005, 089331). The QC data are not included in the data set reviewed for COPC identification; the QC data are discussed in Appendix F.

Twenty-two inorganic chemicals, 12 organic chemicals, and 1 radionuclide were identified and retained as COPCs at SWMU 10-004(a).

6.3.1.1 Inorganic Chemicals

The inorganic COPCs identified in soil, alluvium, and tuff at SWMU 10-004(a) are summarized in Table 6.3-2.

6.3.1.2 Organic Chemicals

The organic chemical COPCs identified in soil, alluvium, and tuff at SWMU 10-004(a) are summarized in Table 6.3-2.

6.3.1.3 Radionuclides

The radionuclide COPCs identified in soil, alluvium, and tuff at SWMU 10-004(a) are summarized in Table 6.3-2.

6.3.2 Spatial Distribution of COPCs at SWMU 10-004(a)

The inorganic chemical, organic chemical, and radionuclide distributions at SWMU 10-004(a) are described in the following sections. The approved work plan discussed in detail the data required to complete the characterization of inorganic, organic, and radionuclide COPCs at SWMU 10-004(a); those data requirements are summarized in section 2.4 and are discussed in Appendix H. The discussion below summarizes the soil and rock analytical results for specific data requirements identified for the site.

6.3.2.1 Inorganic Chemicals

The distribution of inorganic COPCs at SWMU 10-004(a) is shown in Plate 8; the analytical results are presented in Table 6.3-3.

Beryllium, lead, and zinc decrease from the maximum concentrations of 4.6 mg/kg, 27.5 mg/kg, and 68.2 mg/kg, respectively, observed at TD of 62.5 ft at pre-2007 borehole location 10-01277, to concentrations below BVs at greater depth in a proximal 2007 borehole (location 10-601192) positioned immediately southeast of borehole location 10-01277. Cadmium decreases from the maximum observed concentration of 1 mg/kg in pre-2007 samples from borehole location 10-01279 to concentrations below the BV in samples collected from a 2007 borehole (location 10-601191) sited to the west to define the lateral extent of cadmium.

Mercury decreases from the maximum observed concentration of 0.69 mg/kg in the pre-2007 data set to nondetects in samples collected from the 2007 borehole (location 10-601190) sited (to the north) to define the lateral extent of mercury. Mercury also decreases from 0.13 mg/kg at TD (50 ft bgs) in a pre-2007 borehole to a level below the analytical detection limit in a sample collected from greater depth in a proximal 2007 borehole.

Perchlorate was not detected in any of the SWMU 10-004(a) samples and therefore is not a site COPC. The cyanide detection limits for multiple SWMU10-004(a) samples exceeded the BV; however, all EDLs ranged from 0.52 mg/kg to 0.68 mg/kg, slightly above the BV of 0.5 mg/kg.

6.3.2.2 Organic Chemicals

The distribution of organic COPCs at SWMU 10-004(a) is shown in Plate 9; analytical results are presented in Table 6.3-4.

Bis(2-ethylhexyl)phthalate was detected at two pre-2007 locations but was not detected in samples collected from 2007 boreholes sited to complete the characterization of bis(2-ethylhexyl)phthalate. Furthermore, bis(2-ethylhexyl)phthalate was not identified as a detected chemical using current data-quality validation standards in any site samples, including the historical (pre-2007) samples and is no longer identified as a COPC for SWMU 10-004(a).

Methylene chloride was identified in the 2007 data as a COPC. Methylene chloride was observed at a maximum concentration of 0.00054 mg/kg from the 9.0–11.0-ft interval in borehole location 10-601191. Methylene chloride decreased to trace concentrations with depth at this location and is not detected above trace concentrations at any other location within the SWMU.

Di-n-butylphthalate had not been identified previously as a COPC at SWMU 10-004(a); however, after data quality revalidation of the pre-2007data for this report, results for two pre-2007 samples were re-qualified as detections. These results show that di-n-butylphthalate is present at concentrations of 45 mg/kg and 60 mg/kg in samples collected from intervals of 38.5–39.4 ft and 49.0–50.0 ft (TD) in borehole location 10-01279. Di-n-butylphthalate was not detected in any of the other site samples.

All other organic chemicals were detected infrequently and only at trace concentrations at SWMU 10-004(a).

6.3.2.3 Radionuclides

The distribution of radionuclides at SWMU 10-004(a) is shown in Plate 8; detected analytical results are presented in Table 6.3-5.

Strontium-90 was previously characterized at SWMU 10-004(a) and was not detected in any of the 2007 samples.

6.4 Site Contamination at AOC 10-009 and AOC C-10-001

The subsections below summarize the results of laboratory analyses for soil and tuff at AOCs 10-009 and C-10-001.

6.4.1 Soil and Rock Analytical Results

The data set reviewed for AOCs 10-009 and C-10-001 includes results from soil and tuff samples collected during pre-2007 and the 2007 investigations. Pre-2007 samples were analyzed for strontium-90 only; 2007 investigation samples were analyzed for pH, TAL metals, perchlorate, cyanide, HE, SVOCs, VOCs, and strontium-90. Table 6.4-1 summarizes all samples collected and their associated analyses that are representative of current site conditions at AOCs 10-009 and C-10-001.

Six QC samples were collected in association with the samples included in the data review. QC samples included two field duplicates, two rinsate samples, and two trip blanks. For the 2007 investigation, QC samples were collected at the frequency specified in the approved investigation work plan (LANL 2005, 089331). The QC data are not included in the data set reviewed for COPC identification; the QC data are discussed in Appendix F.

Thirteen inorganic chemicals, one organic chemical, and one radionuclide were identified and retained as COPCs at AOCs 10-009 and C-10-001.

6.4.1.1 Inorganic Chemicals

The inorganic COPCs identified in soil and tuff at AOCs 10-009 and C-10-001 are summarized in Table 6.4-2.

6.4.1.2 Organic Chemicals

The organic chemical COPC identified in soil and tuff at AOCs 10-009 and C-10-001 is presented in Table 6.4-2.

6.4.1.3 Radionuclides

The radionuclide COPC identified in soil and tuff at AOCs 10-009 and C-10-001 is presented in Table 6.4-2.

6.4.2 Spatial Distribution of COPCs at AOC 10-009 and AOC C-10-001

The inorganic chemical, organic chemical, and radionuclide distributions at AOCs 10-009 and C-10-001 are described in the following sections. The approved work plan discussed in detail the data required to complete the characterization of inorganic, organic, and radionuclide COPCs at AOCs 10-009 and C-10-001; those data requirements are summarized in section 2.4 and are discussed in Appendix H. The discussion below summarizes the soil and rock analytical results for specific data requirements identified for the site.

6.4.2.1 Inorganic Chemicals

The distribution of inorganic COPCs at AOCs 10-009 and C-10-001 is shown in Figure 6.4-1; the analytical results are presented in Table 6.4-3.

Nearly all the inorganic COPCs identified at AOCs 10-009 and C-10-001, including aluminum, arsenic, barium, magnesium, manganese, nickel, and vanadium, are present at concentrations approximately less than 2 times the BV. Furthermore, the data show decreasing concentrations with depth, and the concentrations in the tuff are typically less than the BVs for soil.

Molybdenum was detected in soil and tuff samples at concentrations slightly greater than the EDL only.

Antimony, chromium, selenium, and cyanide were not detected at concentrations exceeding the BV in soil or tuff samples; however, the analytical detection limits for some samples exceeded the BV.

Perchlorate was not detected in any samples collected from AOCs 10-009 and C-10-001.

6.4.2.2 Organic Chemicals

The distribution of organic COPCs at AOCs 10-009 and C-10-001 is shown in Figure 6.4-2; the analytical results are presented in Table 6.4-4.

Toluene was detected in one surface sample and three subsurface samples (from two 2007 boreholes). All concentrations of toluene were estimated values slightly above the EQL.

6.4.2.3 Radionuclides

The extent of strontium-90 was previously characterized at AOC C-10-001, and strontium-90 was not detected in any 2007 samples. The analytical results are presented in Table 6.4-5.

7.0 CONCLUSIONS

The Bayo Canyon Aggregate Area consists of Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMUs 10-004(a) and 10-006, and AOCs 10-009 and C-10-001. The Bayo Canyon Aggregate Area investigation was conducted in accordance with the approved investigation work plan (LANL 2005, 092083). The investigation work plan presented a comprehensive analysis of the existing (pre-2007) site data and identified the data required to complete an evaluation of the sites and to support corrective measures decisions. Soil, alluvium, and tuff were sampled during the 2007 investigation in an effort to complete the characterization of all sites. In addition, radiation surveys were conducted to characterize any residual radioactivity, and geophysical surveys were conducted to confirm the location and distribution of buried structures, shrapnel, and debris. Test pits were also excavated in specified areas to confirm the location of a suspected landfill, the waste types and volumes, and the distribution of buried debris to further support corrective measures evaluations. An effort was made to find the location of SWMU 10-006 through site walkovers, hand-augered test pits, and aerial photos. No evidence of the site was found and therefore no samples were collected.

Data from investigations conducted in 1994 and 1996 were combined with the 2007 investigation data to provide a comprehensive understanding of site contamination and potential human health and ecological risk. In general, concentrations of inorganic and organic COPCs at all sites sampled in the Bayo Canyon Aggregate Area are low, and the data do not exhibit marked concentration trends or strong correlations among COPCs. Previous site operations are known to have resulted in the release of strontium-90, principally at Consolidated Unit 10-002(a)-99, and DU at Consolidated Unit 10-001(a)-99. These releases were identified during previous investigations and are confirmed by the 2007 investigation results. The inorganic and organic COPCs are not consistently correlated with these areas of known historical operational releases. The sites underwent extensive D&D operations, including substantial soil removal work, which in part accounts for the current data on the site conditions.

The distributions of most inorganic, organic, and radionuclide COPCs were largely defined during previous investigations. The specific undetermined contaminant distribution concerns identified in the approved investigation work plan have been effectively addressed by the 2007 investigation, and the nature and extent of all site COPCs are defined. Appendix H discusses the factors considered when determining whether the nature and extent of a COPC are defined and analyzes the nature and extent of site releases for all site COPCs.

The following sections present a summary of investigation results and an overview of the risk evaluations for the individual sites that were sampled during the Bayo Canyon Aggregate Area investigation.

7.1 Conclusive Summary of Investigations

All data used to support site decisions included in the final reporting data set meet Consent Order quality requirements. Analytical data collected during previous investigations conducted from 1994 to 1997 were revalidated to present data-quality standards and combined with the 2007 investigation data. A total of 24 inorganic, 42 organic, and 6 radionuclide COPCs were identified in solid media in the Bayo Canyon Aggregate Area. Conclusions from the 2007 investigation sampling and survey campaign are presented first, followed by the conclusions from the risk assessment.

7.1.1 Consolidated Unit 10-001(a)-99

Consolidated Unit 10-001(a)-99 was characterized by collecting surface, shallow-subsurface, and subsurface samples of solid media. A total of 26 new locations (24 surface and shallow subsurface and 2 boreholes) were sampled. Twenty-three inorganic, 17 organic, and 1 radionuclide COPCs were identified within Consolidated Unit 10-001(a)-99.

The nature and extent of all COPCs have been defined for this site, including the vertical extent of cadmium, copper, lead, mercury, zinc, nitrobenzene, and HMX at specific pre-2007 surface sampling locations, the lateral extent of cadmium, and the vertical and lateral extent of strontium-90 at specific pre-2007 surface sampling and borehole locations. No evidence was found of a release of cyanide or perchlorate at the site. Strontium-90 is not a COPC at Consolidated Unit 10-001(a)-99, and the nature and extent of uranium-238, identified as a COPC in the 2007 data set only, are defined.

The geophysical survey identified residual shrapnel in the soil with a higher quantity of material occurring nearer to former firing site pads and diminishing radially outward. The extent of the remaining shrapnel at Consolidated Unit 10-001(a)-99 is delineated, and the shrapnel is confined to the near surface. No ordnance hazards were identified.

The radiological survey conducted at the site identified localized areas of elevated radiation and defined the extent. The elevated radiation is attributed to small granules of uranium-238/DU disseminated in the soil. As stated above, the radionuclide data demonstrate the nature and extent of the uranium-238 are defined.

The combined radiological and geophysical survey data demonstrate that the localized areas of elevated radiation are not correlated to shrapnel. Thus, residual shrapnel is not a radiological risk.

Finally, six hand-auger borings and two small test pits were excavated at a suspected location in the search for SWMU 10-006. No evidence of residual contamination from burning activities was discovered.

7.1.2 Consolidated Unit 10-002(a)-99

A total of 47 new locations (43 borehole and 4 hand auger) were sampled at Consolidated Unit 10-002(a)-99. Twenty-two inorganic, 36 organic, and 6 radionuclide COPCs were identified at the site.

The nature and extent of all inorganic and organic COPCs have been defined for Consolidated Unit 10-002(a)-99 within the Central Area, including the lateral extent of antimony, beryllium, mercury, naphthalene, and zinc, and the lateral and vertical extent of cadmium, ethylbenzene, and xylene near the pre-2007 borehole locations discussed in section 2.4 and identified in Appendix H. No evidence was found of a release of perchlorate or cyanide at the site.

The 2007 data also confirm the previous conclusions that the highest activities of strontium-90 occur in the interval between approximately 14 ft and 25 ft bgs in a spatially restricted area between borehole locations 10-01215 and 10-02220, with activities decreasing substantially with depth and laterally from this area. It is important to note that the pre-2007 samples were analyzed for strontium-90 by gamma spectroscopy; by contrast, the 2007 samples were analyzed using the more accurate gas proportional counting method. The different method and the natural radioactive decay that has occurred over the last 13 yr may explain why the activities are now substantially lower (approximately 30 times) than previously observed. In addition, the lateral extent of strontium-90 west and north of former sampling array 1 has now been defined, and the nature and extent of strontium-90 throughout the Central Area are defined.

The radiological survey conducted at Consolidated Unit 10-002(a)-99 outside of the Central Area identified two locations with elevated radioactivity. Analytical results confirmed the presence of strontium-90 at the locations south of the former radiochemistry building and also indicate that the nature and extent of strontium-90 contamination are well defined. Analytical results also confirmed that no hazardous organic or inorganic chemicals are associated with the two areas of elevated radioactivity.

Within the Central Area at Consolidated Unit 10-002(a)-99, the radiological survey identified two isolated areas with slightly elevated radioactivity (approximately 1.5 times the background count rate). The areas are limited in extent, well defined, and within the fenced area.

The geophysical surveys effectively confirmed the presence of buried construction debris within the Central Area at the location of the known landfill (SWMU 10-007) and improved the delineation of the buried debris. The landfill is estimated to cover an area of 6,010 sq ft. The geophysical surveys did not identify any anomalies that would indicate buried structures (or the leach field) in all other areas surveyed within the consolidated unit, indicating that these subsurface structures were removed during D&D activities.

7.1.3 SWMU 10-004(a)

A total of five new locations (all boreholes) were sampled at SWMU 10-004(a). Twenty-two inorganic, 12 organic, and 1 radionuclide COPCs were identified at SWMU 10-004(a).

The extent of all COPCs has been defined for SWMU 10-004(a), specifically including the lateral extent of cadmium, mercury, and bis(2-ethylhexyl)phthalate and the vertical extent of beryllium, lead, and zinc near the pre-2007 borehole locations discussed in section 2.4 and identified in Appendix H. No evidence was found of a release of perchlorate or cyanide at the site. In addition, bis(2-ethylhexyl)phthalate was not identified as a detected chemical in any site samples, including the historical (pre-2007) samples, when current data-quality validation standards were used and is no longer identified as a COPC for SWMU 10-004(a). Methylene chloride was identified in the 2007 data as a COPC; however, its concentrations decrease laterally and vertically to trace concentrations, and the nature and extent of methylene chloride are defined.

The geophysical survey did not identify subsurface anomalies, suggesting that the buried pipe thought to be in the area was removed during previous D&D activities. The radiological survey did not identify elevated radioactivity in the area.

7.1.4 AOCs 10-009 and C-10-001

A total of five surface and shallow-subsurface samples were collected and five boreholes were drilled to characterize AOCs 10-009 and C-10-001. In addition, six test pits were excavated in the area during the

2007 investigation. Thirteen inorganic, one organic, and one radionuclide COPCs were identified at AOCs 10-009 and C-10-001.

The nature and extent of all COPCs have been defined for the site. The data indicate that the concentrations of inorganic COPCs are not indicative of any release and may be attributed to localized variability. No organic chemicals were detected in tuff, and toluene was detected only at a trace concentration in one soil sample.

The geophysical survey of the area did not identify any buried material, and it is concluded that a landfill or debris field does not exist in the area. The test pit data support this conclusion. The radiological survey identified minor areas of slightly elevated radiation and defined the extent. The elevated radiation is attributed to small granules of DU disseminated in the soil.

7.2 Conclusive Summary of Risk Screening Assessments

Screening-level human health and ecological risk assessments were performed to support site decisions. The potential risks associated with COPCs were assessed under recreational and construction worker scenarios; the site was also assessed under a residential scenario as required by the Consent Order for comparison purposes. Details of the risk assessment methods, scenario parameters, supporting data, and risk calculations and results are presented in Appendix I.

7.2.1 Consolidated Unit 10-001(a)-99

Screening-level human health risk assessments were performed for Consolidated Unit 10-001(a)-99 using the above scenarios to support site decisions.

7.2.1.1 Human Health Risk Screening Assessment

A human health screening assessment was conducted to determine if COPCs in soil and tuff at Consolidated Unit 10-001(a)-99 pose a potential unacceptable risk to human receptors. Based on the current and reasonably foreseeable land use, the recreational scenario was designated as the decision scenario for the consolidated unit.

The exposure point concentrations (EPCs) for carcinogenic COPCs were divided by the appropriate SSL and multiplied by 1×10^{-5} to estimate the excess lifetime cancer risk. The total excess cancer risk was compared to the NMED target risk level of 1×10^{-5} (NMED 2006, 092513). A hazard quotient (HQ) was generated for each noncarcinogenic COPC by dividing the EPC by the appropriate SSL. The HQs were summed to generate an HI, which was compared with the NMED target HI of 1.0 (NMED 2006, 092513).

The total excess cancer risk for the recreational scenario is 8×10^{-13}, which is less than the NMED target risk of 1×10^{-5} (NMED 2006, 092513). Individual EPCs for the noncarcinogenic COPCs also did not exceed their respective recreational SSLs. The recreational HI is 0.03, which is less than the NMED target HI of 1.0 (NMED 2006, 092513).

The total excess cancer risk under the construction-worker scenario is approximately 1×10^{-6}, which is below the NMED target risk of 1×10^{-5}. The construction worker HI is approximately 2, which is above NMED’s target level of 1.0 (NMED 2006, 092513). Manganese contributed approximately 76% of the construction worker HI; however, the EPC (240 mg/kg) is similar to background concentrations (maximum background concentrations are 1100 mg/kg for soil, 752 mg/kg for Qbt 3, and 210 mg/kg for Qbo). Exposure across the site is, therefore, similar to background levels for the construction worker. The construction worker HI is 0.5 without manganese, which is less than NMED’s target level.

The total excess cancer risk for a resident is approximately 3×10^{-6}, which is below the NMED target risk of 1×10^{-5} (NMED 2006, 092513). The residential HI is 0.8, which is below the NMED target of 1.0 (NMED 2006, 092513).

Ten COPCs had risk-based SSLs above the soil saturation concentration (C_{sat}) for at least one exposure scenario. The forward risk calculation results show that the excess cancer risk is below 10^{-5} and the HQs are below 1.0 for all scenarios.

One radionuclide, uranium-238, was identified as a COPC at Consolidated Unit 10-001(a)-99. The doses for the recreational, construction, and residential scenarios are 0.01mrem/yr, 0.2 mrem/yr, and 0.3 mrem/yr, respectively, which are below the target dose of 15 mrem/yr (DOE 2000, 067489). Excess cancer risk from uranium-238 was less than 1×10^{-5} for all scenarios.

7.2.1.2 Ecological Risk Screening Assessment

An ecological screening assessment was conducted to determine whether chemicals of potential ecological concern (COPECs) at Consolidated Unit 10-001(a)-99 result in a potential unacceptable risk to ecological receptors. Based on the ecological screening assessment, several COPECs (including COPECs without ESLs) were identified at the Bayo Canyon Aggregate Area sites. Receptors were evaluated for potential risk using the following lines of evidence: minimum ESL comparisons, HI analyses, comparison to background, potential effects to populations (individuals for threatened and endangered [T&E] species), the relative toxicity of related compounds, and the infrequency of detection.

The results of the ecological risk screening assessment indicate no potential risk to ecological receptors at the site, and further investigation or corrective action is not warranted based on ecological risk.

7.2.2 Consolidated Unit 10-002(a)-99

Screening-level human health risk assessments were performed for Consolidated Unit 10-002(a)-99 using the scenarios described above to support site decisions.

7.2.2.1 Human Health Risk Screening Assessment

A human health screening assessment was conducted to determine if COPCs in soil and tuff pose a potential unacceptable risk to human receptors. Based on the current and reasonably foreseeable land use, the recreational scenario was designated as the decision scenario.

The EPCs for carcinogenic chemicals were divided by the appropriate SSL and multiplied by 1×10^{-5} to estimate the excess lifetime cancer risk. The sum of the carcinogenic risks was compared to the NMED target risk level of 1×10^{-5} (NMED 2006, 092513). An HQ was generated for each noncarcinogenic COPC by dividing the EPC by the appropriate SSL. The HQs were summed to generate an HI. The HI was compared with the NMED target HI of 1.0 (NMED 2006, 092513).

No carcinogenic COPCs were identified for the recreational receptor and therefore no excess cancer risk exists. Individual EPCs for the noncarcinogenic COPCs also do not exceed their respective recreational SSLs. The recreational HI is 0.04, which is less than the NMED target HI of 1.0 (NMED 2006, 092513).

The total excess cancer risk under the construction worker scenario is approximately 2×10^{-6}, which is below the NMED target risk of 1×10^{-5} (NMED 2006, 092513). The construction worker HI is approximately 2.0. Manganese contributed approximately 76% of the construction worker HI; however, the EPC (231 mg/kg) is similar to background concentrations (maximum background concentrations are

1100 mg/kg for soil, 752 mg/kg for Qbt 3, and 210 mg/kg for Qbo). Therefore, exposure across the site is similar to background levels for the construction worker. Without manganese, the construction worker HI is 0.5, which is less than NMED's target level.

The total excess cancer risk for a resident is approximately 4×10^{-6}, which is below the NMED target risk of 1×10^{-5} (NMED 2006, 092513). The residential HI of 0.6 is below the NMED target of 1.0 (NMED 2006, 092513).

Two COPCs had risk-based SSLs above the C_{sat}. None of the COPCs were carcinogenic. The HQs are below 1.0 for all scenarios.

One radionuclide, strontium-90, was identified as a COPC at Consolidated Unit 10-002(a)-99. The doses for the recreational, construction and residential scenarios are 0.2 mrem/yr, 0.6 mrem/yr, and 91 mrem/yr, respectively. The doses for the recreational and construction worker scenarios are below the target dose of 15 mrem/yr (DOE 2000, 067489). The total excess cancer risk from radionuclides under the recreational and construction worker scenarios is below 1×10^{-5}. The excess cancer risk from radionuclides for the residential scenario is 1×10^{-4}.

7.2.2.2 Ecological Risk Screening Assessment

An ecological screening assessment was conducted to determine whether COPECs at Consolidated Unit 10-002(a)-99 result in a potential unacceptable risk to ecological receptors. Based on the ecological screening assessment, several COPECs (including COPECs without ESLs) were identified at the Bayo Canyon Aggregate Area sites. Receptors were evaluated for potential risk using the following lines of evidence: minimum ESL comparisons, HI analyses, comparison to background, potential effects to populations (individuals for T&E species), the relative toxicity of related compounds, and the infrequency of detection.

The results of the ecological risk screening assessment indicate no potential risk to ecological receptors at the site, and further investigation or corrective action is not warranted based on ecological risk.

7.2.3 SWMU 10-004(a)

Screening-level human health and ecological risk assessments were performed for SWMU 10-004(a) using the scenarios described above to support site decisions.

7.2.3.1 Human Health Risk Screening Assessment

A human health screening assessment was conducted to determine if COPCs in soil and tuff pose a potential unacceptable risk to human receptors. Although the current and reasonably foreseeable land use is recreational, the residential scenario was designated as the decision scenario.

The EPCs for carcinogenic COPCs were divided by the appropriate SSL and multiplied by 1×10^{-5} to estimate the excess lifetime cancer risk. The total excess cancer risk was compared to the NMED target risk level of 1×10^{-5} (NMED 2006, 092513). An HQ was generated for each noncarcinogenic COPC by dividing the EPC by the appropriate SSL. The HQs were summed to generate an HI, which was compared with the NMED target HI of 1.0 (NMED 2006, 092513).

No COPCs were identified for the recreational receptor. No organic chemicals and inorganic chemicals were detected above the BV in the residential depth interval (0–1 ft bgs).

The total excess cancer risk under the construction-worker scenario is approximately 2×10^{-6}, which is below the NMED target risk of 1×10^{-5}. The construction worker HI is approximately 2, which is above NMED's target level of 1.0 (NMED 2006, 092513). Manganese contributed approximately 87% of the construction worker HI; however, the EPC (194 mg/kg) is similar to background concentrations (maximum background concentrations are 1100 mg/kg for soil, 752 mg/kg for Qbt 3, and 210 mg/kg for Qbo). The construction worker HI is 0.2 without manganese, which is less than NMED's target level.

The total excess cancer risk for a resident is approximately 2×10^{-6}, which is below the NMED target risk of 1×10^{-5} (NMED 2006, 092513). The residential HI of 0.9 is below the NMED target of 1.0 (NMED 2006, 092513).

Two COPCs had risk-based SSLs above the C_{sat}. The results, provided in Table I-4.2-20, show excess cancer risk below the NMED target of 1×10^{-5} (NMED 2006, 092513) and HQs below 1.0 for all scenarios.

One radionuclide, strontium-90, was identified as a COPC at SWMU 10-004(a). The doses for the recreational, construction worker, and residential scenarios are 0.001 mrem/yr, 0.005 mrem/yr, and 0.7 mrem/yr, respectively, which are below the target dose of 15 mrem/yr (DOE 2000, 067489). The results for the dose assessment are presented in Table I-4.3-21. The excess cancer risk from strontium-90 was less than 1×10^{-5} for all scenarios.

7.2.3.2 Ecological Risk Screening Assessment

An ecological screening assessment was conducted to determine whether COPECs at SWMU 10-004(a) result in a potential unacceptable risk to ecological receptors. Based on the ecological screening assessment, several COPECs (including COPECs without ESLs) were identified at the Bayo Canyon Aggregate Area sites. Receptors were evaluated for potential risk using the following lines of evidence: minimum ESL comparisons, HI analyses, comparison to background, potential effects to populations (individuals for T&E species), the relative toxicity of related compounds, and the infrequency of detection.

The results of the ecological risk screening assessment indicate no potential risk to ecological receptors at the site, and further investigation or corrective action is not warranted based on ecological risk.

7.2.4 AOCs 10-009 and C-10-001

Screening-level human health and ecological risk assessments were performed for AOCs 10-009 and C-10-001 using the scenarios described above to support site decisions.

7.2.4.1 Human Health Risk Screening Assessment

A human health screening assessment was conducted to determine if COPCs in soil and tuff pose a potential unacceptable risk to human receptors. Although the current and reasonably foreseeable land use is recreational, the residential scenario was designated as the decision scenario.

The EPCs for carcinogenic chemicals were divided by the appropriate SSL and multiplied by 1×10^{-5} to estimate the excess lifetime cancer risk. The total excess cancer risk was compared to the NMED target risk level of 1×10^{-5} (NMED 2006, 092513). An HQ was generated for each noncarcinogenic COPC by dividing the EPC by the appropriate SSL. The HQs were summed to generate an HI, which was compared with the NMED target HI of 1.0 (NMED 2006, 092513).

No carcinogenic COPCs were identified for the recreational receptor, and no excess carcinogenic risk exists. Individual EPCs for the noncarcinogenic COPCs also do not exceed their respective recreational SSLs. The recreational HI is approximately 0.0002, which is less than the NMED target HI of 1.0 (NMED 2006, 092513).

No carcinogenic COPCs were identified for the construction worker scenario, and no excess carcinogenic risk exists. The construction worker HI is approximately 0.0005, which is below NMED's target level of 1.0 (NMED 2006, 092513).

No carcinogenic COPCs were identified for AOCs 10-009 and C-10-001 for the residential scenario. The concentrations of noncarcinogenic COPCs were all below their respective residential SSLs. The residential HI of 0.002 is below the NMED target of 1.0 (NMED 2006, 092513).

One COPC had a risk-based SSL above the C_{sat}. The results, provided in Table I-4.3-25, show the COPC is not a carcinogen and the HQ is below 1.0.

One radionuclide, strontium-90, was identified as a COPC. The doses for the recreational, construction worker, and residential scenarios are 0.02 mrem/yr, 0.001 mrem/yr, and 13 mrem/yr, respectively. The doses for all scenarios are below the target dose of 15 mrem/yr (DOE 2000, 067489). The total excess cancer risk from radionuclides for the recreational and construction worker scenarios is below 1×10^{-5}. The excess cancer risk from radionuclides for the residential scenario is 2×10^{-5}.

7.2.4.2 Ecological Risk Screening Assessment

An ecological screening assessment was conducted to determine whether COPECs at AOC 10-009 result in a potential unacceptable risk to ecological receptors. Based on the ecological screening assessment, several COPECs (including COPECs without ESLs) were identified at the Bayo Canyon Aggregate Area sites. Receptors were evaluated for potential risk using the following lines of evidence: minimum ESL comparisons, HI analyses, comparison to background, potential effects to populations (individuals for T&E species), the relative toxicity of related compounds, and the infrequency of detection.

The results of the ecological risk screening assessment indicate no potential risk to ecological receptors at the site, and further investigation or corrective action is not warranted based on ecological risk.

8.0 RECOMMENDATIONS

The following recommendations are made for Consolidated Unit 10-001(a)-99, SWMUs 10-004(a) and 10-006, and AOCs C-10-001 and 10-009 based on the results of sampling and analysis, the evaluation of nature and extent of contamination, and the assessment of potential risk and dose.

- Consolidated Unit 10-001(a)-99—The nature and extent of contamination are defined, and residual shrapnel does not pose a physical hazard or radiological risk; therefore, the SWMUs and AOCs within Consolidated Unit 10-001(a)-99 [SWMUs 10-001(a–d) and 10-005 and AOCs 10-001(e) and 10-008] are proposed as corrective actions complete without controls.
- SWMU 10-004(a)—The nature and extent of contamination are defined and no cleanup is warranted; therefore, SWMU 10-004(a) is proposed as corrective actions complete without controls.
- AOC 10-009—The nature and extent of contamination are defined and no cleanup is warranted; therefore, AOC 10-009 is proposed as corrective actions complete without controls.

- AOC C-10-001—The nature and extent of contamination are defined and no further cleanup is warranted; therefore, AOC C-10-001 is proposed as corrective actions complete without controls.
- SWMU 10-006—Efforts were made to locate this SWMU, but it could not be found. There is no indication that it exists and may have been cleaned up during D&D of former TA-10. Therefore, SWMU 10-006 is proposed for corrective actions complete without controls.

In addition, preliminary corrective action alternatives were evaluated for SWMU 10-007 and are discussed in detail in Appendix J. Based on the low radiological dose to humans and the absence of contaminant migration from the site, long-term institutional controls are an appropriate final action for the subsurface strontium-90 contamination beneath the buried debris. Other actions may also be identified, as determined by the DOE and the current property owner (Los Alamos County).

Lastly, removal of two isolated areas of elevated strontium-90 activity identified south of the former radiochemistry laboratory is proposed as a good stewardship practice, pending DOE and Los Alamos County approval.

9.0 REFERENCES AND MAP DATA SOURCES

9.1 References

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

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

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9.2 Map Data Sources

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Los Alamos County Streets; County of Los Alamos, Information Services; as published 16 May 2006.

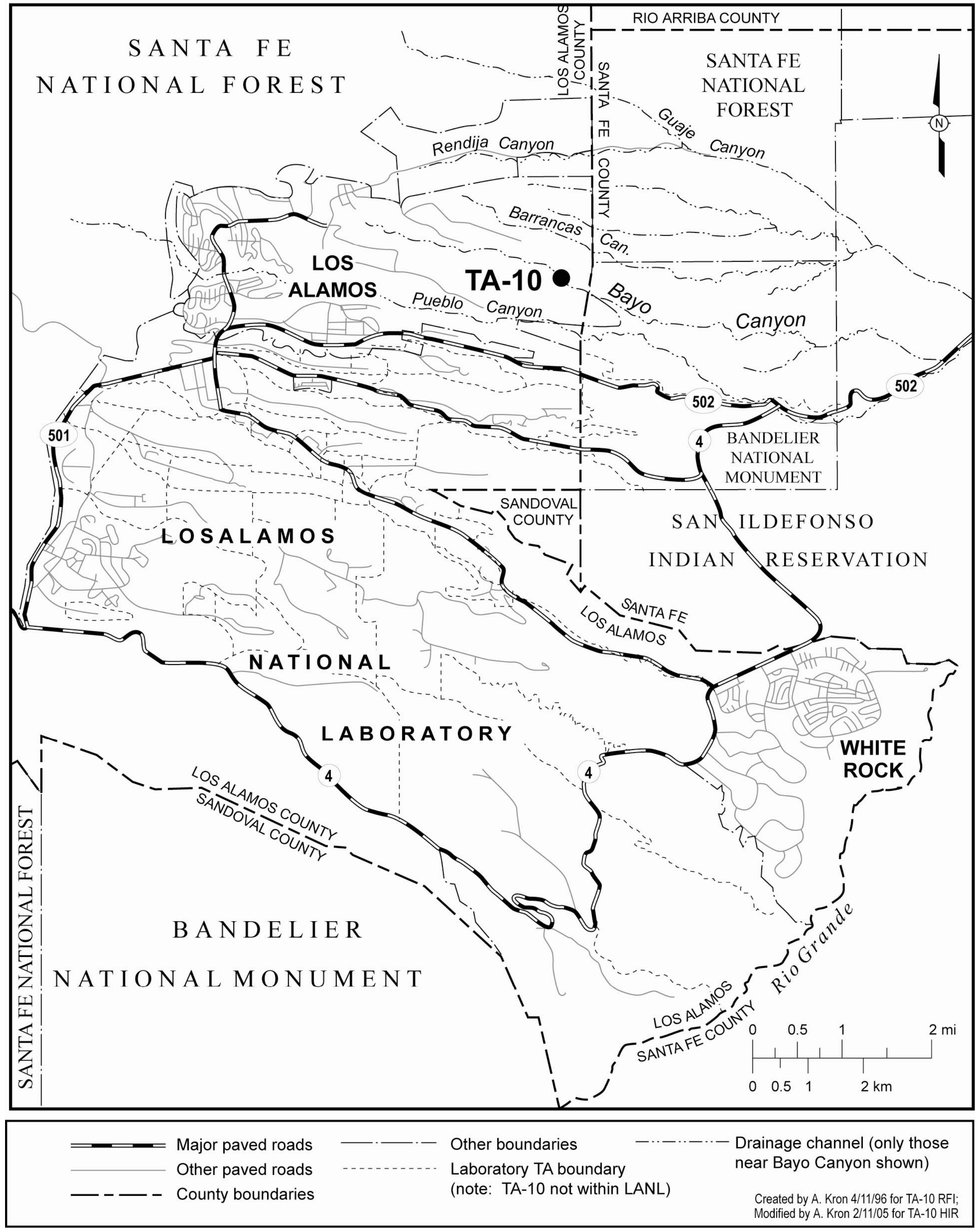


Figure 1.0-1 Location of TA-10 with respect to Laboratory technical areas

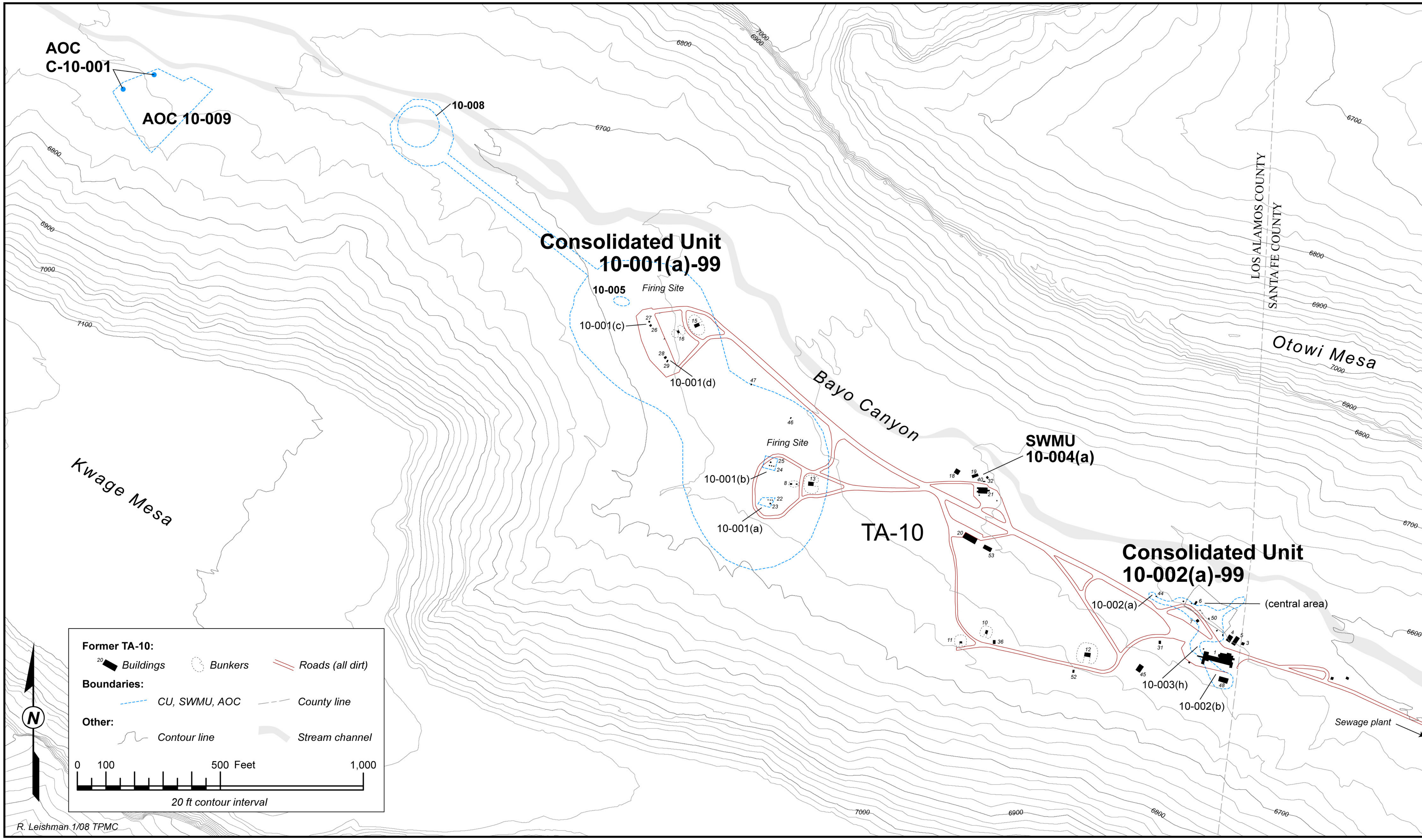


Figure 1.0-2 Locations of Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001

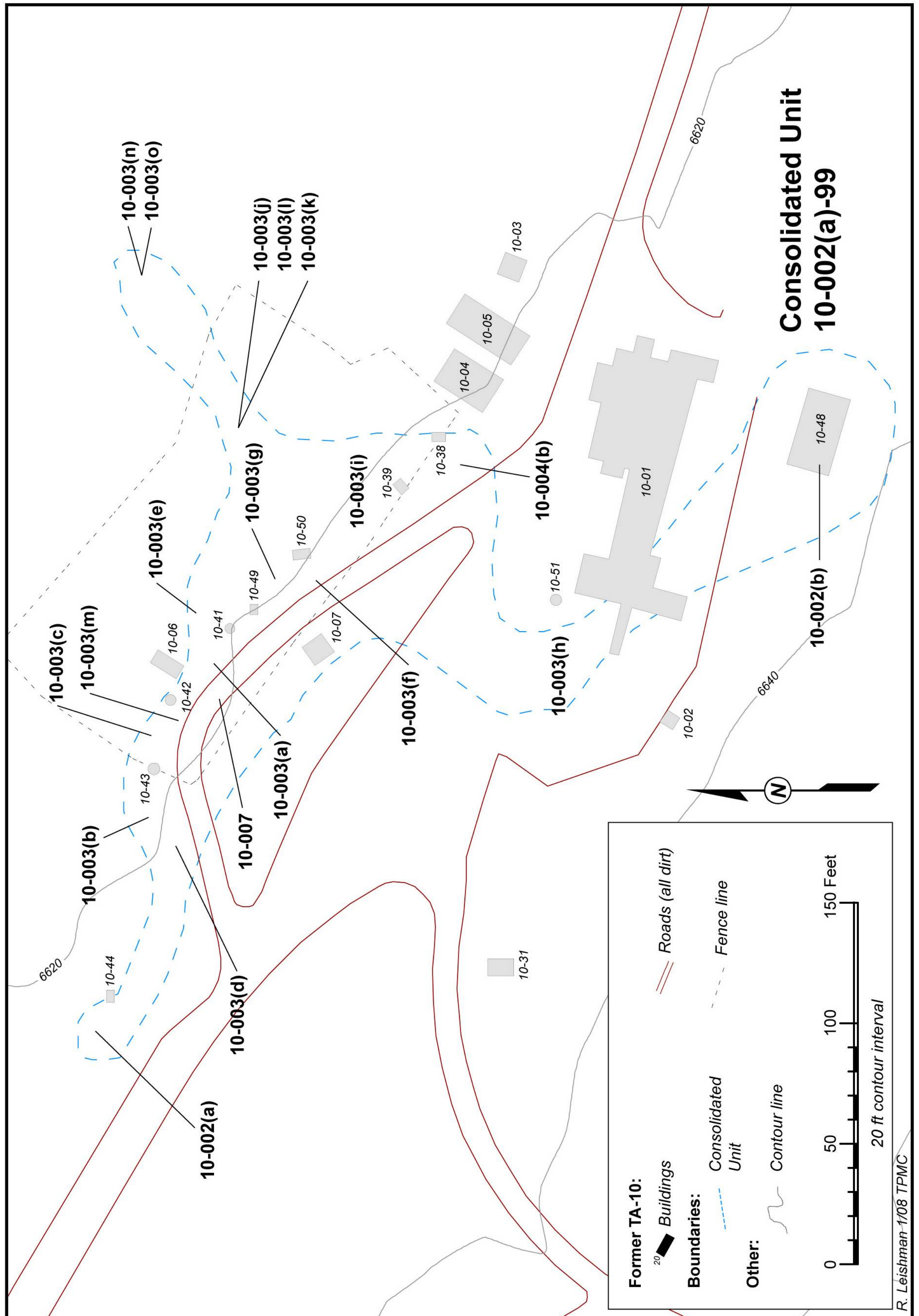


Figure 2.1-1 Locations of SWMUs and AOCs within Consolidated Unit 10-002(a)-99

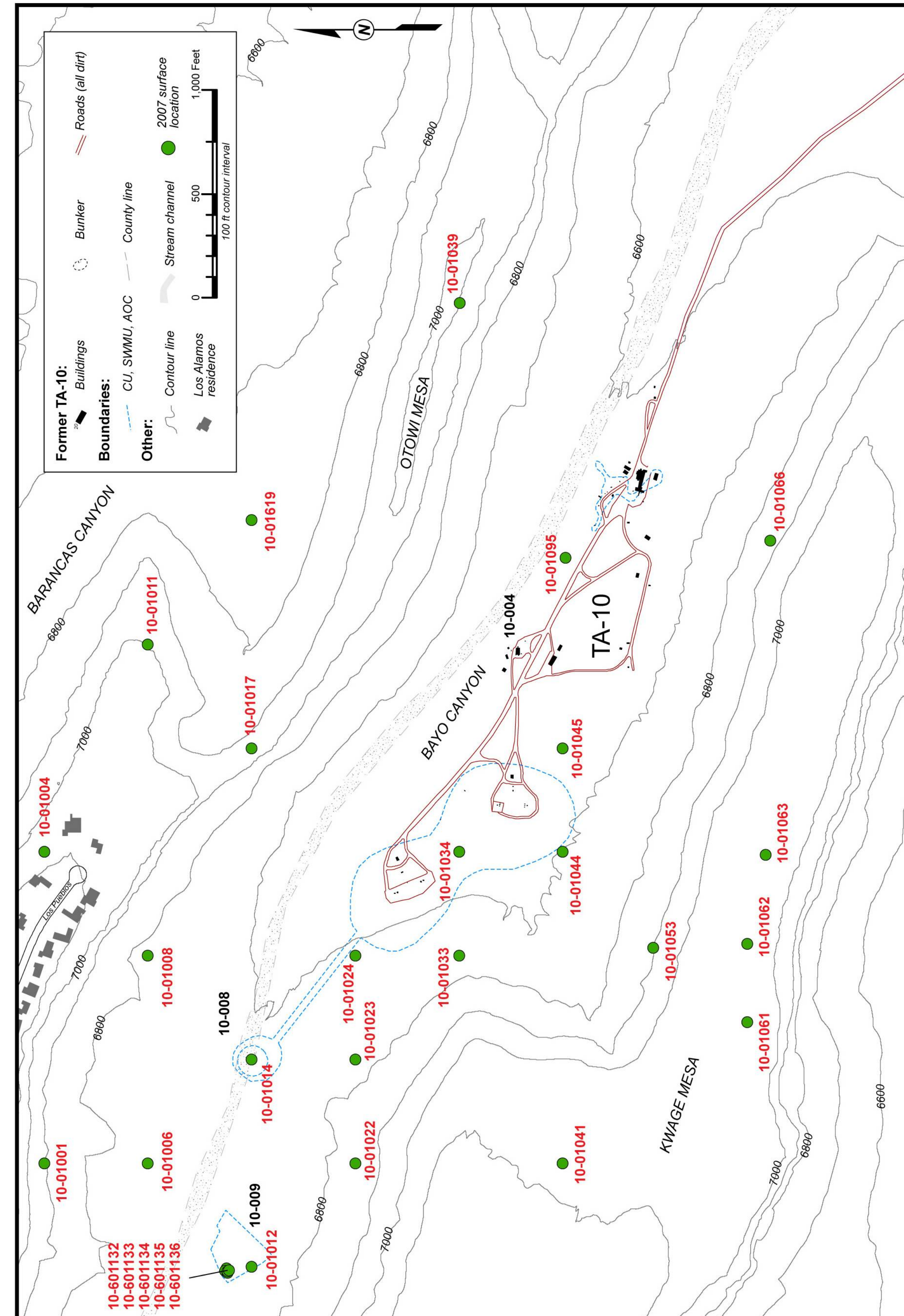


Figure 4.2-1 Locations of surface and shallow subsurface samples collected from Bayo Canyon Aggregate Area in 2007

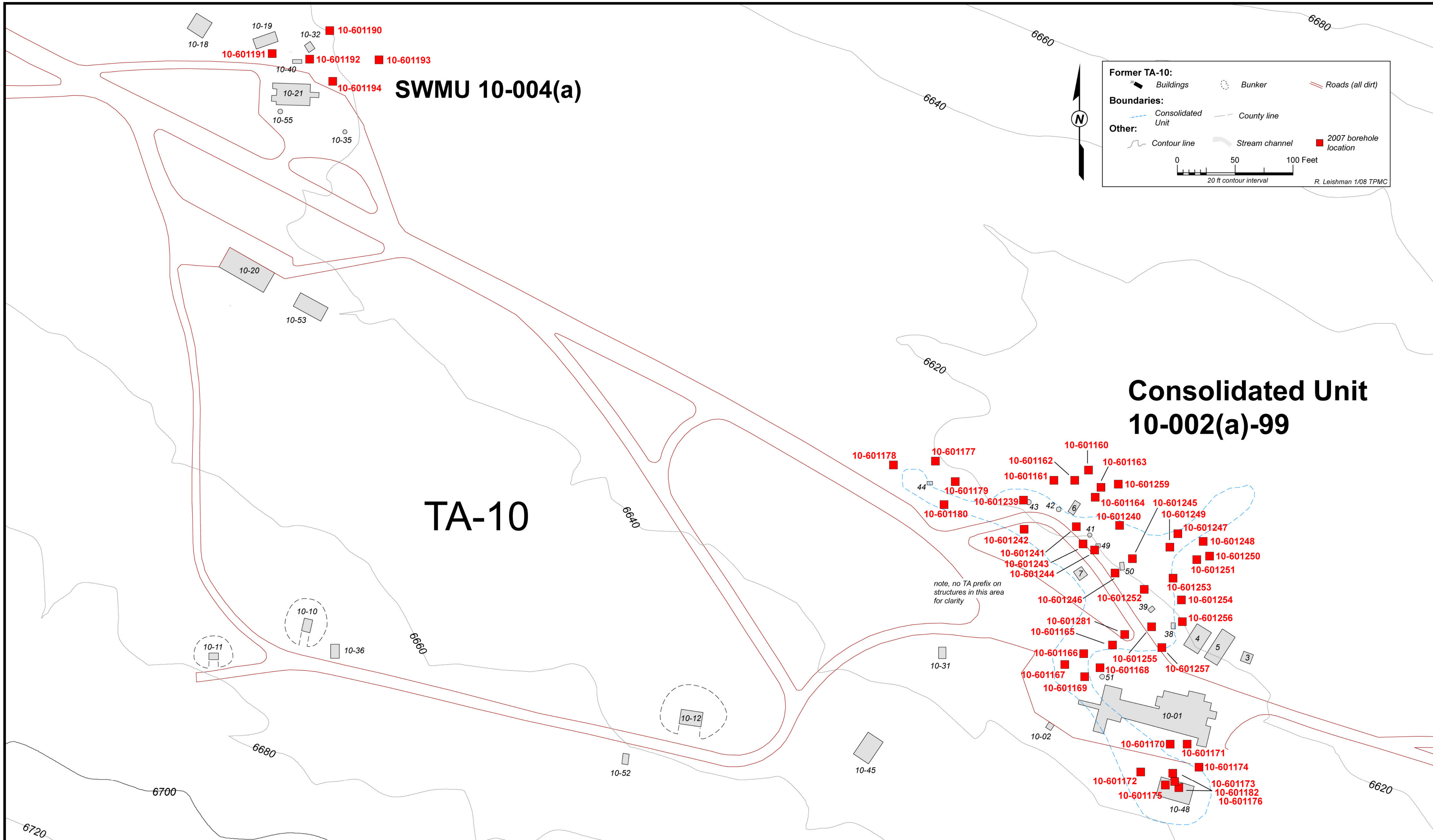


Figure 4.3-1 Location of boreholes drilled at Consolidated Unit 10-002(a)-99 and SWMU 10-004(a)

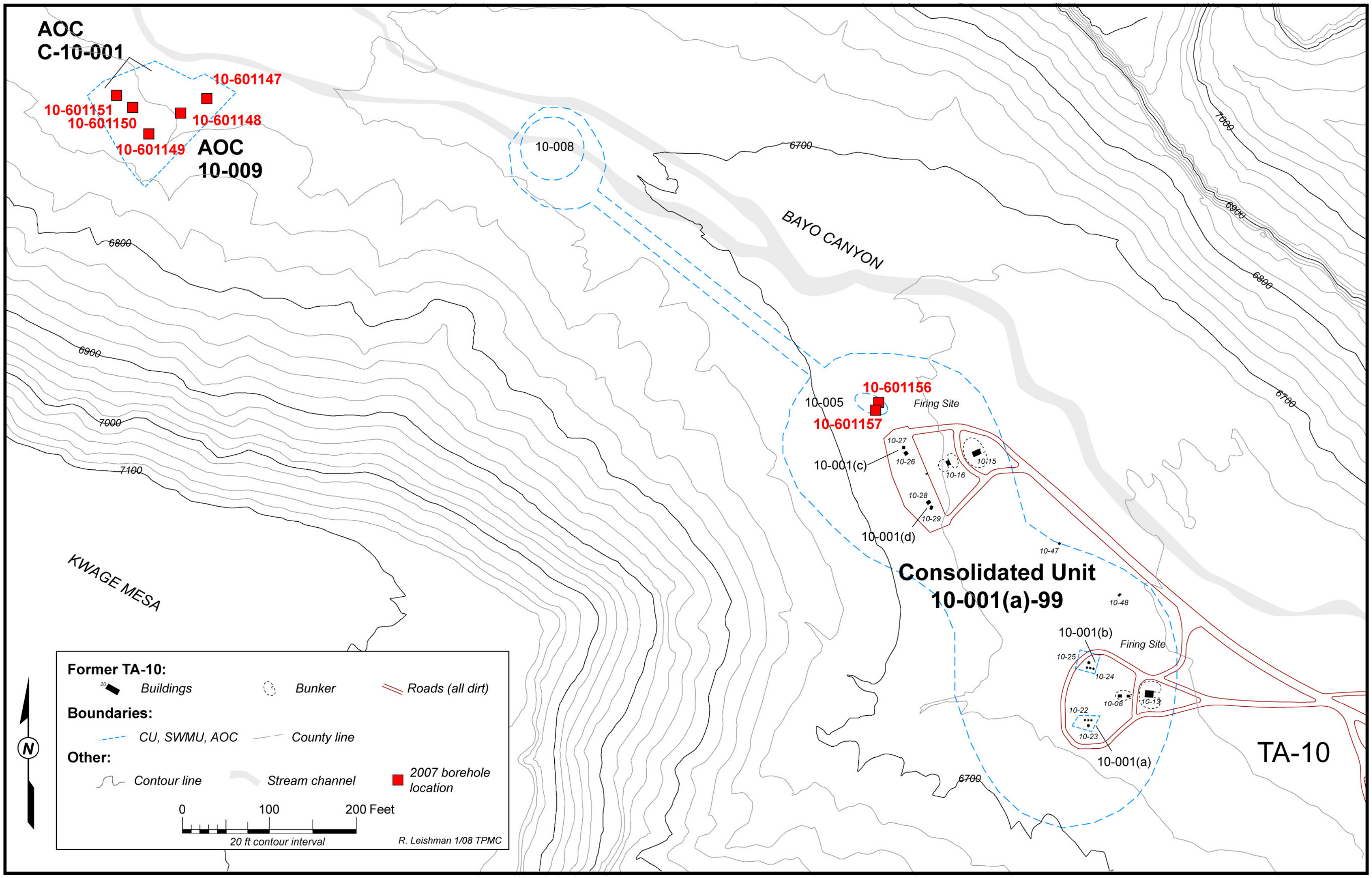


Figure 4.3-2 Locations of boreholes drilled at Consolidated Unit 10-001(a)-99 and AOC 10-009 in 2007

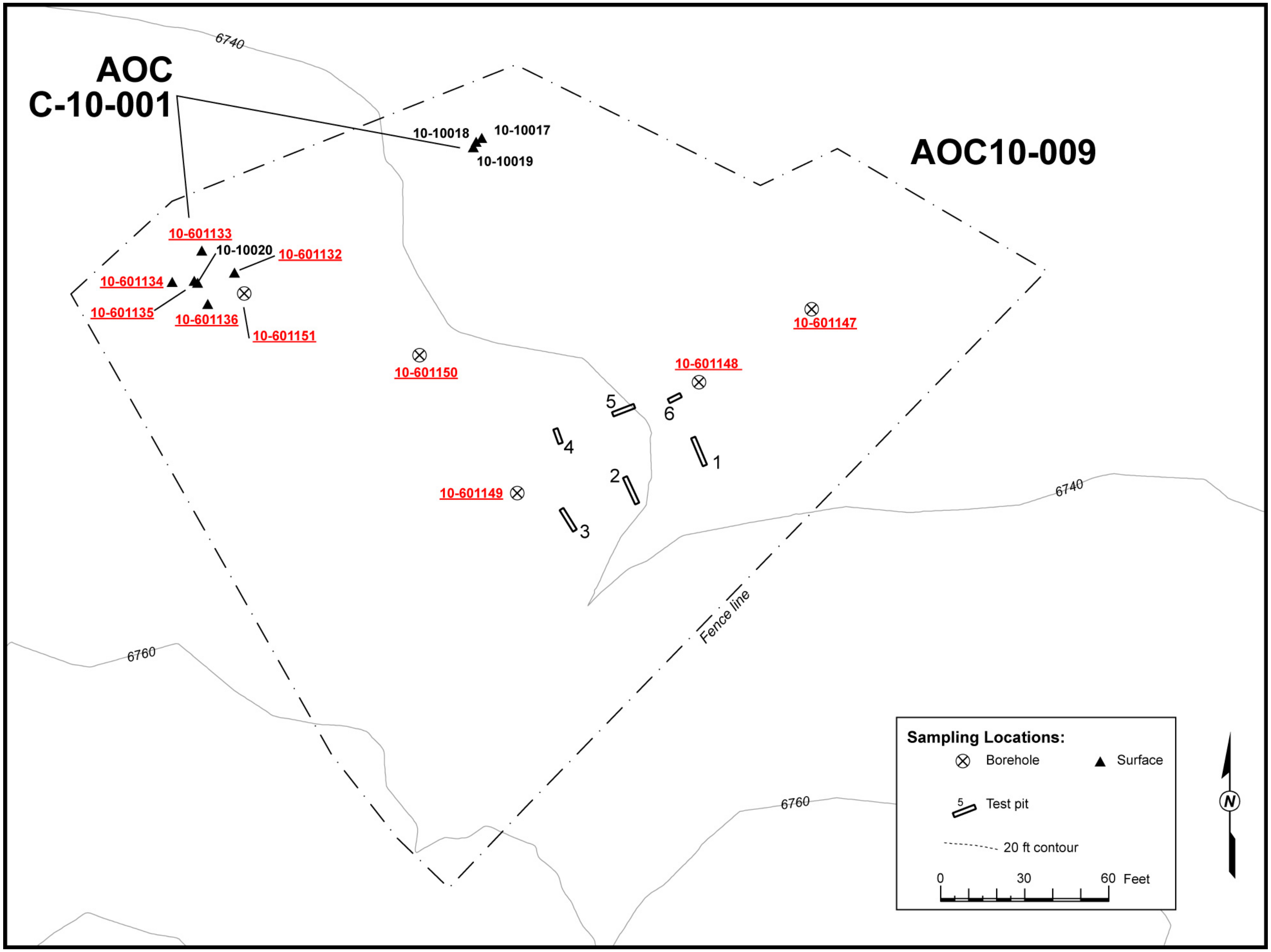


Figure 4.3-3 Locations of test pits excavated at AOC 10-009

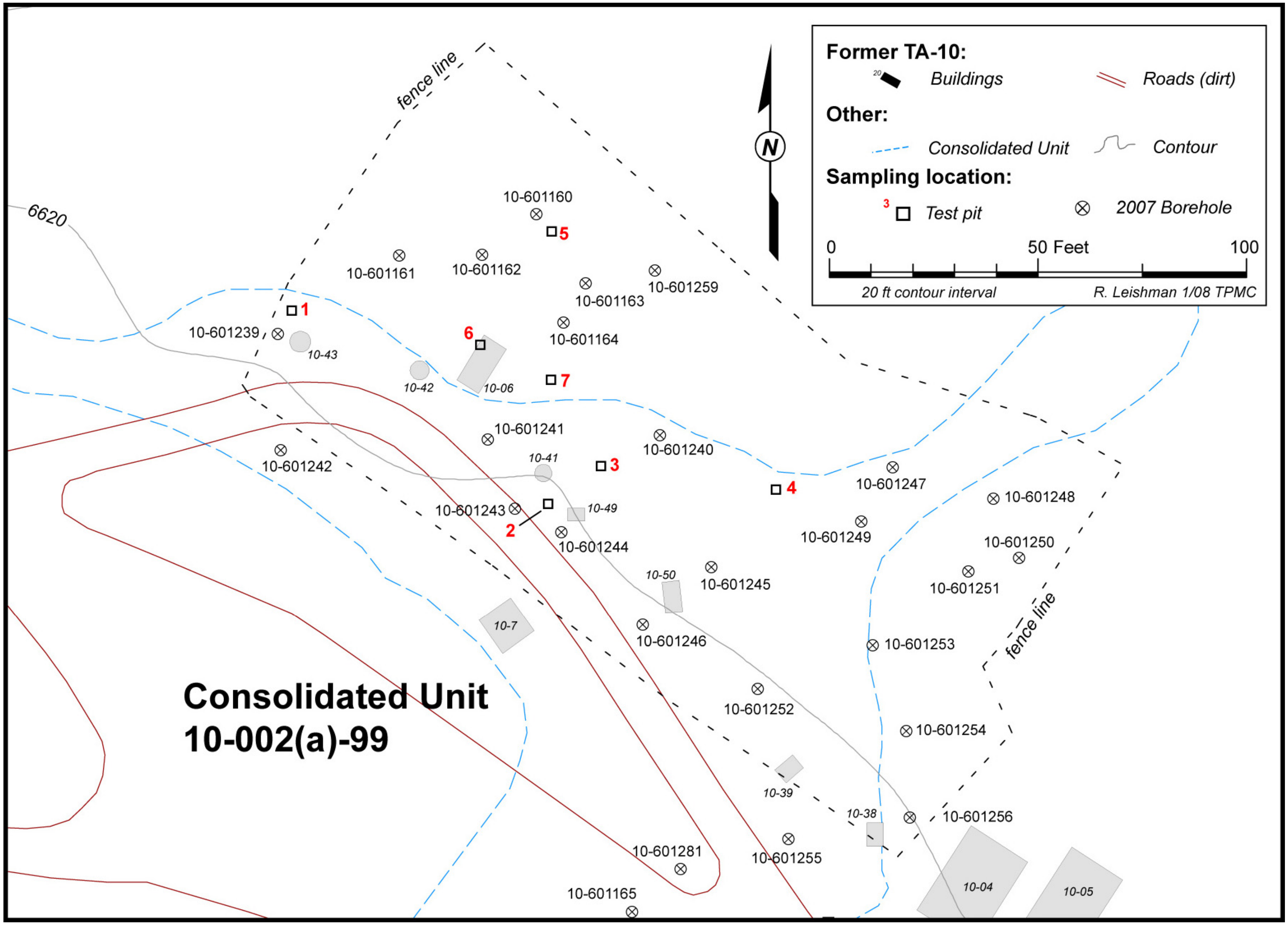


Figure 4.3-4 Locations of test pits excavated at SWMU 10-007, located within Consolidated Unit 10-002(a)-99

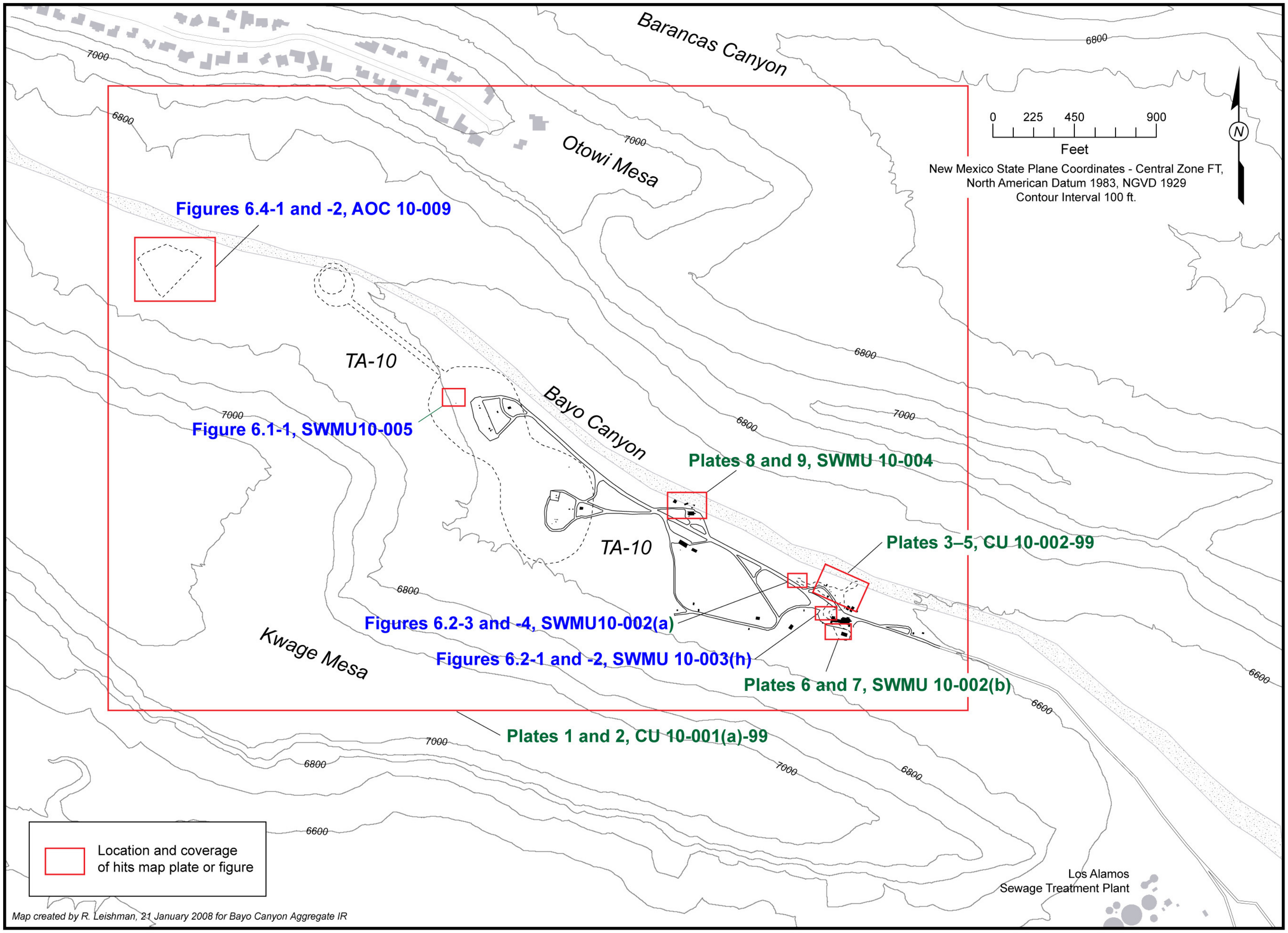


Figure 6.0-1 Index map showing the locations of plates and figures

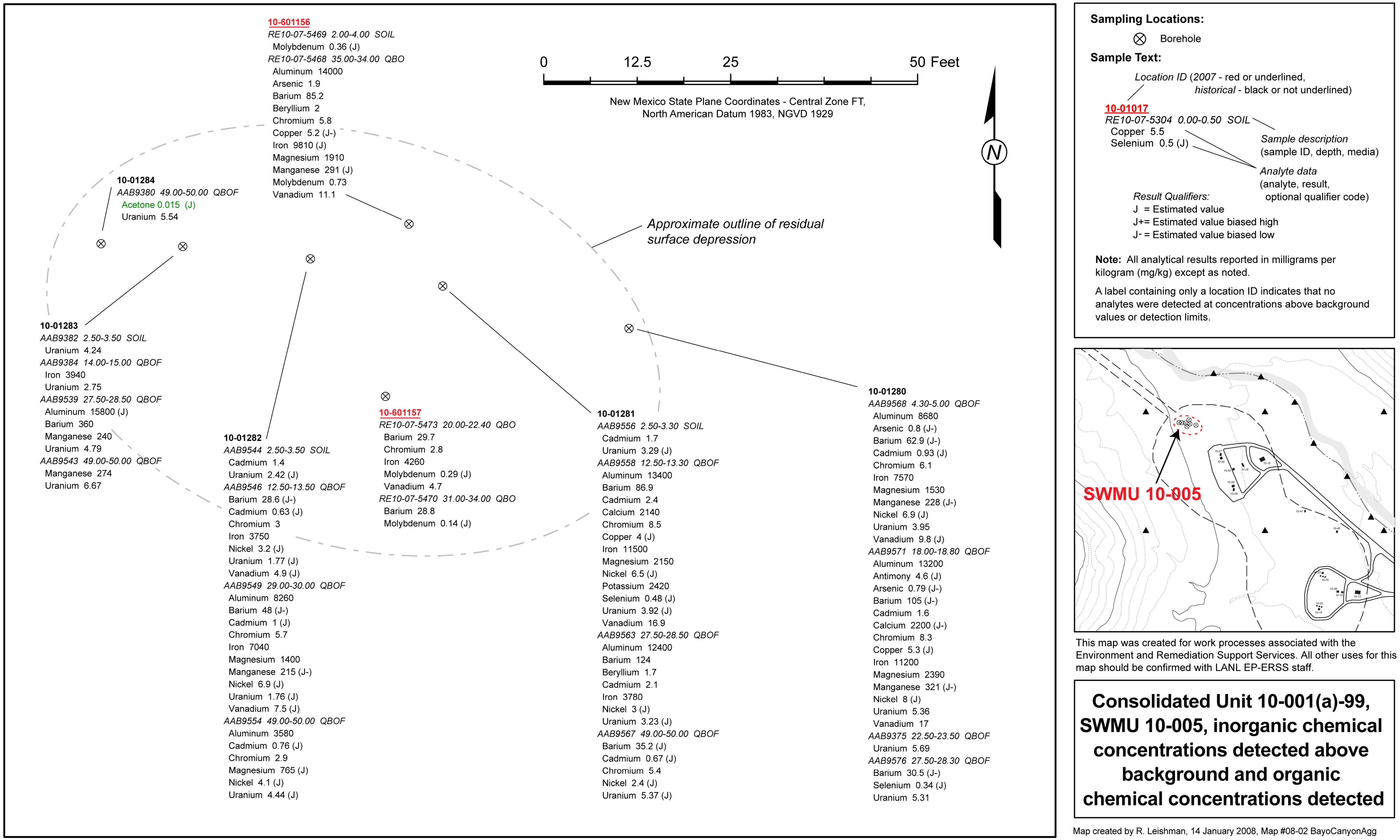
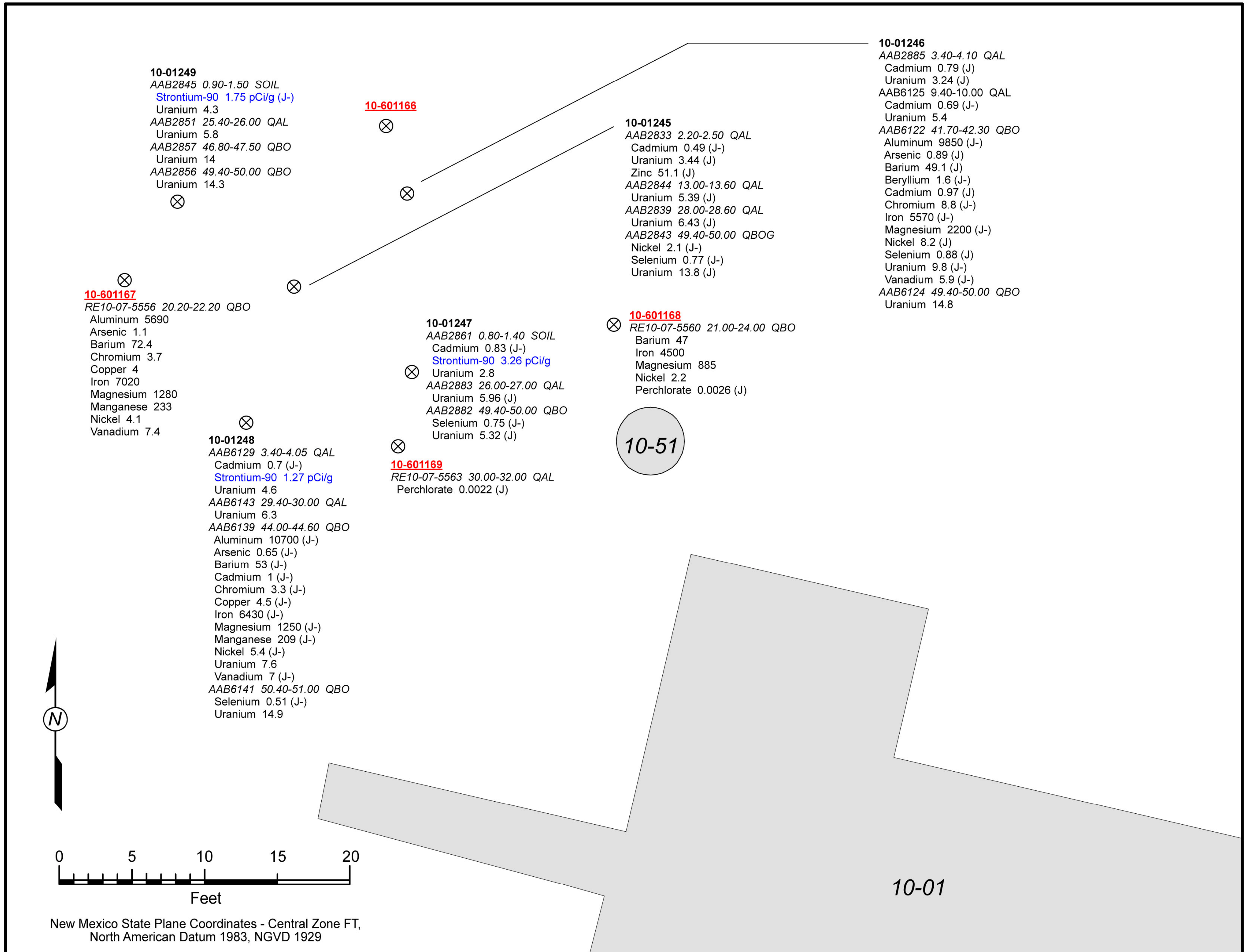


Figure 6.1-1 SWMU 10-005 inorganic chemicals detected above BVs and detected organic chemicals



Sampling Locations: ⊗ Borehole

Other: 20 ft contour

Former Structure: 10-01 TA-10 building

Sample Data:

Location ID (2007 - red or underlined, *historical* - black or not underlined)

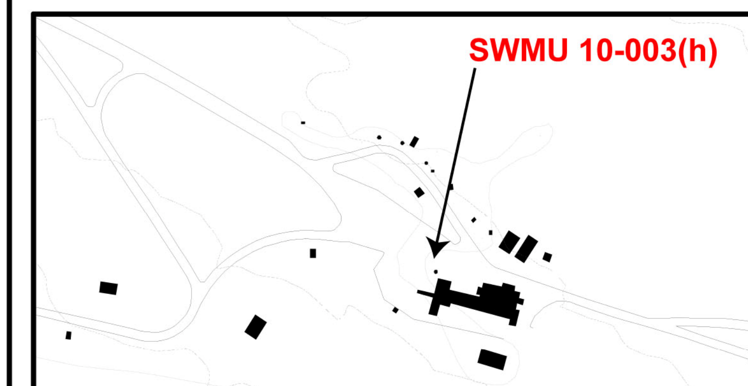
10-01017
RE10-07-5304 0.00-0.50 SOIL — *Sample description* (sample ID, depth (ft), media)
Copper 5.5
Selenium 0.5 (J) — *Analyte data* (analyte, result, optional qualifier code)

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) except as noted.

A label containing only a location ID indicates that no analytes were detected at concentrations above background values or detection limits.

QBOF is equivalent to QBO



This map was created for work processes associated with the Environment and Remediation Support Services. All other uses for this map should be confirmed with LANL EP-ERSS staff.

Consolidated Unit 10-002(a)-99, SWMU 10-003(h) inorganic chemical concentrations and radionuclides detected above background or fallout values

Map created by R. Leishman, 16 January 2008, Map #08-04 BayoCanyonAgg

Figure 6.2-1 SWMU 10-003(h) inorganic chemicals and radionuclides detected above BVs/FVs

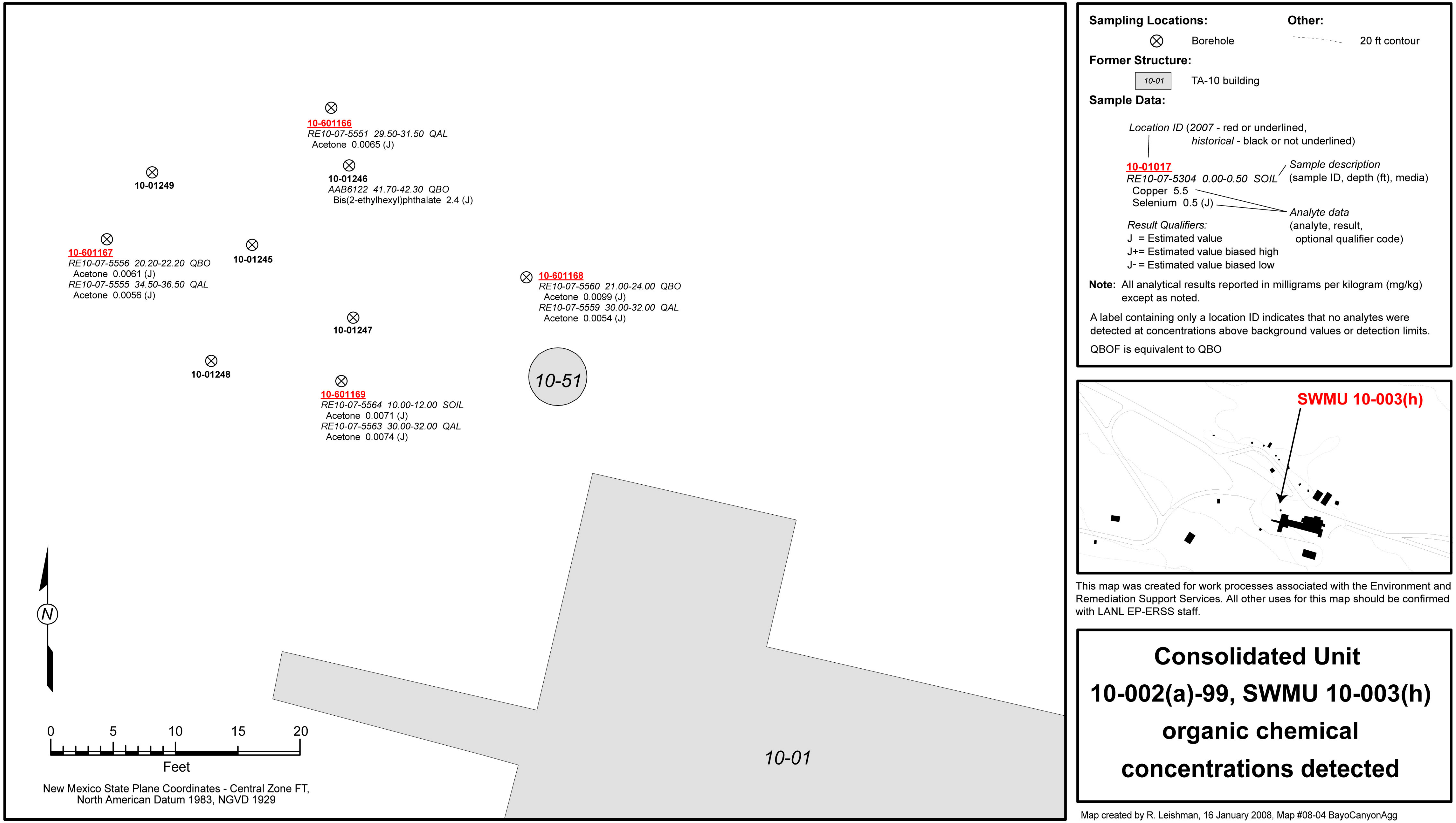


Figure 6.2-2 SWMU 10-003(h) detected organic chemicals

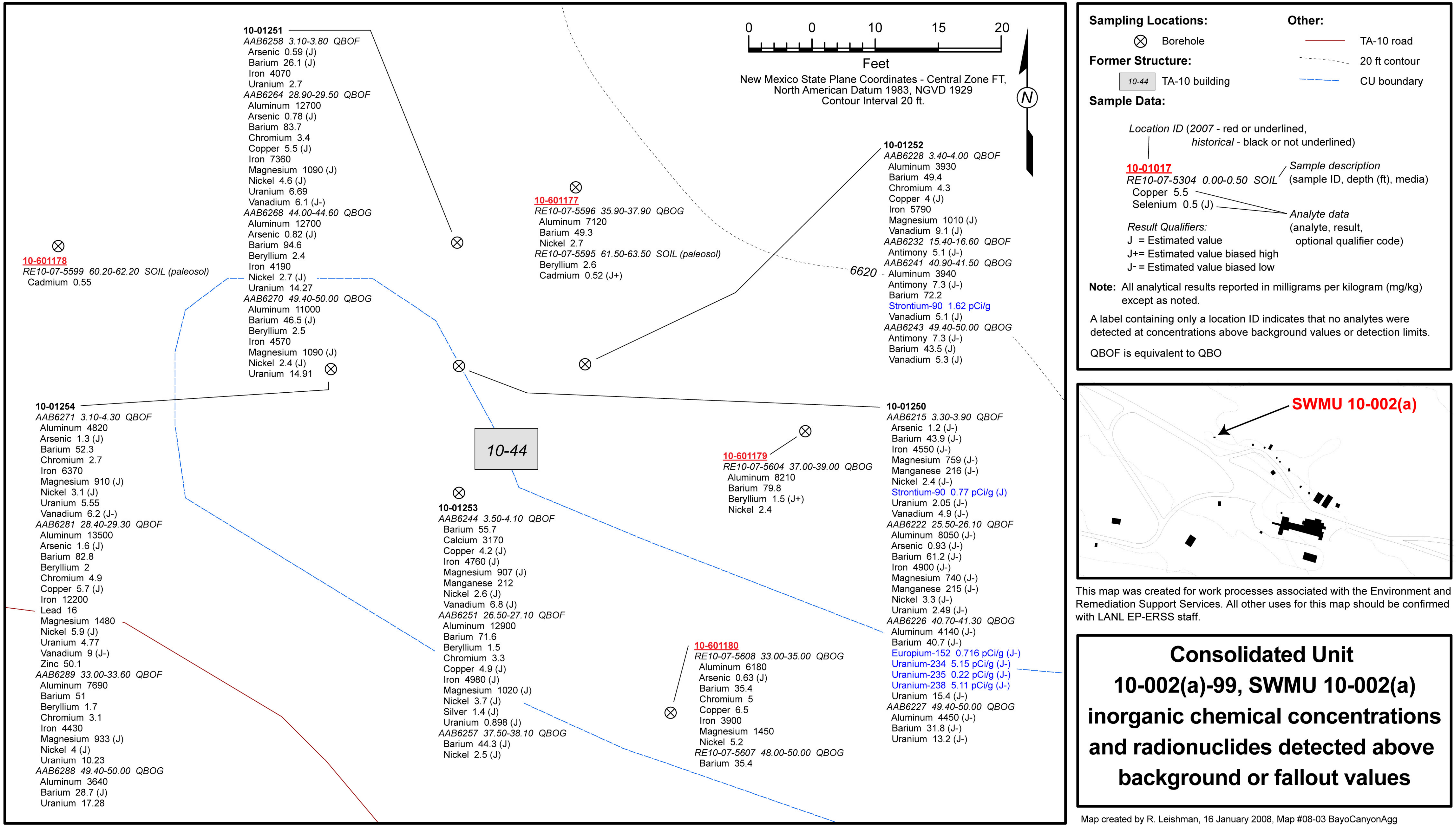


Figure 6.2-3 SWMU 10-002(a) inorganic chemicals and radionuclides detected above BVs/FVs

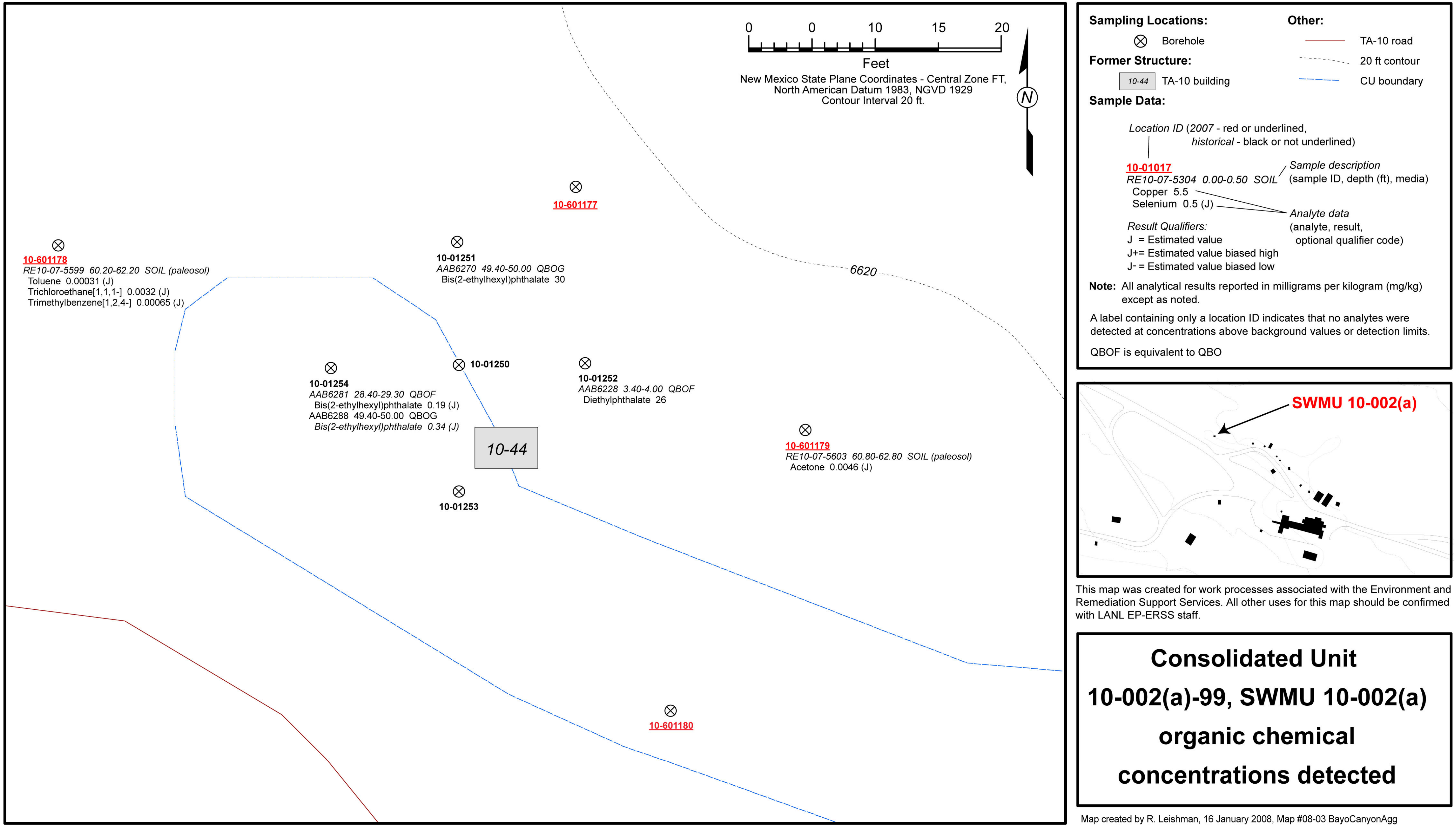


Figure 6.2-4 SWMU 10-002(a) detected organic chemicals

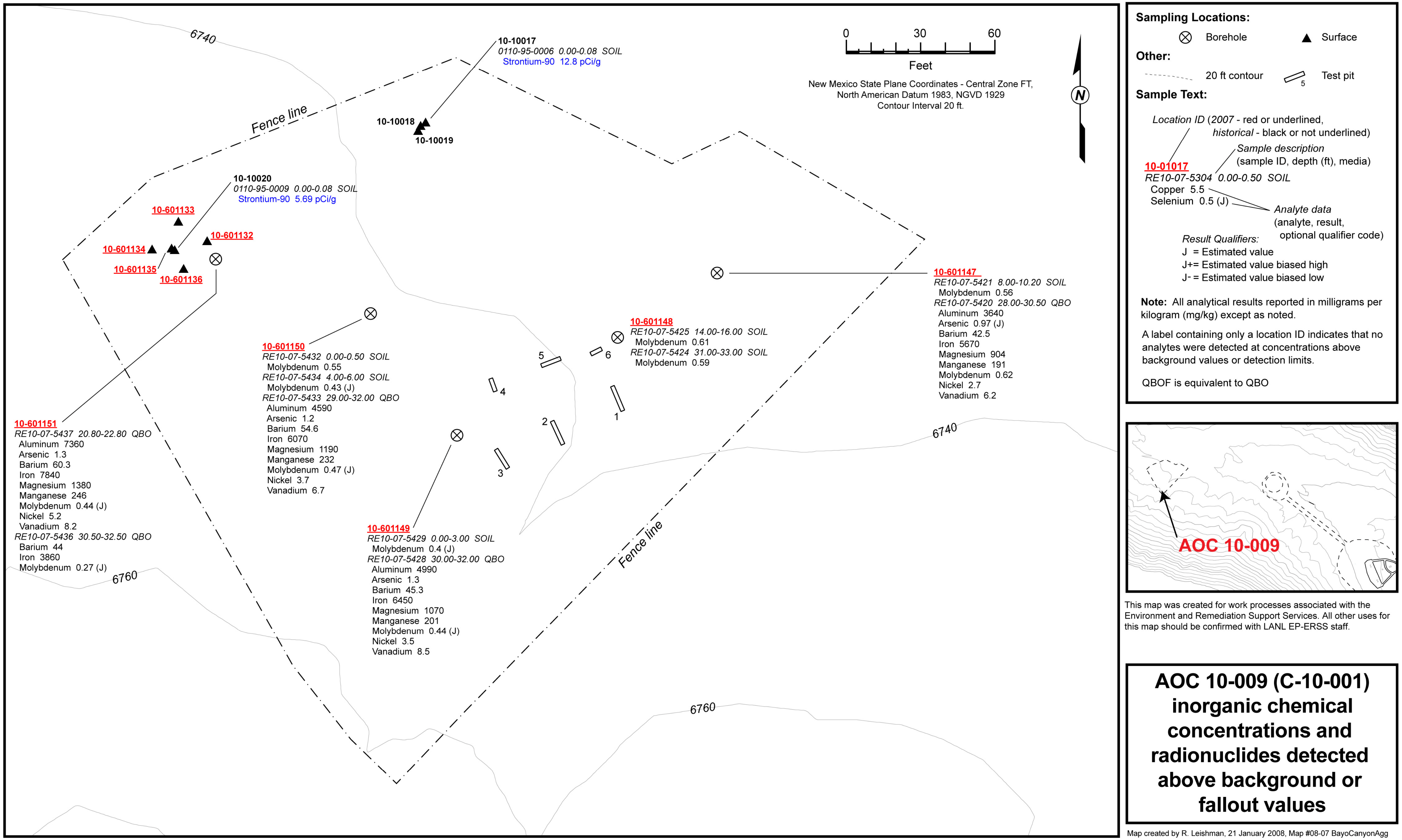


Figure 6.4-1 AOCs 10-009 and C-10-001 inorganic chemicals and radionuclides detected above BVs/FVs

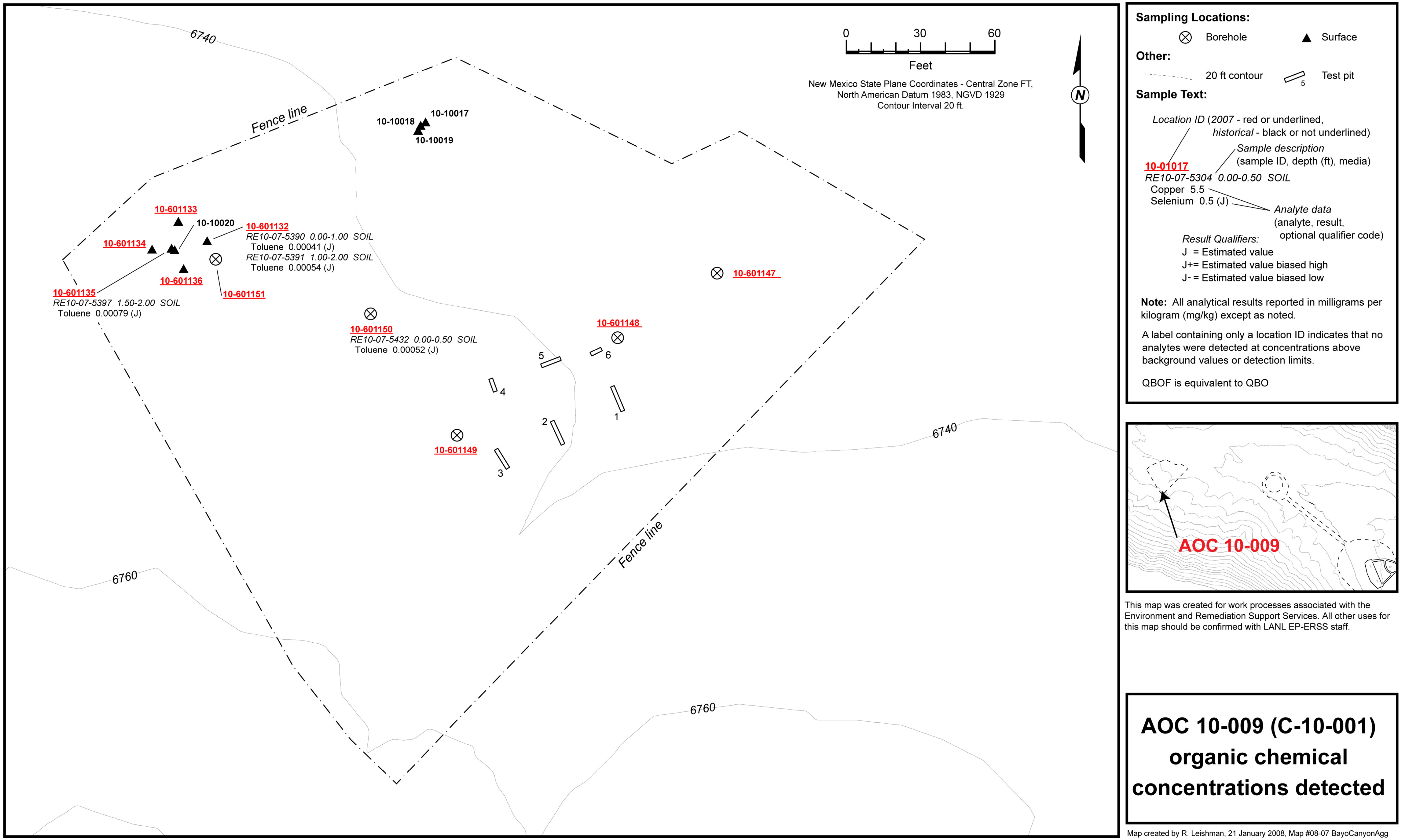


Figure 6.4-2 AOCs 10-009 and C-10-001 detected organic chemicals

Table 2.1-1
Summary of Bayo Canyon Aggregate Area Consolidated Units, SWMUs, and AOCs

Consolidated Unit	SWMU/AOC	Description
10-001(a)-99	SWMUs 10-001(a–d)	Inactive firing sites
	SWMU 10-005	Open surface disposal pit
	AOC 10-001(e)	Possible sand pile detonation test site
	AOC 10-008	Satellite firing site (non-radiological)
10-002(a)-99	SWMU 10-002(a,b)	Solid waste disposal pit
	SWMU 10-003(a–o)[a]	Radiochemistry lab liquid waste disposal
	SWMU 10-004(b)[a]	540-gallon reinforced concrete sanitary septic
	SWMU 10-007[a]	Building debris landfill (remains in place)
—[b]	SWMU 10-004(a)	Former 1060-gallon septic tank
—	SWMU 10-006	Potential burn sites (location unknown)
—	AOC C-10-001	Two sites of radioactively contaminated soil
—	AOC 10-009	Landfill associated with former firing sites

[a] Included in Central Area, with the exception of SWMU 10-003(h).

[b] — = Not part of a consolidated unit.

Table 4.2-1
Surface and Shallow Subsurface Samples Collected in 2007 from the Bayo Canyon Aggregate Area

Sample ID	Location ID	Depth (ft)	Media	Isotopic Uranium	Explosive Compounds	TAL Metals	Perchlorate	Strontium-90	SVOC	VOC	Cyanide + pH
Consolidated Unit 10-001(a)-99											
RE10-07-5286	10-01001	0.0000–0.5000	SOIL	—[a]	07-583	07-585	07-585	07-585	07-583	07-584	07-585
RE10-07-5287	10-01001	1.5000–2.0000	SOIL	—	07-583	07-585	07-585	07-585	07-583	07-584	07-585
RE10-07-5292	10-01004	0.0000–0.5000	QBT3	—	08-24	08-24	08-24	08-24	08-24	08-24	08-24
RE10-07-5293	10-01004	1.5000–2.0000	QBT3	—	08-24	08-24	08-24	08-24	08-24	08-24	08-24
RE10-07-5294	10-01006	0.0000–0.5000	SOIL	07-506	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5295	10-01006	1.5000–2.0000	SOIL	07-506	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5296	10-01008	0.0000–0.5000	SOIL	—	07-583	07-585	07-585	07-585	07-583	07-584	07-585
RE10-07-5297	10-01008	1.5000–2.0000	SOIL	—	07-583	07-585	07-585	07-585	07-583	07-584	07-585
RE10-07-5298	10-01011	0.0000–0.5000	SOIL	—	07-687	07-689	07-689	07-689	07-687	07-688	07-689
RE10-07-5299	10-01011	1.5000–2.0000	SOIL	—	07-687	07-689	07-689	07-689	07-687	07-688	07-689
RE10-07-5300	10-01012	0.0000–0.5000	SOIL	07-506	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5301	10-01012	1.5000–2.0000	SOIL	07-506	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5302	10-01014	0.0000–0.5000	SOIL	07-583	07-583	07-585	07-585	07-585	07-583	07-584	07-585
RE10-07-5303	10-01014	1.5000–2.0000	SOIL	07-583	07-583	07-585	07-585	07-585	07-583	07-584	07-585
RE10-07-5304	10-01017	0.0000–0.5000	SOIL	—	07-687	07-689	07-689	07-689	07-687	07-688	07-689
RE10-07-5305	10-01017	1.5000–2.0000	SOIL	—	07-687	07-689	07-689	07-689	07-687	07-688	07-689
RE10-07-5307	10-01022	0.0000–0.5000	SOIL	—	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5306	10-01022	1.5000–2.0000	SOIL	—	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5308	10-01023	0.0000–0.5000	SOIL	07-583	07-583	07-585	07-585	07-585	07-583	07-584	07-585
RE10-07-5309	10-01023	1.5000–2.0000	SOIL	07-583	07-583	07-585	07-585	07-585	07-583	07-584	07-585
RE10-07-5310	10-01024	0.0000–0.5000	SOIL	07-583	07-583	07-585	07-585	07-585	07-583	07-584	07-585
RE10-07-5311	10-01024	1.5000–2.0000	SOIL	07-583	07-583	07-585	07-585	07-585	07-583	07-584	07-585
RE10-07-5312	10-01033	0.0000–0.5000	SOIL	07-583	07-583	07-585	07-585	07-585	07-583	07-584	07-585
RE10-07-5313	10-01033	1.5000–2.0000	SOIL	07-583	07-583	07-585	07-585	07-585	07-583	07-584	07-585

Table 4.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Isotopic Uranium	Explosive Compounds	TAL Metals	Perchlorate	Strotium-90	SVOC	VOC	Cyanide + pH
RE10-07-5314	10-01034	0.0000–0.5000	SOIL	07-632	07-632	07-634	07-634	07-634	07-632	07-633	07-634
RE10-07-5315	10-01034	1.5000–2.0000	SOIL	07-632	07-632	07-634	07-634	07-634	07-632	07-633	07-634
RE10-07-5317	10-01039	0.0000–0.2500	SOIL	—	07-1037	07-1038	07-1038	07-1038	07-1037	07-1038	07-1038
RE10-07-5316	10-01039	1.0000–2.0000	QBT3	—	07-1037	07-1038	07-1038	07-1038	07-1037	07-1038	07-1038
RE10-07-5318	10-01041	0.0000–0.5000	SOIL	—	07-637	07-639	07-639	07-639	07-637	07-638	07-639
RE10-07-5319	10-01041	1.5000–2.0000	QBT3	—	07-637	07-639	07-639	07-639	07-637	07-638	07-639
RE10-07-5320	10-01044	0.0000–0.5000	SOIL	07-632	07-632	07-634	07-634	07-634	07-632	07-633	07-634
RE10-07-5321	10-01044	1.5000–2.0000	SOIL	07-632	07-632	07-634	07-634	07-634	07-632	07-633	07-634
RE10-07-5322	10-01045	0.0000–0.5000	SOIL	07-632	07-632	07-634	07-634	07-634	07-632	07-633	07-634
RE10-07-5323	10-01045	1.5000–2.0000	SOIL	07-632	07-632	07-634	07-634	07-634	07-632	07-633	07-634
RE10-07-5324	10-01053	0.0000–0.5000	SOIL	—	07-632	07-634	07-634	07-634	07-632	07-633	07-634
RE10-07-5325	10-01053	1.5000–2.0000	SOIL	—	07-632	07-634	07-634	07-634	07-632	07-633	07-634
RE10-07-5326	10-01061	0.0000–0.5000	SOIL	—	07-637	07-639	07-639	07-639	07-637	07-638	07-639
RE10-07-5327	10-01061	1.5000–2.0000	SOIL	—	07-637	07-639	07-639	07-639	07-637	07-638	07-639
RE10-07-5336	10-01062	0.0000–0.5000	SOIL	—	07-637	07-639	07-639	07-639	07-637	07-638	07-639
RE10-07-5337	10-01062	1.5000–2.0000	QBT3	—	07-637	07-639	07-639	07-639	07-637	07-638	07-639
RE10-07-5328	10-01063	0.0000–0.5000	SOIL	—	07-637	07-639	07-639	07-639	07-637	07-638	07-639
RE10-07-5329	10-01063	1.5000–2.0000	QBT3	—	07-637	07-639	07-639	07-639	07-637	07-638	07-639
RE10-07-5330	10-01066	0.0000–0.5000	SOIL	—	07-687	07-689	07-689	07-689	07-687	07-688	07-689
RE10-07-5331	10-01066	1.5000–2.0000	SOIL	—	07-687	07-689	07-689	07-689	07-687	07-688	07-689
RE10-07-5332	10-01095	0.0000–0.5000	SOIL	07-687	07-687	07-689	07-689	07-689	07-687	07-688	07-689
RE10-07-5333	10-01095	1.5000–2.0000	SOIL	07-687	07-687	07-689	07-689	07-689	07-687	07-688	07-689
RE10-07-5334	10-01619	0.0000–0.5000	SOIL	—	07-687	07-689	07-689	07-689	07-687	07-688	07-689
RE10-07-5335	10-01619	1.5000–2.0000	SOIL	—	07-687	07-689	07-689	07-689	07-687	07-688	07-689

Table 4.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Isotopic Uranium	Explosive Compounds	TAL Metals	Perchlorate	Strotium-90	SVOC	VOC	Cyanide + pH
AOC C-10-001											
RE10-07-5390	10-601132	0.0000–1.0000	SOIL	—	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5391	10-601132	1.0000–2.0000	SOIL	—	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5392	10-601133	0.0000–0.5000	SOIL	—	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5393	10-601133	1.5000–2.0000	SOIL	—	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5394	10-601134	0.0000–0.5000	SOIL	—	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5395	10-601134	1.5000–2.0000	SOIL	—	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5396	10-601135	0.0000–0.5000	SOIL	—	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5397	10-601135	1.5000–2.0000	SOIL	—	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5398	10-601136	0.0000–0.5000	SOIL	—	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5399	10-601136	1.5000–2.0000	SOIL	—	07-506	07-507	07-507	07-507	07-506	07-508	07-507
Consolidated Unit 10-002(a)-99[b]											
RE10-07-6291	10-601319	0.0000–0.2500	SOIL	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100
RE10-08-9973	10-601319	1.5000–2.0000	SOIL	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100
RE10-08-9965	10-603263	0.0000–1.0000	SOIL	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100
RE10-08-9966	10-603263	1.5000–2.0000	SOIL	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100
RE10-08-9967	10-603264	0.0000–1.0000	SOIL	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100
RE10-08-9968	10-603264	1.5000–2.0000	SOIL	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100
RE10-08-9969	10-603265	0.0000–1.0000	SOIL	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100
RE10-08-9970	10-603265	1.5000–3.2000	SOIL	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100	07-1100

Note: Numbers in analyte columns are request numbers.

[a] — = Analysis not requested.

[b] Samples were also analyzed for americium-241, gross alpha/beta, and gamma spectroscopy.

Table 4.2-2
Summary of 2007 Field Screening Results from Surface and Shallow Subsurface Soil Samples Collected from Bayo Canyon Aggregate Area

Consolidated Unit, SWMU, or AOC	Location ID	Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Collection Date	PID HS (ppm)	Radiation	
							α (dpm)	β (dpm)
10-001(a)-99	10-01001	RE10-07-5286	0.0	0.5	8/14/2007	45.6	<MDA	<MDA
10-001(a)-99	10-01001	RE10-07-5287	1.5	2.0	8/14/2007	0.8	<MDA	<MDA
10-001(a)-99	10-01004	RE10-07-5292	0	0.5	10/2/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01004	RE10-07-5293	1.5	2	10/2/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01006	RE10-07-5294	0.0	0.5	8/13/2007	0.9	<MDA	<MDA
10-001(a)-99	10-01006	RE10-07-5295	1.5	2.0	8/13/2007	0.8	<MDA	<MDA
10-001(a)-99	10-01008	RE10-07-5296	0.0	0.5	8/14/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01008	RE10-07-5338	0.0	0.5	8/14/2007	0.9	<MDA	<MDA
10-001(a)-99	10-01008	RE10-07-5297	1.5	2.0	8/14/2007	43.2	<MDA	<MDA
10-001(a)-99	10-01011	RE10-07-5298	0.0	0.5	8/17/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01011	RE10-07-5299	1.5	2.0	8/17/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01012	RE10-07-5300	0.0	0.5	8/13/2007	3.6	<MDA	<MDA
10-001(a)-99	10-01012	RE10-07-5301	1.5	2.0	8/13/2007	0.7	<MDA	<MDA
10-001(a)-99	10-01014	RE10-07-5302	0.0	0.5	8/14/2007	4.0	<MDA	<MDA
10-001(a)-99	10-01014	RE10-07-5303	1.5	2.0	8/14/2007	0.5	<MDA	<MDA
10-001(a)-99	10-01017	RE10-07-5304	0.0	0.5	8/17/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01017	RE10-07-5305	1.5	2.0	8/17/2007	7.6	<MDA	<MDA
10-001(a)-99	10-01022	RE10-07-5307	0.0	0.5	8/13/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01022	RE10-07-5306	1.5	2.0	8/13/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01023	RE10-07-5308	0.0	0.5	8/14/2007	0.1	<MDA	<MDA
10-001(a)-99	10-01023	RE10-07-5309	1.5	2.0	8/14/2007	29.2	<MDA	<MDA
10-001(a)-99	10-01024	RE10-07-5310	0.0	0.5	8/14/2007	5.7	<MDA	<MDA
10-001(a)-99	10-01024	RE10-07-5311	1.5	2.0	8/14/2007	61.9	<MDA	<MDA
10-001(a)-99	10-01033	RE10-07-5312	0.0	0.5	8/15/2007	2.3	<MDA	<MDA
10-001(a)-99	10-01033	RE10-07-5313	1.5	2.0	8/15/2007	2.4	<MDA	<MDA
10-001(a)-99	10-01034	RE10-07-5314	0	0.5	8/15/2007	0.5	<MDA	<MDA
10-001(a)-99	10-01034	RE10-07-5339	0.0	0.5	8/15/2007	0.5	<MDA	<MDA
10-001(a)-99	10-01034	RE10-07-5315	1.5	2	8/15/2007	0.7	<MDA	<MDA
10-001(a)-99	10-01039	RE10-07-5317	0	0.25	9/13/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01039	RE10-07-5316	1.0	2.0	9/12/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01041	RE10-07-5318	0.0	0.5	8/16/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01041	RE10-07-5319	1.5	2.0	8/16/2007	2.3	<MDA	<MDA
10-001(a)-99	10-01044	RE10-07-5320	0	0.5	8/15/2007	8.0	<MDA	<MDA
10-001(a)-99	10-01044	RE10-07-5321	1.5	2	8/15/2007	23.0	<MDA	<MDA
10-001(a)-99	10-01045	RE10-07-5322	0	0.5	8/15/2007	1.5	<MDA	<MDA

Table 4.2-2 (continued)

Consolidated Unit, SWMU, or AOC	Location ID	Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Collection Date	PID HS (ppm)	Radiation	
							α (dpm)	β (dpm)
10-001(a)-99	10-01045	RE10-07-5323	1.5	2	8/15/2007	3.7	<MDA	<MDA
10-001(a)-99	10-01053	RE10-07-5324	0	0.5	8/15/2007	1.5	<MDA	<MDA
10-001(a)-99	10-01053	RE10-07-5325	1.5	2	8/15/2007	3.7	<MDA	<MDA
10-001(a)-99	10-01061	RE10-07-5326	0.0	0.5	8/16/2007	0.5	<MDA	<MDA
10-001(a)-99	10-01061	RE10-07-5327	1.5	2.0	8/16/2007	6.0	<MDA	<MDA
10-001(a)-99	10-01062	RE10-07-5336	0.0	0.5	8/16/2007	1.0	<MDA	<MDA
10-001(a)-99	10-01062	RE10-07-5337	1.5	2.0	8/16/2007	1.1	<MDA	<MDA
10-001(a)-99	10-01063	RE10-07-5328	0.0	0.5	8/16/2007	31.1	<MDA	<MDA
10-001(a)-99	10-01063	RE10-07-5329	1.5	2.0	8/16/2007	2.0	<MDA	<MDA
10-001(a)-99	10-01066	RE10-07-5330	0.0	0.5	8/17/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01066	RE10-07-5331	1.5	2.0	8/17/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01095	RE10-07-5332	0.0	0.5	8/17/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01095	RE10-07-5340	0.0	0.5	8/17/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01095	RE10-07-5333	1.5	2.0	8/17/2007	0.0	<MDA	<MDA
10-001(a)-99	10-01619	RE10-07-5334	0.0	0.5	8/17/2007	3.1	<MDA	<MDA
10-001(a)-99	10-01619	RE10-07-5335	1.5	2.0	8/17/2007	5.3	<MDA	<MDA
C-10-001	10-601132	RE10-07-5390	0.0	1.0	8/13/2007	30.0	<MDA	<MDA
C-10-001	10-601132	RE10-07-5391	1.0	2.0	8/13/2007	50.0	<MDA	<MDA
C-10-001	10-601133	RE10-07-5392	0.0	0.5	8/13/2007	1.2	<MDA	<MDA
C-10-001	10-601133	RE10-07-5393	1.5	2.0	8/13/2007	0.2	<MDA	<MDA
C-10-001	10-601134	RE10-07-5394	0.0	0.5	8/13/2007	0.0	<MDA	<MDA
C-10-001	10-601134	RE10-07-5395	1.5	2.0	8/13/2007	0.0	<MDA	<MDA
C-10-001	10-601135	RE10-07-5396	0.0	0.5	8/13/2007	0.3	<MDA	<MDA
C-10-001	10-601135	RE10-07-5397	1.5	2.0	8/13/2007	10.5	<MDA	<MDA
C-10-001	10-601136	RE10-07-5398	0.0	0.5	8/13/2007	0.3	<MDA	<MDA
C-10-001	10-601136	RE10-07-5348	0.0	0.5	8/13/2007	0.3	<MDA	<MDA
C-10-001	10-601136	RE10-07-5399	1.5	2.0	8/13/2007	0.3	<MDA	<MDA
10-002(a)-99	10-601319	RE10-07-6291	0.0	0.25	9/18/2007	0.0	500	15000
10-002(a)-99	10-601319	RE10-08-9973	1.5	2.0	12/19/2008	0.0	11	511
10-002(a)-99	10-603263	RE10-08-9965	0.0	1.0	12/19/2008	0.0	<MDA	1832
10-002(a)-99	10-603263	RE10-08-9966	1.5	2.0	12/19/2008	0.0	17	1826
10-002(a)-99	10-603264	RE10-08-9967	0.0	1.0	12/19/2008	0.0	<MDA	1524
10-002(a)-99	10-603264	RE10-08-9968	1.5	2.0	12/19/2008	0.0	<MDA	712
10-002(a)-99	10-603265	RE10-08-9969	0.0	1.0	12/19/2008	0.0	42	1574
10-002(a)-99	10-603265	RE10-08-9970	1.5	3.2	12/19/2008	0.0	21	1725

Table 4.3-1
Location ID and Total Depth of
Boreholes Drilled in 2007 at Bayo Canyon Aggregate Area

Consolidated Unit, SWMU, or AOC	Location ID	Total Depth (ft bgs)
Consolidated Unit		
10-001(a)-99	10-601156	34
10-001(a)-99	10-601157	34
10-002(a)-99	10-601160	60.8
10-002(a)-99	10-601161	60
10-002(a)-99	10-601162	61.5
10-002(a)-99	10-601163	53
10-002(a)-99	10-601164	54
10-002(a)-99	10-601239	34
10-002(a)-99	10-601240	64
10-002(a)-99	10-601241	30
10-002(a)-99	10-601242	30
10-002(a)-99	10-601243	50
10-002(a)-99	10-601244	50
10-002(a)-99	10-601259	53
10-002(a)-99	10-601245	30
10-002(a)-99	10-601246	30
10-002(a)-99	10-601247	33
10-002(a)-99	10-601248	44
10-002(a)-99	10-601249	34
10-002(a)-99	10-601250	44
10-002(a)-99	10-601251	44
10-002(a)-99	10-601252	40
10-002(a)-99	10-601253	34
10-002(a)-99	10-601254	40
10-002(a)-99	10-601255	35
10-002(a)-99	10-601256	40
10-002(a)-99	10-601257	35
10-002(a)-99	10-601181	34
10-002(a)-99	10-601165	34
10-002(a)-99	10-601166	34
10-002(a)-99	10-601167	39
10-002(a)-99	10-601168	34
10-002(a)-99	10-601169	34
10-002(a)-99	10-601170	64
10-002(a)-99	10-601171	64
10-002(a)-99	10-601172	60
10-002(a)-99	10-601173	64
10-002(a)-99	10-601174	63

Table 4.3-1 (continued)

Consolidated Unit, SWMU, or AOC	Location ID	Total Depth (ft bgs)
10-002(a)-99	10-601175	64
10-002(a)-99	10-601176	60
10-002(a)-99	10-601177	64
10-002(a)-99	10-601178	63.5
10-002(a)-99	10-601179	62.8
10-002(a)-99	10-601180	50
10-002(a)-99	10-601182	60
SWMU		
10-004(a)	10-601190	64
10-004(a)	10-601191	34
10-004(a)	10-601192	68.5
10-004(a)	10-601193	64
10-004(a)	10-601194	64
AOC		
10-009	10-601147	33
10-009	10-601148	34
10-009	10-601149	34
10-009	10-601150	34
10-009	10-601151	34

Table 4.3-2
Borehole Samples Collected in 2007 from Bayo Canyon Aggregate Area

Location ID	Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Media	Explosive Compounds	TAL Metals	Perchlorate	Strontium-90	SVOC	VOC	Cyanide + pH
Consolidated Unit 10-001(a)-99											
10-601156	RE10-07-5468	32.0	34.0	QBO	07-509	07-511	07-511	07-511	07-509	07-510	07-511
10-601156	RE10-07-5469	2.0	4.0	SOIL	07-509	07-511	07-511	07-511	07-509	07-510	07-511
10-601157	RE10-07-5470	31.0	34.0	QBO	07-509	07-511	07-511	07-511	07-509	07-510	07-511
10-601157	RE10-07-5473	20.0	22.4	QBO	07-509	07-511	07-511	07-511	07-509	07-510	07-511
Consolidated Unit 10-002(a)-99											
10-601160	RE10-07-5490	59.0	60.8	SOIL	07-970	07-972	07-972	07-972	07-970	07-971	07-972
10-601160	RE10-07-5491	42.0	44.0	QBOG	07-970	07-972	07-972	07-972	07-970	07-971	07-972
10-601160	RE10-07-5492	0.8	2.8	SOIL	07-970	07-972	07-972	07-972	07-970	07-971	07-972
10-601161	RE10-07-5495	58.2	60.0	SOIL	07-1016	07-1018	07-1018	07-1018	07-1016	07-1017	07-1018
10-601161	RE10-07-5496	43.0	45.0	QBOG	07-1016	07-1018	07-1018	07-1018	07-1016	07-1017	07-1018
10-601162	RE10-07-5500	59.0	61.5	SOIL	07-970	07-972	07-972	07-972	07-970	07-971	07-972
10-601162	RE10-07-5501	41.3	43.3	QBOG	07-970	07-972	07-972	07-972	07-970	07-971	07-972
10-601162	RE10-07-5502	0.0	2.1	SOIL	07-970	07-972	07-972	07-972	07-970	07-971	07-972
10-601163	RE10-07-5505	49.5	51.5	QBOG	07-1016	07-1018	07-1018	07-1018	07-1016	07-1017	07-1018
10-601163	RE10-07-5506	13.0	14.8	QAL	07-1016	07-1018	07-1018	07-1018	07-1016	07-1017	07-1018
10-601164	RE10-07-5510	52.0	54.0	QBOG	07-1016	07-1018	07-1018	07-1018	07-1016	07-1017	07-1018
10-601164	RE10-07-5511	39.0	40.5	QBOG	07-1016	07-1018	07-1018	07-1018	07-1016	07-1017	07-1018
10-601164	RE10-07-5512	14.0	16.0	QAL	07-1099	07-1099	07-1099	07-1099	07-1099	07-1099	07-1099
10-601164	RE10-07-5513	19.0	21.0	QAL	07-1016	07-1018	07-1018	07-1018	07-1016	07-1017	07-1018
10-601239	RE10-07-5898	30.2	32.2	QAL	07-931	07-933	07-933	07-933	07-931	07-932	07-933
10-601239	RE10-07-5899	19.9	21.9	QAL	07-931	07-933	07-933	07-933	07-931	07-932	07-933
10-601240	RE10-07-5903	60.5	62.5	SOIL	07-906	07-907	07-907	07-907	07-906	07-907	07-907
10-601240	RE10-07-5904	37.0	39.0	QBOG	07-906	07-907	07-907	07-907	07-906	07-907	07-907
10-601241	RE10-07-5908	26.9	28.9	QAL	07-1016	07-1018	07-1018	07-1018	07-1016	07-1017	07-1018

Table 4.3-2 (continued)

Location ID	Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Media	Explosive Compounds	TAL Metals	Perchlorate	Strontium-90	SVOC	VOC	Cyanide + pH
10-601241	RE10-07-5909	15.8	17.8	QAL	07-1016	07-1018	07-1018	07-1018	07-1016	07-1017	07-1018
10-601242	RE10-07-5913	26.0	28.0	QAL	07-931	07-933	07-933	07-933	07-931	07-932	07-933
10-601242	RE10-07-5914	1.0	3.0	SOIL	07-931	07-933	07-933	07-933	07-931	07-932	07-933
10-601243	RE10-07-5918	48.0	50.0	QBOG	07-931	07-933	07-933	07-933	07-931	07-932	07-933
10-601243	RE10-07-5919	31.9	33.9	QAL	07-931	07-933	07-933	07-933	07-931	07-932	07-933
10-601244	RE10-07-5923	48.0	50.0	QBOG	07-931	07-933	07-933	07-933	07-931	07-932	07-933
10-601244	RE10-07-5924	32.5	34.5	QBOG	07-931	07-933	07-933	07-933	07-931	07-932	07-933
10-601245	RE10-07-5928	25.0	27.6	QAL	07-890	07-892	07-892	07-892	07-890	07-891	07-892
10-601245	RE10-07-5929	6.0	8.0	QAL	07-890	07-892	07-892	07-892	07-890	07-891	07-892
10-601246	RE10-07-5933	26.6	28.6	QAL	07-897	07-899	07-899	07-899	07-897	07-898	07-899
10-601246	RE10-07-5934	16.3	18.3	QAL	07-897	07-899	07-899	07-899	07-897	—*	07-899
10-601247	RE10-07-5938	28.7	30.7	QAL	07-890	07-892	07-892	07-892	07-890	07-891	07-892
10-601247	RE10-07-5939	13.7	15.7	QAL	07-890	07-892	07-892	07-892	07-890	07-891	07-892
10-601248	RE10-07-5943	42.0	44.0	QBOG	07-872	07-874	07-874	07-874	07-872	07-873	07-874
10-601248	RE10-07-5944	19.8	21.8	QAL	07-872	07-874	07-874	07-874	07-872	07-873	07-874
10-601249	RE10-07-5948	32.0	34.0	QBOG	07-890	07-892	07-892	07-892	07-890	07-891	07-892
10-601249	RE10-07-5949	20.2	22.2	QAL	07-890	07-892	07-892	07-892	07-890	07-891	07-892
10-601250	RE10-07-5953	42.0	44.0	QBOG	07-872	07-874	07-874	07-874	07-872	07-873	07-874
10-601250	RE10-07-5954	27.0	29.0	QAL	07-872	07-874	07-874	07-874	07-872	07-873	07-874
10-601251	RE10-07-5958	42.0	44.0	QBOG	07-872	07-874	07-874	07-874	07-872	07-873	07-874
10-601251	RE10-07-5959	7.0	9.0	QAL	07-872	07-874	07-874	07-874	07-872	07-873	07-874
10-601252	RE10-07-5963	38.0	40.0	QBOG	07-890	07-892	07-892	07-892	07-890	07-891	07-892
10-601252	RE10-07-5964	33.0	35.0	QBOG	07-890	07-892	07-892	07-892	07-890	07-891	07-892
10-601253	RE10-07-5968	30.4	32.4	QBOG	07-890	07-892	07-892	07-892	07-890	07-891	07-892
10-601253	RE10-07-5969	27.0	29.0	QBO	07-890	07-892	07-892	07-892	07-890	07-891	07-892
10-601254	RE10-07-5973	38.0	40.0	QBOG	07-872	07-874	07-874	07-874	07-872	07-873	07-874

Table 4.3-2 (continued)

Location ID	Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Media	Explosive Compounds	TAL Metals	Perchlorate	Strontium-90	SVOC	VOC	Cyanide + pH
10-601254	RE10-07-5974	26.8	28.8	QAL	07-872	07-874	07-874	07-874	07-872	07-873	07-874
10-601255	RE10-07-5978	32.7	34.7	QAL	07-897	07-899	07-899	07-899	07-897	07-898	07-899
10-601255	RE10-07-5979	7.6	9.6	SOIL	07-897	07-899	07-899	07-899	07-897	07-898	07-899
10-601256	RE10-07-5983	36.7	38.7	QBOG	07-872	07-874	07-874	07-874	07-872	07-873	07-874
10-601256	RE10-07-5984	10.0	12.0	SOIL	07-872	07-874	07-874	07-874	07-872	07-873	07-874
10-601257	RE10-07-5988	31.0	33.0	QAL	07-897	07-899	07-899	07-899	07-897	07-898	07-899
10-601257	RE10-07-5989	21.3	23.3	QAL	07-897	07-899	07-899	07-899	07-897	07-898	07-899
10-601259	RE10-07-5998	51.0	53.0	QBOG	07-1039	07-1041	07-1041	07-1041	07-1039	07-1041	07-1041
10-601259	RE10-07-5999	28.8	30.8	QAL	07-1039	07-1041	07-1041	07-1041	07-1039	07-1041	07-1041
10-601259	RE10-07-6000	13.0	19.5	QAL	07-1039	07-1041	07-1041	07-1041	07-1039	07-1041	07-1041
10-601165	RE10-07-5547	30.2	32.2	QAL	07-684	07-686	07-686	07-686	07-684	07-685	07-686
10-601165	RE10-07-5548	4.7	6.7	SOIL	07-684	07-686	07-686	07-686	07-684	07-685	07-686
10-601166	RE10-07-5551	29.5	31.5	QAL	07-684	07-686	07-686	07-686	07-684	07-685	07-686
10-601166	RE10-07-5552	5.0	7.0	SOIL	07-684	07-686	07-686	07-686	07-684	07-685	07-686
10-601167	RE10-07-5555	34.5	36.5	QAL	07-684	07-686	07-686	07-686	07-684	07-685	07-686
10-601167	RE10-07-5556	20.2	22.2	QBO	07-684	07-686	07-686	07-686	07-684	07-685	07-686
10-601168	RE10-07-5559	30.0	32.0	QAL	07-684	07-686	07-686	07-686	07-684	07-685	07-686
10-601168	RE10-07-5560	21.0	24.0	QBO	07-684	07-686	07-686	07-686	07-684	07-685	07-686
10-601169	RE10-07-5563	30.0	32.0	QAL	07-684	07-686	07-686	07-686	07-684	07-685	07-686
10-601169	RE10-07-5564	10.0	12.0	SOIL	07-684	07-686	07-686	07-686	07-684	07-685	07-686
10-601170	RE10-07-5567	62.0	64.0	QBOG	07-707	07-708	07-708	07-708	07-707	07-708	07-708
10-601170	RE10-07-5568	20.4	22.4	QAL	07-707	07-708	07-708	07-708	07-707	07-708	07-708
10-601171	RE10-07-5571	62.0	64.0	QBOG	07-707	07-708	07-708	07-708	07-707	07-708	07-708
10-601171	RE10-07-5572	42.0	44.0	QBO	07-707	07-708	07-708	07-708	07-707	07-708	07-708
10-601172	RE10-07-5575	58.0	60.0	QBOG	07-736	07-738	07-738	07-738	07-736	07-737	07-738
10-601172	RE10-07-5576	26.2	28.2	QBO	07-736	07-738	07-738	07-738	07-736	07-737	07-738

Table 4.3-2 (continued)

Location ID	Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Media	Explosive Compounds	TAL Metals	Perchlorate	Strontium-90	SVOC	VOC	Cyanide + pH
10-601173	RE10-07-5579	61.5	63.5	QBOG	07-736	07-738	07-738	07-738	07-736	07-737	07-738
10-601173	RE10-07-5580	19.8	21.8	QAL	07-736	07-738	07-738	07-738	07-736	07-737	07-738
10-601174	RE10-07-5583	61.0	63.0	QBOG	07-756	07-757	07-757	07-757	07-756	07-757	07-757
10-601174	RE10-07-5584	30.0	31.7	QBOG	07-756	07-757	07-757	07-757	07-756	07-757	07-757
10-601175	RE10-07-5587	62.0	64.0	QBOG	07-736	07-738	07-738	07-738	07-736	07-737	07-738
10-601175	RE10-07-5588	32.0	34.0	QBO	07-736	07-738	07-738	07-738	07-736	07-737	07-738
10-601176	RE10-07-5591	58.0	60.0	QBOG	07-736	07-738	07-738	07-738	07-736	07-737	07-738
10-601176	RE10-07-5592	27.1	29.1	QBO	07-736	07-738	07-738	07-738	07-736	07-737	07-738
10-601177	RE10-07-5595	61.5	63.5	SOIL	07-635	07-636	07-636	07-636	07-635	07-636	07-636
10-601177	RE10-07-5596	35.9	37.9	QBOG	07-635	07-636	07-636	07-636	07-635	07-636	07-636
10-601178	RE10-07-5599	60.2	62.2	SOIL	07-629	07-631	07-631	07-631	07-629	07-630	07-631
10-601178	RE10-07-5600	14.0	16.0	QAL	07-629	07-631	07-631	07-631	07-629	07-630	07-631
10-601179	RE10-07-5603	60.8	62.8	SOIL	07-629	07-631	07-631	07-631	07-629	07-630	07-631
10-601179	RE10-07-5604	37.0	39.0	QBOG	07-629	07-631	07-631	07-631	07-629	07-630	07-631
10-601180	RE10-07-5607	48.0	50.0	QBOG	07-635	07-636	07-636	07-636	07-635	07-636	07-636
10-601180	RE10-07-5608	33.0	35.0	QBOG	07-635	07-636	07-636	07-636	07-635	07-636	07-636
10-601181	RE10-07-5611	30.0	32.0	QAL	07-684	07-686	07-686	07-686	07-684	07-685	07-686
10-601181	RE10-07-5612	14.5	16.5	QAL	07-684	07-686	07-686	07-686	07-684	07-685	07-686
10-601182	RE10-07-5615	58.0	60.0	QBOG	07-736	07-738	07-738	07-738	07-736	07-737	07-738
10-601182	RE10-07-5616	33.0	35.0	QBOG	07-736	07-738	07-738	07-738	07-736	07-737	07-738
SWMU 10-004(a)											
10-601190	RE10-07-5678	62.0	64.0	SOIL	07-568	07-569	07-569	07-569	07-568	07-569	07-569
10-601190	RE10-07-5679	25.0	27.0	QAL	07-568	07-569	07-569	07-569	07-568	07-569	07-569
10-601191	RE10-07-5683	30.0	32.0	QAL	07-515	07-518	07-518	07-518	07-515	07-516	07-518
10-601191	RE10-07-5684	9.0	11.0	QAL	07-515	07-518	07-518	07-518	07-515	07-516	07-518
10-601192	RE10-07-5688	66.5	68.5	SOIL	07-515	07-518	07-518	07-518	07-515	07-516	07-518

Table 4.3-2 (continued)

Location ID	Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Media	Explosive Compounds	TAL Metals	Perchlorate	Strontium-90	SVOC	VOC	Cyanide + pH
10-601192	RE10-07-5689	42.0	44.0	QBOG	07-515	07-518	07-518	07-518	07-515	07-516	07-518
10-601192	RE10-07-5690	4.0	6.0	SOIL	07-515	07-518	07-518	07-518	07-515	07-516	07-518
10-601193	RE10-07-5693	62.0	64.0	SOIL	07-758	07-759	07-759	07-759	07-758	07-759	07-759
10-601193	RE10-07-5694	56.0	58.0	QBOG	07-758	07-759	07-759	07-759	07-758	07-759	07-759
10-601194	RE10-07-5698	60.5	62.5	SOIL	07-568	07-569	07-569	07-569	07-568	07-569	07-569
10-601194	RE10-07-5699	30.0	32.4	QAL	07-568	07-569	07-569	07-569	07-568	07-569	07-569
AOC 10-009											
10-601147	RE10-07-5420	28.0	30.5	QBO	07-512	07-514	07-514	07-514	07-512	07-513	07-514
10-601147	RE10-07-5421	8.0	10.2	SOIL	07-512	07-514	07-514	07-514	07-512	07-513	07-514
10-601148	RE10-07-5424	31.0	33.0	SOIL	07-512	07-514	07-514	07-514	07-512	07-513	07-514
10-601148	RE10-07-5425	14.0	16.0	SOIL	07-512	07-514	07-514	07-514	07-512	07-513	07-514
10-601149	RE10-07-5428	30.0	32.0	QBO	07-512	07-514	07-514	07-514	07-512	07-513	07-514
10-601149	RE10-07-5429	0.0	3.0	SOIL	07-512	07-514	07-514	07-514	07-512	07-513	07-514
10-601150	RE10-07-5432	0.0	0.5	SOIL	07-512	07-514	07-514	07-514	07-512	07-513	07-514
10-601150	RE10-07-5433	29.0	32.0	QBO	07-512	07-514	07-514	07-514	07-512	07-513	07-514
10-601150	RE10-07-5434	4.0	6.0	SOIL	07-512	07-514	07-514	07-514	07-512	07-513	07-514
10-601151	RE10-07-5436	30.5	32.5	QBO	07-512	07-514	07-514	07-514	07-512	07-513	07-514
10-601151	RE10-07-5437	20.8	22.8	QBO	07-512	07-514	07-514	07-514	07-512	07-513	07-514

Note: Numbers in analyte columns are request numbers.

*— = Analysis not requested.

Table 4.3-3
Summary of 2007 Field Screening Results
from Borehole Samples Collected from Bayo Canyon Aggregate Area

Consolidated Unit, SWMU, or AOC	Location ID	Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Collection Date	PID Core (ppm)	PID HS (ppm)	Radiation	
								α (dpm)	β (dpm)
10-009	10-601147	RE10-07-5421	8.0	10.2	8/10/2007	1.2	19.2	<MDA	<MDA
10-009	10-601147	RE10-07-5420	28.0	30.5	8/10/2007	0.0	1.2	<MDA	<MDA
10-009	10-601148	RE10-07-5425	14.0	16.0	8/10/2007	0.0	3.8	<MDA	<MDA
10-009	10-601148	RE10-07-5424	31.0	33.0	8/10/2007	0.0	0.0	<MDA	<MDA
10-009	10-601149	RE10-07-5429	0.0	3.0	8/10/2007	3.4	3.4	<MDA	<MDA
10-009	10-601149	RE10-07-5428	30.0	32.0	8/10/2007	0.0	0.0	<MDA	<MDA
10-009	10-601150	RE10-07-5432	0.0	0.5	8/10/2007	0.0	0.0	<MDA	<MDA
10-009	10-601150	RE10-07-5434	4.0	6.0	8/10/2007	1.7	1.2	<MDA	<MDA
10-009	10-601150	RE10-07-5433	29.0	32.0	8/10/2007	0.0	0.0	<MDA	<MDA
10-009	10-601150	RE10-07-5456	29.0	32.0	8/10/2007	0.0	0.0	<MDA	<MDA
10-009	10-601151	RE10-07-5437	20.8	22.8	8/11/2007	0.0	0.0	<MDA	<MDA
10-009	10-601151	RE10-07-5436	30.5	32.5	8/11/2007	0.0	0.0	<MDA	<MDA
10-005	10-601156	RE10-07-5469	2.0	4.0	8/11/2007	0.0	0.0	<MDA	<MDA
10-005	10-601156	RE10-07-5468	32.0	34.0	8/11/2007	0.0	0.0	<MDA	<MDA
10-005	10-601157	RE10-07-5473	20.0	22.4	8/11/2007	0.0	0.0	<MDA	<MDA
10-005	10-601157	RE10-07-5470	31.0	34.0	8/11/2007	0.0	0.0	<MDA	<MDA
10-005	10-601157	RE10-07-5484	31.0	34.0	8/11/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601160	RE10-07-5492	0.8	2.8	9/10/2007	0.0	0.0	65	1974
10-002(a)-99	10-601160	RE10-07-5491	42.0	44.0	9/10/2007	0.0	0.0	81	868
10-002(a)-99	10-601160	RE10-07-5490	59.0	60.8	9/10/2007	0.0	0.0	18	717
10-002(a)-99	10-601161	RE10-07-5496	43.0	45.0	9/11/2007	0.0	0.0	<MDA	908
10-002(a)-99	10-601161	RE10-07-5495	58.2	60.0	9/11/2007	0.0	0.0	<MDA	352
10-002(a)-99	10-601162	RE10-07-5502	0.0	2.1	9/10/2007	0.0	0.0	<MDA	617
10-002(a)-99	10-601162	RE10-07-5501	41.3	43.3	9/10/2007	0.0	0.0	<MDA	980
10-002(a)-99	10-601162	RE10-07-5501	41.3	43.3	9/10/2007	0.0	0.0	<MDA	980
10-002(a)-99	10-601162	RE10-07-5518	41.3	43.3	9/10/2007	0.0	0.0	91	1044
10-002(a)-99	10-601162	RE10-07-5500	59.0	61.5	9/10/2007	0.0	0.0	20	154
10-002(a)-99	10-601163	RE10-07-5506	13.0	14.8	9/11/2007	0.0	0.0	736	46000
10-002(a)-99	10-601163	RE10-07-5505	49.5	51.5	9/11/2007	0.0	0.0	23	529
10-002(a)-99	10-601164	RE10-07-5512	14.0	16.0	9/12/2007	0.0	0.0	5800	436000
10-002(a)-99	10-601164	RE10-07-5513	19.0	21.0	9/12/2007	0.0	0.0	390	15000
10-002(a)-99	10-601164	RE10-07-5526	34.0	35.4	9/12/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601164	RE10-07-5511	39.0	40.5	9/12/2007	0.0	0.0	49	1585

Table 4.3-3 (continued)

Consolidated Unit, SWMU, or AOC	Location ID	Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Collection Date	PID Core (ppm)	PID HS (ppm)	Radiation	
								α (dpm)	β (dpm)
10-002(a)-99	10-601164	RE10-07-5525	40.5	41.5	9/12/2007	0.0	0.0	<MDA	1000
10-002(a)-99	10-601164	RE10-07-5510	52.0	54.0	9/12/2007	0.0	0.0	7	1662
10-002(a)-99	10-601165	RE10-07-5548	4.7	6.7	8/18/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601165	RE10-07-5547	30.2	32.2	8/18/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601166	RE10-07-5552	5.0	7.0	8/17/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601166	RE10-07-5551	29.5	31.5	8/17/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601167	RE10-07-5556	20.2	22.2	8/18/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601167	RE10-07-5555	34.5	36.5	8/18/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601168	RE10-07-5560	21.0	24.0	8/17/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601168	RE10-07-5627	21.0	24.0	8/17/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601168	RE10-07-5559	30.0	32.0	8/17/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601169	RE10-07-5564	10.0	12.0	8/18/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601169	RE10-07-5563	30.0	32.0	8/18/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601170	RE10-07-5568	20.4	22.4	8/20/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601170	RE10-07-5567	62.0	64.0	8/20/2007	0.0	0.0	<MDA	1144
10-002(a)-99	10-601171	RE10-07-5572	42.0	44.0	8/20/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601171	RE10-07-5571	62.0	64.0	8/20/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601172	RE10-07-5576	26.2	28.2	8/21/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601172	RE10-07-5575	58.0	60.0	8/21/2007	0.0	0.0	<MDA	1665
10-002(a)-99	10-601173	RE10-07-5580	19.8	21.8	8/21/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601173	RE10-07-5579	61.5	63.5	8/21/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601174	RE10-07-5584	30.0	31.7	8/23/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601174	RE10-07-5583	61.0	63.0	8/23/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601175	RE10-07-5588	32.0	34.0	8/21/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601175	RE10-07-5587	62.0	64.0	8/21/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601175	RE10-07-5628	62.0	64.0	8/21/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601176	RE10-07-5592	27.1	29.1	8/22/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601176	RE10-07-5591	58.0	60.0	8/22/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601177	RE10-07-5596	35.9	37.9	8/16/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601177	RE10-07-5595	61.5	63.5	8/16/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601178	RE10-07-5600	14.0	16.0	8/15/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601178	RE10-07-5599	60.2	62.2	8/15/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601179	RE10-07-5604	37.0	39.0	8/15/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601179	RE10-07-5603	60.8	62.8	8/15/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601180	RE10-07-5608	33.0	35.0	8/16/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601180	RE10-07-5607	48.0	50.0	8/16/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601181	RE10-07-5612	14.5	16.5	8/18/2007	0.0	0.0	<MDA	<MDA

Table 4.3-3 (continued)

Consolidated Unit, SWMU, or AOC	Location ID	Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Collection Date	PID Core (ppm)	PID HS (ppm)	Radiation	
								α (dpm)	β (dpm)
10-002(a)-99	10-601181	RE10-07-5611	30.0	32.0	8/18/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601182	RE10-07-5616	33.0	35.0	8/22/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601182	RE10-07-5615	58.0	60.0	8/22/2007	0.0	0.0	<MDA	<MDA
10-004(a)	10-601190	RE10-07-5679	25.0	27.0	8/14/2007	0.0	0.0	<MDA	<MDA
10-004(a)	10-601190	RE10-07-5678	62.0	64.0	8/14/2007	0.0	1.2	<MDA	<MDA
10-004(a)	10-601191	RE10-07-5684	9.0	11.0	8/13/2007	0.0	0.0	<MDA	<MDA
10-004(a)	10-601191	RE10-07-5683	30.0	32.0	8/13/2007	0.0	0.0	<MDA	<MDA
10-004(a)	10-601192	RE10-07-5690	4.0	6.0	8/13/2007	0.0	0.0	<MDA	<MDA
10-004(a)	10-601192	RE10-07-5689	42.0	44.0	8/13/2007	0.0	0.0	<MDA	<MDA
10-004(a)	10-601192	RE10-07-5723	42.0	44.0	8/13/2007	0.0	0.0	<MDA	<MDA
10-004(a)	10-601192	RE10-07-5688	66.5	68.5	8/13/2007	0.0	0.0	<MDA	<MDA
10-004(a)	10-601193	RE10-07-5694	56.0	58.0	8/23/2007	0.0	0.0	<MDA	<MDA
10-004(a)	10-601193	RE10-07-5693	62.0	64.0	8/23/2007	0.0	0.0	<MDA	<MDA
10-004(a)	10-601194	RE10-07-5699	30.0	32.4	8/14/2007	0.0	0.0	<MDA	<MDA
10-004(a)	10-601194	RE10-07-5698	60.5	62.5	8/14/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601239	RE10-07-5899	19.9	21.9	9/8/2007	0.0	0.0	9	132
10-002(a)-99	10-601239	RE10-07-5898	30.2	32.2	9/8/2007	0.0	0.0	19	455
10-002(a)-99	10-601240	RE10-07-5904	37.0	39.0	9/6/2007	0.0	0.0	79	737
10-002(a)-99	10-601240	RE10-07-5903	60.5	62.5	9/6/2007	0.0	0.0	32	737
10-002(a)-99	10-601241	RE10-07-5909	15.8	17.8	9/12/2007	0.0	0.0	45	463
10-002(a)-99	10-601241	RE10-07-5908	26.9	28.9	9/12/2007	0.0	0.0	4	687
10-002(a)-99	10-601242	RE10-07-5914	1.0	3.0	9/8/2007	0.0	12.3	25	515
10-002(a)-99	10-601242	RE10-07-5913	26.0	28.0	9/8/2007	0.0	0.0	62	310
10-002(a)-99	10-601243	RE10-07-5919	31.9	33.9	9/7/2007	0.0	0.0	63	596
10-002(a)-99	10-601243	RE10-07-5918	48.0	50.0	9/7/2007	0.0	0.0	91.0	1044
10-002(a)-99	10-601244	RE10-07-5924	32.5	34.5	9/7/2007	0.0	0.0	94	1080
10-002(a)-99	10-601244	RE10-07-5517	32.5	34.5	9/7/2007	0.0	0.0	94	1080
10-002(a)-99	10-601244	RE10-07-5923	48.0	50.0	9/7/2007	0.0	0.0	94	1488
10-002(a)-99	10-601245	RE10-07-5929	6.0	8.0	9/4/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601245	RE10-07-5928	25.0	27.6	9/4/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601245	RE10-07-5516	25.0	27.6	9/4/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601246	RE10-07-5934	16.3	18.3	9/5/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601246	RE10-07-5933	26.6	28.6	9/5/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601247	RE10-07-5939	13.7	15.7	9/4/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601247	RE10-07-5938	28.7	30.7	9/4/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601248	RE10-07-5944	19.8	21.8	8/31/2007	0.0	0.0	27	1172
10-002(a)-99	10-601248	RE10-07-5943	42.0	44.0	8/31/2007	0.0	0.0	45	1781

Table 4.3-3 (continued)

Consolidated Unit, SWMU, or AOC	Location ID	Sample ID	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Collection Date	PID Core (ppm)	PID HS (ppm)	Radiation	
								α (dpm)	β (dpm)
10-002(a)-99	10-601249	RE10-07-5949	20.2	22.2	9/4/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601249	RE10-07-5948	32.0	34.0	9/4/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601250	RE10-07-5954	27.0	29.0	8/31/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601250	RE10-07-5953	42.0	44.0	8/31/2007	0.0	0.0	57	1685
10-002(a)-99	10-601251	RE10-07-5959	7.0	9.0	8/31/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601251	RE10-07-5958	42.0	44.0	8/31/2007	0.0	0.0	27	1557
10-002(a)-99	10-601252	RE10-07-5964	33.0	35.0	9/4/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601252	RE10-07-5963	38.0	40.0	9/4/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601253	RE10-07-5969	27.0	29.0	9/4/2007	0.0	0.0	<MDA	1306
10-002(a)-99	10-601253	RE10-07-5968	30.4	32.4	9/4/2007	0.0	0.0	<MDA	1362
10-002(a)-99	10-601254	RE10-07-5974	26.8	28.8	8/31/2007	0.0	0.0	27	703
10-002(a)-99	10-601254	RE10-07-5973	38.0	40.0	8/31/2007	0.0	0.0	45	1566
10-002(a)-99	10-601255	RE10-07-5979	7.6	9.6	9/5/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601255	RE10-07-5978	32.7	34.7	9/5/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601256	RE10-07-5984	10.0	12.0	8/31/2007	0.0	0.0	21	1189
10-002(a)-99	10-601256	RE10-07-5983	36.7	38.7	8/31/2007	0.0	0.0	33	1541
10-002(a)-99	10-601256	RE10-07-5515	36.7	38.7	8/31/2007	0.0	0.0	33	1541
10-002(a)-99	10-601257	RE10-07-5989	21.3	23.3	9/5/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601257	RE10-07-5988	31.0	33.0	9/5/2007	0.0	0.0	<MDA	<MDA
10-002(a)-99	10-601259	RE10-07-6000	13.0	19.5	9/13/2007	0.0	0.0	70	442
10-002(a)-99	10-601259	RE10-07-5999	28.8	30.8	9/13/2007	0.0	0.0	15	552
10-002(a)-99	10-601259	RE10-07-5998	51.0	53.0	9/13/2007	0.0	0.0	49	1129

Table 4.3-4
Geotechnical Sampling Results from SWMU 10-007

Sample ID	Location ID	Sample Depth (ft)	Geologic Unit	Density (g/cm^3)	Saturated Hydraulic Conductivity (cm/s)	Moisture Content (%)	Calculated Total Porosity (%)
10-601164	RE10-07-5525	40.5 to 41.5	QBOG	0.91	0.00029	23.2	65.8
10-601164	RE10-07-5526	34.0 to 35.4	QAL	1.41	0.0017	8.5	46.7
10-601259	RE10-07-6836	8.0 to 9.6	QAL	1.49	0.018	4.7	43.7
10-601259	RE10-07-6837	23.0 to 24.2	QAL	1.01	0.00013	14.8	62
			Average	1.205	0.0050333	12.8	54.55

Table 5.0-1
Summary of Applicable SSLs for Inorganic and Organic COPCs and SALs for Radionuclide COPCs at Bayo Canyon Aggregate Area

Consolidated Unit/SWMU/AOC	COPC	Media	Residential Scenario[a]	Construction Worker Scenario[a]	Recreational Scenario[b]
Inorganic Chemicals			**SSL (mg/kg)**	**SSL (mg/kg)**	**SSL (mg/kg)**
Consolidated Unit 10-001(a)-99	Aluminum	Tuff	7.78E+04	1.44E+04	1.00E+05
Consolidated Unit 10-002(a)-99		Tuff			
SWMU 10-004(a)		Tuff			
AOC 10-009		Tuff			
Consolidated Unit 10-001(a)-99	Antimony	Soil, Sediment, Tuff	3.13E+01	1.24E+02	3.17E+02
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
SWMU 10-004(a)		Soil, Alluvium, Tuff			
AOC 10-009		Tuff			
Consolidated Unit 10-001(a)-99	Arsenic	Tuff	3.90E+00	8.52E+01	2.77E+01
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
SWMU 10-004(a)		Tuff			
AOC 10-009		Tuff			
Consolidated Unit 10-001(a)-99	Barium	Tuff	1.56E+04	6.02E+04	1.00E+05
Consolidated Unit 10-002(a)-99		Tuff			
SWMU 10-004(a)		Tuff			
AOC 10-009		Tuff			
Consolidated Unit 10-001(a)-99	Beryllium	Tuff	1.56E+02	5.62E+01	1.58E+03
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
SWMU 10-004(a)		Soil, Tuff			

Table 5.0-1 (continued)

Consolidated Unit/SWMU/AOC	COPC	Media	Residential Scenario[a]	Construction Worker Scenario[a]	Recreational Scenario[b]
Inorganic Chemicals			**SSL (mg/kg)**	**SSL (mg/kg)**	**SSL (mg/kg)**
Consolidated Unit 10-001(a)-99	Cadmium	Sediment, Soil, Tuff	3.90E+01	1.54E+02	3.92E+02
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
SWMU 10-004(a)		Soil, Alluvium, Tuff			
Consolidated Unit 10-001(a)-99	Calcium	Soil, Tuff	nv[c]	nv	nv
Consolidated Unit 10-002(a)-99		Tuff			
SWMU 10-004(a)		Tuff			
Consolidated Unit 10-001(a)-99	Chromium[d]	Tuff	2.34E+02	2.61E+01	2.38E+03
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
SWMU 10-004(a)		Tuff			
AOC 10-009		Tuff			
Consolidated Unit 10-001(a)-99	Cobalt	Tuff	1.52E+03	6.10E+01	1.57E+04
Consolidated Unit 10-001(a)-99	Copper	Soil, Tuff	3.13E+03	1.24E+04	3.17E+04
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
SWMU 10-004(a)		Tuff			
Consolidated Unit 10-001(a)-99	Cyanide (Total)	Soil, Tuff	1.22E+03	4.76E+03	7.97E+03
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
SWMU 10-004(a)		Soil, Alluvium, Tuff			
AOC 10-009		Soil, Tuff			
Consolidated Unit 10-001(a)-99	Iron	Tuff	2.35E+04	9.29E+04	1.00E+05
Consolidated Unit 10-002(a)-99		Tuff			
SWMU 10-004(a)		Tuff			
AOC 10-009		Tuff			
Consolidated Unit 10-001(a)-99	Lead	Soil	4.00E+02	8.00E+02	5.60E+02
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
SWMU 10-004(a)		Tuff			

Table 5.0-1 (continued)

Consolidated Unit/SWMU/AOC	COPC	Media	Residential Scenario[a]	Construction Worker Scenario[a]	Recreational Scenario[b]
Inorganic Chemicals			**SSL (mg/kg)**	**SSL (mg/kg)**	**SSL (mg/kg)**
Consolidated Unit 10-001(a)-99	Magnesium	Tuff	nv	nv	nv
Consolidated Unit 10-002(a)-99		Tuff			
SWMU 10-004(a)		Soil, Tuff			
AOC 10-009		Tuff			
Consolidated Unit 10-001(a)-99	Manganese	Tuff	3.59E+03	1.50E+02	3.69E+04
Consolidated Unit 10-002(a)-99		Tuff			
SWMU 10-004(a)		Tuff			
AOC 10-009		Tuff			
Consolidated Unit 10-001(a)-99	Mercury	Soil, Tuff	1.00E+05	9.27E+02	2.38E+02
Consolidated Unit 10-002(a)-99		Alluvium, Tuff			
SWMU 10-004(a)		Tuff			
Consolidated Unit 10-001(a)-99	Molybdenum	Soil, Tuff	3.91E+02	1.55E+03	3.96E+03
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
SWMU 10-004(a)		Soil, Alluvium, Tuff			
AOC 10-009		Soil, Tuff			
Consolidated Unit 10-001(a)-99	Nickel	Tuff	1.56E+03	6.19E+03	1.58E+04
Consolidated Unit 10-002(a)-99		Tuff			
SWMU 10-004(a)		Tuff			
AOC 10-009		Tuff			
Consolidated Unit 10-001(a)-99	Perchlorate	Soil	nv	nv	7.92E+01
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
Consolidated Unit 10-001(a)-99	Potassium	Tuff	nv	nv	nv
Consolidated Unit 10-001(a)-99	Selenium	Sediment, Tuff	3.91E+02	1.55E+03	3.96E+03
Consolidated Unit 10-002(a)-99		Soil, Tuff			
SWMU 10-004(a)		Tuff			

Table 5.0-1 (continued)

Consolidated Unit/SWMU/AOC	COPC	Media	Residential Scenario[a]	Construction Worker Scenario[a]	Recreational Scenario[b]
Inorganic Chemicals			**SSL (mg/kg)**	**SSL (mg/kg)**	**SSL (mg/kg)**
AOC 10-009	Selenium	Tuff	3.91E+02	1.55E+03	3.96E+03
Consolidated Unit 10-001(a)-99	Silver	Soil, Tuff	3.91E+02	1.55E+03	3.96E+03
Consolidated Unit 10-002(a)-99		Alluvium, Tuff			
SWMU 10-004(a)		Alluvium			
Consolidated Unit 10-001(a)-99	Thallium	Soil	5.16E+00	2.04E+01	5.23E+01
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
SWMU 10-004(a)		Soil, Alluvium			
Consolidated Unit 10-001(a)-99	Uranium	Soil, Sediment, Tuff	1.60E+01[e]	2.00E+01[f]	1.60E+01[c]
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
SWMU 10-004(a)		Alluvium, Tuff			
Consolidated Unit 10-001(a)-99	Vanadium	Tuff	7.82E+01	3.10E+02	7.92E+02
Consolidated Unit 10-002(a)-99		Tuff			
SWMU 10-004(a)		Tuff			
AOC 10-009		Tuff			
Consolidated Unit 10-001(a)-99	Zinc	Soil	2.35E+04	9.29E+04	1.00E+05
Consolidated Unit 10-002(a)-99		Alluvium, Tuff			
SWMU 10-004(a)		Tuff			
Organic Chemicals			**SSL (mg/kg)**	**SSL (mg/kg)**	**SSL (mg/kg)**
Consolidated Unit 10-002(a)-99	Acenaphthene	Tuff	3.73E+03	1.41E+04	4.75E+04
Consolidated Unit 10-001(a)-99	Acetone	Soil, Tuff	2.81E+04	9.85E+04	1.00E+05
Consolidated Unit 10-002(a)-99		Soil, Alluvium, Tuff			
SWMU 10-004(a)		Soil, Alluvium, Tuff			
Consolidated Unit 10-002(a)-99	Benzene	Tuff	1.03E+01	1.74E+02	2.24E+02
Consolidated Unit 10-001(a)-99	Benzo(g,h,i)perylene	Sediment	nv	nv	nv
Consolidated Unit 10-001(a)-99	Benzoic acid	Soil	nv	nv	1.00E+05

Table 5.0-1 (continued)

Consolidated Unit/SWMU/AOC	COPC	Media	Residential Scenario[a]	Construction Worker Scenario[a]	Recreational Scenario[b]
Organic Chemicals			**SSL (mg/kg)**	**SSL (mg/kg)**	**SSL (mg/kg)**
Consolidated Unit 10-002(a)-99	Benzoic acid	Tuff			
Consolidated Unit 10-002(a)-99	Bis(2-ethylhexyl)phthalate	Alluvium, Tuff	3.47E+02	4.66E+03	1.83E+03
Consolidated Unit 10-002(a)-99	Bromobenzene	Tuff	3.70E+01	1.21E+02	2.45E+02
Consolidated Unit 10-002(a)-99	Bromoform	Tuff	6.21E+02	4.44E+03	7.16E+03
Consolidated Unit 10-002(a)-99	Butanone[2-]	Alluvium, Tuff	3.18E+04	4.87E+04	4.87E+04
SWMU 10-004(a)	Butylbenzene[n-]	Soil	6.21E+01	6.21E+01	6.21E+01
Consolidated Unit 10-002(a)-99	Butylbenzene[sec-]	Alluvium	6.06E+01	6.06E+01	6.06E+01
SWMU 10-004(a)		Soil			
Consolidated Unit 10-002(a)-99	Butylbenzene[tert-]	Alluvium	1.06E+02	1.06E+02	1.06E+02
SWMU 10-004(a)		Soil			
Consolidated Unit 10-002(a)-99	Butylbenzylphthalate	Soil	nv	nv	nv
Consolidated Unit 10-002(a)-99	Carbon Tetrachloride	Alluvium	3.47E+00	1.80E+02	7.79E+01
Consolidated Unit 10-002(a)-99	Chlorobenzene	Tuff	1.94E+02	2.45E+02	2.45E+02
Consolidated Unit 10-002(a)-99	Chloroform	Alluvium	4.00E+00	2.16E+02	1.02E+02
Consolidated Unit 10-002(a)-99	Chlorophenol[2-]	Tuff	1.66E+02	5.86E+02	2.75E+03
Consolidated Unit 10-001(a)-99	Dichlorobenzene[1,2-]	Tuff	3.74E+01	3.74E+01	3.74E+01
Consolidated Unit 10-002(a)-99		Alluvium			
SWMU 10-004(a)		Soil			
Consolidated Unit 10-001(a)-99	Dichlorobenzene[1,3-]	Soil, Tuff	3.26E+01	3.74E+01	3.74E+01
Consolidated Unit 10-002(a)-99		Alluvium, Tuff			
SWMU 10-004(a)		Soil			
Consolidated Unit 10-001(a)-99	Dichlorobenzene[1,4-]	Soil, Tuff	3.95E+01	1.96E+03	2.36E+03
SWMU 10-004(a)		Soil			
Consolidated Unit 10-002(a)-99	Dichloroethane[1,1-]	Alluvium	1.40E+03	1.42E+03	1.42E+03
Consolidated Unit 10-002(a)-99	Dichloroethene[1,1-]	Tuff	2.06E+02	6.78E+02	9.27E+02

Table 5.0-1 (continued)

Consolidated Unit/SWMU/AOC	COPC	Media	Residential Scenario[a]	Construction Worker Scenario[a]	Recreational Scenario[b]
Organic Chemicals			**SSL (mg/kg)**	**SSL (mg/kg)**	**SSL (mg/kg)**
Consolidated Unit 10-001(a)-99	Diethylphthalate	Soil, Sediment	4.89E+04	1.00E+05	1.00E+05
Consolidated Unit 10-002(a)-99		Alluvium, Tuff			
Consolidated Unit 10-002(a)-99	Dimethyl Phthalate	Tuff	1.00E+05	1.00E+05	1.00E+05
Consolidated Unit 10-002(a)-99	Di-n-butylphthalate	Soil, Alluvium, Tuff	6.11E+03	2.33E+04	3.99E+04
SWMU 10-004(a)		Tuff			
Consolidated Unit 10-001(a)-99	Ethylbenzene	Soil	1.28E+02	1.28E+02	1.28E+02
Consolidated Unit 10-001(a)-99	Isopropyltoluene[4-]	Soil	nv	nv	nv
Consolidated Unit 10-002(a)-99		Alluvium			
SWMU 10-004(a)		Soil			
Consolidated Unit 10-002(a)-99	Methyl-2-pentanone[4-]	Alluvium	5.51E+03	7.01E+03	7.01E+03
Consolidated Unit 10-001(a)-99	Methylene Chloride	Soil	1.82E+02	2.63E+03	2.63E+03
Consolidated Unit 10-002(a)-99		Alluvium, Tuff			
SWMU 10-004(a)		Soil, Alluvium, Tuff			
Consolidated Unit 10-002(a)-99	Naphthalene	Alluvium	7.95E+01	2.62E+02	1.58E+04
Consolidated Unit 10-002(a)-99	Phenol	Alluvium	1.83E+04	6.99E+04	1.00E+05
Consolidated Unit 10-001(a)-99	Pyrene	Soil	2.29E+03	9.01E+03	2.38E+04
Consolidated Unit 10-002(a)-99	Tetrachloroethene	Alluvium	1.25E+01	1.34E+02	1.34E+02
Consolidated Unit 10-001(a)-99	Toluene	Soil, Tuff	2.52E+02	2.52E+02	2.52E+02
Consolidated Unit 10-002(a)-99		Alluvium, Tuff			
AOC 10-009		Soil			
Consolidated Unit 10-001(a)-99	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Soil	3.28E+03	3.28E+03	3.28E+03
Consolidated Unit 10-002(a)-99		Soil, Alluvium			
Consolidated Unit 10-001(a)-99	Trichloroethane[1,1,1-]	Soil	5.63E+02	5.63E+02	5.63E+02
Consolidated Unit 10-002(a)-99		Soil, Alluvium			
Consolidated Unit 10-002(a)-99	Trichloroethene	Alluvium, Tuff	6.38E-01	3.36E+01	1.51E+01

Table 5.0-1 (continued)

Consolidated Unit/SWMU/AOC	COPC	Media	Residential Scenario[a]	Construction Worker Scenario[a]	Recreational Scenario[b]
Organic Chemicals			**SSL (mg/kg)**	**SSL (mg/kg)**	**SSL (mg/kg)**
Consolidated Unit 10-001(a)-99	Trimethylbenzene[1,2,4-]	Soil	5.80E+01	1.90E+02	3.96E+04
Consolidated Unit 10-002(a)-99		Soil, Alluvium			
SWMU 10-004(a)		Soil			
Consolidated Unit 10-001(a)-99	Trimethylbenzene[1,3,5-]	Tuff	2.48E+01	6.92E+01	6.92E+01
Consolidated Unit 10-002(a)-99		Alluvium, Tuff			
SWMU 10-004(a)		Soil			
Consolidated Unit 10-001(a)-99	Xylene (Total)	Soil	8.20E+01	8.20E+01	8.20E+01
Consolidated Unit 10-002(a)-99		Tuff			
Consolidated Unit 10-002(a)-99	Xylene[1,3-]+Xylene[1,4-][g]	Soil	8.20E+01	8.20E+01	8.20E+01
Radionuclides			**SAL (pCi/g)**	**SAL (pCi/g)**	**SAL (pCi/g)**
Consolidated Unit 10-002(a)-99	Cesium-137	Alluvium	5.6	18	210
Consolidated Unit 10-002(a)-99	Europium-152	Alluvium, Tuff	2.9	9.1	100
Consolidated Unit 10-002(a)-99	Strontium-90	Soil, Alluvium, Tuff	5.7	800	5600
SWMU 10-004(a)		Soil, Alluvium			
AOC 10-009		Soil			
Consolidated Unit 10-002(a)-99	Uranium-234	Tuff	170	220	3200
Consolidated Unit 10-002(a)-99	Uranium-235	Tuff	17	43	520
Consolidated Unit 10-001(a)-99	Uranium-238	Soil	86	160	2100
Consolidated Unit 10-002(a)-99		Alluvium, Tuff			

[a] SSL values are derived from (NMED 2006, 092513); SAL values are derived from (LANL 2005, 088493).

[b] SSL values are derived from (LANL 2007, 094496); SAL values are derived from (LANL 2005, 088493).

[c] nv = No value.

[d] NMED SSL value and LANL Recreational SSL value for chromium VI used.

[e] SSL from EPA, Region 9, residential (http://www.EPA.gov/region9/waste/sfund/prg/.

[f] SSL from EPA, Region 9, construction (http://www.EPA.gov/region9/waste/sfund/prg/.

[g] NMED SSL value and LANL Recreational SSL value for total xylene used.

Table 6.1-1
Summary of Samples Collected and Analyses Requested for Soil, Sediment, and Tuff at Consolidated Unit 10-001(a)-99

Sample ID	Location ID	Depth (ft)	Media	Gamma Spectroscopy	Explosive Compounds	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
RE10-07-5286	10-01001	0.0–0.5	SOIL	—*	07-583	—	07-585	07-585	07-585	07-583	—	07-584	07-585
RE10-07-5287	10-01001	1.5–2.0	SOIL	—	07-583	—	07-585	07-585	07-585	07-583	—	07-584	07-585
AAB5598	10-01002	0.0–0.17	SOIL	—	—	—	18990, 19779	—	18990	—	—	—	—
AAB5600	10-01003	0.0–0.33	SOIL	—	—	—	18990, 19779	—	18990	—	—	—	—
RE10-07-5292	10-01004	0.0–0.5	QBT3	—	08-24	—	08-24	08-24	08-24	08-24	—	08-24	08-24
RE10-07-5293	10-01004	1.5–2.0	QBT3	—	08-24	—	08-24	08-24	08-24	08-24	—	08-24	08-24
AAB5512	10-01005	0.0–0.33	SOIL	—	—	—	19785	—	19705	—	19705	—	—
RE10-07-5294	10-01006	0.0–0.5	SOIL	—	07-506	07-506	07-507	07-507	07-507	07-506	—	07-508	07-507
RE10-07-5295	10-01006	1.5–2.0	SOIL	—	07-506	07-506	07-507	07-507	07-507	07-506	—	07-508	07-507
AAB5515	10-01007	0.0–0.33	SOIL	—	—	—	19785	—	19705	—	19705	—	—
RE10-07-5296	10-01008	0.0–0.5	SOIL	—	07-583	—	07-585	07-585	07-585	07-583	—	07-584	07-585
RE10-07-5297	10-01008	1.5–2.0	SOIL	—	07-583	—	07-585	07-585	07-585	07-583	—	07-584	07-585
AAB5503	10-01009	0.0–0.25	SOIL	—	—	—	19785	—	19705	—	19705	—	—
AAB5504	10-01010	0.0–0.33	SOIL	—	—	—	19785	—	19705	—	19705	—	—
RE10-07-5298	10-01011	0.0–0.5	SOIL	—	07-687	—	07-689	07-689	07-689	07-687	—	07-688	07-689
RE10-07-5299	10-01011	1.5–2.0	SOIL	—	07-687	—	07-689	07-689	07-689	07-687	—	07-688	07-689
RE10-07-5300	10-01012	0.0–0.5	SOIL	—	07-506	07-506	07-507	07-507	07-507	07-506	—	07-508	07-507
RE10-07-5301	10-01012	1.5–2.0	SOIL	—	07-506	07-506	07-507	07-507	07-507	07-506	—	07-508	07-507
AAB5469	10-01013	0.0–0.33	SOIL	—	—	—	—	—	19768	—	19768	—	—
RE10-07-5302	10-01014	0.0–0.5	SOIL	—	07-583	07-583	07-585	07-585	07-585	07-583	—	07-584	07-585
RE10-07-5303	10-01014	1.5–2.0	SOIL	—	07-583	07-583	07-585	07-585	07-585	07-583	—	07-584	07-585
AAB5451	10-01015	0.0–0.42	SOIL	—	—	—	19792	—	19765	—	19765	—	—
AAB5452	10-01016	0.0–0.33	SOIL	—	—	—	19792	—	19765	—	19765	—	—
RE10-07-5304	10-01017	0.0–0.5	SOIL	—	07-687	—	07-689	07-689	07-689	07-687	—	07-688	07-689
RE10-07-5305	10-01017	1.5–2.0	SOIL	—	07-687	—	07-689	07-689	07-689	07-687	—	07-688	07-689
AAB5482	10-01018	0.0–0.33	SOIL	—	—	—	19500	—	19766	—	19766	—	19500
AAB5486	10-01019	0.0–0.33	SED	—	—	—	19500	—	19766	—	19766	—	19500
AAB5492	10-01020	0.0–0.33	SOIL	—	—	—	19500	—	19766	—	19766	—	19500
AAB5517	10-01021	0.0–0.33	SOIL	—	—	—	19785	—	19705	—	19705	—	—
RE10-07-5307	10-01022	0.0–0.5	SOIL	—	07-506	—	07-507	07-507	07-507	07-506	—	07-508	07-507
RE10-07-5306	10-01022	1.5–2.0	SOIL	—	07-506	—	07-507	07-507	07-507	07-506	—	07-508	07-507
RE10-07-5308	10-01023	0.0–0.5	SOIL	—	07-583	07-583	07-585	07-585	07-585	07-583	—	07-584	07-585
RE10-07-5309	10-01023	1.5–2.0	SOIL	—	07-583	07-583	07-585	07-585	07-585	07-583	—	07-584	07-585

Table 6.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Gamma Spectroscopy	Explosive Compounds	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
RE10-07-5310	10-01024	0.0–0.5	SOIL	—	07-583	07-583	07-585	07-585	07-585	07-583	—	07-584	07-585
RE10-07-5311	10-01024	1.5–2.0	SOIL	—	07-583	07-583	07-585	07-585	07-585	07-583	—	07-584	07-585
AAB5450	10-01025	0.0–0.33	SOIL	—	—	—	19792	—	19765	—	19765	—	—
AAB5609	10-01025	0.0–0.33	SOIL	19,706	17916	—	—	—	—	—	—	—	—
AAB5453	10-01026	0.0–0.33	SOIL	—	—	—	19792	—	19765	—	19765	—	—
AAB5616	10-01026	0.0–0.33	SOIL	19,706	17916	—	—	—	—	—	—	—	—
AAB5526	10-01027	0.0–0.33	SOIL	—	—	—	18990, 19779	—	18990	—	—	—	—
AAB5606	10-01028	0.0–0.33	SOIL	—	—	—	18990, 19779	—	18990	—	—	—	—
AAB5505	10-01029	0.0–0.33	SOIL	—	—	—	18990, 19779	—	18990	—	—	—	—
AAB5588	10-01030	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB5581	10-01031	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB5520	10-01032	0.0–0.33	SOIL	—	—	—	19759	—	19762	—	19762	—	—
AAB5611	10-01032	0.0–0.33	SOIL	19,706	17916	—	—	—	—	—	—	—	—
RE10-07-5312	10-01033	0.0–0.5	SOIL	—	07-583	07-583	07-585	07-585	07-585	07-583	—	07-584	07-585
RE10-07-5313	10-01033	1.5–2.0	SOIL	—	07-583	07-583	07-585	07-585	07-585	07-583	—	07-584	07-585
RE10-07-5314	10-01034	0.0–0.5	SOIL	—	07-632	07-632	07-634	07-634	07-634	07-632	—	07-633	07-634
RE10-07-5315	10-01034	1.5–2.0	SOIL	—	07-632	07-632	07-634	07-634	07-634	07-632	—	07-633	07-634
AAB5454	10-01035	0.0–0.33	SOIL	—	—	—	19792	—	19765	—	19765	—	—
AAB5615	10-01035	0.0–0.33	SOIL	19,706	17916	—	—	—	—	—	—	—	—
AAB5480	10-01036	0.0–0.33	SOIL	—	—	—	—	—	19768	—	19768	—	—
AAB5481	10-01037	0.0–0.33	SOIL	—	—	—	—	—	19768	—	19768	—	—
AAB5483	10-01038	0.0–0.33	SED	—	—	—	—	—	19768	—	19768	—	—
RE10-07-5317	10-01039	0.0–0.25	SOIL	—	07-1037	—	07-1038	07-1038	07-1038	07-1037	—	07-1038	07-1038
RE10-07-5316	10-01039	1.0–2.0	QBT3	—	07-1037	—	07-1038	07-1038	07-1038	07-1037	—	07-1038	07-1038
AAB5591	10-01040	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
RE10-07-5318	10-01041	0.0–0.5	SOIL	—	07-637	—	07-639	07-639	07-639	07-637	—	07-638	07-639
RE10-07-5319	10-01041	1.5–2.0	QBT3	—	07-637	—	07-639	07-639	07-639	07-637	—	07-638	07-639
AAB5584	10-01042	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB5523	10-01043	0.0–0.33	SOIL	—	—	—	19759	—	19762	—	19762	—	—
RE10-07-5320	10-01044	0.0–0.5	SOIL	—	07-632	07-632	07-634	07-634	07-634	07-632	—	07-633	07-634
RE10-07-5321	10-01044	1.5–2.0	SOIL	—	07-632	07-632	07-634	07-634	07-634	07-632	—	07-633	07-634
RE10-07-5322	10-01045	0.0–0.5	SOIL	—	07-632	07-632	07-634	07-634	07-634	07-632	—	07-633	07-634
RE10-07-5323	10-01045	1.5–2.0	SOIL	—	07-632	07-632	07-634	07-634	07-634	07-632	—	07-633	07-634
AAB5468	10-01046	0.0–0.33	SOIL	—	—	—	—	—	19768	—	19768	—	—
AAB5449	10-01047	0.0–0.33	SOIL	—	—	—	—	—	19768	—	19768	—	—

Table 6.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Gamma Spectroscopy	Explosive Compounds	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB5479	10-01048	0.0–0.33	SOIL	—	—	—	—	—	19768	—	19768	—	—
AAB5570	10-01049	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB5593	10-01050	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB5590	10-01051	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB5596	10-01052	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
RE10-07-5324	10-01053	0.0–0.5	SOIL	—	07-632	—	07-634	07-634	07-634	07-632	—	07-633	07-634
RE10-07-5325	10-01053	1.5–2.0	SOIL	—	07-632	—	07-634	07-634	07-634	07-632	—	07-633	07-634
AAB5518	10-01054	0.0–0.33	SOIL	—	—	—	19499	—	19769	—	19769	—	19499
AAB5477	10-01055	0.0–0.33	SOIL	—	—	—	—	—	19768	—	19768	—	—
AAB5476	10-01056	0.0–0.33	SOIL	—	—	—	—	—	19768	—	19768	—	—
AAB5464	10-01057	0.0–0.33	SOIL	—	—	—	—	—	19768	—	19768	—	—
AAB5478	10-01058	0.0–0.33	SOIL	—	—	—	—	—	19768	—	19768	—	—
AAB5470	10-01059	0.0–0.33	SOIL	—	—	—	—	—	19768	—	19768	—	—
AAB5586	10-01060	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB5580	10-01061	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
RE10-07-5326	10-01061	0.0–0.5	SOIL	—	07-637	—	07-639	07-639	07-639	07-637	—	07-638	07-639
RE10-07-5327	10-01061	1.5–2.0	SOIL	—	07-637	—	07-639	07-639	07-639	07-637	—	07-638	07-639
AAB5585	10-01062	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
RE10-07-5336	10-01062	0.0–0.5	SOIL	—	07-639	—	07-639	07-639	07-639	07-637	—	07-638	07-639
RE10-07-5337	10-01062	1.5–2.0	QBT3	—	07-639	—	07-639	07-639	07-639	07-637	—	07-638	07-639
RE10-07-5328	10-01063	0.0–0.5	SOIL	—	07-637	—	07-639	07-639	07-639	07-637	—	07-638	07-639
RE10-07-5329	10-01063	1.5–2.0	QBT3	—	07-637	—	07-639	07-639	07-639	07-637	—	07-638	07-639
AAB5576	10-01064	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB5595	10-01065	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
RE10-07-5330	10-01066	0.0–0.5	SOIL	—	07-687	—	07-689	07-689	07-689	07-687	—	07-688	07-689
RE10-07-5331	10-01066	1.5–2.0	SOIL	—	07-687	—	07-689	07-689	07-689	07-687	—	07-688	07-689
AAB5574	10-01067	0.0–0.25	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB5594	10-01068	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB5475	10-01084	0.0–0.17	SOIL	—	—	—	19759	—	19762	—	19762	—	—
AAB5495	10-01084	0.0–0.25	SOIL	—	—	—	19759	—	19762	—	19762	—	—
AAB5496	10-01085	0.0–0.25	SOIL	—	—	—	19759	—	19762	—	19762	—	—
AAB5474	10-01085	0.0–0.33	SOIL	—	—	—	19759	—	19762	—	19762	—	—
AAB5497	10-01086	0.0–0.33	SOIL	—	—	—	19785	—	19705	—	19705	—	—
AAB5507	10-01086	0.0–0.33	SED	—	—	—	19759, 19785	—	19705, 19762	—	19705, 19762	—	—
AAB5487	10-01087	0.0–0.25	SED	—	—	—	19785	—	19705	—	19705	—	—

Table 6.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Gamma Spectroscopy	Explosive Compounds	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB5510	10-01087	0.0–0.25	SOIL	—	—	—	19785	—	19705	—	19705	—	—
AAB5511	10-01088	0.0–0.25	SOIL	—	—	—	19785	—	19705	—	19705	—	—
AAB5516	10-01088	0.0–0.25	SED	—	—	—	19785	—	19705	—	19705	—	—
AAB5525	10-01089	0.0–0.25	SED	—	—	—	19785	—	19705	—	19705	—	—
AAB2818	10-01090	0.0–0.25	SED	—	17919	—	—	—	—	—	—	—	—
AAB5499	10-01090	0.0–0.25	SED	—	—	—	19785	—	19705	—	19705	—	—
AAB5582	10-01091	0.0–0.25	SED	—	—	—	19785	—	19705	—	19705	—	—
AAB5592	10-01091	0.0–0.25	SOIL	—	—	—	19785	—	19705	—	19705	—	—
AAB5473	10-01092	0.0–0.33	SOIL	—	—	—	19785	—	19705	—	19705	—	—
AAB5519	10-01092	0.0–0.33	SOIL	—	—	—	19785	—	19705	—	19705	—	—
AAB5498	10-01093	0.0–0.33	SED	—	—	—	19785	—	19705	—	19705	—	—
AAB5501	10-01093	0.0–0.33	SOIL	—	—	—	19785	—	19705	—	19705	—	—
AAB5509	10-01094	0.0–0.33	SED	—	—	—	19759	—	19762	—	19762	—	—
AAB5542	10-01094	0.0–0.33	SED	—	17915	—	—	—	—	—	—	—	—
AAB5489	10-01094	0.0–0.58	SOIL	—	—	—	19759	—	19762	—	19762	—	—
RE10-07-5332	10-01095	0.0–0.5	SOIL	—	07-687	07-687	07-689	07-689	07-689	07-687	—	07-688	07-689
RE10-07-5333	10-01095	1.5–2.0	SOIL	—	07-687	07-687	07-689	07-689	07-689	07-687	—	07-688	07-689
AAB5514	10-01096	0.0–0.33	SOIL	—	—	—	19759	—	19762	—	19762	—	—
AAB5484	10-01096	0.0–0.42	SOIL	—	—	—	19759	—	19762	—	19762	—	—
AAB2823	10-01097	0.0–0.33	SOIL	—	—	—	19501	—	19772	17793	19772	—	19501
AAB2824	10-01097	0.0–0.33	SED	—	—	—	19501	—	19772	17793	19772	—	19501
AAB5536	10-01097	0.0–0.33	SOIL	—	17784	—	—	—	—	—	—	—	—
AAB5540	10-01097	0.0–0.33	SED	—	17784	—	—	—	—	—	—	—	—
AAB2821	10-01098	0.0–0.33	SOIL	—	—	—	19501	—	19772	17793	19772	—	19501
AAB5537	10-01098	0.0–0.33	SED	—	17784	—	—	—	—	—	—	—	—
AAB5539	10-01098	0.0–0.33	SOIL	—	17784	—	—	—	—	—	—	—	—
AAB2822	10-01098	0.0–0.5	SED	—	—	—	19501	—	19772	17793	19772	—	19501
AAB2819	10-01099	0.0–0.17	SED	—	—	—	19499	—	19769	17772	19769	—	19499
AAB5535	10-01099	0.0–0.17	SED	—	17781	—	—	—	—	—	—	—	—
AAB2820	10-01099	0.0–0.33	SOIL	—	—	—	19499	—	19769	17772	19769	—	19499
AAB5541	10-01099	0.0–0.33	SOIL	—	17781	—	—	—	—	—	—	—	—
AAB9568	10-01280	4.3–5.0	QBOF	—	—	—	20318	—	20328	—	20328	—	—
AAB9571	10-01280	18.0–18.8	QBOF	—	—	—	20318	—	20328	—	20328	—	—
AAB9375	10-01280	22.5–23.5	QBOF	—	19547	—	20091	—	20086	19547	20086	19547	—
AAB9576	10-01280	27.5–28.3	QBOF	—	—	—	20318	—	20328	—	20328	—	—

Table 6.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Gamma Spectroscopy	Explosive Compounds	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB9556	10-01281	2.5–3.3	SOIL	—	—	—	20319	—	20332	20147	20332	20147	—
AAB9558	10-01281	12.5–13.3	QBOF	—	—	—	20319	—	20332	20147	20332	20147	—
AAB9563	10-01281	27.5–28.5	QBOF	—	—	—	20319	—	20332	20147	20332	20147	—
AAB9567	10-01281	49.0–50.0	QBOF	—	—	—	20319	—	20332	20147	20332	20147	—
AAB9544	10-01282	2.5–3.5	SOIL	—	—	—	20323	—	20111	20032	20111	20032	—
AAB9546	10-01282	12.5–13.5	QBOF	—	—	—	20323	—	20111	20032	20111	20032	—
AAB9549	10-01282	29.0–30.0	QBOF	—	—	—	20323	—	20111	20032	20111	20032	—
AAB9554	10-01282	49.0–50.0	QBOF	—	—	—	20323	—	20111	20032	20111	20032	—
AAB9382	10-01283	2.5–3.5	SOIL	—	—	—	20110	—	20113	19895	20113	19895	—
AAB9384	10-01283	14.0–15.0	QBOF	—	—	—	20110	—	20113	19895	20113	19895	—
AAB9539	10-01283	27.5–28.5	QBOF	—	—	—	20110	—	20113	19895	20113	19895	—
AAB9543	10-01283	49.0–50.0	QBOF	—	—	—	20110	—	20113	19895	20113	19895	—
AAB9369	10-01284	2.5–3.4	SOIL	—	19547	—	20091	—	20086	19547	20086	19547	—
AAB9381	10-01284	10.0–11.0	QBOF	—	—	—	20092	—	20087	19630	20087	19630	—
AAB9380	10-01284	49.0–50.0	QBOF	—	—	—	20092	—	20087	19630	20087	19630	—
AAB5493	10-01605	0.0–0.33	SOIL	—	—	—	19785	—	19705	—	19705	—	—
AAB5529	10-01605	0.0–0.33	SOIL	—	17919	—	—	—	—	—	—	—	—
AAB5530	10-01611	0.0–0.25	SOIL	—	17917	—	—	—	—	—	—	—	—
AAB5601	10-01611	0.0–0.25	SOIL	—	—	—	18990, 19779	—	18990	—	—	—	—
AAB5494	10-01617	0.0–0.33	SOIL	—	—	—	19500	—	19766	—	19766	—	19500
AAB5548	10-01617	0.0–0.33	SOIL	—	17911	—	—	—	—	—	—	—	—
RE10-07-5334	10-01619	0.0–0.5	SOIL	—	07-687	—	07-689	07-689	07-689	07-687	—	07-688	07-689
RE10-07-5335	10-01619	1.5–2.0	SOIL	—	07-687	—	07-689	07-689	07-689	07-687	—	07-688	07-689
AAB5527	10-01623	0.0–0.17	SOIL	—	17913	—	—	—	—	—	—	—	—
AAB5465	10-01623	0.0–0.33	SOIL	—	—	—	—	—	19768	—	19768	—	—
AAB5531	10-01627	0.0–0.33	SOIL	—	17917	—	—	—	—	—	—	—	—
AAB5605	10-01627	0.0–0.33	SOIL	—	—	—	18990, 19779	—	18990	—	—	—	—
AAB5528	10-01650	0.0–0.33	SOIL	—	17915	—	—	—	—	—	—	—	—
AAB5578	10-01650	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB5532	10-01661	0.0–0.33	SOIL	—	17915	—	—	—	—	—	—	—	—
AAB5577	10-01661	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB2817	10-01663	0.0–0.33	SOIL	—	17915	—	—	—	—	—	—	—	—
AAB5575	10-01663	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—
AAB5546	10-01668	0.0–0.17	SOIL	—	17915	—	—	—	—	—	—	—	—
AAB5569	10-01668	0.0–0.33	SOIL	—	—	—	19682	—	19681	—	19681	—	—

Table 6.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Gamma Spectroscopy	Explosive Compounds	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
RE10-07-5469	10-601156	2.0–4.0	SOIL	—	07-509	—	07-511	07-511	07-511	07-509	—	07-510	07-511
RE10-07-5468	10-601156	32.0–34.0	QBO	—	07-509	—	07-511	07-511	07-511	07-509	—	07-510	07-511
RE10-07-5473	10-601157	20.0–22.4	QBO	—	07-509	—	07-511	07-511	07-511	07-509	—	07-510	07-511
RE10-07-5470	10-601157	31.0–34.0	QBO	—	07-509	—	07-511	07-511	07-511	07-509	—	07-510	07-511

Note: Numbers in analyte columns are request numbers.
*— = Analysis not requested.

Table 6.1-2
Inorganic, Organic, and Radionuclide Chemicals of Potential Concern for Consolidated Unit 10-001(a)-99

COPCs	Media
Inorganics	
Aluminum	Tuff
Antimony	Soil, sediment, tuff
Arsenic	Tuff
Barium	Tuff
Beryllium	Tuff
Cadmium[a]	Soil
Cadmium	Sediment, tuff
Calcium[b]	Soil, tuff
Chromium	Tuff
Cobalt	Tuff
Copper	Soil, tuff
Cyanide (total)	Soil, tuff
Iron[b]	Tuff
Lead	Soil
Magnesium	Tuff
Manganese	Tuff
Mercury	Soil, tuff
Molybdenum	Soil, tuff
Nickel	Tuff
Perchlorate	Soil
Potassium[a]	Tuff
Selenium	Sediment, tuff
Silver	Soil, tuff
Thallium	Soil
Uranium	Soil, sediment, tuff
Vanadium	Tuff
Zinc	Soil
Organics	
Acetone	Soil, tuff
Benzo(g,h,i)perylene	Sediment
Benzoic acid	Soil
Dichlorobenzene[1,2-]	Tuff
Dichlorobenzene[1,3-]	Soil, tuff
Dichlorobenzene[1,4-]	Soil, tuff
Diethylphthalate	Soil, sediment
Ethylbenzene	Soil
Isopropyltoluene[4-]	Soil

Table 6.1-2 (continued)

COPCs	Media
Methylene chloride	Soil
Pyrene	Soil
Toluene	Soil, tuff
Trichloro-1,2,2-trifluoroethane[1,1,2-]	Soil
Trichloroethane[1,1,1-]	Soil
Trimethylbenzene[1,2,4-]	Soil
Trimethylbenzene[1,3,5-]	Tuff
Xylene (total)	Soil
Radionuclides	
Uranium-238	Soil

[a] Cadmium and potassium were eliminated as COPCs because the maximum observed concentrations were within the chemical-specific background range.

[b] Calcium and iron were eliminated as COPCs because they were detected infrequently and within range of background; in addition calcium is considered an essential nutrient (EPA 1989, 008021).

Table 6.1-3
Summary of Inorganic Chemicals above BVs in Soil, Sediment, and Tuff at Consolidated Unit 10-001(a)-99

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**3,560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1,900**	**2.6**	**8.89**	**3.96**	**0.5**	**3,700**	**13.5**
QBOF BV[a]				**3,560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1,900**	**2.6**	**8.89**	**3.96**	**0.5**	**3,700**	**13.5**
QBT3 BV[a]				**7,340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2,200**	**7.14**	**3.14**	**4.66**	**0.5**	**14,500**	**11.2**
SED BV[a]				**15,400**	**0.83**	**3.98**	**127**	**1.31**	**0.4**	**4,420**	**10.5**	**4.73**	**11.2**	**0.82**	**13,800**	**19.7**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6,120**	**19.3**	**8.64**	**14.7**	**0.5**	**21,500**	**22.3**
RE10-07-5286	10-01001	0.0000–0.5000	SOIL	—[b]	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5287	10-01001	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—	—
AAB5598	10-01002	0.0000–0.1700	SOIL	—	—	—	—	—	0.41 (J–)	—	—	—	—	NA[c]	—	28.3 (J–)
AAB5600	10-01003	0.0000–0.3300	SOIL	—	—	—	—	—	0.46 (J–)	—	—	—	—	NA	—	24.4 (J–)
RE10-07-5292	10-01004	0.0000–0.5000	QBT3	—	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5293	10-01004	1.5000–2.0000	QBT3	—	—	—	—	—	—	—	—	—	—	—	—	—
AAB5512	10-01005	0.0000–0.3300	SOIL	—	4.3 (UJ)	—	—	—	0.41 (J+)	—	—	—	—	NA	—	—
RE10-07-5294	10-01006	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5295	10-01006	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
AAB5515	10-01007	0.0000–0.3300	SOIL	—	4.2 (UJ)	—	—	—	0.42 (J+)	—	—	—	—	NA	—	—
RE10-07-5296	10-01008	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5297	10-01008	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.51 (UJ)	—	—
AAB5503	10-01009	0.0000–0.2500	SOIL	—	4.2 (UJ)	—	—	—	—	—	—	—	—	NA	—	—
AAB5504	10-01010	0.0000–0.3300	SOIL	—	4.2 (UJ)	—	—	—	0.78 (J+)	—	—	—	—	NA	—	—
RE10-07-5298	10-01011	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5300	10-01012	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5301	10-01012	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
AAB5469	10-01013	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RE10-07-5302	10-01014	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5303	10-01014	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (UJ)	—	—
AAB5451	10-01015	0.0000–0.4200	SOIL	—	—	—	—	—	—	—	—	—	—	NA	—	—
AAB5452	10-01016	0.0000–0.3300	SOIL	—	—	—	—	—	—	—	—	—	—	NA	—	—
RE10-07-5304	10-01017	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5305	10-01017	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.51 (U)	—	—
AAB5482	10-01018	0.0000–0.3300	SOIL	—	4.3 (U)	—	—	—	—	—	—	—	—	—	—	—
AAB5486	10-01019	0.0000–0.3300	SED	—	4.2 (U)	—	—	—	—	—	—	—	—	—	—	—
AAB5492	10-01020	0.0000–0.3300	SOIL	—	4.4 (U)	—	—	—	—	—	—	—	—	—	—	—

Table 6.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**3,560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1,900**	**2.6**	**8.89**	**3.96**	**0.5**	**3,700**	**13.5**
QBOF BV[a]				**3,560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1,900**	**2.6**	**8.89**	**3.96**	**0.5**	**3,700**	**13.5**
QBT3 BV[a]				**7,340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2,200**	**7.14**	**3.14**	**4.66**	**0.5**	**14,500**	**11.2**
SED BV[a]				**15,400**	**0.83**	**3.98**	**127**	**1.31**	**0.4**	**4,420**	**10.5**	**4.73**	**11.2**	**0.82**	**13,800**	**19.7**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6,120**	**19.3**	**8.64**	**14.7**	**0.5**	**21,500**	**22.3**
AAB5517	10-01021	0.0000–0.3300	SOIL	—	4.3 (UJ)	—	—	—	—	—	—	—	—	NA	—	—
RE10-07-5307	10-01022	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5306	10-01022	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5308	10-01023	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—
RE10-07-5309	10-01023	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—
RE10-07-5310	10-01024	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5311	10-01024	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
AAB5450	10-01025	0.0000–0.3300	SOIL	—	—	—	—	—	—	—	—	—	—	NA	—	—
AAB5453	10-01026	0.0000–0.3300	SOIL	—	—	—	—	—	—	—	—	—	—	NA	—	—
AAB5526	10-01027	0.0000–0.3300	SOIL	—	—	—	—	—	—	—	—	—	—	NA	—	—
AAB5606	10-01028	0.0000–0.3300	SOIL	—	—	—	—	—	—	—	—	—	—	NA	—	—
AAB5505	10-01029	0.0000–0.3300	SOIL	—	—	—	—	—	—	—	—	—	—	NA	—	—
AAB5588	10-01030	0.0000–0.3300	SOIL	—	4.8 (U)	—	—	—	0.62 (J)	—	—	—	—	NA	—	—
AAB5581	10-01031	0.0000–0.3300	SOIL	—	4.2 (U)	—	—	—	0.8 (J)	—	—	—	—	NA	—	—
AAB5520	10-01032	0.0000–0.3300	SOIL	—	3.1 (UJ)	—	—	—	0.69 (J–)	—	—	—	—	NA	—	—
RE10-07-5312	10-01033	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.51 (U)	—	—
RE10-07-5313	10-01033	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5314	10-01034	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5315	10-01034	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
AAB5454	10-01035	0.0000–0.3300	SOIL	—	—	—	—	—	—	—	—	—	—	NA	—	—
AAB5480	10-01036	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB5481	10-01037	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB5483	10-01038	0.0000–0.3300	SED	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RE10-07-5317	10-01039	0.0000–0.2500	SOIL	—	—	—	—	—	—	60,300 (J+)	—	—	—	0.51 (U)	—	—
RE10-07-5316	10-01039	1.0000–2.0000	QBT3	—	—	—	—	—	—	27,200 (J+)	—	—	5.5	—	—	—
AAB5591	10-01040	0.0000–0.3300	SOIL	—	4.3 (U)	—	—	—	0.92 (J)	—	—	—	—	NA	—	—
RE10-07-5319	10-01041	1.5000–2.0000	QBT3	12,600	—	3.4	276	—	—	4,810	11.5	3.3	—	0.54 (U)	—	—
AAB5584	10-01042	0.0000–0.3300	SOIL	—	4.2 (U)	—	—	—	0.85 (J)	—	—	—	—	NA	—	—
AAB5523	10-01043	0.0000–0.3300	SOIL	—	3.1 (UJ)	—	—	—	0.6 (J–)	—	—	—	—	NA	—	—

Table 6.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**3,560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1,900**	**2.6**	**8.89**	**3.96**	**0.5**	**3,700**	**13.5**
QBOF BV[a]				**3,560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1,900**	**2.6**	**8.89**	**3.96**	**0.5**	**3,700**	**13.5**
QBT3 BV[a]				**7,340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2,200**	**7.14**	**3.14**	**4.66**	**0.5**	**14,500**	**11.2**
SED BV[a]				**15,400**	**0.83**	**3.98**	**127**	**1.31**	**0.4**	**4,420**	**10.5**	**4.73**	**11.2**	**0.82**	**13,800**	**19.7**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6,120**	**19.3**	**8.64**	**14.7**	**0.5**	**21,500**	**22.3**
RE10-07-5320	10-01044	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5321	10-01044	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5322	10-01045	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.51 (U)	—	—
RE10-07-5323	10-01045	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
AAB5468	10-01046	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB5449	10-01047	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB5479	10-01048	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB5570	10-01049	0.0000–0.3300	SOIL	—	4.2 (U)	—	—	—	0.63 (J)	—	—	—	—	NA	—	—
AAB5593	10-01050	0.0000–0.3300	SOIL	—	4.2 (U)	—	—	—	0.65 (J)	—	—	—	—	NA	—	—
AAB5590	10-01051	0.0000–0.3300	SOIL	—	4.3 (U)	—	—	—	0.78 (J)	—	—	—	—	NA	—	—
AAB5596	10-01052	0.0000–0.3300	SOIL	—	4.2 (U)	—	—	—	0.77 (J)	—	—	—	—	NA	—	—
RE10-07-5324	10-01053	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—
RE10-07-5325	10-01053	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.51 (U)	—	—
AAB5518	10-01054	0.0000–0.3300	SOIL	—	—	—	—	—	—	—	—	—	—	—	—	—
AAB5477	10-01055	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB5476	10-01056	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB5464	10-01057	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB5478	10-01058	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB5586	10-01060	0.0000–0.3300	SOIL	—	4.3 (U)	—	—	—	0.7 (J)	33,900	—	—	—	NA	—	—
AAB5580	10-01061	0.0000–0.3300	SOIL	—	4.3 (U)	—	—	—	0.92 (J)	—	—	—	—	NA	—	24.2
RE10-07-5326	10-01061	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5327	10-01061	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—
AAB5585	10-01062	0.0000–0.3300	SOIL	—	4.2 (U)	—	—	—	0.75 (J)	—	—	—	—	NA	—	23.8
RE10-07-5336	10-01062	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5337	10-01062	1.5000–2.0000	QBT3	—	—	3.7	127	2.3	—	47.900	—	—	—	0.54 (U)	—	—
RE10-07-5328	10-01063	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.54 (U)	—	—
RE10-07-5329	10-01063	1.5000–2.0000	QBT3	—	—	—	—	—	—	2.870	10.3	—	—	0.51 (U)	—	—
AAB5576	10-01064	0.0000–0.3300	SOIL	—	4.5 (U)	—	—	—	0.86 (J)	7.420	—	—	—	NA	—	—
AAB5595	10-01065	0.0000–0.3300	SOIL	—	4.3 (U)	—	—	—	—	—	—	—	—	NA	—	—

Table 6.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**3,560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1,900**	**2.6**	**8.89**	**3.96**	**0.5**	**3,700**	**13.5**
QBOF BV[a]				**3,560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1,900**	**2.6**	**8.89**	**3.96**	**0.5**	**3,700**	**13.5**
QBT3 BV[a]				**7,340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2,200**	**7.14**	**3.14**	**4.66**	**0.5**	**14,500**	**11.2**
SED BV[a]				**15,400**	**0.83**	**3.98**	**127**	**1.31**	**0.4**	**4,420**	**10.5**	**4.73**	**11.2**	**0.82**	**13,800**	**19.7**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6,120**	**19.3**	**8.64**	**14.7**	**0.5**	**21,500**	**22.3**
RE10-07-5330	10-01066	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5331	10-01066	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.51 (U)	—	—
AAB5574	10-01067	0.0000–0.2500	SOIL	—	4.2 (U)	—	—	—	—	—	—	—	—	NA	—	—
AAB5594	10-01068	0.0000–0.3300	SOIL	—	4.3 (U)	—	—	—	0.6 (J)	—	—	—	—	NA	—	—
AAB5475	10-01084	0.0000–0.1700	SOIL	—	3.1 (UJ)	—	—	—	0.41 (J–)	—	—	—	—	NA	—	—
AAB5495	10-01084	0.0000–0.2500	SOIL	—	3.1 (UJ)	—	—	—	0.59 (J–)	—	—	—	—	NA	—	—
AAB5496	10-01085	0.0000–0.2500	SOIL	—	3.1 (UJ)	—	—	—	—	—	—	—	—	NA	—	—
AAB5474	10-01085	0.0000–0.3300	SOIL	—	3.1 (UJ)	—	—	—	0.78 (J-)	—	—	—	—	NA	—	—
AAB5497	10-01086	0.0000–0.3300	SOIL	—	4.2 (UJ)	—	—	—	-	—	—	—	—	NA	—	—
AAB5507	10-01086	0.0000–0.3300	SED	—	3.1 (UJ)	—	—	—	-	—	—	—	—	NA	—	—
AAB5487	10-01087	0.0000–0.2500	SED	—	4.2 (UJ)	—	—	—	0.43 (J+)	—	—	—	—	NA	—	—
AAB5510	10-01087	0.0000–0.2500	SOIL	—	4.2 (UJ)	—	—	—	-	—	—	—	—	NA	—	—
AAB5511	10-01088	0.0000–0.2500	SOIL	—	4.2 (UJ)	—	—	—	-	—	—	—	—	NA	—	—
AAB5516	10-01088	0.0000–0.2500	SED	—	4.2 (UJ)	—	—	—	-	—	—	—	—	NA	—	—
AAB5525	10-01089	0.0000–0.2500	SED	—	4.2 (UJ)	—	—	—	-	—	—	—	—	NA	—	—
AAB5499	10-01090	0.0000–0.2500	SED	—	4.2 (UJ)	—	—	—	-	—	—	—	—	NA	—	—
AAB5582	10-01091	0.0000–0.2500	SED	—	4.2 (UJ)	—	—	—	-	—	—	—	—	NA	—	—
AAB5592	10-01091	0.0000–0.2500	SOIL	—	4.2 (UJ)	—	—	—	-	—	—	—	—	NA	—	—
AAB5473	10-01092	0.0000–0.3300	SOIL	—	4.2 (UJ)	—	—	—	0.49 (J+)	—	—	—	—	NA	—	—
AAB5519	10-01092	0.0000–0.3300	SOIL	—	4.3 (UJ)	—	—	—	-	—	—	—	—	NA	—	—
AAB5498	10-01093	0.0000–0.3300	SED	—	4.2 (UJ)	—	—	—	-	—	—	—	—	NA	—	—
AAB5501	10-01093	0.0000–0.3300	SOIL	—	4.3 (UJ)	—	—	—	0.42 (J+)	—	—	—	—	NA	—	—
AAB5509	10-01094	0.0000–0.3300	SED	—	3.1 (UJ)	—	—	—	-	—	—	—	—	NA	—	—
AAB5489	10-01094	0.0000–0.5800	SOIL	—	3.1 (UJ)	—	—	—	0.43 (J-)	—	—	—	—	NA	—	—
RE10-07-5332	10-01095	0.0000–0.5000	SOIL	—	-	—	—	—	-	—	—	—	—	0.52 (U)	—	—
RE10-07-5333	10-01095	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
AAB5514	10-01096	0.0000–0.3300	SOIL	—	3.1 (UJ)	—	—	—	0.49 (J–)	—	—	—	—	NA	—	—
AAB5484	10-01096	0.0000–0.4200	SOIL	—	3.1 (UJ)	—	—	—	0.54 (J–)	—	—	—	—	NA	—	—
AAB2823	10-01097	0.0000–0.3300	SOIL	—	4.2 (UJ)	—	—	—	—	—	—	—	—	—	—	—

Table 6.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**3,560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1,900**	**2.6**	**8.89**	**3.96**	**0.5**	**3,700**	**13.5**
QBOF BV[a]				**3,560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1,900**	**2.6**	**8.89**	**3.96**	**0.5**	**3,700**	**13.5**
QBT3 BV[a]				**7,340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2,200**	**7.14**	**3.14**	**4.66**	**0.5**	**14,500**	**11.2**
SED BV[a]				**15,400**	**0.83**	**3.98**	**127**	**1.31**	**0.4**	**4,420**	**10.5**	**4.73**	**11.2**	**0.82**	**13,800**	**19.7**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6,120**	**19.3**	**8.64**	**14.7**	**0.5**	**21,500**	**22.3**
AAB2824	10-01097	0.0000–0.3300	SED	—	4.3 (UJ)	—	—	—	—	—	—	—	—	—	—	—
AAB2821	10-01098	0.0000–0.3300	SOIL	—	4.2 (UJ)	—	—	—	—	—	—	—	—	—	—	—
AAB2822	10-01098	0.0000–0.5000	SED	—	4.2 (UJ)	—	—	—	—	—	—	—	—	—	—	—
AAB2819	10-01099	0.0000–0.1700	SED	—	—	—	—	—	—	—	—	—	—	—	—	—
AAB9568	10-01280	4.3000–5.0000	QBOF	8,680	3.9 (U)	0.8 (J–)	62.9 (J–	—	0.93 (J)	—	6.1	—	—	NA	7,570	—
AAB9571	10-01280	18.0000–18.8000	QBOF	13,200	4.6 (J)	0.79 (J–)	105 (J–)	—	1.6	2,200 (J–)	8.3	—	5.3 (J)	NA	11,200	—
AAB9375	10-01280	22.5000–23.5000	QBOF	—	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9576	10-01280	27.5000–28.3000	QBOF	—	3.5 (U)	—	30.5 (J–)	—	0.58 (U)	—	—	—	—	NA	—	—
AAB9556	10-01281	2.5000–3.3000	SOIL	—	3.5 (U)	—	—	—	1.7	—	—	—	—	NA	—	—
AAB9558	10-01281	12.5000–13.3000	QBOF	13,400	3.9 (U)	—	86.9	—	2.4	2,140	8.5	—	4 (J)	NA	11,500	—
AAB9563	10-01281	27.5000–28.5000	QBOF	12,400	4 (U)	—	124	1.7	2.1	—	—	—	—	NA	3,780	—
AAB9567	10-01281	49.0000–50.0000	QBOF	—	3.7 (U)	—	35.2 (J)	—	0.67 (J)	—	5.4	—	—	NA	—	—
AAB9544	10-01282	2.5000–3.5000	SOIL	—	4 (UJ)	—	—	—	1.4	—	—	—	—	NA	—	—
AAB9546	10-01282	12.5000–13.5000	QBOF	—	3.5 (UJ)	—	28.6 (J–)	—	0.63 (J)	—	3	—	—	NA	3,750	—
AAB9549	10-01282	29.0000–30.0000	QBOF	8,260	3.7 (UJ)	—	48 (J–)	—	1 (J)	—	5.7	—	—	NA	7040	—
AAB9554	10-01282	49.0000–50.0000	QBOF	3,580	3.8 (UJ)	—	—	—	0.76 (J)	—	2.9	—	—	NA	—	—
AAB9382	10-01283	2.5000–3.5000	SOIL	—	—	—	—	—	0.43 (U)	—	—	—	—	NA	—	—
AAB9384	10-01283	14.0000–15.0000	QBOF	—	—	1 (U)	41 (U)	—	0.43 (U)	—	—	—	—	NA	3940	—
AAB9539	10-01283	27.5000–28.5000	QBOF	15,800 (J)	—	0.69 (U)	360	—	0.46 (U)	—	—	—	—	NA	—	—
AAB9543	10-01283	49.0000–50.0000	QBOF	—	—	0.69 (U)	37.9 (U)	—	0.46 (U)	—	—	—	—	NA	—	—
AAB9369	10-01284	2.5000–3.4000	SOIL	—	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9381	10-01284	10.0000–11.0000	QBOF	—	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9380	10-01284	49.0000–50.0000	QBOF	—	—	—	—	—	—	—	—	—	—	NA	—	—
AAB5493	10-01605	0.0000–0.3300	SOIL	—	4.3 (UJ)	—	—	—	—	—	—	—	—	NA	—	—
AAB5601	10-01611	0.0000–0.2500	SOIL	—	—	—	—	—	—	—	—	—	17.7 (J–)	NA	—	—
AAB5494	10-01617	0.0000–0.3300	SOIL	—	4.2 (U)	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5334	10-01619	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	0.51 (U)	—	—
AAB5465	10-01623	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB5605	10-01627	0.0000–0.3300	SOIL	—	—	—	—	—	—	—	—	—	—	NA	—	—

Table 6.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**3,560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1,900**	**2.6**	**8.89**	**3.96**	**0.5**	**3,700**	**13.5**
QBOF BV[a]				**3,560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1,900**	**2.6**	**8.89**	**3.96**	**0.5**	**3,700**	**13.5**
QBT3 BV[a]				**7,340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2,200**	**7.14**	**3.14**	**4.66**	**0.5**	**14,500**	**11.2**
SED BV[a]				**15,400**	**0.83**	**3.98**	**127**	**1.31**	**0.4**	**4,420**	**10.5**	**4.73**	**11.2**	**0.82**	**13,800**	**19.7**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6,120**	**19.3**	**8.64**	**14.7**	**0.5**	**21,500**	**22.3**
AAB5578	10-01650	0.0000–0.3300	SOIL	—	4.3 (U)	—	—	—	0.69 (J)	—	—	—	—	NA	—	—
AAB5577	10-01661	0.0000–0.3300	SOIL	—	4.3 (U)	—	—	—	0.68 (J)	—	—	—	—	NA	—	—
AAB5575	10-01663	0.0000–0.3300	SOIL	—	4.8 (U)	—	—	—	0.91 (J)	—	—	—	—	NA	—	25.5
AAB5569	10-01668	0.0000–0.3300	SOIL	—	4.2 (U)	—	—	—	—	—	—	—	—	NA	—	—
RE10-07-5469	10-601156	2.0000–4.0000	SOIL	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5468	10-601156	32.0000–34.0000	QBO	14,000	—	1.9	85.2	2	—	—	5.8	—	5.2 (J–)	—	9810 (J)	—
RE10-07-5473	10-601157	20.0000–22.4000	QBO	—	0.52 (UJ)	—	29.7	—	—	—	2.8	—	—	0.52 (U)	4260	—
RE10-07-5470	10-601157	31.0000–34.0000	QBO	—	0.53 (UJ)	1.1 (U)	28.8	—	—	—	—	—	—	—	—	—

Table 6.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Potassium	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**2,390**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**2,390**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBT3 BV[a]				**1,690**	**482**	**0.1**	**na**	**6.58**	**na**	**3,500**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
SED BV[a]				**2,370**	**543**	**0.1**	**na**	**9.38**	**na**	**2,690**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
SOIL BV[a]				**4,610**	**671**	**0.1**	**na**	**15.4**	**na**	**3,460**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
RE10-07-5286	10-01001	0.0000–0.5000	SOIL	—	—	—	0.89	—	—	—	—	—	—	NA	—	—
RE10-07-5287	10-01001	1.5000–2.0000	SOIL	—	—	—	0.97	—	—	—	—	—	—	NA	—	56 (J–)
AAB5598	10-01002	0.0000–0.1700	SOIL	—	—	—	NA	—	NA	—	—	—	—	5.3	—	—
AAB5600	10-01003	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	4.3	—	54.9 (J–)
RE10-07-5292	10-01004	0.0000–0.5000	QBT3	—	—	—	NA	—	—	—	7.4	—	—	NA	—	—
RE10-07-5293	10-01004	1.5000–2.0000	QBT3	—	—	—	NA	—	—	—	6.15	—	—	NA	—	—
AAB5512	10-01005	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	4.56 (J)	—	—
RE10-07-5294	10-01006	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	1.4	NA	—	—
RE10-07-5295	10-01006	1.5000–2.0000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
AAB5515	10-01007	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.78 (J)	—	—
RE10-07-5296	10-01008	0.0000–0.5000	SOIL	—	—	—	0.93	—	—	—	—	—	—	NA	—	—
RE10-07-5297	10-01008	1.5000–2.0000	SOIL	—	—	—	0.75	—	—	—	—	—	—	NA	—	—
AAB5503	10-01009	0.0000–0.2500	SOIL	—	—	—	NA	—	NA	—	—	—	—	—	—	—
AAB5504	10-01010	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.01 (J)	—	—
RE10-07-5298	10-01011	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	50.4 (U)
RE10-07-5300	10-01012	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5301	10-01012	1.5000–2.0000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
AAB5469	10-01013	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.74 (J–)	NA	NA
RE10-07-5302	10-01014	0.0000–0.5000	SOIL	—	—	—	0.58	—	—	—	—	—	—	NA	—	79.3 (J–)
RE10-07-5303	10-01014	1.5000–2.0000	SOIL	—	—	—	0.56	—	—	—	—	—	—	NA	—	—
AAB5451	10-01015	0.0000–0.4200	SOIL	—	—	—	NA	—	NA	—	—	—	—	8.1 (J–)	—	—
AAB5452	10-01016	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	4.83 (J–)	—	—
RE10-07-5304	10-01017	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5305	10-01017	1.5000–2.0000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
AAB5482	10-01018	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.09 (U)	—	—
AAB5486	10-01019	0.0000–0.3300	SED	—	—	—	NA	—	NA	—	0.5 (UJ)	—	—	—	—	—
AAB5492	10-01020	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.63 (U)	—	—

Table 6.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Potassium	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**739**	**189**	**0.1**	**na[d]**	**2**	**na**	**2,390**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**2,390**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBT3 BV[a]				**1,690**	**482**	**0.1**	**na**	**6.58**	**na**	**3,500**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
SED BV[a]				**2,370**	**543**	**0.1**	**na**	**9.38**	**na**	**2,690**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
SOIL BV[a]				**4,610**	**671**	**0.1**	**na**	**15.4**	**na**	**3,460**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB5517	10-01021	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.81 (J)	—	—
RE10-07-5307	10-01022	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5306	10-01022	1.5000–2.0000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5308	10-01023	0.0000–0.5000	SOIL	—	—	—	0.29 (J)	—	—	—	—	—	—	NA	—	—
RE10-07-5309	10-01023	1.5000–2.0000	SOIL	—	—	—	0.19 (J)	—	0.0023 (J)	—	—	—	—	NA	—	—
RE10-07-5310	10-01024	0.0000–0.5000	SOIL	—	—	—	0.47 (J)	—	—	—	—	—	—	NA	—	—
RE10-07-5311	10-01024	1.5000–2.0000	SOIL	—	—	—	0.29 (J)	—	—	—	—	—	—	NA	—	—
AAB5450	10-01025	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.71 (J–)	—	—
AAB5453	10-01026	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	4 (J–)	—	—
AAB5526	10-01027	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	4.7	—	—
AAB5606	10-01028	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	6.4	—	—
AAB5505	10-01029	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	5.6	—	—
AAB5588	10-01030	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.16 (J)	—	—
AAB5581	10-01031	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.25 (J)	—	—
AAB5520	10-01032	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	0.89 (J–)	4.32 (J–)	—	—
RE10-07-5312	10-01033	0.0000–0.5000	SOIL	—	—	—	0.51 (J)	—	—	—	—	—	—	NA	—	—
RE10-07-5313	10-01033	1.5000–2.0000	SOIL	—	—	—	0.51 (J)	—	—	—	—	—	—	NA	—	—
RE10-07-5314	10-01034	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5315	10-01034	1.5000–2.0000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
AAB5454	10-01035	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	4.98 (J–)	—	—
AAB5480	10-01036	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.42 (J–)	NA	NA
AAB5481	10-01037	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.84 (J–)	NA	NA
AAB5483	10-01038	0.0000–0.3300	SED	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.8 (J–)	NA	NA
RE10-07-5317	10-01039	0.0000–0.2500	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5316	10-01039	1.0000–2.0000	QBT3	—	—	—	NA	—	—	—	0.5 (U)	—	—	NA	—	—
AAB5591	10-01040	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.72 (J)	—	—
RE10-07-5319	10-01041	1.5000–2.0000	QBT3	2020	—	—	NA	8.1	—	—	—	—	—	NA	—	—
AAB5584	10-01042	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.83 (J)	—	—

Table 6.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Potassium	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**739**	**189**	**0.1**	**na[d]**	**2**	**na**	**2,390**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**2,390**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBT3 BV[a]				**1,690**	**482**	**0.1**	**na**	**6.58**	**na**	**3,500**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
SED BV[a]				**2,370**	**543**	**0.1**	**na**	**9.38**	**na**	**2,690**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
SOIL BV[a]				**4,610**	**671**	**0.1**	**na**	**15.4**	**na**	**3,460**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB5523	10-01043	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.73 (J–)	—	—
RE10-07-5320	10-01044	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5321	10-01044	1.5000–2.0000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5322	10-01045	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5323	10-01045	1.5000–2.0000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
AAB5468	10-01046	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.87 (J–)	NA	NA
AAB5449	10-01047	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.98 (J–)	NA	NA
AAB5479	10-01048	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8 (J–)	NA	NA
AAB5570	10-01049	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.3 (J)	—	—
AAB5593	10-01050	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.52 (J)	—	—
AAB5590	10-01051	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.17 (J)	—	—
AAB5596	10-01052	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.27 (J)	—	—
RE10-07-5324	10-01053	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5325	10-01053	1.5000–2.0000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	53.8 (J–)
AAB5518	10-01054	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.37 (U)	—	—
AAB5477	10-01055	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.6 (J–)	NA	NA
AAB5476	10-01056	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.2 (J–)	NA	NA
AAB5464	10-01057	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.4 (J–)	NA	NA
AAB5478	10-01058	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.98 (J–)	NA	NA
AAB5586	10-01060	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.85 (J)	—	—
AAB5580	10-01061	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.21 (J)	—	—
RE10-07-5326	10-01061	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5327	10-01061	1.5000–2.0000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
AAB5585	10-01062	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	4.02 (J)	—	—
RE10-07-5336	10-01062	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5337	10-01062	1.5000–2.0000	QBT3	2,400	—	—	NA	10.3	—	—	0.74	—	—	NA	—	—
RE10-07-5328	10-01063	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5329	10-01063	1.5000–2.0000	QBT3	—	—	—	NA	7.1	—	—	0.33 (J)	—	—	NA	—	—

Table 6.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Potassium	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**739**	**189**	**0.1**	**na[d]**	**2**	**na**	**2,390**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**2,390**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBT3 BV[a]				**1,690**	**482**	**0.1**	**na**	**6.58**	**na**	**3,500**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
SED BV[a]				**2,370**	**543**	**0.1**	**na**	**9.38**	**na**	**2,690**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
SOIL BV[a]				**4,610**	**671**	**0.1**	**na**	**15.4**	**na**	**3,460**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB5576	10-01064	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.86 (J)	—	—
AAB5595	10-01065	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.57 (J)	—	—
RE10-07-5330	10-01066	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	59.7 (U)
RE10-07-5331	10-01066	1.5000–2.0000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	58.9 (U)
AAB5574	10-01067	0.0000–0.2500	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.42 (J)	—	—
AAB5594	10-01068	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.09 (J)	—	—
AAB5475	10-01084	0.0000–0.1700	SOIL	—	—	—	NA	—	NA	—	—	—	—	—	—	—
AAB5495	10-01084	0.0000–0.2500	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.06 (J–)	—	—
AAB5496	10-01085	0.0000–0.2500	SOIL	—	—	—	NA	—	NA	—	—	—	—	—	—	—
AAB5474	10-01085	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	4.04 (J–)	—	—
AAB5497	10-01086	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	5.92 (J)	—	—
AAB5507	10-01086	0.0000–0.3300	SED	—	—	—	NA	—	NA	—	0.34 (UJ)	—	—	2.61 (J–)	—	—
AAB5487	10-01087	0.0000–0.2500	SED	—	—	—	NA	—	NA	—	0.5 (UJ)	—	—	—	—	—
AAB5510	10-01087	0.0000–0.2500	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.34 (J)	—	—
AAB5511	10-01088	0.0000–0.2500	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.59 (J)	—	—
AAB5516	10-01088	0.0000–0.2500	SED	—	—	—	NA	—	NA	—	0.5 (UJ)	—	—	—	—	—
AAB5525	10-01089	0.0000–0.2500	SED	—	—	—	NA	—	NA	—	0.5 (UJ)	—	—	2.77 (J)	—	—
AAB5499	10-01090	0.0000–0.2500	SED	—	—	—	NA	—	NA	—	0.5 (UJ)	—	—	—	—	—
AAB5582	10-01091	0.0000–0.2500	SED	—	—	—	NA	—	NA	—	0.5 (UJ)	—	—	—	—	—
AAB5592	10-01091	0.0000–0.2500	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.54 (J)	—	—
AAB5473	10-01092	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.88 (J)	—	—
AAB5519	10-01092	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.29 (J)	—	—
AAB5498	10-01093	0.0000–0.3300	SED	—	—	—	NA	—	NA	—	0.5 (UJ)	—	—	—	—	—
AAB5501	10-01093	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.36 (J)	—	—
AAB5509	10-01094	0.0000–0.3300	SED	—	—	—	NA	—	NA	—	0.34 (UJ)	—	—	—	—	—
AAB5489	10-01094	0.0000–0.5800	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.09 (J–)	—	—
RE10-07-5332	10-01095	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
RE10-07-5333	10-01095	1.5000–2.0000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—

Table 6.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Potassium	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**739**	**189**	**0.1**	**na[d]**	**2**	**na**	**2,390**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**2,390**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBT3 BV[a]				**1,690**	**482**	**0.1**	**na**	**6.58**	**na**	**3,500**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
SED BV[a]				**2,370**	**543**	**0.1**	**na**	**9.38**	**na**	**2,690**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
SOIL BV[a]				**4,610**	**671**	**0.1**	**na**	**15.4**	**na**	**3,460**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB5514	10-01096	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	—	—	—
AAB5484	10-01096	0.0000–0.4200	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.6 (J–)	—	—
AAB2823	10-01097	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	4 (U)	—	—
AAB2824	10-01097	0.0000–0.3300	SED	—	—	—	NA	—	NA	—	0.52 (UJ)	—	—	2.83 (U)	—	—
AAB2821	10-01098	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	1.98 (U)	—	—
AAB2822	10-01098	0.0000–0.5000	SED	—	—	—	NA	—	NA	—	0.5 (UJ)	—	—	—	—	—
AAB2819	10-01099	0.0000–0.1700	SED	—	—	—	NA	—	NA	—	—	—	—	3.02 (U)	—	—
AAB9568	10-01280	4.3000–5.0000	QBOF	1530	228 (J–)	—	NA	6.9 (J)	NA	—	—	—	—	3.95	9.8 (J)	—
AAB9571	10-01280	18.0000–18.8000	QBOF	2390	321 (J–)	0.12 (U)	NA	8 (J)	NA	—	—	—	—	5.36	17	—
AAB9375	10-01280	22.5000–23.5000	QBOF	—	—	—	NA	—	NA	—	—	—	—	5.69	—	—
AAB9576	10-01280	27.5000–28.3000	QBOF	—	—	—	NA	—	NA	—	0.34 (J)	—	—	5.31	—	—
AAB9556	10-01281	2.5000–3.3000	SOIL	—	—	0.11 (U)	NA	—	NA	—	—	—	—	3.29 (J)	—	—
AAB9558	10-01281	12.5000–13.3000	QBOF	2150	—	0.11 (U)	NA	6.5 (J)	NA	2,420	0.48 (J)	—	—	3.92 (J)	16.9	—
AAB9563	10-01281	27.5000–28.5000	QBOF	—	—	0.11 (U)	NA	3 (J)	NA	—	—	—	—	3.23 (J)	—	—
AAB9567	10-01281	49.0000–50.0000	QBOF	—	—	0.11 (U)	NA	2.4 (J)	NA	—	—	—	—	5.37 (J)	—	—
AAB9544	10-01282	2.5000–3.5000	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.42 (J)	—	—
AAB9546	10-01282	12.5000–13.5000	QBOF	—	—	—	NA	3.2 (J)	NA	—	—	—	—	1.77 (J)	4.9 (J)	—
AAB9549	10-01282	29.0000–30.0000	QBOF	1400	215 (J–)	—	NA	6.9 (J)	NA	—	—	—	—	1.76 (J)	7.5 (J)	—
AAB9554	10-01282	49.0000–50.0000	QBOF	765 (J)	—	0.11 (U)	NA	4.1 (J)	NA	—	—	—	—	4.44 (J)	—	—
AAB9382	10-01283	2.5000–3.5000	SOIL	—	—	—	NA	—	NA	—	—	2.1 (U)	—	4.24	—	—
AAB9384	10-01283	14.0000–15.0000	QBOF	—	—	—	NA	3 (U)	NA	—	0.65 (U)	2.2 (U)	—	2.75	5.2 (U)	—
AAB9539	10-01283	27.5000–28.5000	QBOF	—	240	—	NA	4.6 (U)	NA	—	0.69 (U)	2.3 (U)	—	4.79	—	—
AAB9543	10-01283	49.0000–50.0000	QBOF	—	274	—	NA	3.1 (U)	NA	—	0.69 (U)	2.3 (U)	—	6.67	—	—
AAB9369	10-01284	2.5000–3.4000	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.93 (U)	—	—
AAB9381	10-01284	10.0000–11.0000	QBOF	—	—	—	NA	—	NA	—	—	—	—	1.87 (U)	—	—
AAB9380	10-01284	49.0000–50.0000	QBOF	—	—	—	NA	—	NA	—	—	—	—	5.54	—	—
AAB5493	10-01605	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.43 (J)	—	—
AAB5601	10-01611	0.0000–0.2500	SOIL	—	—	—	NA	—	NA	—	—	—	—	4.2	—	—

Table 6.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Potassium	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**739**	**189**	**0.1**	**na[d]**	**2**	**na**	**2,390**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**2,390**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBT3 BV[a]				**1,690**	**482**	**0.1**	**na**	**6.58**	**na**	**3,500**	**0.3**	**1**	**1.1**	**2.4**	**17**	**63.5**
SED BV[a]				**2,370**	**543**	**0.1**	**na**	**9.38**	**na**	**2,690**	**0.3**	**1**	**0.73**	**2.22**	**19.7**	**60.2**
SOIL BV[a]				**4,610**	**671**	**0.1**	**na**	**15.4**	**na**	**3,460**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB5494	10-01617	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	5.02 (J–)	—	—
RE10-07-5334	10-01619	0.0000–0.5000	SOIL	—	—	—	NA	—	—	—	—	—	—	NA	—	—
AAB5465	10-01623	0.0000–0.3300	SOIL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.27 (J–)	NA	NA
AAB5605	10-01627	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	4.3	—	—
AAB5578	10-01650	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.32 (J)	—	—
AAB5577	10-01661	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.2 (J)	—	—
AAB5575	10-01663	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	2.97 (J)	—	—
AAB5569	10-01668	0.0000–0.3300	SOIL	—	—	—	NA	—	NA	—	—	—	—	3.03 (J)	—	—
RE10-07-5469	10-601156	2.0000–4.0000	SOIL	—	—	—	0.36 (J)	—	—	—	—	—	—	NA	—	—
RE10-07-5468	10-601156	32.0000–34.0000	QBO	1910	291 (J)	—	0.73	6.8 (U)	—	—	—	—	—	NA	11.1	—
RE10-07-5473	10-601157	20.0000–22.4000	QBO	—	—	—	0.29 (J)	2.7 (U)	—	—	0.52 (UJ)	—	—	NA	4.7	—
RE10-07-5470	10-601157	31.0000–34.0000	QBO	—	—	—	0.14 (J)	2.3 (U)	—	—	0.53 (UJ)	—	—	NA	—	—

Note: Results are in mg/kg.

[a] BVs are from LANL 1998, 059730.

[b] — = Not detected or not detected above BV.

[c] NA = Not analyzed.

[d] na = Not available.

Table 6.1-4
Summary of Organic Chemicals Detected in Soil, Sediment, and Tuff at Consolidated Unit 10-001(a)-99

Sample ID	Location ID	Depth (ft)	Media	Acetone	Benzo(g,h,i)perylene	Benzoic Acid	Dichlorobenzene[1,2-]	Dichlorobenzene[1,3-]	Dichlorobenzene[1,4-]	Diethylphthalate	Ethylbenzene	Isopropyltoluene[4-]	Methylene Chloride	Pyrene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)
Organic Chemical Detects per Sample, Standard UOM = mg/kg																				
RE10-07-5286	10-01001	0.0000–0.5000	SOIL	—[a]	—	—	—	—	—	—	—	—	0.0026 (J)	—	0.0012 (J)	—	—	—	—	—
RE10-07-5287	10-01001	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.00026 (J)	—	—	—	—	—
RE10-07-5292	10-01004	0.0000–0.5000	QBT3	—	—	—	—	—	—	—	—	—	—	—	0.000504 (J)	—	—	—	—	NA[b]
RE10-07-5294	10-01006	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.0012 (J)	—	—	—	—	—
RE10-07-5295	10-01006	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.0004 (J)	—	—	—	—	—
RE10-07-5296	10-01008	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.00065 (J)	—	—	—	—	—
RE10-07-5297	10-01008	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.0006 (J)	—	—	—	—	—
RE10-07-5299	10-01011	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	0.00077 (J)	—	—	—	—	—	—	—	—
RE10-07-5301	10-01012	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.0003 (J)	—	—	0.00038 (J)	—	—
RE10-07-5302	10-01014	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.00042 (J)	—	—	—	—	—
RE10-07-5304	10-01017	0.0000–0.5000	SOIL	0.012 (J)	—	—	—	—	—	—	—	0.018	—	—	—	—	—	—	—	—
RE10-07-5305	10-01017	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	0.00046 (J)	0.00031 (J)	—	—	0.0027 (J)	—	—	—	—	—
RE10-07-5307	10-01022	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.0042 (J)	—	—	—	—	—
RE10-07-5306	10-01022	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.00046 (J)	—	—	—	—	—
RE10-07-5308	10-01023	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.00051 (J)	—	—	—	—	—
RE10-07-5309	10-01023	1.5000–2.0000	SOIL	0.0065 (J)	—	—	—	—	—	—	—	—	—	—	—	0.00085 (J)	—	0.00046 (J)	—	—
RE10-07-5310	10-01024	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.0012 (J)	—	—	—	—	—
RE10-07-5311	10-01024	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.00049 (J)	—	—	—	—	—
RE10-07-5312	10-01033	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.00085 (J)	—	—	—	—	—
RE10-07-5313	10-01033	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.00045 (J)	—	—	—	—	—
RE10-07-5314	10-01034	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	0.00086 (J)	—	—	0.0011 (J)	—	—	—	—	—
RE10-07-5315	10-01034	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.00045 (J)	—	—	—	—	—
RE10-07-5316	10-01039	1.0000–2.0000	QBT3	—	—	—	0.00053 (J)	0.0005 (J)	0.00062 (J)	—	—	—	—	—	—	—	—	—	0.00033 (J)	—
RE10-07-5318	10-01041	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	0.00027 (J)	—	—	—	—	—	—	—	—	—
RE10-07-5320	10-01044	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.0013 (J)	—	0.00023 (J)	—	—	—
RE10-07-5321	10-01044	1.5000–2.0000	SOIL	0.0049 (J)	—	—	—	—	—	—	—	—	—	—	0.0004 (J)	0.00062 (J)	—	—	—	—
RE10-07-5322	10-01045	0.0000–0.5000	SOIL	—	—	—	—	0.00014 (J)	0.0002 (J)	—	—	—	—	—	0.0011 (J)	—	—	—	—	—
RE10-07-5324	10-01053	0.0000–0.5000	SOIL	0.0046 (J)	—	0.733	—	—	—	—	0.00042 (J)	0.0096 (J)	—	—	0.007 (J)	—	0.00082 (J)	—	—	—
RE10-07-5325	10-01053	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	0.00031 (J)	—	—	—	0.0017 (J)	—	—	—	—	—
RE10-07-5326	10-01061	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	0.0005 (J)	—	—	—	—	—	—	—	—	0.0011 (J)

Table 6.1-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acetone	Benzo(g,h,i)perylene	Benzoic Acid	Dichlorobenzene[1,2-]	Dichlorobenzene[1,3-]	Dichlorobenzene[1,4-]	Diethylphthalate	Ethylbenzene	Isopropyltoluene[4-]	Methylene Chloride	Pyrene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)
Organic Chemical Detects per Sample, Standard UOM = mg/kg																				
RE10-07-5336	10-01062	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	0.00032 (J)	—	—	—	—	—	—	—	—	0.00093 (J)
RE10-07-5330	10-01066	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.0039 (J)	—	—	—	—	0.0012 (J)
AAB2823	10-01097	0.0000–0.3300	SOIL	NA	—	—	—	—	—	0.032 (J)	NA	NA	NA	—	NA	NA	NA	NA	NA	NA
AAB2824	10-01097	0.0000–0.3300	SED	NA	0.11 (J)	—	—	—	—	—	NA	NA	NA	—	NA	NA	NA	NA	NA	NA
AAB2822	10-01098	0.0000–0.5000	SED	NA	—	—	—	—	—	0.017 (J)	NA	NA	NA	—	NA	NA	NA	NA	NA	NA
AAB2819	10-01099	0.0000–0.1700	SED	NA	—	—	—	—	—	0.035 (J)	NA	NA	NA	—	NA	NA	NA	NA	NA	NA
AAB2820	10-01099	0.0000–0.3300	SOIL	NA	—	—	—	—	—	0.042 (J)	NA	NA	NA	0.02 (J)	NA	NA	NA	NA	NA	NA
AAB9380	10-01284	49.0000–50.0000	QBOF	0.015 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5334	10-01619	0.0000–0.5000	SOIL	—	—	—	—	—	—	—	—	—	—	—	0.0036 (J)	—	—	—	—	—
RE10-07-5335	10-01619	1.5000–2.0000	SOIL	—	—	—	—	—	—	—	—	0.00052 (J)	—	—	—	—	—	—	—	—

Note: Units are mg/kg.
[a] — = Not detected
[b] NA = Not analyzed

Table 6.1-5
Summary of Radionuclides above BVs/FVs in
Soil, Sediment, and Tuff at Consolidated Unit 10-001(a)-99

Sample ID	Location ID	Depth (ft)	Media	Uranium-238
Radionuclides Detected above BVs/FVs, Standard UOM = pCi/g				
SOIL BV*				**2.29**
RE10-07-5312	10-01033	0.0000-0.5000	SOIL	2.34

Note: Results are in pCi/g.

* BVs are from LANL 1998, 059730.

Table 6.2-1
Summary of Samples Collected and Analyses Requested for Alluvium, Soil and Tuff at Consolidated Unit 10-002(a)-99

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB9278	10-01200	16.1000-16.8000	QAL	—*	—	—	—	—	—	19,898	—	20,077	—	20,077	19,420	—
AAB9281	10-01200	26.1000-26.8000	QAL	—	—	—	—	—	—	19,898	—	20,077	—	20,077	19,420	—
AAB9283	10-01200	36.0000-37.0000	QBO	—	—	—	—	—	—	19,898	—	20,077	—	20,077	19,420	—
AAB9286	10-01200	48.7000-49.6000	QBO	—	—	—	—	—	—	19,898	—	20,077	—	20,077	19,420	—
0110-96-0001	10-01201	11.0000-11.5000	QAL	—	2040	—	—	2040	—	—	—	—	—	—	—	—
AAB9337	10-01201	11.1000-11.8000	QAL	—	—	—	—	—	—	—	—	—	—	—	20,039	—
AAB9341	10-01201	16.9000-17.5000	QAL	—	—	—	—	—	—	—	—	—	—	—	20,039	—
0110-96-0002	10-01201	19.0000-20.0000	QAL	—	2040	—	—	2040	—	—	—	—	—	—	—	—
AAB9342	10-01201	19.2000-20.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	20,039	—
AAB9347	10-01201	33.3000-33.7000	QBO	—	—	—	—	—	—	20,323	—	20,111	—	20,111	—	—
AAB9350	10-01201	48.0000-48.5000	QBO	—	—	—	—	—	—	20,323	—	20,111	—	20,111	—	—
AAB9287	10-01202	15.8000-16.6000	QAL	—	—	—	—	—	—	19,898	—	20,077	—	20,077	19,420	—
AAB9289	10-01202	25.4000-26.2000	QAL	—	—	—	—	—	—	19,898	—	20,077	—	20,077	19,420	—
AAB9293	10-01202	36.0000-36.8000	QBO	—	—	—	—	—	—	19,898	—	20,077	—	20,077	19,420	—
AAB9296	10-01202	48.7000-49.5000	QBO	—	—	—	—	—	—	19,898	—	20,077	—	20,077	19,420	—
AAB9385	10-01203	13.6000-14.3000	QAL	—	—	—	—	—	—	—	—	20,087	19,630	20,087	19,630	—
AAB9388	10-01203	20.5000-20.6000	QAL	—	—	—	—	—	—	—	—	—	—	—	19,630	—
AAB9389	10-01203	27.5000-28.0000	QBO	—	—	—	—	—	—	—	—	20,087	19,630	20,087	19,630	—
AAB9390	10-01203	38.0000-39.5000	QBOG	—	—	—	—	—	—	—	—	20,087	19,630	20,087	19,630	—
AAB9394	10-01203	49.1000-50.0000	QBOG	—	—	—	—	—	—	—	—	20,087	19,630	20,087	19,630	—
AAB9309	10-01204	15.7000-16.4000	QAL	—	19,574	—	—	—	19,574	19,571	—	—	19,570	19,574	19,570	—
AAB9313	10-01204	25.8000-26.4000	QBO	—	—	—	—	—	—	—	—	20,082	19,487	20,082	19,487	—
AAB9315	10-01204	35.5000-36.5000	QBO	—	—	—	—	—	—	—	—	20,082	19,487	20,082	19,487	—
AAB9310	10-01204	47.7000-49.3000	QBO	—	—	—	—	—	—	—	—	20,082	19,487	20,082	19,487	—
AAB9360	10-01205	10.0000-10.5000	QAL	—	—	—	—	—	—	20,317	—	20,325	—	20,325	20,282	—
AAB9361	10-01205	14.3000-14.8000	QAL	—	—	—	—	—	20,232	20,231	—	20,232	20,230	—	20,230	—
AAB9363	10-01205	19.5000-20.0000	QAL	—	—	—	—	—	—	20,317	—	20,325	—	20,325	20,282	—
AAB9364	10-01205	20.0000-20.9000	QAL	—	20,232	—	—	—	20,232	20,231	—	—	20,230	—	20,230	—
AAB9368	10-01205	39.0000-40.0000	QBO	—	—	—	—	—	—	20,318	—	20,328	—	20,328	—	—
AAB9399	10-01205	49.3000-50.0000	QBO	—	—	—	—	—	—	20,318	—	20,328	—	20,328	—	—
AAB9297	10-01206	15.8000-16.8000	QAL	—	—	—	19,441	—	—	—	—	20,080	—	20,080	19,434	—
AAB9301	10-01206	25.9000-26.8000	QBO	—	—	—	19,441	—	—	—	—	20,080	19,434	20,080	19,434	—
AAB9300	10-01206	35.7000-36.9000	QBOG	—	—	—	19,441	—	—	—	—	20,080	19,434	20,080	19,434	—

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB9308	10-01206	48.4000-49.3000	QBOG	—	—	—	19,441	—	—	—	—	20,080	19,434	20,080	19,434	—
AAB9327	10-01207	10.8000-11.5000	QAL	—	—	—	—	—	—	20,110	—	20,113	19,895	20,113	19,895	—
AAB9330	10-01207	25.5000-26.1000	QAL	—	—	—	—	—	—	20,110	—	20,113	19,895	20,113	19,895	—
AAB9333	10-01207	35.9000-36.6000	QBO	—	—	—	—	—	—	20,110	—	20,113	19,895	20,113	19,895	—
AAB9336	10-01207	48.3000-49.3000	QBOG	—	—	—	—	—	—	20,110	—	20,113	19,895	20,113	19,895	—
AAB9317	10-01208	15.6000-16.6000	QBOF	—	—	—	—	—	—	—	—	20,084	—	20,084	—	—
AAB9322	10-01208	26.0000-26.7000	QBOF	—	—	—	—	—	—	—	—	20,084	—	20,084	—	—
AAB9324	10-01208	35.7000-36.5000	QBOG	—	—	—	—	—	—	—	—	20,084	—	20,084	—	—
AAB9326	10-01208	49.0000-50.0000	QBOG	—	—	—	—	—	—	—	—	20,084	—	20,084	—	—
AAB9351	10-01209	14.0000-14.7000	QAL	—	—	—	—	—	—	20,319	—	20,332	—	20,332	20,147	—
AAB9354	10-01209	29.0000-29.6000	QBO	—	—	—	—	—	—	20,319	—	20,332	—	20,332	20,147	—
AAB9357	10-01209	37.5000-38.4000	QBO	—	—	—	—	—	—	20,319	—	20,332	—	20,332	20,147	—
AAB9359	10-01209	48.4000-49.2000	QBOG	—	—	—	—	—	—	20,319	—	20,332	—	20,332	20,147	—
AAB6392	10-01213	6.3000-6.8000	QAL	—	—	—	—	—	—	19,404	—	19,804	18,660	19,804	—	—
AAB6395	10-01213	19.2000-19.7000	QAL	—	—	—	—	—	—	19,404	—	19,804	18,660	19,804	—	—
AAB6404	10-01213	39.2000-39.7000	QBOG	—	—	—	—	—	—	19,404	—	19,804	18,660	19,804	—	—
AAB6403	10-01213	46.8000-47.3000	QBOG	—	—	—	—	—	—	19,404	—	19,804	18,660	19,804	—	—
AAB6363	10-01214	5.0000-6.0000	QAL	—	—	—	—	—	—	18,869	—	19,604	18,564	19,604	—	—
AAB6371	10-01214	25.9000-26.4000	QAL	—	—	—	—	—	—	18,869	—	19,604	18,564	19,604	—	—
AAB6376	10-01214	36.6000-37.1000	QBO	—	—	—	—	—	—	18,869	—	19,604	18,564	19,604	—	—
AAB6378	10-01214	49.4000-50.0000	QBOG	—	—	—	—	—	—	18,869	—	19,604	18,564	19,604	—	—
AAB6405	10-01215	7.9000-8.4000	QAL	—	—	—	—	—	—	19,409	—	19,805	18,668	19,805	—	—
AAB6409	10-01215	15.0000-15.9000	QAL	—	19,807	—	—	—	19,807	19,406	—	—	18,750	19,807	—	—
AAB6569	10-01215	21.7000-22.2000	QAL	—	19,574	—	—	—	19,574	19,571	—	—	—	19,574	—	—
AAB6580	10-01215	26.6000-27.1000	QAL	—	19,574	—	—	—	19,574	19,571	—	—	—	19,574	—	—
AAB6579	10-01215	46.1000-46.6000	QBOG	—	—	—	—	—	—	19,406	—	19,807	18,750	19,807	—	—
AAB6350	10-01217	5.0000-5.5000	QAL	—	—	—	—	—	—	18,853	—	19,106	18,556	—	—	—
AAB6353	10-01217	15.8000-16.3000	QAL	—	—	—	—	—	—	18,853	—	19,106	18,556	—	—	—
AAB6360	10-01217	37.5000-38.2000	QBO	—	—	—	—	—	—	18,853	—	19,106	18,556	—	—	—
AAB6362	10-01217	48.7000-49.4000	QBOG	—	—	—	—	—	—	18,853	—	19,106	18,556	—	—	—
AAB6379	10-01218	5.9000-6.4000	QAL	—	—	—	—	—	—	—	—	19,695	18,621	19,695	—	—
AAB6384	10-01218	21.5000-22.0000	QAL	—	—	—	—	—	—	—	—	19,695	18,621	19,695	—	—
AAB6390	10-01218	48.9000-49.4000	QBOG	—	—	—	—	—	—	—	—	19,695	18,621	19,695	—	—
AAB6604	10-01223	16.0000-16.5000	QAL	—	19,892	—	—	—	19,892	19,445	—	—	19,107	19,892	19,107	—
AAB6610	10-01223	30.0000-30.5000	QAL	—	—	—	—	—	—	19,445	—	—	19,107	19,892	19,107	—

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB6612	10-01223	37.5000-38.0000	QBOG	—	—	—	—	—	—	19,445	—	19,892	19,107	19,892	19,107	—
AAB6614	10-01223	46.5000-47.0000	QBOG	—	—	—	—	—	—	19,445	—	19,892	19,107	19,892	19,107	—
AAB9257	10-01225	16.4000-16.9000	QAL	—	—	—	—	—	—	19,821	—	19,878	19,316	19,878	19,316	—
AAB9260	10-01225	26.2000-26.9000	QAL	—	—	—	—	—	—	19,821	—	19,878	19,316	19,878	19,316	—
AAB9265	10-01225	41.2000-42.1000	QBOG	—	—	—	—	—	—	19,821	—	19,878	19,316	19,878	19,316	—
AAB9267	10-01225	48.5000-49.3000	QBOG	—	—	—	—	—	—	19,821	—	19,878	19,316	19,878	19,316	—
AAB3046	10-01226	3.7000-4.7000	QAL	—	—	—	—	—	—	18,432	—	19,101	18,278	19,101	—	—
AAB3057	10-01226	32.5000-33.0000	QBO	—	—	—	—	—	—	18,432	—	19,101	18,278	19,101	—	—
AAB3059	10-01226	43.9000-44.3000	QBOG	—	—	—	—	—	—	18,432	—	19,101	18,278	19,101	—	—
AAB3060	10-01226	49.1000-49.8000	QBOG	—	—	—	—	—	—	18,432	—	19,101	18,278	19,101	—	—
AAB6423	10-01227	3.1000-3.7000	QAL	—	—	—	18,398	—	—	18,584	—	—	18,397	18,731	—	—
AAB6428	10-01227	29.1000-29.6000	QBO	—	—	—	18,398	—	—	18,584	—	18,731	18,397	18,731	—	—
AAB6433	10-01227	44.5000-45.0000	QBOG	—	—	—	18,398	—	—	18,584	—	—	18,397	18,731	—	—
AAB6432	10-01227	49.1000-49.9000	QBOG	—	—	—	18,398	—	—	18,584	—	—	18,397	18,731	—	—
AAB3062	10-01228	3.5000-4.2000	QAL	—	—	—	18,307	—	—	18,430	—	18,725	—	18,725	—	—
AAB3073	10-01228	21.4000-21.8000	QAL	—	—	—	—	—	—	18,501	—	18,727	18,272	18,727	—	—
AAB3069	10-01228	32.1000-32.5000	QBO	—	—	—	—	—	—	18,501	—	18,727	18,272	18,727	—	—
AAB3072	10-01228	49.0000-49.8000	QBOG	—	—	—	—	—	—	18,501	—	18,727	18,272	18,727	—	—
AAB3087	10-01229	3.0000-3.5000	QAL	—	—	—	—	—	—	18,862	—	19,104	18,362	19,104	—	—
AAB6414	10-01229	28.0000-28.2000	QBO	—	—	—	—	—	—	18,862	—	19,104	18,362	19,104	—	—
AAB6421	10-01229	35.0000-35.8000	QBOG	—	—	—	—	—	—	18,584	—	—	18,397	18,731	—	—
AAB6420	10-01229	47.5000-47.8000	QBOG	—	—	—	—	—	—	18,862	—	19,104	18,362	19,104	—	—
AAB6434	10-01230	4.0000-4.5000	QAL	—	—	—	—	—	—	18,584	—	18,731	18,397	18,731	—	—
AAB6439	10-01230	29.0000-29.6000	QBO	—	—	—	—	—	—	18,584	—	18,731	18,397	18,731	—	—
AAB6446	10-01230	46.6000-49.5500	QBOG	—	—	—	—	—	—	18,584	—	18,731	18,397	18,731	—	—
AAB6444	10-01230	48.5000-49.5000	QBOG	—	—	—	—	—	—	18,584	—	18,731	18,397	18,731	—	—
AAB6461	10-01231	4.0000-4.5000	QAL	—	—	—	—	—	—	18,585	—	18,743	18,487	18,743	—	—
AAB6465	10-01231	11.1000-11.8000	QAL	—	—	—	—	—	—	18,585	—	18,743	18,487	18,743	—	—
AAB6472	10-01231	32.0000-32.8000	QBO	—	—	—	—	—	—	18,585	—	18,743	18,487	18,743	—	—
AAB6471	10-01231	48.4000-49.3000	QBOG	—	—	—	—	—	—	18,585	—	18,743	18,487	18,743	—	—
AAB3074	10-01232	4.1000-4.6000	QAL	—	—	—	18,388	—	—	18,583	—	18,729	—	18,729	—	—
AAB3080	10-01232	21.5000-21.9000	QAL	—	—	—	18,388	—	—	18,583	—	18,729	—	18,729	—	—
AAB3085	10-01232	41.8000-42.3000	QBOG	—	—	—	18,388	—	—	18,583	—	18,729	—	18,729	—	—
AAB3086	10-01232	49.4000-50.0000	QBOG	—	—	—	18,388	—	—	18,583	—	18,729	—	18,729	—	—
AAB6447	10-01233	3.7000-4.3000	QAL	—	—	—	—	—	—	—	—	18,742	18,485	18,742	—	—

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB6454	10-01233	28.6000-29.5000	QBO	—	—	—	—	—	—	18,871	—	19,102	18,484	19,102	—	—
AAB6460	10-01233	40.0000-40.8000	QBOG	—	—	—	—	—	—	18,871	—	19,102	18,484	19,102	—	—
AAB6459	10-01233	48.7000-49.5000	QBOG	—	—	—	—	—	—	18,871	—	19,102	18,484	19,102	—	—
AAB6473	10-01234	3.7000-4.3000	QAL	—	—	—	—	—	—	18,853	—	19,106	18,556	—	—	—
AAB6478	10-01234	23.4000-23.9000	QAL	—	—	—	—	—	—	18,853	—	19,106	18,556	—	—	—
AAB6484	10-01234	30.0000-30.8000	QBOG	—	—	—	—	—	—	18,853	—	19,106	18,556	—	—	—
AAB6483	10-01234	48.2000-49.1000	QBOG	—	—	—	—	—	—	18,853	—	19,106	18,556	—	—	—
AAB6485	10-01235	3.5000-4.5000	QAL	—	—	—	—	—	—	18,853	—	19,106	18,556	—	—	—
AAB6492	10-01235	33.1000-34.4000	QBO	—	—	—	—	—	—	18,853	—	19,106	18,556	—	—	—
AAB6500	10-01235	43.6000-44.1000	QBOG	—	—	—	—	—	—	18,853	—	19,106	18,556	—	—	—
AAB6498	10-01235	48.9000-49.4000	QBOG	—	—	—	—	—	—	18,853	—	19,106	18,556	—	—	—
AAB6126	10-01236	2.8000-3.4000	SOIL	—	—	—	—	—	—	18,544	—	18,709	—	18,709	—	—
AAB6151	10-01236	30.0000-31.2000	QBO	—	—	—	—	—	—	18,544	—	18,709	—	18,709	—	—
AAB6155	10-01236	49.4000-50.0000	QBOG	—	—	—	—	—	—	—	—	18,709	—	18,709	—	—
AAB6157	10-01237	2.5000-3.1000	QAL	—	—	—	—	—	—	18,544	—	18,709	—	18,709	—	—
AAB6162	10-01237	23.5000-24.1000	QBO	—	—	—	—	—	—	18,544	—	18,709	—	18,709	—	—
AAB6166	10-01237	41.6000-42.2000	QBOG	—	—	—	—	—	—	18,544	—	18,709	—	18,709	—	—
AAB6168	10-01237	49.4000-50.0000	QBOG	—	—	—	—	—	—	18,544	—	18,709	—	18,709	—	—
AAB6198	10-01238	4.4000-5.0000	QAL	—	—	—	—	—	—	18,849, 18,898	—	—	18,100	—	—	—
AAB6205	10-01238	23.1000-23.7000	QAL	—	—	—	—	—	—	18,849, 18,898	—	—	18,100	—	—	—
AAB6211	10-01238	38.8000-39.4000	QBOG	—	—	—	—	—	—	18,849, 18,898	—	—	18,100	—	—	—
AAB6214	10-01238	49.4000-50.0000	QBOG	—	—	—	—	—	—	18,849, 18,898	—	—	18,100	—	—	—
AAB6181	10-01239	0.0000-0.6000	SOIL	—	—	—	—	—	—	19,784	—	19,764	17,994	19,764	—	—
AAB6169	10-01239	2.5000-3.1000	QAL	—	—	—	—	—	—	19,784	—	19,764	17,994	19,764	—	—
AAB6180	10-01239	49.4000-50.0000	QBOG	—	—	—	—	—	—	19,784	—	19,764	17,994	19,764	—	—
AAB6182	10-01240	3.1000-3.7000	QAL	—	—	—	—	—	—	18,849, 18,898	—	—	18,100	—	—	—
AAB6186	10-01240	19.0000-19.6000	QAL	—	—	—	—	—	—	18,849, 18,898	—	—	18,100	—	—	—
AAB6193	10-01240	36.6000-37.6000	QBOG	—	—	—	—	—	—	18,849, 18,898	—	—	18,100	—	—	—
AAB6197	10-01240	49.4000-50.0000	QBOG	—	—	—	—	—	—	18,849, 18,898	—	—	18,100	—	—	—
AAB2991	10-01241	3.5000-4.0000	QAL	—	—	—	—	—	—	18,852, 18,932	—	18,932	18,149	—	—	—
AAB3002	10-01241	22.0000-22.3000	QAL	—	—	—	—	—	—	18,852, 18,932	—	18,932	18,149	—	—	—
AAB3003	10-01241	33.9000-34.3000	QBO	—	—	—	—	—	—	18,852, 18,932	—	18,932	18,149	—	—	—
AAB3001	10-01241	49.1000-49.6000	QBOG	—	—	—	—	—	—	18,852, 18,932	—	18,932	18,149	—	—	—
AAB3019	10-01242	4.1000-4.7000	QAL	—	—	—	—	—	—	18,863	—	18,716	—	18,716	—	—
AAB3032	10-01242	6.2000-6.8000	QAL	—	—	—	—	—	—	18,863	—	18,716	—	18,716	—	—

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB3033	10-01242	30.3000-30.9000	QBO	—	—	—	—	—	—	18,863	—	18,716	—	18,716	—	—
AAB3030	10-01242	46.5000-47.3000	QBOG	—	—	—	—	—	—	18,863	—	18,716	—	18,716	—	—
AAB3034	10-01243	4.1000-4.6000	QAL	—	—	—	—	—	—	19,786	—	19,760	18,209	19,760	—	—
AAB3045	10-01243	25.9000-26.5000	QAL	—	—	—	—	—	—	19,786	—	19,760	18,209	19,760	—	—
AAB3042	10-01243	36.8000-37.3000	QBO	—	—	—	—	—	—	19,786	—	19,760	18,209	19,760	—	—
AAB3044	10-01243	48.7000-49.0000	QBOG	—	—	—	—	—	—	19,786	—	19,760	18,209	19,760	—	—
AAB3004	10-01244	4.3000-4.9000	QAL	—	—	—	—	—	—	18,578	—	18,710	—	18,710	—	—
AAB3018	10-01244	12.5000-13.1000	QAL	—	—	—	—	—	—	18,581	—	18,713	18,189	18,713	—	—
AAB3017	10-01244	32.0000-32.5000	QAL	—	—	—	—	—	—	18,581	—	18,713	18,189	18,713	—	—
AAB3016	10-01244	49.1000-49.8000	QBOG	—	—	—	—	—	—	18,581	—	18,713	18,189	18,713	—	—
AAB2833	10-01245	2.2000-2.5000	QAL	—	—	—	—	—	—	20,307	—	20,315	—	20,315	—	—
AAB2844	10-01245	13.0000-13.6000	QAL	—	—	—	—	—	—	19,787	—	19,773	—	19,773	—	—
AAB2839	10-01245	28.0000-28.6000	QAL	—	—	—	—	—	—	19,787	—	19,773	—	19,773	—	—
AAB2843	10-01245	49.4000-50.0000	QBOG	—	—	—	—	—	—	19,787	—	19,773	—	19,773	—	—
AAB2885	10-01246	3.4000-4.1000	QAL	—	—	—	17,920	—	—	19,745	—	19,964	17,875	19,964	—	—
AAB6125	10-01246	9.4000-10.0000	QAL	—	—	—	17,918	—	—	18,994, 19,761	—	18,994	17,874	—	—	—
AAB6122	10-01246	41.7000-42.3000	QBO	—	—	—	17,920	—	—	19,745	—	20,438	17,875	20,438	—	—
AAB6124	10-01246	49.4000-50.0000	QBO	—	—	—	17,918	—	—	18,994, 19,761	—	18,994	17,874	—	—	—
AAB2861	10-01247	0.8000-1.4000	SOIL	—	—	—	—	—	—	19,783, 20,500	—	19,763	17,854	19,763	—	—
AAB2863	10-01247	10.9000-11.1000	QAL	—	—	—	—	—	—	19,783	—	—	—	—	—	—
AAB2883	10-01247	26.0000-27.0000	QAL	—	—	—	—	—	—	19,780	—	19,706	17,869	19,706	—	—
AAB2882	10-01247	49.4000-50.0000	QBO	—	—	—	—	—	—	19,780	—	19,706	17,869	19,706	—	—
AAB6129	10-01248	3.4000-4.0500	QAL	—	—	—	17,918	—	—	18,994, 19,761	—	18,994	17,874	—	—	—
AAB6143	10-01248	29.4000-30.0000	QAL	—	—	—	17,918	—	—	18,994, 19,761	—	18,994	17,874	—	—	—
AAB6139	10-01248	44.0000-44.6000	QBO	—	—	—	17,918	—	—	18,994, 19,761	—	18,994	17,874	—	—	—
AAB6141	10-01248	50.4000-51.0000	QBO	—	—	—	17,918	—	—	18,994, 19,761	—	18,994	17,874	—	—	—
AAB2845	10-01249	0.9000-1.5000	SOIL	—	—	—	—	—	—	18,990, 19,779	—	18,990	17,853	—	—	—
AAB2851	10-01249	25.4000-26.0000	QAL	—	—	—	—	—	—	18,990, 19,779	—	18,990	17,853	—	—	—
AAB2857	10-01249	46.8000-47.5000	QBO	—	—	—	—	—	—	18,990, 19,779	—	18,990	17,853	—	—	—
AAB2856	10-01249	49.4000-50.0000	QBO	—	—	—	—	—	—	18,990, 19,779	—	18,990	17,853	—	—	—
AAB6215	10-01250	3.3000-3.9000	QBOF	—	—	—	—	—	—	20,371	—	20,370	—	20,370	—	—
AAB6222	10-01250	25.5000-26.1000	QBOF	—	—	—	—	—	—	20,371	—	20,370	—	20,370	—	—
AAB6226	10-01250	40.7000-41.3000	QBOG	—	20,370	—	—	—	20,370	20,371	—	—	—	20,370	—	—
AAB6227	10-01250	49.4000-50.0000	QBOG	—	—	—	—	—	—	20,371	—	20,370	—	20,370	—	—
AAB6258	10-01251	3.1000-3.8000	QBOF	—	—	—	—	—	—	19,786	—	19,760	18,209	19,760	—	—

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB6264	10-01251	28.9000-29.5000	QBOF	—	—	—	—	—	—	19,786	—	19,760	18,209	19,760	—	—
AAB6268	10-01251	44.0000-44.6000	QBOG	—	—	—	—	—	—	19,786	—	19,760	18,209	19,760	—	—
AAB6270	10-01251	49.4000-50.0000	QBOG	—	—	—	—	—	—	19,786	—	19,760	18,209	19,760	—	—
AAB6228	10-01252	3.4000-4.0000	QBOF	—	—	—	—	—	—	18,852, 18,932	—	18,932	18,149	—	—	—
AAB6232	10-01252	15.4000-16.6000	QBOF	—	—	—	—	—	—	18,852, 18,932	—	18,932	18,149	—	—	—
AAB6241	10-01252	40.9000-41.5000	QBOG	—	—	—	—	—	—	18,852, 18,932	—	18,932	18,149	—	—	—
AAB6243	10-01252	49.4000-50.0000	QBOG	—	—	—	—	—	—	18,852, 18,932	—	18,932	18,149	—	—	—
AAB6244	10-01253	3.5000-4.1000	QBOF	—	—	—	—	—	—	18,581	—	18,713	18,189	18,713	—	—
AAB6251	10-01253	26.5000-27.1000	QBOF	—	—	—	—	—	—	18,581	—	18,713	18,189	18,713	—	—
AAB6257	10-01253	37.5000-38.1000	QBOG	—	—	—	—	—	—	18,581	—	18,713	18,189	18,713	—	—
AAB6256	10-01253	49.4000-50.0000	QBOG	—	—	—	—	—	—	18,581	—	18,713	18,189	18,713	—	—
AAB6271	10-01254	3.1000-4.3000	QBOF	—	—	—	—	—	—	19,786	—	19,760	18,209	19,760	—	—
AAB6281	10-01254	28.4000-29.3000	QBOF	—	—	—	—	—	—	19,786	—	19,760	18,209	19,760	—	—
AAB6289	10-01254	33.0000-33.6000	QBOF	—	—	—	—	—	—	19,786	—	19,760	18,209	19,760	—	—
AAB6288	10-01254	49.4000-50.0000	QBOG	—	—	—	—	—	—	19,786	—	19,760	18,209	19,760	—	—
AAB6501	10-01255	3.6000-4.2000	QBOF	—	—	—	—	—	—	—	—	19,695	18,621	19,695	—	—
AAB6511	10-01255	20.0000-20.4000	QBOF	—	—	—	—	—	—	—	—	19,695	18,621	19,695	—	—
AAB6507	10-01255	28.7000-29.3000	QBOF	—	—	—	—	—	—	—	—	19,695	18,621	19,695	—	—
AAB6510	10-01255	48.7000-49.4000	QBOF	—	—	—	—	—	—	—	—	19,695	18,621	19,695	—	—
AAB6565	10-01256	3.9000-4.6000	QBOF	—	—	—	—	—	—	19,402	—	19,809	18,768	19,809	—	—
AAB8647	10-01256	28.5000-29.0000	QBOF	—	—	—	—	—	—	19,402	—	19,809	18,768	19,809	—	—
AAB8652	10-01256	35.0000-35.8000	QBOF	—	—	—	—	—	—	19,402	—	19,809	18,768	19,809	—	—
AAB8651	10-01256	47.4000-48.1000	QBOF	—	—	—	—	—	—	19,402	—	19,809	18,768	19,809	—	—
AAB6537	10-01257	3.6000-4.2000	QBOF	—	—	—	—	—	—	19,400	—	19,808	18,712	19,808	—	—
AAB6551	10-01257	20.0000-20.8000	QBOF	—	—	—	—	—	—	19,400	—	19,808	18,712	19,808	—	—
AAB6546	10-01257	28.4000-29.1000	QBOF	—	—	—	—	—	—	19,400	—	19,808	18,712	19,808	—	—
AAB6550	10-01257	48.5000-49.4000	QBOF	—	—	—	—	—	—	19,400	—	19,808	18,712	19,808	—	—
AAB8653	10-01258	3.5000-4.1000	QBOF	—	—	—	—	—	—	19,397	—	19,811	18,793	19,811	—	—
AAB8666	10-01258	15.0000-15.8000	QBOF	—	—	—	—	—	—	19,397	—	19,811	18,793	19,811	—	—
AAB8661	10-01258	28.5000-29.1000	QBOF	—	—	—	—	—	—	19,397	—	19,811	18,793	19,811	—	—
AAB8665	10-01258	48.6000-49.4000	QBOF	—	—	—	—	—	—	19,397	—	19,811	18,793	19,811	—	—
AAB6512	10-01259	2.8000-3.7000	SOIL	—	—	—	—	—	—	—	—	19,695	18,621	19,695	—	—
AAB6525	10-01259	15.2000-16.0000	QBOF	—	—	—	—	—	—	19,404	—	19,804	18,660	19,804	—	—
AAB6517	10-01259	18.7000-19.1000	QBOF	—	—	—	—	—	—	—	—	—	—	—	18,697	—
AAB6520	10-01259	28.5000-29.2000	QBOF	—	—	—	—	—	—	19,404	—	19,804	18,660	19,804	—	—

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB6524	10-01259	48.6000-49.5000	QBOF	—	—	—	—	—	—	19,404	—	19,804	18,660	19,804	—	—
AAB6552	10-01261	2.8000-3.8000	SOIL	—	—	—	—	—	—	19,402	—	19,809	18,768	19,809	—	—
AAB6563	10-01261	15.0000-15.8000	QBOF	—	—	—	—	—	—	19,402	—	19,809	18,768	19,809	—	—
AAB6558	10-01261	25.6000-26.2000	QBOF	—	—	—	—	—	—	19,402	—	19,809	18,768	19,809	—	—
AAB6562	10-01261	48.4000-49.3000	QBOF	—	—	—	—	—	—	19,402	—	19,809	18,768	19,809	—	—
AAB8667	10-01262	1.8000-1.9000	SOIL	—	—	—	—	—	—	—	—	—	—	—	18,827	—
AAB8668	10-01262	2.7000-3.3000	SOIL	—	—	—	—	—	—	19,410	—	19,812	18,827	19,812	—	—
AAB8679	10-01262	15.0000-15.8000	QBOF	—	—	—	—	—	—	19,410	—	19,812	18,827	19,812	—	—
AAB8674	10-01262	29.5000-29.8000	QBOF	—	—	—	—	—	—	19,410	—	19,812	18,827	19,812	—	—
AAB8678	10-01262	47.3000-48.3000	QBOF	—	—	—	—	—	—	19,410	—	19,812	18,827	19,812	—	—
AAB6526	10-01263	3.1000-4.0000	QBOF	—	—	—	—	—	—	19,409	—	19,805	18,668	19,805	—	—
AAB6536	10-01263	16.0000-16.7000	QBOF	—	—	—	—	—	—	19,409	—	19,805	18,668	19,805	—	—
AAB6532	10-01263	28.9000-29.6000	QBOF	—	—	—	—	—	—	19,409	—	19,805	18,668	19,805	—	—
AAB6535	10-01263	41.5000-42.0000	QBOF	—	—	—	—	—	—	19,409	—	19,805	18,668	19,805	—	—
AAB2893	10-01264	3.5000-4.1000	QBOF	—	—	—	—	—	—	19,780	—	19,706	17,869	19,706	—	—
AAB2905	10-01264	9.0000-9.5000	QBOF	—	—	—	—	—	—	19,745	—	19,964	17,875	19,964	—	—
AAB2904	10-01264	36.5000-37.0000	QBOF	—	—	—	—	—	—	19,745	—	19,964	17,875	19,964	—	—
AAB2903	10-01264	48.2000-49.0000	QBOG	—	—	—	—	—	—	19,745	—	19,964	17,875	19,964	—	—
AAB2935	10-01265	3.0000-3.5000	SOIL	—	—	—	—	—	—	19,781	—	19,770	17,880	19,770	—	—
AAB2947	10-01265	28.6000-28.9000	QBOF	—	—	—	—	—	—	18,544	—	18,709	—	18,709	—	—
AAB2944	10-01265	36.5000-37.0000	QBOF	—	—	—	—	—	—	18,544	—	18,709	—	18,709	—	—
AAB2946	10-01265	48.5000-49.0000	QBOG	—	—	—	—	—	—	18,544	—	18,709	—	18,709	—	—
AAB2949	10-01266	3.0000-3.5000	SOIL	—	—	—	—	—	—	19,114	—	19,789	18,046	19,789	—	—
AAB2962	10-01266	16.2000-16.8000	QBOF	—	—	—	—	—	—	19,114	—	19,789	18,046	19,789	—	—
AAB2958	10-01266	40.2000-40.8000	QBOG	—	—	—	—	—	—	19,114	—	19,789	18,046	19,789	—	—
AAB2959	10-01266	49.3000-50.0000	QBOG	—	—	—	—	—	—	19,114	—	19,789	18,046	19,789	—	—
AAB2979	10-01268	4.1000-4.6000	QBOF	—	—	—	—	—	—	19,114	—	19,789	18,046	19,789	—	—
AAB2990	10-01268	20.0000-20.5000	QBOF	—	—	—	—	—	—	18,852, 18,932	—	18,932	18,149	—	—	—
AAB2988	10-01268	39.3000-39.8000	QBOF	—	—	—	—	—	—	18,852, 18,932	—	18,932	18,149	—	—	—
AAB2989	10-01268	49.0000-49.5000	QBOG	—	—	—	—	—	—	18,852, 18,932	—	18,932	18,149	—	—	—
AAB2906	10-01269	3.5000-4.0000	QBOF	—	—	—	—	—	—	18,994, 19,761	—	18,994	17,874	—	—	—
AAB2916	10-01269	14.0000-14.5000	QBOF	—	—	—	—	—	—	18,994, 19,761	—	18,994	17,874	—	—	—
AAB2917	10-01269	26.5000-27.0000	QBOF	—	—	—	—	—	—	18,994, 19,761	—	18,994	17,874	—	—	—
AAB2915	10-01269	47.5000-48.0000	QBOG	—	—	—	—	—	—	18,994, 19,761	—	18,994	17,874	—	—	—
AAB2963	10-01270	4.0000-4.8000	QBOF	—	—	—	—	—	—	18,849, 18,898	—	—	18,100	—	—	—

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB2978	10-01270	34.6000-34.8000	QBOF	—	—	—	—	—	—	18,849, 18,898	—	—	18,100	—	—	—
AAB2973	10-01270	40.6000-41.0000	QBOG	—	—	—	—	—	—	20,371	—	20,370	—	20,370	—	—
AAB2977	10-01270	45.5000-46.0000	QBOG	—	—	—	—	—	—	18,849, 18,898	—	—	18,100	—	—	—
AAB2920	10-01271	3.5000-4.0000	QBOF	—	—	—	—	—	—	19,782	—	19,771	17,877	19,771	—	—
AAB2928	10-01271	21.8000-22.3000	QBOF	—	19,771	—	—	—	—	19,782	—	—	17,877	19,771	—	—
AAB2934	10-01271	38.3000-39.0000	QBOF	—	—	—	—	—	—	19,781	—	19,770	17,880	19,770	—	—
AAB2933	10-01271	48.0000-48.6000	QBOG	—	—	—	—	—	—	19,781	—	19,770	17,880	19,770	—	—
AAB8685	10-01285	22.5000-23.5000	QBOF	—	—	—	—	—	—	19,431	—	19,814	18,917	19,814	—	—
AAB8680	10-01285	29.0000-29.5000	QBOF	—	—	—	—	—	—	19,431	—	19,814	18,917	19,814	—	—
AAB8722	10-01285	30.0000-30.7000	QBOF	—	—	—	—	—	—	19,430	—	19,815	18,993	19,815	—	—
AAB8719	10-01285	46.6000-47.2000	QBOF	—	—	—	—	—	—	19,430	—	19,815	18,993	19,815	—	—
AAB8691	10-01286	4.2000-4.6000	QBOF	—	—	—	—	—	—	19,430	—	19,815	18,993	19,815	—	—
AAB8728	10-01286	15.0000-15.4000	QBOF	—	—	—	—	—	—	19,430	—	19,815	18,993	19,815	—	—
AAB8697	10-01286	24.0000-24.4000	QBOF	—	—	—	—	—	—	19,430	—	19,815	18,993	19,815	—	—
AAB8727	10-01286	49.1000-49.6000	QBOF	—	—	—	—	—	—	19,430	—	19,815	18,993	19,815	—	—
AAB8715	10-01287	3.5000-4.1000	QBOF	—	—	—	—	—	—	19,428	—	19,890	19,042	19,890	19,042	—
AAB9210	10-01287	10.0000-10.8000	QBOF	—	—	—	—	—	—	19,428	—	19,890	19,042	19,890	19,042	—
AAB9204	10-01287	29.1000-30.0000	QBOF	—	—	—	—	—	—	19,428	—	19,890	19,042	19,890	19,042	—
AAB9209	10-01287	48.5000-49.1000	QBOF	—	—	—	—	—	—	19,428	—	19,890	19,042	19,890	19,042	—
AAB9429	10-01288	4.2000-5.0000	QBOF	—	—	—	—	—	—	19,810	—	19,887	19,249	19,887	19,249	—
AAB9433	10-01288	22.5000-23.5000	QBOF	—	—	—	—	—	—	19,810	—	19,887	19,249	19,887	19,249	—
AAB9438	10-01288	46.2000-47.0000	QBOF	—	—	—	—	—	—	—	—	19,880	19,260	19,880	19,260	—
AAB9439	10-01288	47.8000-48.5000	QBOF	—	—	—	—	—	—	—	—	19,880	19,260	19,880	19,260	—
AAB9224	10-01289	3.3000-4.1000	QBOF	—	—	—	—	—	—	19,445	—	19,892	19,107	19,892	19,107	—
AAB9227	10-01289	11.4000-12.1000	QBOF	—	19,892	—	—	—	19,892	19,445	—	—	19,107	19,892	19,107	—
AAB9231	10-01289	28.9000-29.3000	QBOF	—	—	—	—	—	—	19,445	—	—	19,107	19,892	19,107	—
AAB9234	10-01289	48.5000-49.4000	QBOF	—	—	—	—	—	—	19,445	—	—	19,107	19,892	19,107	—
AAB8701	10-01290	4.1000-4.5000	QBOF	—	—	—	—	—	—	19,429	—	19,884	18,995	19,884	—	—
AAB8714	10-01290	15.0000-15.4000	QBOF	—	—	—	—	—	—	19,428	—	19,890	19,042	19,890	—	—
AAB8709	10-01290	29.0000-29.4000	QBOF	—	—	—	—	—	—	19,429	—	19,884	18,995	19,884	—	—
AAB8712	10-01290	48.0000-48.5000	QBOF	—	—	—	—	—	—	19,428	—	19,890	19,042	19,890	—	—
AAB9211	10-01291	2.8000-3.7000	SOIL	—	—	—	—	—	—	19,445	—	19,892	19,107	19,892	19,107	—
AAB9223	10-01291	15.0000-15.8000	QBOF	—	—	—	—	—	—	19,445	—	19,892	19,107	19,892	19,107	—
AAB9216	10-01291	28.2000-29.0000	QBOF	—	—	—	—	—	—	19,445	—	19,892	19,107	19,892	19,107	—
AAB9222	10-01291	48.5000-49.5000	QBOF	—	—	—	—	—	—	19,445	—	19,892	19,107	19,892	19,107	—

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB9235	10-01293	2.5000-3.9000	SOIL	—	—	—	—	—	—	19,810	—	19,887	19,249	19,887	19,249	—
AAB9247	10-01293	10.0000-10.8000	QBOF	—	—	—	—	—	—	19,810	—	19,887	19,249	19,887	19,249	—
AAB9242	10-01293	28.7000-29.4000	QBOF	—	—	—	—	—	—	19,810	—	19,887	19,249	19,887	19,249	—
AAB9246	10-01293	48.6000-49.6000	QBOF	—	—	—	—	—	—	19,810	—	19,887	19,249	19,887	19,249	—
AAB9269	10-01294	15.0000-15.9000	QBOF	—	—	—	—	—	—	19,852	—	20,070	—	20,070	—	—
AAB9271	10-01294	26.5000-27.1000	QBOF	—	—	—	—	—	—	19,852	—	20,070	—	20,070	—	—
AAB9274	10-01294	36.6000-37.4000	QBOG	—	—	—	—	—	—	19,852	—	20,070	—	20,070	—	—
AAB9277	10-01294	48.7000-49.4000	QBOG	—	—	—	—	—	—	19,852	—	20,070	—	20,070	—	—
AAB6292	10-02210	6.0000-6.6000	SOIL	—	—	—	—	—	—	18,432	—	19,101	18,278	19,101	—	—
AAB6307	10-02210	11.9000-12.5000	QAL	—	18,323	—	—	—	18,323	18,320, 18,323	—	—	—	—	—	—
AAB6299	10-02210	18.0000-18.6000	QAL	—	18,323	—	—	—	18,323	18,320, 18,323	—	—	—	—	—	—
AAB6304	10-02210	40.0000-40.6000	QBO	—	—	—	18,307	—	—	18,430	—	18,725	—	18,725	—	—
AAB6306	10-02210	49.0000-49.8000	QBOG	—	—	—	18,307	—	—	18,430	—	18,725	—	18,725	—	—
AAB6338	10-02211	13.8000-14.3000	QAL	—	—	—	—	—	—	18,585	—	18,743	18,487	18,743	—	—
AAB6349	10-02211	16.3000-16.8000	QAL	—	—	—	—	—	—	18,585	—	18,743	18,487	18,743	—	—
AAB6343	10-02211	31.4000-31.9000	QAL	—	—	—	—	—	—	18,585	—	18,743	18,487	18,743	—	—
AAB6348	10-02211	49.5000-50.0000	QBOG	—	—	—	—	—	—	18,585	—	18,743	18,487	18,743	—	—
AAB6308	10-02212	3.6000-4.2000	QAL	—	—	—	—	—	—	18,583	—	18,729	—	18,729	—	—
AAB6313	10-02212	22.9000-23.5000	QAL	—	—	—	18,396	—	—	18,862	—	19,104	18,362	19,104	—	—
AAB6317	10-02212	37.2000-37.8000	QBOG	—	—	—	18,396	—	—	18,862	—	19,104	18,362	19,104	—	—
AAB6320	10-02212	49.4000-50.0000	QBOG	—	—	—	18,396	—	—	18,862	—	19,104	18,362	19,104	—	—
AAB6321	10-02216	7.5000-8.5000	QAL	—	—	—	18,451	—	—	18,867	—	—	18,443	18,741	—	—
AAB6336	10-02216	17.5000-18.2000	QAL	—	—	—	18,451	—	—	18,867	—	18,741	18,443	18,741	—	—
AAB6330	10-02216	27.5000-28.0000	QAL	—	—	—	18,451	—	—	18,867	—	—	18,443	18,741	—	—
AAB6335	10-02216	47.5000-47.9000	QBOG	—	—	—	18,451	—	—	18,867	—	18,741	18,443	18,741	—	—
AAB6581	10-02219	16.3000-16.8000	QAL	—	18,782	—	—	—	18,782	—	—	—	18,780	—	—	—
AAB6585	10-02219	20.3000-20.8000	QAL	—	18,782	—	—	—	18,782	—	—	—	18,780	—	—	—
AAB6587	10-02219	28.4000-28.9000	QAL	—	—	—	—	—	—	19,397	—	19,811	18,793	19,811	—	—
AAB6594	10-02219	46.9000-47.4000	QBOG	—	—	—	—	—	—	19,397	—	19,811	18,793	19,811	—	—
AAB6583	10-02220	14.0000-14.5000	QAL	—	—	—	—	—	—	19,013, 19,014	—	19,014	—	—	—	19,013, 21,943
AAB6584	10-02220	17.0000-17.5000	QAL	—	19,014	—	—	—	—	19,013, 19,014	—	—	—	—	—	19,013
AAB9428	10-02220	18.0000-18.6000	QAL	—	19,574	—	—	—	19,574	19,571	—	—	—	19,574	—	—
AAB6600	10-02220	37.0000-37.5000	QBO	—	—	—	—	—	—	19,429	—	19,884	18,995	19,884	—	—
AAB6603	10-02220	49.4000-50.0000	QBOG	—	—	—	—	—	—	19,445	—	—	19,107	19,892	—	—
AAB8642	10-02221	14.2000-15.0000	QAL	—	—	—	—	—	—	19,446	—	—	19,143	19,888	19,143	—

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB9422	10-02221	28.8000-29.5000	QAL	—	—	—	—	—	—	19,813	—	19,886	—	19,886	—	—
AAB9424	10-02221	35.3000-36.0000	QBOG	—	—	—	—	—	—	19,813	—	19,886	—	19,886	—	—
AAB9427	10-02221	49.2000-50.0000	QBOG	—	—	—	—	—	—	19,813	—	19,886	—	19,886	—	—
AAB9248	10-02222	15.7000-16.5000	QAL	—	—	—	—	—	—	—	—	19,880	19,260	19,880	19,260	—
AAB9251	10-02222	25.4000-26.1000	QAL	—	—	—	—	—	—	—	—	19,880	19,260	19,880	19,260	—
AAB9253	10-02222	40.6000-41.6000	QBOG	—	—	—	—	—	—	—	—	19,880	19,260	19,880	19,260	—
AAB9256	10-02222	48.1000-49.0000	QBOG	—	—	—	—	—	—	—	—	19,880	19,260	19,880	19,260	—
AAB6615	10-02224	14.3000-15.0000	QAL	—	—	—	—	—	—	19,446	—	—	19,143	19,888	19,143	—
AAB6617	10-02224	24.0000-25.0000	QAL	—	—	—	—	—	—	19,446	—	—	19,143	19,888	19,143	—
AAB6623	10-02224	37.5000-38.3000	QBOG	—	—	—	—	—	—	19,446	—	—	19,143	19,888	19,143	—
AAB8641	10-02224	49.2000-50.0000	QBOG	—	—	—	—	—	—	19,446	—	—	19,143	19,888	19,143	—
0110-96-0062	10-10040	0.0000-0.3300	SOIL	—	—	—	—	—	—	—	—	2787	—	—	—	—
0110-96-0066	10-10044	0.0000-0.3300	SOIL	—	—	—	—	—	—	—	—	2787	—	—	—	—
0110-96-0078	10-10057	0.0000-0.3300	SOIL	—	—	—	—	—	—	—	—	2840	—	—	—	—
0110-96-0097	10-10064	0.0000-0.3300	SOIL	—	—	—	—	—	—	—	—	2787	—	—	—	—
0110-96-0098	10-10065	0.0000-0.3300	SOIL	—	—	—	—	—	—	—	—	2787	—	—	—	—
0110-96-0125	10-10104	0.0000-0.3300	SOIL	—	—	—	—	—	—	—	—	2787	—	—	—	—
0110-96-0126	10-10105	0.0000-0.3300	SOIL	—	—	—	—	—	—	—	—	2840	—	—	—	—
0110-96-0144	10-10142	1.6700-2.1700	SOIL	—	—	—	—	—	—	—	—	2787	—	—	—	—
RE10-07-5492	10-601160	0.8000-2.8000	SOIL	—	—	—	07-970	—	—	07-972	07-972	07-972	07-970	—	07-971	07-972
RE10-07-5491	10-601160	42.0000-44.0000	QBOG	—	—	—	07-970	—	—	07-972	07-972	07-972	07-970	—	07-971	07-972
RE10-07-5490	10-601160	59.0000-60.8000	SOIL	—	—	—	07-970	—	—	07-972	07-972	07-972	07-970	—	07-971	07-972
RE10-07-5496	10-601161	43.0000-45.0000	QBOG	—	—	—	07-1016	—	—	07-1018	07-1018	07-1018	07-1016	—	07-1017	07-1018
RE10-07-5495	10-601161	58.2000-60.0000	SOIL	—	—	—	07-1016	—	—	07-1018	07-1018	07-1018	07-1016	—	07-1017	07-1018
RE10-07-5502	10-601162	0.0000-2.1000	SOIL	—	—	—	07-970	—	—	07-972	07-972	07-972	07-970	—	07-971	07-972
RE10-07-5501	10-601162	41.3000-43.3000	QBOG	—	—	—	07-970	—	—	07-972	07-972	07-972	07-970	—	07-971	07-972
RE10-07-5500	10-601162	59.0000-61.5000	SOIL	—	—	—	07-970	—	—	07-972	07-972	07-972	07-970	—	07-971	07-972
RE10-07-5506	10-601163	13.0000-14.8000	QAL	—	—	—	07-1016	—	—	07-1018	07-1018	07-1018	07-1016	—	07-1017	07-1018
RE10-07-5505	10-601163	49.5000-51.5000	QBOG	—	—	—	07-1016	—	—	07-1018	07-1018	07-1018	07-1016	—	07-1017	07-1018
RE10-07-5512	10-601164	14.0000-16.0000	QAL	—	—	—	07-1099	—	—	07-1099	07-1099	07-1099	07-1099	—	07-1099	07-1099
RE10-07-5513	10-601164	19.0000-21.0000	QAL	—	—	—	07-1016	—	—	07-1018	07-1018	07-1018	07-1016	—	07-1017	07-1018
RE10-07-5511	10-601164	39.0000-40.5000	QBOG	—	—	—	07-1016	—	—	07-1018	07-1018	07-1018	07-1016	—	07-1017	07-1018
RE10-07-5510	10-601164	52.0000-54.0000	QBOG	—	—	—	07-1016	—	—	07-1018	07-1018	07-1018	07-1016	—	07-1017	07-1018
RE10-07-5548	10-601165	4.7000-6.7000	SOIL	—	—	—	07-684	—	—	07-686	07-686	07-686	07-684	—	07-685	07-686
RE10-07-5547	10-601165	30.2000-32.2000	QAL	—	—	—	07-684	—	—	07-686	07-686	07-686	07-684	—	07-685	07-686

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
RE10-07-5552	10-601166	5.0000-7.0000	SOIL	—	—	—	07-684	—	—	07-686	07-686	07-686	07-684	—	07-685	07-686
RE10-07-5551	10-601166	29.5000-31.5000	QAL	—	—	—	07-684	—	—	07-686	07-686	07-686	07-684	—	07-685	07-686
RE10-07-5556	10-601167	20.2000-22.2000	QBO	—	—	—	07-684	—	—	07-686	07-686	07-686	07-684	—	07-685	07-686
RE10-07-5555	10-601167	34.5000-36.5000	QAL	—	—	—	07-684	—	—	07-686	07-686	07-686	07-684	—	07-685	07-686
RE10-07-5560	10-601168	21.0000-24.0000	QBO	—	—	—	07-684	—	—	07-686	07-686	07-686	07-684	—	07-685	07-686
RE10-07-5559	10-601168	30.0000-32.0000	QAL	—	—	—	07-684	—	—	07-686	07-686	07-686	07-684	—	07-685	07-686
RE10-07-5564	10-601169	10.0000-12.0000	SOIL	—	—	—	07-684	—	—	07-686	07-686	07-686	07-684	—	07-685	07-686
RE10-07-5563	10-601169	30.0000-32.0000	QAL	—	—	—	07-684	—	—	07-686	07-686	07-686	07-684	—	07-685	07-686
RE10-07-5568	10-601170	20.4000-22.4000	QAL	—	—	—	07-707	—	—	07-708	07-708	07-708	07-707	—	07-708	07-708
RE10-07-5567	10-601170	62.0000-64.0000	QBOG	—	—	—	07-707	—	—	07-708	07-708	07-708	07-707	—	07-708	07-708
RE10-07-5572	10-601171	42.0000-44.0000	QBO	—	—	—	07-707	—	—	07-708	07-708	07-708	07-707	—	07-708	07-708
RE10-07-5571	10-601171	62.0000-64.0000	QBOG	—	—	—	07-707	—	—	07-708	07-708	07-708	07-707	—	07-708	07-708
RE10-07-5576	10-601172	26.2000-28.2000	QBO	—	—	—	07-736	—	—	07-738	07-738	07-738	07-736	—	07-737	07-738
RE10-07-5575	10-601172	58.0000-60.0000	QBOG	—	—	—	07-736	—	—	07-738	07-738	07-738	07-736	—	07-737	07-738
RE10-07-5580	10-601173	19.8000-21.8000	QAL	—	—	—	07-736	—	—	07-738	07-738	07-738	07-736	—	07-737	07-738
RE10-07-5579	10-601173	61.5000-63.5000	QBOG	—	—	—	07-736	—	—	07-738	07-738	07-738	07-736	—	07-737	07-738
RE10-07-5584	10-601174	30.0000-31.7000	QBOG	—	—	—	07-756	—	—	07-757	07-757	07-757	07-756	—	07-757	07-757
RE10-07-5583	10-601174	61.0000-63.0000	QBOG	—	—	—	07-756	—	—	07-757	07-757	07-757	07-756	—	07-757	07-757
RE10-07-5588	10-601175	32.0000-34.0000	QBO	—	—	—	07-736	—	—	07-738	07-738	07-738	07-736	—	07-737	07-738
RE10-07-5587	10-601175	62.0000-64.0000	QBOG	—	—	—	07-736	—	—	07-738	07-738	07-738	07-736	—	07-737	07-738
RE10-07-5592	10-601176	27.1000-29.1000	QBO	—	—	—	07-736	—	—	07-738	07-738	07-738	07-736	—	07-737	07-738
RE10-07-5591	10-601176	58.0000-60.0000	QBOG	—	—	—	07-736	—	—	07-738	07-738	07-738	07-736	—	07-737	07-738
RE10-07-5596	10-601177	35.9000-37.9000	QBOG	—	—	—	07-635	—	—	07-636	07-636	07-636	07-635	—	07-636	07-636
RE10-07-5595	10-601177	61.5000-63.5000	SOIL	—	—	—	07-635	—	—	07-636	07-636	07-636	07-635	—	07-636	07-636
RE10-07-5600	10-601178	14.0000-16.0000	QAL	—	—	—	07-629	—	—	07-631	07-631	07-631	07-629	—	07-630	07-631
RE10-07-5599	10-601178	60.2000-62.2000	SOIL	—	—	—	07-629	—	—	07-631	07-631	07-631	07-629	—	07-630	07-631
RE10-07-5604	10-601179	37.0000-39.0000	QBOG	—	—	—	07-629	—	—	07-631	07-631	07-631	07-629	—	07-630	07-631
RE10-07-5603	10-601179	60.8000-62.8000	SOIL	—	—	—	07-629	—	—	07-631	07-631	07-631	07-629	—	07-630	07-631
RE10-07-5608	10-601180	33.0000-35.0000	QBOG	—	—	—	07-635	—	—	07-636	07-636	07-636	07-635	—	07-636	07-636
RE10-07-5607	10-601180	48.0000-50.0000	QBOG	—	—	—	07-635	—	—	07-636	07-636	07-636	07-635	—	07-636	07-636
RE10-07-5612	10-601181	14.5000-16.5000	QAL	—	—	—	07-684	—	—	07-686	07-686	07-686	07-684	—	07-685	07-686
RE10-07-5611	10-601181	30.0000-32.0000	QAL	—	—	—	07-684	—	—	07-686	07-686	07-686	07-684	—	07-685	07-686
RE10-07-5616	10-601182	33.0000-35.0000	QBOG	—	—	—	07-736	—	—	07-738	07-738	07-738	07-736	—	07-737	07-738
RE10-07-5615	10-601182	58.0000-60.0000	QBOG	—	—	—	07-736	—	—	07-738	07-738	07-738	07-736	—	07-737	07-738
RE10-07-5899	10-601239	19.9000-21.9000	QAL	—	—	—	07-931	—	—	07-933	07-933	07-933	07-931	—	07-932	07-933

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
RE10-07-5898	10-601239	30.2000-32.2000	QAL	—	—	—	07-931	—	—	07-933	07-933	07-933	07-931	—	07-932	07-933
RE10-07-5904	10-601240	37.0000-39.0000	QBOG	—	—	—	07-906	—	—	07-907	07-907	07-907	07-906	—	07-907	07-907
RE10-07-5903	10-601240	60.5000-62.5000	SOIL	—	—	—	07-906	—	—	07-907	07-907	07-907	07-906	—	07-907	07-907
RE10-07-5909	10-601241	15.8000-17.8000	QAL	—	—	—	07-1016	—	—	07-1018	07-1018	07-1018	07-1016	—	07-1017	07-1018
RE10-07-5908	10-601241	26.9000-28.9000	QAL	—	—	—	07-1016	—	—	07-1018	07-1018	07-1018	07-1016	—	07-1017	07-1018
RE10-07-5914	10-601242	1.0000-3.0000	SOIL	—	—	—	07-931	—	—	07-933	07-933	07-933	07-931	—	07-932	07-933
RE10-07-5913	10-601242	26.0000-28.0000	QAL	—	—	—	07-931	—	—	07-933	07-933	07-933	07-931	—	07-932	07-933
RE10-07-5919	10-601243	31.9000-33.9000	QAL	—	—	—	07-931	—	—	07-933	07-933	07-933	07-931	—	07-932	07-933
RE10-07-5918	10-601243	48.0000-56.0000	QBOG	—	—	—	07-931	—	—	07-933	07-933	07-933	07-931	—	07-932	07-933
RE10-07-5924	10-601244	32.5000-34.5000	QBOG	—	—	—	07-931	—	—	07-933	07-933	07-933	07-931	—	07-932	07-933
RE10-07-5923	10-601244	48.0000-50.0000	QBOG	—	—	—	07-931	—	—	07-933	07-933	07-933	07-931	—	07-932	07-933
RE10-07-5929	10-601245	6.0000-8.0000	QAL	—	—	—	07-890	—	—	07-892	07-892	07-892	07-890	—	07-891	07-892
RE10-07-5928	10-601245	25.0000-27.6000	QAL	—	—	—	07-890	—	—	07-892	07-892	07-892	07-890	—	07-891	07-892
RE10-07-5934	10-601246	16.3000-18.3000	QAL	—	—	—	07-897	—	—	07-899	07-899	07-899	07-897	—	—	07-899
RE10-07-5933	10-601246	26.6000-28.6000	QAL	—	—	—	07-897	—	—	07-899	07-899	07-899	07-897	—	07-898	07-899
RE10-07-5939	10-601247	13.7000-15.7000	QAL	—	—	—	07-890	—	—	07-892	07-892	07-892	07-890	—	07-891	07-892
RE10-07-5938	10-601247	28.7000-30.7000	QAL	—	—	—	07-890	—	—	07-892	07-892	07-892	07-890	—	07-891	07-892
RE10-07-5944	10-601248	19.8000-21.8000	QAL	—	—	—	07-872	—	—	07-874	07-874	07-874	07-872	—	07-873	07-874
RE10-07-5943	10-601248	42.0000-44.0000	QBOG	—	—	—	07-872	—	—	07-874	07-874	07-874	07-872	—	07-873	07-874
RE10-07-5949	10-601249	20.2000-22.2000	QAL	—	—	—	07-890	—	—	07-892	07-892	07-892	07-890	—	07-891	07-892
RE10-07-5948	10-601249	32.0000-34.0000	QBOG	—	—	—	07-890	—	—	07-892	07-892	07-892	07-890	—	07-891	07-892
RE10-07-5954	10-601250	27.0000-29.0000	QAL	—	—	—	07-872	—	—	07-874	07-874	07-874	07-872	—	07-873	07-874
RE10-07-5953	10-601250	42.0000-44.0000	QBOG	—	—	—	07-872	—	—	07-874	07-874	07-874	07-872	—	07-873	07-874
RE10-07-5959	10-601251	7.0000-9.0000	QAL	—	—	—	07-872	—	—	07-874	07-874	07-874	07-872	—	07-873	07-874
RE10-07-5958	10-601251	42.0000-44.0000	QBOG	—	—	—	07-872	—	—	07-874	07-874	07-874	07-872	—	07-873	07-874
RE10-07-5964	10-601252	33.0000-35.0000	QBOG	—	—	—	07-890	—	—	07-892	07-892	07-892	07-890	—	07-891	07-892
RE10-07-5963	10-601252	38.0000-40.0000	QBOG	—	—	—	07-890	—	—	07-892	07-892	07-892	07-890	—	07-891	07-892
RE10-07-5969	10-601253	27.0000-29.0000	QBO	—	—	—	07-890	—	—	07-892	07-892	07-892	07-890	—	07-891	07-892
RE10-07-5968	10-601253	30.4000-32.4000	QBOG	—	—	—	07-890	—	—	07-892	07-892	07-892	07-890	—	07-891	07-892
RE10-07-5974	10-601254	26.8000-28.8000	QAL	—	—	—	07-872	—	—	07-874	07-874	07-874	07-872	—	07-873	07-874
RE10-07-5973	10-601254	38.0000-40.0000	QBOG	—	—	—	07-872	—	—	07-874	07-874	07-874	07-872	—	07-873	07-874
RE10-07-5979	10-601255	7.6000-9.6000	SOIL	—	—	—	07-897	—	—	07-899	07-899	07-899	07-897	—	07-898	07-899
RE10-07-5978	10-601255	32.7000-34.7000	QAL	—	—	—	07-897	—	—	07-899	07-899	07-899	07-897	—	07-898	07-899
RE10-07-5984	10-601256	10.0000-12.0000	SOIL	—	—	—	07-872	—	—	07-874	07-874	07-874	07-872	—	07-873	07-874
RE10-07-5983	10-601256	36.7000-38.7000	QBOG	—	—	—	07-872	—	—	07-874	07-874	07-874	07-872	—	07-873	07-874

Table 6.2-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Gamma Spectroscopy	Gross AB	High Explosives	Isotopic Plutonium	Isotopic Uranium	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
RE10-07-5989	10-601257	21.3000-23.3000	QAL	—	—	—	07-897	—	—	07-899	07-899	07-899	07-897	—	07-898	07-899
RE10-07-5988	10-601257	31.0000-33.0000	QAL	—	—	—	07-897	—	—	07-899	07-899	07-899	07-897	—	07-898	07-899
RE10-07-6000	10-601259	13.0000-19.5000	QAL	—	—	—	07-1039	—	—	07-1041	07-1041	07-1041	07-1039	—	07-1041	07-1041
RE10-07-5999	10-601259	28.8000-30.8000	QAL	—	—	—	07-1039	—	—	07-1041	07-1041	07-1041	07-1039	—	07-1041	07-1041
RE10-07-5998	10-601259	51.0000-53.0000	QBOG	—	—	—	07-1039	—	—	07-1041	07-1041	07-1041	07-1039	—	07-1041	07-1041
RE10-08-9973	10-601319	1.5000-2.0000	SOIL	—	—	—	—	—	—	—	—	08-452	—	—	—	—
RE10-07-6291	10-601319	0.0000-0.2500	SOIL	07-1100	07-1100	07-1100	07-1100	—	07-1100	07-1100	07-1100	07-1100	07-1100	—	07-1100	07-1100
RE10-08-9965	10-603263	0.0000-1.0000	SOIL	08-452	08-452	08-452	08-452	—	08-452	08-452	08-452	08-452	08-452	—	08-452	08-452
RE10-08-9966	10-603263	1.5000-2.0000	SOIL	08-452	08-452	08-452	08-452	—	08-452	08-452	08-452	08-452	08-452	—	08-452	08-452
RE10-08-9967	10-603264	0.0000-1.0000	SOIL	08-452	08-452	08-452	08-452	—	08-452	08-452	08-452	08-452	08-452	—	08-452	08-452
RE10-08-9968	10-603264	1.5000-2.0000	SOIL	08-452	08-452	08-452	08-452	—	08-452	08-452	08-452	08-452	08-452	—	08-452	08-452
RE10-08-9969	10-603265	0.0000-1.0000	SOIL	08-452	08-452	08-452	08-452	—	08-452	08-452	08-452	08-452	08-452	—	08-452	08-452
RE10-08-9970	10-603265	1.5000-3.2000	SOIL	08-452	08-452	08-452	08-452	—	08-452	08-452	08-452	08-452	08-452	—	08-452	08-452

Note: Numbers in analyte columns are request numbers.

*— = Analysis not requested.

Table 6.2-2
Inorganic, Organic, and Radionuclide COPCs for Consolidated Unit 10-002(a)-99

COPCs	Media
Inorganics	
Aluminum	Tuff
Antimony	Soil, alluvium, tuff
Arsenic	Soil, alluvium, tuff
Barium	Tuff
Beryllium	Soil, alluvium, tuff
Cadmium	Soil, alluvium, tuff
Calcium[a]	Tuff
Chromium[b]	Soil, alluvium
Chromium	Tuff
Copper	Soil, alluvium, tuff
Cyanide (total)	Soil, alluvium, tuff
Iron[a]	Tuff
Lead	Soil, alluvium, tuff
Magnesium	Tuff
Manganese	Tuff
Mercury	Alluvium, tuff
Molybdenum	Soil, alluvium, tuff
Nickel	Tuff
Perchlorate	Soil, alluvium, tuff
Selenium	Soil, tuff
Silver	Alluvium, tuff
Thallium	Soil, alluvium, tuff
Uranium	Soil, alluvium, tuff
Vanadium	Tuff
Zinc	Alluvium, tuff
Organics	
Acenaphthene	Tuff
Acetone	Soil, alluvium, tuff
Benzene	Tuff
Benzoic acid	Tuff
Bis(2-ethylhexyl)phthalate	Alluvium, tuff
Bromobenzene	Tuff
Bromoform	Tuff
Butanone[2-]	Alluvium, tuff
Butylbenzene[sec-]	Alluvium
Butylbenzene[tert-]	Alluvium
Butylbenzylphthalate	Soil
Carbon tetrachloride	Alluvium
Chloroform	Alluvium

Table 6.2-2 (continued)

COPCs	Media
Chlorobenzene	Tuff
Chlorophenol[2-]	Tuff
Di-n-butylphthalate	Soil, alluvium, tuff
Dichlorobenzene[1,2-]	Alluvium
Dichlorobenzene[1,3-]	Alluvium, tuff
Dichloroethane[1,1-]	Alluvium
Dichloroethene[1,1-]	Tuff
Diethylphthalate	Alluvium, tuff
Dimethyl phthalate	Tuff
Isopropyltoluene[4-]	Alluvium
Methyl-2-pentanone[4-]	Alluvium
Methylene chloride	Alluvium, tuff
Naphthalene	Alluvium
Phenol	Alluvium
Tetrachloroethene	Alluvium
Toluene	Alluvium, tuff
Trichloro-1,2,2-trifluoroethane[1,1,2-]	Soil, alluvium
Trichloroethane[1,1,1-]	Soil, alluvium
Trichloroethene	Alluvium, tuff
Trimethylbenzene[1,2,4-]	Soil, alluvium
Trimethylbenzene[1,3,5-]	Alluvium, tuff
Xylene[1,3-]+xylene[1,4-]	Soil
Xylene (total)	Tuff
Radionuclides	
Cesium-137	Alluvium
Europium-152	Alluvium, tuff
Uranium-234	Tuff
Uranium-235	Tuff
Uranium-238	Alluvium, tuff
Strontium-90	Soil, alluvium, tuff

[a] Calcium and iron were eliminated as COPCs because they were detected infrequently and within range of background; in addition calcium is considered an essential nutrient (EPA 1989, 008021).

[b] Chromium was eliminated as a COPC because the maximum observed concentration was within the chemical-specific background range.

Table 6.2-3
Summary of Inorganic Chemicals above BVs in Alluvium, Soil and Tuff at Consolidated Unit 10-002(a)-99

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB9278	10-01200	16.1000–16.8000	QAL	—[b]	5 (J–)	—	—	—	0.6 (U)	—	—	—	NA[c]	—	—
AAB9281	10-01200	26.1000–26.8000	QAL	—	5.6 (UJ)	—	—	—	0.71 (U)	—	—	—	NA	—	—
AAB9283	10-01200	36.0000–37.0000	QBO	—	5.6 (UJ)	0.95 (J)	—	—	0.7 (U)	—	2.8 (U)	—	NA	—	—
AAB9286	10-01200	48.7000–49.6000	QBO	6070	6 (UJ)	2.5 (J)	48.8 (J–)	—	0.75 (U)	—	—	—	NA	—	—
AAB9347	10-01201	33.3000–33.7000	QBO	7220	4.3 (U)	—	43.1 (U)	—	1.2	—	3.7	—	NA	6880	—
AAB9350	10-01201	48.0000–48.5000	QBO	5600	3.8 (U)	—	53.4 (J)	—	1.1	—	—	—	NA	—	—
AAB9287	10-01202	15.8000–16.6000	QAL	—	4.8 (UJ)	—	—	—	0.6 (U)	—	—	—	NA	—	—
AAB9289	10-01202	25.4000–26.2000	QAL	—	5.5 (UJ)	8.9	—	2.1	0.68 (U)	—	—	—	NA	—	—
AAB9293	10-01202	36.0000–36.8000	QBO	—	5.9 (J)	—	—	—	0.74 (U)	—	5.2 (J)	—	NA	—	—
AAB9296	10-01202	48.7000–49.5000	QBO	4980 (J+)	6.1 (UJ)	1 (J)	52.1	—	0.76 (U)	—	8 (J)	—	NA	—	—
AAB9385	10-01203	13.6000–14.3000	QAL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9389	10-01203	27.5000–28.0000	QBO	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9390	10-01203	38.0000–39.5000	QBOG	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9394	10-01203	49.1000–50.0000	QBOG	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9309	10-01204	15.7000–16.4000	QAL	—	4.7 (U)	—	—	—	—	—	—	—	NA	—	—
AAB9313	10-01204	25.8000–26.4000	QBO	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9315	10-01204	35.5000–36.5000	QBO	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9310	10-01204	47.7000–49.3000	QBO	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9360	10-01205	10.0000–10.5000	QAL	—	4.1 (UJ)	—	—	—	3.3	—	26.2	61.8	NA	—	—
AAB9361	10-01205	14.3000–14.8000	QAL	—	—	—	—	—	1.1	—	—	—	NA	—	—
AAB9363	10-01205	19.5000–20.0000	QAL	—	3.8 (UJ)	—	—	—	1.3	—	—	—	NA	—	—
AAB9364	10-01205	20.0000–20.9000	QAL	—	—	—	—	—	0.81 (U)	—	—	—	NA	—	—
AAB9368	10-01205	39.0000–40.0000	QBO	22,100	4.1 (J)	—	124 (J–)	2.2 (J–)	2.7	—	4.9	4.8 (J)	NA	10,400	—
AAB9399	10-01205	49.3000–50.0000	QBO	9970	3.9 (U)	—	99.7 (J–)	1.5 (J–)	1.2	—	—	—	NA	—	—
AAB9297	10-01206	15.8000–16.8000	QAL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9301	10-01206	25.9000–26.8000	QBO	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9300	10-01206	35.7000–36.9000	QBOG	—	—	—	—	—	—	—	—	—	NA	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB9308	10-01206	48.4000–49.3000	QBOG	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9327	10-01207	10.8000–11.5000	QAL	—	—	—	—	—	0.41 (U)	—	—	—	NA	—	—
AAB9330	10-01207	25.5000–26.1000	QAL	—	—	—	—	—	0.41 (U)	—	—	—	NA	—	—
AAB9333	10-01207	35.9000–36.6000	QBO	8770 (J)	—	0.73 (U)	49.8	—	0.48 (U)	—	5.2	—	NA	4150	—
AAB9336	10-01207	48.3000–49.3000	QBOG	3790 (J)	—	0.77 (U)	39.3 (U)	—	0.51 (U)	—	2.7	—	NA	—	—
AAB9317	10-01208	15.6000–16.6000	QBOF	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9322	10-01208	26.0000–26.7000	QBOF	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9324	10-01208	35.7000–36.5000	QBOG	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9326	10-01208	49.0000–50.0000	QBOG	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9351	10-01209	14.0000–14.7000	QAL	—	3.5 (U)	—	—	—	0.73 (J)	—	—	—	NA	—	—
AAB9354	10-01209	29.0000–29.6000	QBO	4840	4.1 (U)	—	82	—	0.79 (J)	—	5	—	NA	6560	—
AAB9357	10-01209	37.5000–38.4000	QBO	4490	3.6 (U)	—	—	—	0.73 (J)	—	4.2	—	NA	9460	—
AAB9359	10-01209	48.4000–49.2000	QBOG	15,900	4.1 (U)	2.1 (U)	145	2.2	2.8	—	2.9	4.1 (J)	NA	4850	—
AAB6392	10-01213	6.3000–6.8000	QAL	—	9.6 (U)	—	—	—	0.77 (U)	—	—	—	NA	—	—
AAB6395	10-01213	19.2000–19.7000	QAL	—	10.4 (J)	—	—	—	0.76 (U)	—	—	—	NA	—	—
AAB6404	10-01213	39.2000–39.7000	QBOG	8600 (J)	18.6	—	113	1.5	0.93 (U)	—	—	—	NA	—	—
AAB6403	10-01213	46.8000–47.3000	QBOG	6530 (J)	11.7 (U)	—	64.1	—	0.94 (U)	—	—	—	NA	—	—
AAB6363	10-01214	5.0000–6.0000	QAL	—	7.24 (UJ)	—	—	—	0.51 (U)	—	—	—	NA	—	—
AAB6371	10-01214	25.9000–26.4000	QAL	—	7.82 (UJ)	—	—	—	0.77 (U)	—	—	—	NA	—	—
AAB6376	10-01214	36.6000–37.1000	QBO	14,300	8.68 (UJ)	0.86 (U)	152	2.5	0.62 (U)	—	10.6 (J)	4.3 (J)	NA	4360	14.8 (J–)
AAB6378	10-01214	49.4000–50.0000	QBOG	6660	8.46 (UJ)	0.84 (U)	76.6	—	0.6 (U)	—	—	—	NA	—	—
AAB6405	10-01215	7.9000–8.4000	QAL	—	9.7 (UJ)	—	—	—	0.78 (U)	—	—	—	NA	—	—
AAB6409	10-01215	15.0000–15.9000	QAL	—	22.8	—	—	—	0.92 (U)	—	—	—	NA	—	—
AAB6569	10-01215	21.7000–22.2000	QAL	—	5.1 (U)	—	—	—	0.42 (J)	—	—	—	NA	—	—
AAB6580	10-01215	26.6000–27.1000	QAL	—	4.9 (U)	—	—	—	0.55 (J)	—	—	—	NA	—	—
AAB6579	10-01215	46.1000–46.6000	QBOG	4180 (J)	12.3 (J)	—	55.1	—	0.94 (U)	—	5.8	5 (J)	NA	—	—
AAB6350	10-01217	5.0000–5.5000	QAL	—	7.29 (U)	—	—	—	—	—	—	—	NA	—	—
AAB6353	10-01217	15.8000–16.3000	QAL	—	7.39 (U)	—	—	—	—	—	—	—	NA	—	—
AAB6360	10-01217	37.5000–38.2000	QBO	—	7.92 (U)	0.79 (U)	28.4 (J)	—	0.43 (U)	—	—	—	NA	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB6362	10-01217	48.7000–49.4000	QBOG	—	8.87 (U)	0.88 (U)	—	—	0.48 (U)	—	—	—	NA	—	—
AAB6379	10-01218	5.9000–6.4000	QAL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB6384	10-01218	21.5000–22.0000	QAL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB6604	10-01223	16.0000–16.5000	QAL	—	5.5 (UJ)	—	—	—	11.7 (J)	—	—	229 (J)	NA	—	—
AAB6610	10-01223	30.0000–30.5000	QAL	—	5.6 (UJ)	—	—	—	0.56 (UJ)	—	—	—	NA	—	—
AAB6612	10-01223	37.5000–38.0000	QBOG	29,100 (J+)	6.6 (UJ)	1.3 (J)	176 (J)	2.2 (J)	0.66 (UJ)	2110 (J)	6.7 (J)	8.9 (J)	NA	11,200 (J)	18.5 (J–)
AAB6614	10-01223	46.5000–47.0000	QBOG	17,800 (J+)	6.9 (UJ)	0.87 (J)	170 (J)	2.8 (J)	0.69 (UJ)	—	—	6 (J)	NA	5780 (J)	—
AAB9257	10-01225	16.4000–16.9000	QAL	—	14.1 (J–)	—	—	—	0.83 (U)	—	—	—	NA	—	—
AAB9260	10-01225	26.2000–26.9000	QAL	—	21.8 (J–)	—	—	2.7	0.92 (U)	—	—	—	NA	—	—
AAB9265	10-01225	41.2000–42.1000	QBOG	—	11.8 (UJ)	—	36.9 (J)	—	0.95 (U)	—	4.3	4.4 (J)	NA	—	—
AAB9267	10-01225	48.5000–49.3000	QBOG	4260	14.9 (J–)	—	62.6	—	0.96 (U)	—	—	4.4 (J)	NA	—	—
AAB3046	10-01226	3.7000–4.7000	QAL	—	3.66 (U)	—	—	—	—	—	—	—	NA	—	—
AAB3057	10-01226	32.5000–33.0000	QBO	10,900	4.29 (U)	—	62.1	2.2	—	—	7.2	5.8	NA	6040	—
AAB3059	10-01226	43.9000–44.3000	QBOG	—	4.8 (U)	0.68 (J)	—	—	—	—	3.6	—	NA	—	—
AAB3060	10-01226	49.1000–49.8000	QBOG	—	5.34 (U)	0.67 (J)	—	—	—	—	2.7	—	NA	—	—
AAB6423	10-01227	3.1000–3.7000	QAL	—	7.66 (U)	—	—	—	0.41 (U)	—	—	—	NA	—	—
AAB6428	10-01227	29.1000–29.6000	QBO	7460	8.01 (U)	0.79 (U)	52.9	—	0.43 (U)	—	2.8	—	NA	4560	—
AAB6433	10-01227	44.5000–45.0000	QBOG	—	8.9 (U)	0.88 (U)	26.6 (J)	—	0.71 (J)	—	—	—	NA	—	—
AAB6432	10-01227	49.1000–49.9000	QBOG	—	8.8 (U)	0.87 (U)	—	—	0.47 (U)	—	—	—	NA	—	—
AAB3062	10-01228	3.5000–4.2000	QAL	—	3.73 (U)	—	—	—	—	—	—	—	NA	—	—
AAB3073	10-01228	21.4000–21.8000	QAL	—	5.3 (UJ)	—	—	2.3	0.87 (J)	—	—	—	NA	—	—
AAB3069	10-01228	32.1000–32.5000	QBO	12,900	4.9 (UJ)	0.91 (J)	80.5	2.5 (J)	0.48 (J)	2260	3.9	5.7 (J)	NA	6360 (J–)	—
AAB3072	10-01228	49.0000–49.8000	QBOG	—	5.8 (UJ)	—	—	—	1.1 (J)	—	—	—	NA	—	—
AAB3087	10-01229	3.0000–3.5000	QAL	—	7.23 (UJ)	—	—	—	—	—	—	—	NA	—	—
AAB6414	10-01229	28.0000–28.2000	QBO	—	8.19 (UJ)	0.81 (U)	29.6 (U)	—	0.44 (U)	—	—	—	NA	4090 (J)	—
AAB6421	10-01229	35.0000–35.8000	QBOG	—	8.17 (U)	0.81 (U)	—	—	0.44 (U)	—	—	—	NA	—	—
AAB6420	10-01229	47.5000–47.8000	QBOG	—	10.7 (UJ)	1.06 (U)	—	—	0.58 (U)	—	—	—	NA	—	—
AAB6434	10-01230	4.0000–4.5000	QAL	—	7.4 (U)	—	—	—	—	—	—	—	NA	—	—
AAB6439	10-01230	29.0000–29.6000	QBO	7560	8.15 (U)	0.81 (U)	62.5	1.7	0.44 (U)	—	—	—	NA	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB6446	10-01230	46.6000–49.5500	QBOG	—	9.76 (U)	0.97 (U)	—	—	0.69 (J)	—	—	—	NA	—	—
AAB6444	10-01230	48.5000–49.5000	QBOG	—	10.1 (U)	1 (U)	—	—	0.54 (U)	—	—	—	NA	—	—
AAB6461	10-01231	4.0000–4.5000	QAL	—	7.39 (UJ)	—	—	—	—	—	—	—	NA	—	—
AAB6465	10-01231	11.1000–11.8000	QAL	—	7.38 (UJ)	—	—	—	—	—	—	—	NA	—	—
AAB6472	10-01231	32.0000–32.8000	QBO	4180	7.46 (UJ)	0.74 (U)	46.6	—	—	—	4 (U)	4.1 (J)	NA	7870	—
AAB6471	10-01231	48.4000–49.3000	QBOG	—	9.51 (UJ)	0.94 (U)	33.6 (J)	—	0.51 (U)	—	—	—	NA	—	—
AAB3074	10-01232	4.1000–4.6000	QAL	—	7.39 (U)	—	—	—	—	—	—	—	NA	—	—
AAB3080	10-01232	21.5000–21.9000	QAL	—	8.01 (U)	—	—	2.2	0.43 (U)	—	—	—	NA	—	—
AAB3085	10-01232	41.8000–42.3000	QBOG	—	9.22 (U)	0.91 (U)	29.1 (J)	—	0.5 (U)	—	—	—	NA	—	—
AAB3086	10-01232	49.4000–50.0000	QBOG	—	9.73 (U)	0.96 (U)	—	—	0.52 (U)	—	—	—	NA	—	—
AAB6454	10-01233	28.6000–29.5000	QBO	—	7.91 (UJ)	0.79 (U)	—	—	0.43 (U)	—	—	—	NA	—	—
AAB6460	10-01233	40.0000–40.8000	QBOG	—	9.74 (UJ)	0.97 (U)	—	—	0.52 (U)	—	15.3 (J)	—	NA	—	—
AAB6459	10-01233	48.7000–49.5000	QBOG	—	8.96 (UJ)	0.89 (U)	—	—	0.48 (U)	—	—	—	NA	—	—
AAB6473	10-01234	3.7000–4.3000	QAL	—	7.46 (U)	—	—	—	—	—	—	—	NA	—	—
AAB6478	10-01234	23.4000–23.9000	QAL	—	8.16 (U)	—	—	—	0.44 (U)	—	—	—	NA	—	—
AAB6484	10-01234	30.0000–30.8000	QBOG	7190 (J)	7.98 (U)	0.79 (U)	65.8	—	0.43 (U)	—	—	—	NA	—	—
AAB6483	10-01234	48.2000–49.1000	QBOG	—	10.8 (U)	1.07 (U)	—	—	0.58 (U)	—	—	—	NA	—	—
AAB6485	10-01235	3.5000–4.5000	QAL	—	7.74 (U)	—	—	—	0.42 (U)	—	—	—	NA	—	—
AAB6492	10-01235	33.1000–34.4000	QBO	7700 (J)	8.44 (U)	0.84 (U)	65.3	1.8	0.45 (U)	—	—	—	NA	—	—
AAB6500	10-01235	43.6000–44.1000	QBOG	—	9.01 (U)	0.89 (U)	29 (J)	—	0.49 (U)	—	—	—	NA	—	—
AAB6498	10-01235	48.9000–49.4000	QBOG	4710 (J)	8.87 (U)	0.88 (U)	39.8 (J)	1.6	0.48 (U)	—	—	—	NA	—	—
AAB6126	10-01236	2.8000–3.4000	SOIL	—	7.8 (U)	—	—	—	0.84 (J)	—	—	—	NA	—	—
AAB6151	10-01236	30.0000–31.2000	QBO	—	7.7 (U)	0.76 (U)	34.3 (J)	—	0.68 (J)	—	—	—	NA	—	—
AAB6157	10-01237	2.5000–3.1000	QAL	—	7.46 (U)	—	—	—	—	—	—	—	NA	—	—
AAB6162	10-01237	23.5000–24.1000	QBO	5350	8.05 (U)	1.1 (J)	62.3	—	0.43 (U)	—	3.6	4.4 (J)	NA	4620	—
AAB6166	10-01237	41.6000–42.2000	QBOG	—	8.5 (U)	0.84 (U)	—	—	0.7 (J)	—	—	—	NA	—	—
AAB6168	10-01237	49.4000–50.0000	QBOG	—	8.72 (U)	0.86 (U)	—	—	0.47 (U)	—	—	—	NA	—	—
AAB6198	10-01238	4.4000–5.0000	QAL	—	5.35 (U)	—	—	—	0.59 (U)	—	—	—	NA	—	—
AAB6205	10-01238	23.1000–23.7000	QAL	—	5.89 (U)	—	—	—	0.65 (U)	—	—	—	NA	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB6211	10-01238	38.8000–39.4000	QBOG	—	5.54 (U)	—	—	—	0.61 (U)	—	—	—	NA	—	—
AAB6214	10-01238	49.4000–50.0000	QBOG	—	5.99 (U)	—	—	—	0.76 (J)	—	—	—	NA	—	—
AAB6181	10-01239	0.0000–0.6000	SOIL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB6169	10-01239	2.5000–3.1000	QAL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB6180	10-01239	49.4000–50.0000	QBOG	—	—	—	28.4 (UJ)	—	—	—	—	—	NA	—	—
AAB6182	10-01240	3.1000–3.7000	QAL	—	4.97 (U)	—	—	—	0.55 (U)	—	—	—	NA	—	—
AAB6186	10-01240	19.0000–19.6000	QAL	—	4.86 (U)	—	—	—	0.54 (U)	—	—	—	NA	—	—
AAB6193	10-01240	36.6000–37.6000	QBOG	—	5.58 (U)	—	—	—	0.62 (U)	—	—	—	NA	—	—
AAB6197	10-01240	49.4000–50.0000	QBOG	—	6.24 (U)	—	—	—	0.69 (U)	—	—	—	NA	—	—
AAB2991	10-01241	3.5000–4.0000	QAL	—	4.86 (UJ)	—	—	—	0.54 (U)	—	—	—	NA	—	—
AAB3002	10-01241	22.0000–22.3000	QAL	—	5.5 (UJ)	—	—	—	0.61 (U)	—	—	—	NA	—	—
AAB3003	10-01241	33.9000–34.3000	QBO	11,800	5.47 (UJ)	—	116	2.2	0.61 (U)	—	2.8	—	NA	4410	16.7 (J+)
AAB3001	10-01241	49.1000–49.6000	QBOG	—	5.6 (UJ)	—	45.3 (J)	—	0.62 (U)	—	—	—	NA	—	—
AAB3019	10-01242	4.1000–4.7000	QAL	—	7.23 (UJ)	—	—	—	—	—	—	—	NA	—	—
AAB3032	10-01242	6.2000–6.8000	QAL	—	7.22 (UJ)	—	—	—	—	—	20.6	—	NA	—	52.6
AAB3033	10-01242	30.3000–30.9000	QBO	27,000 (J)	9.11 (UJ)	1.1 (J)	348	4.1 (J)	0.49 (U)	3140	3.8	9.1	NA	8900	28.6
AAB3030	10-01242	46.5000–47.3000	QBOG	—	8.39 (UJ)	0.83 (U)	44.2 (J)	—	0.45 (U)	—	—	—	NA	—	—
AAB3034	10-01243	4.1000–4.6000	QAL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB3045	10-01243	25.9000–26.5000	QAL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB3042	10-01243	36.8000–37.3000	QBO	17,100	—	1 (J)	133	2.8	—	—	2.9	—	NA	6390	16.2
AAB3044	10-01243	48.7000–49.0000	QBOG	4130	—	—	60.2	—	—	—	—	—	NA	—	—
AAB3004	10-01244	4.3000–4.9000	QAL	—	7.35 (U)	—	—	—	—	—	—	—	NA	—	—
AAB3018	10-01244	12.5000–13.1000	QAL	—	6.1 (U)	—	—	—	0.52 (U)	—	—	—	NA	—	—
AAB3017	10-01244	32.0000–32.5000	QAL	—	7.05 (U)	—	—	2.8	1.2 (U)	—	—	—	NA	—	—
AAB3016	10-01244	49.1000–49.8000	QBOG	—	8.43 (U)	0.84 (U)	46.2 (J)	—	1 (U)	—	—	—	NA	—	—
AAB2833	10-01245	2.2000–2.5000	QAL	—	5.6 (UJ)	—	—	—	0.49 (J–)	—	—	—	NA	—	—
AAB2844	10-01245	13.0000–13.6000	QAL	—	3.1 (UJ)	—	—	—	—	—	—	—	NA	—	—
AAB2839	10-01245	28.0000–28.6000	QAL	—	3.4 (UJ)	—	—	—	0.43 (UJ)	—	—	—	NA	—	—
AAB2843	10-01245	49.4000–50.0000	QBOG	—	3.8 (UJ)	—	—	—	0.46 (UJ)	—	—	—	NA	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB2885	10-01246	3.4000–4.1000	QAL	—	3.3 (UJ)	—	—	—	0.79 (J)	—	—	—	NA	—	—
AAB6125	10-01246	9.4000–10.0000	QAL	—	3.2 (UJ)	—	—	—	0.69 (J–)	—	—	—	NA	—	—
AAB6122	10-01246	41.7000–42.3000	QBO	9850 (J–)	4 (UJ)	0.89 (J)	49.1 (J)	1.6 (J–)	0.97 (J)	—	8.8 (J–)	—	NA	5570 (J–)	—
AAB6124	10-01246	49.4000–50.0000	QBO	—	3.7 (UJ)	—	—	—	0.46 (UJ)	—	—	—	NA	—	—
AAB2861	10-01247	0.8000–1.4000	SOIL	—	3.4 (UJ)	—	—	—	0.83 (J–)	—	—	—	NA	—	—
AAB2863	10-01247	10.9000–11.1000	QAL	—	3.3 (UJ)	—	—	—	0.41 (UJ)	—	—	—	NA	—	—
AAB2883	10-01247	26.0000–27.0000	QAL	—	3.4 (UJ)	—	—	—	0.42 (UJ)	—	—	—	NA	—	—
AAB2882	10-01247	49.4000–50.0000	QBO	—	3.7 (UJ)	—	—	—	0.46 (UJ)	—	—	—	NA	—	—
AAB6129	10-01248	3.4000–4.0500	QAL	—	3.3 (UJ)	—	—	—	0.7 (J–)	—	—	—	NA	—	—
AAB6143	10-01248	29.4000–30.0000	QAL	—	3.4 (UJ)	—	—	—	0.42 (UJ)	—	—	—	NA	—	—
AAB6139	10-01248	44.0000–44.6000	QBO	10,700 (J–)	3.6 (UJ)	0.65 (J–)	53 (J–)	—	1 (J–)	—	3.3 (J–)	4.5 (J–)	NA	6430 (J–)	—
AAB6141	10-01248	50.4000–51.0000	QBO	—	3.8 (UJ)	—	—	—	0.47 (UJ)	—	—	—	NA	—	—
AAB2845	10-01249	0.9000–1.5000	SOIL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB2851	10-01249	25.4000–26.0000	QAL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB2857	10-01249	46.8000–47.5000	QBO	—	—	—	—	—	—	—	—	—	NA	—	—
AAB2856	10-01249	49.4000–50.0000	QBO	—	—	—	—	—	—	—	—	—	NA	—	—
AAB6215	10-01250	3.3000–3.9000	QBOF	—	0.54 (U)	1.2 (J–)	43.9 (J–)	—	—	—	—	—	NA	4550 (J–)	—
AAB6222	10-01250	25.5000–26.1000	QBOF	8050 (J–)	—	0.93 (J–)	61.2 (J–)	—	—	—	—	—	NA	4900 (J–)	—
AAB6226	10-01250	40.7000–41.3000	QBOG	4140 (J–)	0.59 (U)	—	40.7 (J–)	—	—	—	—	—	NA	—	—
AAB6227	10-01250	49.4000–50.0000	QBOG	4450 (J–)	0.76 (U)	—	31.8 (J–)	—	—	—	—	—	NA	—	—
AAB6258	10-01251	3.1000–3.8000	QBOF	—	—	0.59 (J)	26.1 (J)	—	—	—	—	—	NA	4070	—
AAB6264	10-01251	28.9000–29.5000	QBOF	12,700	—	0.78 (J)	83.7	—	—	—	3.4	5.5 (J)	NA	7360	—
AAB6268	10-01251	44.0000–44.6000	QBOG	12,700	—	0.82 (J)	94.6	2.4	—	—	—	—	NA	4190	—
AAB6270	10-01251	49.4000–50.0000	QBOG	11,000	—	—	46.5 (J)	2.5	—	—	—	—	NA	4570	—
AAB6228	10-01252	3.4000–4.0000	QBOF	3930	4.9 (UJ)	—	49.4	—	0.54 (U)	—	4.3	4 (J)	NA	5790	—
AAB6232	10-01252	15.4000–16.6000	QBOF	—	5.1 (J–)	—	—	—	0.53 (U)	—	—	—	NA	—	—
AAB6241	10-01252	40.9000–41.5000	QBOG	3940	7.3 (J–)	—	72.2	—	0.6 (U)	—	—	—	NA	—	—
AAB6243	10-01252	49.4000–50.0000	QBOG	—	7.3 (J–)	—	43.5 (J)	—	0.68 (U)	—	—	—	NA	—	—
AAB6244	10-01253	3.5000–4.1000	QBOF	—	7.31 (U)	0.72 (U)	55.7	—	0.48 (U)	3170	—	4.2 (J)	NA	4760 (J)	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB6251	10-01253	26.5000–27.1000	QBOF	12,900	8.21 (U)	0.81 (U)	71.6	1.5	0.61 (U)	—	3.3	4.9 (J)	NA	4980 (J)	—
AAB6257	10-01253	37.5000–38.1000	QBOG	—	7.9 (U)	0.78 (U)	44.3 (J)	—	2.3 (U)	—	—	—	NA	—	—
AAB6256	10-01253	49.4000–50.0000	QBOG	—	9.32 (U)	0.92 (U)	—	—	0.55 (U)	—	—	—	NA	—	—
AAB6271	10-01254	3.1000–4.3000	QBOF	4820	—	1.3 (J)	52.3	—	—	—	2.7	—	NA	6370	—
AAB6281	10-01254	28.4000–29.3000	QBOF	13500	—	1.6 (J)	82.8	2	—	—	4.9	5.7 (J)	NA	12,200	16
AAB6289	10-01254	33.0000–33.6000	QBOF	7690	—	—	51	1.7	—	—	3.1	—	NA	4430	—
AAB6288	10-01254	49.4000–50.0000	QBOG	3640	—	—	28.7 (J)	—	—	—	—	—	NA	—	—
AAB6501	10-01255	3.6000–4.2000	QBOF	—	—	—	—	—	—	—	—	—	NA	—	—
AAB6511	10-01255	20.0000–20.4000	QBOF	—	—	—	—	—	—	—	—	—	NA	—	—
AAB6507	10-01255	28.7000–29.3000	QBOF	—	—	—	—	—	—	—	—	—	NA	—	—
AAB6510	10-01255	48.7000–49.4000	QBOF	—	—	—	—	—	—	—	—	—	NA	—	—
AAB6565	10-01256	3.9000–4.6000	QBOF	4370 (J–)	10.3 (UJ)	1.1 (J)	38.1 (J)	—	0.82 (U)	—	—	—	NA	6070	—
AAB8647	10-01256	28.5000–29.0000	QBOF	—	10.1 (UJ)	0.94 (J)	47.9	—	0.81 (U)	—	—	4.3 (J)	NA	5050	—
AAB8652	10-01256	35.0000–35.8000	QBOF	—	10.2 (UJ)	—	30.2 (J)	—	0.82 (U)	—	—	—	NA	—	—
AAB8651	10-01256	47.4000–48.1000	QBOF	—	11.9 (J–)	—	—	—	0.86 (U)	—	3.1	—	NA	—	—
AAB6537	10-01257	3.6000–4.2000	QBOF	4430	4.5 (UJ)	0.88 (J)	31.1 (J)	—	—	—	5.1	—	NA	4780 (J–)	—
AAB6551	10-01257	20.0000–20.8000	QBOF	—	4.5 (UJ)	0.58 (U)	44.5	—	—	—	2.9	—	NA	—	—
AAB6546	10-01257	28.4000–29.1000	QBOF	3880 (J)	4.5 (UJ)	0.58 (U)	45.7	—	—	—	3.4	—	NA	—	—
AAB6550	10-01257	48.5000–49.4000	QBOF	—	4.8 (UJ)	0.62 (U)	—	—	—	—	2.7	—	NA	—	—
AAB8653	10-01258	3.5000–4.1000	QBOF	7340 (J)	4.5 (UJ)	0.96 (J)	80.7 (J)	1.5 (J)	—	—	4.9 (J)	4.2 (J)	NA	6960 (J–)	—
AAB8666	10-01258	15.0000–15.8000	QBOF	4760 (J)	4.3 (UJ)	—	62.3 (J)	—	—	—	4.1 (J)	—	NA	5130 (J–)	—
AAB8661	10-01258	28.5000–29.1000	QBOF	4010 (J)	4.4 (UJ)	0.57 (UJ)	50.1 (J)	—	—	—	3.2 (J)	—	NA	3740 (J–)	—
AAB8665	10-01258	48.6000–49.4000	QBOF	—	4.8 (UJ)	0.61 (UJ)	—	—	—	—	—	—	NA	—	—
AAB6512	10-01259	2.8000–3.7000	SOIL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB6525	10-01259	15.2000–16.0000	QBOF	—	10.1 (U)	1.5 (J)	94.4	—	0.81 (U)	—	4	4.9 (J)	NA	5520	—
AAB6520	10-01259	28.5000–29.2000	QBOF	—	9.7 (U)	—	—	—	0.78 (U)	—	—	—	NA	—	—
AAB6524	10-01259	48.6000–49.5000	QBOF	—	14.9	—	26.6 (J)	—	0.84 (U)	—	—	—	NA	—	—
AAB6552	10-01261	2.8000–3.8000	SOIL	—	9.6 (UJ)	—	—	—	0.77	—	—	—	NA	—	—
AAB6563	10-01261	15.0000–15.8000	QBOF	—	9.9 (UJ)	1.3 (J)	57.5	—	0.79 (U)	—	3.3	4.7 (J)	NA	6050	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB6558	10-01261	25.6000–26.2000	QBOF	—	10 (UJ)	—	47.6	—	0.8 (U)	—	—	—	NA	—	—
AAB6562	10-01261	48.4000–49.3000	QBOF	—	10.4 (UJ)	—	—	—	0.84 (U)	—	—	—	NA	—	—
AAB8668	10-01262	2.7000–3.3000	SOIL	—	12.2 (J)	—	—	—	0.79 (U)	—	—	—	NA	—	—
AAB8679	10-01262	15.0000–15.8000	QBOF	3840 (J–)	18.8	1.3 (J)	90.5	—	0.91 (U)	—	4.1	10.1	NA	6880	—
AAB8674	10-01262	29.5000–29.8000	QBOF	—	11.3 (U)	1.2 (J)	53.9	—	0.9 (U)	—	—	4.8 (J)	NA	5400	—
AAB8678	10-01262	47.3000–48.3000	QBOF	—	11.5 (U)	—	—	—	0.92 (U)	—	3.2	—	NA	—	—
AAB6526	10-01263	3.1000–4.0000	QBOF	4540 (J–)	12.3 (J–)	1.7 (J)	52.8	—	0.8 (U)	—	3.5	—	NA	6490	—
AAB6536	10-01263	16.0000–16.7000	QBOF	—	10.2 (UJ)	1.1 (J)	70.7	—	0.82 (U)	—	—	4.1 (J)	NA	4050	—
AAB6532	10-01263	28.9000–29.6000	QBOF	—	9.8 (UJ)	—	40.1 (J)	—	0.79 (U)	—	—	—	NA	3850	—
AAB6535	10-01263	41.5000–42.0000	QBOF	—	10.4 (UJ)	—	—	—	0.84 (U)	—	—	—	NA	—	—
AAB2893	10-01264	3.5000–4.1000	QBOF	3940 (J–)	3.1 (UJ)	0.63 (J–)	40.1 (J–)	—	0.54 (J–)	—	—	—	NA	5340 (J)	—
AAB2905	10-01264	9.0000–9.5000	QBOF	4410 (J–)	3.2 (UJ)	1.3 (J)	48.7 (J–)	—	—	—	2.8 (J–)	—	NA	5650 (J–)	—
AAB2904	10-01264	36.5000–37.0000	QBOF	6710 (J–)	3.4 (UJ)	—	50.9 (J–)	1.5 (J–)	0.67 (J)	—	2.7 (J–)	4.6 (U)	NA	4220 (J–)	—
AAB2903	10-01264	48.2000–49.0000	QBOG	—	3.6 (J)	—	39.4 (J)	—	0.44 (UJ)	—	—	4.6 (U)	NA	—	—
AAB2935	10-01265	3.0000–3.5000	SOIL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB2947	10-01265	28.6000–28.9000	QBOF	5110	7.94 (U)	0.79 (U)	56.5	—	0.43 (U)	1940	3.2	4.2 (J)	NA	4790	—
AAB2944	10-01265	36.5000–37.0000	QBOF	5890	7.87 (U)	0.78 (U)	118	—	0.94 (J)	—	—	—	NA	—	—
AAB2946	10-01265	48.5000–49.0000	QBOG	—	8.52 (U)	0.84 (U)	35.1 (J)	—	0.58 (J)	—	—	—	NA	—	—
AAB2949	10-01266	3.0000–3.5000	SOIL	—	4.6 (UJ)	9.8 (J+)	—	—	0.51 (U)	—	—	—	NA	—	—
AAB2962	10-01266	16.2000–16.8000	QBOF	9230 (J+)	4.7 (UJ)	9.6 (J+)	56.2	—	0.52 (U)	—	4.4	—	NA	8160 (J)	—
AAB2958	10-01266	40.2000–40.8000	QBOG	—	4.9 (UJ)	2.7 (U)	—	—	0.55 (U)	—	—	—	NA	—	—
AAB2959	10-01266	49.3000–50.0000	QBOG	—	5.4 (UJ)	3 (U)	43.9 (J)	—	0.6 (U)	—	—	—	NA	—	—
AAB2979	10-01268	4.1000–4.6000	QBOF	7140 (J+)	4.7 (UJ)	11.5 (J+)	59.9	—	0.52 (U)	—	4.4	4.6 (J)	NA	7950 (J)	—
AAB2990	10-01268	20.0000–20.5000	QBOF	7700	5.6 (J–)	0.7 (J)	79.4	—	0.59 (U)	2350	6.7	6.6	NA	7800	—
AAB2988	10-01268	39.3000–39.8000	QBOF	9150	5.11 (UJ)	—	121	1.5	0.56 (U)	—	—	—	NA	—	—
AAB2989	10-01268	49.0000–49.5000	QBOG	—	6 (J–)	—	54.7	—	0.57 (U)	—	3	—	NA	—	—
AAB2906	10-01269	3.5000–4.0000	QBOF	5170 (J–)	3.2 (UJ)	—	51.7 (J–)	—	0.61 (J–)	—	3.5 (J–)	—	NA	6190 (J–)	—
AAB2916	10-01269	14.0000–14.5000	QBOF	10900 (J–)	3.8 (UJ)	1.4 (J–)	113 (J–)	—	1.1 (J–)	5380 (J–)	5.9 (J–)	5.1 (J–)	NA	8850 (J–)	—
AAB2917	10-01269	26.5000–27.0000	QBOF	10700 (J–)	3.4 (UJ)	2.2 (J–)	66.7 (J–)	1.9 (J–)	1.2 (J–)	1920 (J–)	7.1 (J–)	6.2 (J–)	NA	12,500 (J–)	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB2915	10-01269	47.5000–48.0000	QBOG	—	3.9 (UJ)	—	29.7 (J–)	—	0.48 (UJ)	—	—	—	NA	—	—
AAB2963	10-01270	4.0000–4.8000	QBOF	—	4.86 (U)	1.1 (J)	49.6	—	0.54 (U)	—	—	—	NA	3730 (J)	—
AAB2978	10-01270	34.6000–34.8000	QBOF	7310	5.26 (U)	1 (J)	59.5	1.7	0.58 (U)	—	3.3	4 (J)	NA	4580 (J)	13.9
AAB2973	10-01270	40.6000–41.0000	QBOG	—	—	—	—	—	—	—	—	—	NA	—	—
AAB2977	10-01270	45.5000–46.0000	QBOG	—	5.35 (U)	0.75 (J)	—	—	0.59 (U)	—	—	—	NA	—	—
AAB2920	10-01271	3.5000–4.0000	QBOF	4750 (J–)	—	1.9 (J–)	52.3 (J–)	—	—	—	2.8 (J–)	—	NA	5320 (J–)	—
AAB2928	10-01271	21.8000–22.3000	QBOF	4660	—	1.4 (J–)	65.1 (J–)	—	—	—	2.8 (J–)	—	NA	5320 (J–)	—
AAB2934	10-01271	38.3000–39.0000	QBOF	5930 (J–)	—	0.59 (J–)	36.3 (J–)	—	—	—	—	—	NA	—	—
AAB2933	10-01271	48.0000–48.6000	QBOG	—	—	—	—	—	—	—	—	—	NA	—	—
AAB8685	10-01285	22.5000–23.5000	QBOF	3980 (J+)	5.1 (U)	—	46	—	0.51 (U)	—	2.7	—	NA	4660	—
AAB8680	10-01285	29.0000–29.5000	QBOF	4170 (J+)	4.9 (U)	—	28.1	—	0.49 (U)	—	—	—	NA	5360	—
AAB8722	10-01285	30.0000–30.7000	QBOF	—	5.2 (U)	—	28.9	—	0.52 (U)	—	—	—	NA	—	—
AAB8719	10-01285	46.6000–47.2000	QBOF	—	5.4 (U)	—	—	—	0.54 (U)	—	—	—	NA	—	—
AAB8691	10-01286	4.2000–4.6000	QBOF	—	5 (U)	0.58 (J)	34.6	—	0.5 (U)	—	—	—	NA	4630	—
AAB8728	10-01286	15.0000–15.4000	QBOF	7560 (J+)	5.2 (U)	—	84.5	—	0.52 (U)	—	7.9	5.1	NA	8420	—
AAB8697	10-01286	24.0000–24.4000	QBOF	—	5.3 (U)	—	40.1	—	0.53 (U)	—	—	—	NA	—	—
AAB8727	10-01286	49.1000–49.6000	QBOF	—	5.6 (U)	—	—	—	0.56 (U)	—	—	—	NA	—	—
AAB8715	10-01287	3.5000–4.1000	QBOF	7590	5.1 (U)	—	44.1	—	0.51 (U)	—	4.2	4.3	NA	8780	—
AAB9210	10-01287	10.0000–10.8000	QBOF	4490	5 (U)	—	49.2	—	0.5 (U)	—	2.7	—	NA	7030	—
AAB9204	10-01287	29.1000–30.0000	QBOF	—	5.2 (U)	—	35.1	—	0.52 (U)	—	—	—	NA	—	—
AAB9209	10-01287	48.5000–49.1000	QBOF	—	5.5 (U)	—	—	—	0.55 (U)	—	—	—	NA	—	—
AAB9429	10-01288	4.2000–5.0000	QBOF	—	5.7 (U)	0.92 (J)	58.3	—	0.77 (U)	—	3.3	5.2	NA	6230	—
AAB9433	10-01288	22.5000–23.5000	QBOF	—	5.7 (U)	0.6 (J)	53.4	—	0.77 (U)	—	4.6	—	NA	3950	—
AAB9438	10-01288	46.2000–47.0000	QBOF	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9439	10-01288	47.8000–48.5000	QBOF	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9224	10-01289	3.3000–4.1000	QBOF	4360 (J+)	5.1 (UJ)	0.65 (J)	45.7 (J)	—	0.65 (J)	—	—	57.5 (J)	NA	5670 (J)	—
AAB9227	10-01289	11.4000–12.1000	QBOF	4960 (J+)	5.2 (UJ)	0.69 (J)	48.7 (J)	—	0.52 (UJ)	—	4.1 (J)	—	NA	7390 (J)	—
AAB9231	10-01289	28.9000–29.3000	QBOF	4460 (J+)	5.3 (UJ)	—	41.4 (J)	—	0.53 (UJ)	—	2.8 (J)	—	NA	5350 (J)	—
AAB9234	10-01289	48.5000–49.4000	QBOF	—	5.7 (UJ)	—	—	—	0.57 (UJ)	—	—	—	NA	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB8701	10-01290	4.1000–4.5000	QBOF	—	5.2 (U)	—	37.7	—	0.52 (U)	—	—	—	NA	—	—
AAB8714	10-01290	15.0000–15.4000	QBOF	6150	5.3 (U)	—	64.9	—	0.53 (U)	—	3.7	4.5	NA	7190	—
AAB8709	10-01290	29.0000–29.4000	QBOF	—	5.4 (U)	—	52.7	—	0.54 (U)	—	—	—	NA	4300	—
AAB8712	10-01290	48.0000–48.5000	QBOF	—	5.6 (U)	—	—	—	0.56 (U)	—	3.2	—	NA	—	—
AAB9211	10-01291	2.8000–3.7000	SOIL	—	5 (UJ)	—	—	—	0.5 (UJ)	—	—	—	NA	—	—
AAB9223	10-01291	15.0000–15.8000	QBOF	5140 (J+)	5.1 (UJ)	0.6 (J)	56.2 (J)	—	0.51 (UJ)	—	3.1 (J)	—	NA	6850 (J)	—
AAB9216	10-01291	28.2000–29.0000	QBOF	4190 (J+)	5.2 (UJ)	—	52.4 (J)	—	0.52 (UJ)	—	3.2 (J)	—	NA	4750 (J)	—
AAB9222	10-01291	48.5000–49.5000	QBOF	—	5.8 (UJ)	—	—	—	0.58 (UJ)	—	—	—	NA	—	—
AAB9235	10-01293	2.5000–3.9000	SOIL	—	5.6 (U)	—	—	—	0.92 (J)	—	—	15.5	NA	—	—
AAB9247	10-01293	10.0000–10.8000	QBOF	4330 (J)	5.7 (U)	0.76 (J)	45.4	—	0.77 (U)	—	4.4	9	NA	7130	—
AAB9242	10-01293	28.7000–29.4000	QBOF	—	5.8 (U)	—	40.6 (J)	—	0.78 (U)	—	—	—	NA	4420	—
AAB9246	10-01293	48.6000–49.6000	QBOF	—	6.1 (U)	—	—	—	0.82 (U)	—	—	—	NA	—	—
AAB9269	10-01294	15.0000–15.9000	QBOF	—	—	0.99 (J)	—	—	—	—	—	—	NA	3990	—
AAB9271	10-01294	26.5000–27.1000	QBOF	7550	—	2 (J)	96.8	—	—	—	3.6	—	NA	7400	—
AAB9274	10-01294	36.6000–37.4000	QBOG	6250	—	1.3 (J)	50	—	—	—	—	—	NA	6110	—
AAB9277	10-01294	48.7000–49.4000	QBOG	14000	—	0.94 (J)	172	2.6	—	—	4.4	—	NA	—	—
AAB6292	10-02210	6.0000–6.6000	SOIL	—	3.62 (U)	—	—	—	—	—	—	—	NA	—	—
AAB6307	10-02210	11.9000–12.5000	QAL	—	—	—	—	—	0.57 (J)	—	—	—	—	—	—
AAB6299	10-02210	18.0000–18.6000	QAL	—	—	—	—	—	0.51 (J)	—	—	—	—	—	—
AAB6304	10-02210	40.0000–40.6000	QBO	8730 (J)	4.41 (U)	—	99.2	1.5	—	—	4.7	—	NA	—	—
AAB6306	10-02210	49.0000–49.8000	QBOG	7520	4.41 (U)	—	77.2	1.5	—	—	3.2	—	NA	—	—
AAB6338	10-02211	13.8000–14.3000	QAL	—	7.35 (UJ)	—	—	—	—	—	—	—	NA	—	—
AAB6349	10-02211	16.3000–16.8000	QAL	—	7.54 (UJ)	—	—	—	0.41 (U)	—	—	—	NA	—	—
AAB6343	10-02211	31.4000–31.9000	QAL	—	7.94 (UJ)	—	—	—	0.43 (U)	—	—	—	NA	—	—
AAB6348	10-02211	49.5000–50.0000	QBOG	3830	8.98 (UJ)	0.89 (U)	58.3	—	0.48 (U)	—	—	—	NA	—	13.9
AAB6308	10-02212	3.6000–4.2000	QAL	—	7.53 (U)	—	—	—	12.7	—	—	263	NA	—	—
AAB6313	10-02212	22.9000–23.5000	QAL	—	7.31 (UJ)	—	—	—	—	—	—	—	NA	—	—
AAB6317	10-02212	37.2000–37.8000	QBOG	4830 (J)	8.15 (UJ)	0.81 (U)	51.3	—	0.44 (U)	—	—	—	NA	—	—
AAB6320	10-02212	49.4000–50.0000	QBOG	5080 (J)	9.15 (UJ)	0.91 (U)	54.5	—	0.49 (U)	—	—	—	NA	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB6321	10-02216	7.5000–8.5000	QAL	—	7.58 (UJ)	—	—	—	3.8 (J–)	—	—	—	NA	—	—
AAB6336	10-02216	17.5000–18.2000	QAL	—	7.46 (UJ)	—	—	—	0.76 (U)	—	—	—	NA	—	—
AAB6330	10-02216	27.5000–28.0000	QAL	—	7.84 (UJ)	—	—	—	0.42 (UJ)	—	—	—	NA	—	—
AAB6335	10-02216	47.5000–47.9000	QBOG	3830 (J)	8.94 (UJ)	0.89 (U)	36.2 (J)	—	0.48 (UJ)	—	—	—	NA	—	—
AAB6587	10-02219	28.4000–28.9000	QAL	—	4.9 (UJ)	—	—	—	—	—	—	—	NA	—	—
AAB6594	10-02219	46.9000–47.4000	QBOG	8080 (J)	5.4 (UJ)	0.69 (UJ)	82.6 (J)	1.6 (J)	0.43 (UJ)	—	9.6 (J)	—	NA	—	—
AAB6583	10-02220	14.0000–14.5000	QAL	—	—	—	—	—	6.7	—	—	120 (J+)	—	—	—
AAB6584	10-02220	17.0000–17.5000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9428	10-02220	18.0000–18.6000	QAL	—	5.3 (U)	—	—	—	0.46 (J)	—	—	—	NA	—	—
AAB6600	10-02220	37.0000–37.5000	QBO	5800	5.8 (U)	0.92 (J)	49.2	—	0.58 (U)	—	2.7	—	NA	6610	—
AAB6603	10-02220	49.4000–50.0000	QBOG	16600 (J+)	6.7 (UJ)	—	152 (J)	3 (J)	0.67 (UJ)	—	—	6.4 (J)	NA	4180 (J)	—
AAB8642	10-02221	14.2000–15.0000	QAL	—	5.4 (U)	—	—	—	0.54 (U)	—	—	—	NA	—	—
AAB9422	10-02221	28.8000–29.5000	QAL	—	6.4 (U)	—	—	—	0.86 (U)	—	—	—	NA	—	—
AAB9424	10-02221	35.3000–36.0000	QBOG	6180	6.6 (U)	—	47.2 (J)	—	0.89 (U)	—	4.1	—	NA	—	—
AAB9427	10-02221	49.2000–50.0000	QBOG	9550	7.1 (U)	—	105	1.8	0.96 (U)	—	—	5.3 (J)	NA	—	—
AAB9251	10-02222	25.4000–26.1000	QAL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9253	10-02222	40.6000–41.6000	QBOG	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9256	10-02222	48.1000–49.0000	QBOG	—	—	—	—	—	—	—	—	—	NA	—	—
AAB6615	10-02224	14.3000–15.0000	QAL	—	5.2 (U)	—	—	—	0.52 (U)	—	—	—	NA	—	—
AAB6617	10-02224	24.0000–25.0000	QAL	—	6 (U)	—	—	—	0.6 (U)	—	—	—	NA	—	—
AAB6623	10-02224	37.5000–38.3000	QBOG	9020	5.9 (U)	—	75.5	—	0.59 (U)	—	2.9	6	NA	4080	—
AAB8641	10-02224	49.2000–50.0000	QBOG	11000	6.8 (U)	—	117	1.7	0.68 (U)	—	—	4.2	NA	—	—
RE10-07-5492	10-601160	0.8000–2.8000	SOIL	—	—	—	—	—	0.46	—	—	—	0.52 (U)	—	—
RE10-07-5491	10-601160	42.0000–44.0000	QBOG	12100	0.65 (UJ)	0.71 (J)	115	1.9	—	—	—	—	0.65 (U)	—	—
RE10-07-5490	10-601160	59.0000–60.8000	SOIL	—	—	—	—	—	—	—	—	—	0.63 (U)	—	—
RE10-07-5496	10-601161	43.0000–45.0000	QBOG	17300	0.67 (UJ)	1.1 (J)	130	2.7	—	—	3.3	4.9	0.67 (U)	5240	14.8
RE10-07-5495	10-601161	58.2000–60.0000	SOIL	—	—	—	—	4.2	—	—	—	—	0.61 (U)	—	—
RE10-07-5502	10-601162	0.0000–2.1000	SOIL	—	—	—	—	—	0.61	—	—	—	0.51 (U)	—	—
RE10-07-5501	10-601162	41.3000–43.3000	QBOG	17000	0.66 (UJ)	1 (J)	151	2.2	—	—	2.7	—	0.66 (U)	4950	15.6

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
RE10-07-5500	10-601162	59.0000–61.5000	SOIL	—	—	—	—	—	—	—	—	—	0.62 (U)	—	—
RE10-07-5506	10-601163	13.0000–14.8000	QAL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5505	10-601163	49.5000–51.5000	QBOG	20400	0.7 (UJ)	0.97 (J)	117	3.7	—	—	2.9	4.6	0.7 (U)	4600	16.3
RE10-07-5512	10-601164	14.0000–16.0000	QAL	—	—	—	—	—	—	—	—	68.6 (J+)	—	—	—
RE10-07-5513	10-601164	19.0000–21.0000	QAL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5511	10-601164	39.0000–40.5000	QBOG	9590	0.62 (UJ)	—	80.4	—	—	—	11.2	5.8	0.62 (U)	5310	—
RE10-07-5510	10-601164	52.0000–54.0000	QBOG	20300	0.69 (UJ)	0.99 (J)	60.2	3.4	—	—	—	4.4	0.69 (U)	4340	15.7
RE10-07-5548	10-601165	4.7000–6.7000	SOIL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5547	10-601165	30.2000–32.2000	QAL	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5552	10-601166	5.0000–7.0000	SOIL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5551	10-601166	29.5000–31.5000	QAL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5556	10-601167	20.2000–22.2000	QBO	5690	—	1.1	72.4	—	—	—	3.7	4	0.54 (U)	7020	—
RE10-07-5555	10-601167	34.5000–36.5000	QAL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5560	10-601168	21.0000–24.0000	QBO	—	0.54 (UJ)	—	47	—	—	—	—	—	0.54 (U)	4500	—
RE10-07-5559	10-601168	30.0000–32.0000	QAL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5564	10-601169	10.0000–12.0000	SOIL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5563	10-601169	30.0000–32.0000	QAL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5568	10-601170	20.4000–22.4000	QAL	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5567	10-601170	62.0000–64.0000	QBOG	—	0.71 (UJ)	—	—	—	—	—	—	—	0.71 (U)	—	—
RE10-07-5572	10-601171	42.0000–44.0000	QBO	—	0.58 (UJ)	—	—	—	—	—	—	—	0.58 (U)	—	—
RE10-07-5571	10-601171	62.0000–64.0000	QBOG	—	0.73 (UJ)	—	—	—	—	—	—	—	0.72 (U)	—	—
RE10-07-5576	10-601172	26.2000–28.2000	QBO	—	0.52 (UJ)	—	37.4	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5575	10-601172	58.0000–60.0000	QBOG	—	0.68 (UJ)	—	—	—	—	—	—	—	0.68 (U)	—	—
RE10-07-5580	10-601173	19.8000–21.8000	QAL	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5579	10-601173	61.5000–63.5000	QBOG	—	0.7 (UJ)	—	—	—	—	—	—	—	0.7 (U)	—	—
RE10-07-5584	10-601174	30.0000–31.7000	QBOG	—	0.53 (UJ)	—	29.2	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5583	10-601174	61.0000–63.0000	QBOG	—	0.73 (UJ)	—	—	—	—	—	—	—	0.73 (U)	—	—
RE10-07-5588	10-601175	32.0000–34.0000	QBO	—	0.53 (UJ)	—	30.4	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5587	10-601175	62.0000–64.0000	QBOG	—	0.69 (UJ)	—	27.3	—	—	—	—	—	0.69 (U)	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
RE10-07-5592	10-601176	27.1000–29.1000	QBO	—	0.52 (UJ)	—	39.1	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5591	10-601176	58.0000–60.0000	QBOG	—	0.67 (UJ)	—	—	—	—	—	—	—	0.67 (U)	—	—
RE10-07-5596	10-601177	35.9000–37.9000	QBOG	7120	0.59 (U)	—	49.3	—	—	—	—	—	0.59 (U)	—	—
RE10-07-5595	10-601177	61.5000–63.5000	SOIL	—	—	—	—	2.6	0.52 (J+)	—	—	—	—	—	—
RE10-07-5600	10-601178	14.0000–16.0000	QAL	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5599	10-601178	60.2000–62.2000	SOIL	—	—	—	—	—	0.55	—	—	—	0.56 (U)	—	—
RE10-07-5604	10-601179	37.0000–39.0000	QBOG	8210	0.61 (UJ)	—	79.8	1.5 (J+)	—	—	—	—	0.61 (U)	—	—
RE10-07-5603	10-601179	60.8000–62.8000	SOIL	—	—	—	—	—	—	—	—	—	0.58 (U)	—	—
RE10-07-5608	10-601180	33.0000–35.0000	QBOG	6180	0.56 (U)	0.63 (J)	35.4	—	—	—	5	6.5	0.55 (U)	3900	—
RE10-07-5607	10-601180	48.0000–50.0000	QBOG	—	0.67 (U)	—	35.4	—	—	—	—	—	0.67 (U)	—	—
RE10-07-5612	10-601181	14.5000–16.5000	QAL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5611	10-601181	30.0000–32.0000	QAL	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5616	10-601182	33.0000–35.0000	QBOG	—	0.54 (UJ)	—	28.3	—	—	—	—	—	0.54 (U)	—	—
RE10-07-5615	10-601182	58.0000–60.0000	QBOG	—	0.66 (UJ)	1.3 (U)	—	—	—	—	—	—	0.66 (U)	—	—
RE10-07-5899	10-601239	19.9000–21.9000	QAL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5898	10-601239	30.2000–32.2000	QAL	—	—	—	—	—	—	—	—	—	0.56 (U)	—	—
RE10-07-5904	10-601240	37.0000–39.0000	QBOG	8730 (J)	0.61 (UJ)	—	67.2 (J)	1.6 (J)	—	—	—	—	0.61 (UJ)	—	—
RE10-07-5903	10-601240	60.5000–62.5000	SOIL	—	—	—	—	—	—	—	—	—	0.58 (UJ)	—	—
RE10-07-5909	10-601241	15.8000–17.8000	QAL	—	—	—	—	—	—	—	—	—	0.53 (U)	—	—
RE10-07-5908	10-601241	26.9000–28.9000	QAL	—	—	—	—	—	—	—	—	—	0.58 (U)	—	—
RE10-07-5913	10-601242	26.0000–28.0000	QAL	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—
RE10-07-5919	10-601243	31.9000–33.9000	QAL	—	—	—	—	—	—	—	—	—	0.59 (U)	—	—
RE10-07-5918	10-601243	48.0000–56.0000	QBOG	7840	0.63 (UJ)	—	64.6 (J–)	—	—	—	—	—	0.63 (U)	—	—
RE10-07-5924	10-601244	32.5000–34.5000	QBOG	11700	0.58 (UJ)	—	57.6 (J–)	1.6 (J–)	—	—	4.9 (U)	—	0.58 (U)	5280	—
RE10-07-5923	10-601244	48.0000–50.0000	QBOG	—	0.63 (UJ)	1.3 (U)	—	—	—	—	—	—	—	—	—
RE10-07-5929	10-601245	6.0000–8.0000	QAL	—	—	—	—	—	—	—	—	—	0.53 (UJ)	—	—
RE10-07-5928	10-601245	25.0000–27.6000	QAL	—	—	—	—	—	—	—	—	—	0.55 (UJ)	—	—
RE10-07-5934	10-601246	16.3000–18.3000	QAL	—	—	—	—	—	—	—	—	—	0.54 (UJ)	—	—
RE10-07-5933	10-601246	26.6000–28.6000	QAL	—	—	—	—	—	—	—	—	—	0.59 (UJ)	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
RE10-07-5939	10-601247	13.7000–15.7000	QAL	—	—	—	—	—	—	—	—	—	0.54 (UJ)	—	—
RE10-07-5938	10-601247	28.7000–30.7000	QAL	—	—	—	—	—	—	—	—	—	0.54 (UJ)	—	—
RE10-07-5944	10-601248	19.8000–21.8000	QAL	—	—	—	—	—	—	—	—	—	0.54 (UJ)	—	—
RE10-07-5943	10-601248	42.0000–44.0000	QBOG	3760	0.64 (UJ)	1.3 (U)	41.7	—	—	—	—	—	0.64 (UJ)	—	—
RE10-07-5949	10-601249	20.2000–22.2000	QAL	—	—	—	—	—	—	—	—	—	0.57 (UJ)	—	—
RE10-07-5948	10-601249	32.0000–34.0000	QBOG	11400	0.63 (UJ)	—	74.4	2	—	—	3.7 (U)	4.1	0.62 (UJ)	5150 (U)	—
RE10-07-5954	10-601250	27.0000–29.0000	QAL	—	—	—	—	—	—	—	—	—	0.55 (UJ)	—	—
RE10-07-5953	10-601250	42.0000–44.0000	QBOG	—	0.65 (UJ)	—	—	—	—	—	—	—	0.65 (UJ)	—	—
RE10-07-5959	10-601251	7.0000–9.0000	QAL	—	—	—	—	—	—	—	—	—	0.52 (UJ)	—	—
RE10-07-5958	10-601251	42.0000–44.0000	QBOG	—	0.67 (UJ)	1.3 (U)	—	—	—	—	—	—	0.67 (UJ)	—	—
RE10-07-5964	10-601252	33.0000–35.0000	QBOG	13400	0.62 (UJ)	—	112	2.3	—	—	—	—	0.62 (UJ)	4700 (U)	—
RE10-07-5963	10-601252	38.0000–40.0000	QBOG	6790	0.61 (UJ)	—	44.7	—	—	—	—	—	0.61 (UJ)	—	—
RE10-07-5969	10-601253	27.0000–29.0000	QBO	12100	0.56 (UJ)	—	61	1.8	—	—	—	—	0.56 (UJ)	4290 (U)	—
RE10-07-5968	10-601253	30.4000–32.4000	QBOG	3570	0.57 (UJ)	1.1 (U)	—	—	—	—	4.1 (U)	5.7	0.56 (UJ)	3950 (U)	—
RE10-07-5974	10-601254	26.8000–28.8000	QAL	—	—	—	—	—	—	—	—	—	0.53 (UJ)	—	—
RE10-07-5973	10-601254	38.0000–40.0000	QBOG	6610	0.55 (UJ)	1.1 (U)	66	—	—	—	4.8	—	0.55 (UJ)	—	—
RE10-07-5979	10-601255	7.6000–9.6000	SOIL	—	—	—	—	—	—	—	—	—	0.52 (UJ)	—	—
RE10-07-5978	10-601255	32.7000–34.7000	QAL	—	—	—	—	—	—	—	—	—	0.52 (UJ)	—	—
RE10-07-5984	10-601256	10.0000–12.0000	SOIL	—	—	—	—	—	—	—	—	—	0.52 (UJ)	—	—
RE10-07-5983	10-601256	36.7000–38.7000	QBOG	—	0.54 (UJ)	—	30.1	—	—	—	3.3 (U)	—	0.54 (UJ)	—	—
RE10-07-5989	10-601257	21.3000–23.3000	QAL	—	—	—	—	—	—	—	—	—	0.53 (UJ)	—	—
RE10-07-5988	10-601257	31.0000–33.0000	QAL	—	—	—	—	—	—	—	—	—	0.52 (UJ)	—	—
RE10-07-6000	10-601259	13.0000–19.5000	QAL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5999	10-601259	28.8000–30.8000	QAL	—	—	—	—	—	—	—	—	—	0.58 (U)	—	—
RE10-07-5998	10-601259	51.0000–53.0000	QBOG	10100	0.72 (UJ)	0.78 (J)	—	2	—	—	3.1	—	0.72 (U)	4220	—
RE10-07-6291	10-601319	0.0000–0.2500	SOIL	—	—	—	—	—	0.539 (U)	—	—	—	—	—	23.9
RE10-08-9965	10-603263	0.0000–1.0000	SOIL	—	—	—	—	—	0.56 (U)	—	—	—	—	—	—
RE10-08-9966	10-603263	1.5000–2.0000	SOIL	—	—	—	—	—	0.529 (U)	—	—	—	—	—	—
RE10-08-9967	10-603264	0.0000–1.0000	SOIL	—	—	—	—	—	0.559 (U)	—	—	—	—	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
RE10-08-9968	10-603264	1.5000–2.0000	SOIL	—	—	—	—	—	0.56 (U)	—	—	—	—	—	—
RE10-08-9969	10-603265	0.0000–1.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-08-9970	10-603265	1.5000–3.2000	SOIL	—	—	—	—	—	0.531 (U)	—	—	—	—	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na[d]**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB9278	10-01200	16.1000–16.8000	QAL	—	—	—	NA	—	NA	—	—	—	3.49	—	—
AAB9281	10-01200	26.1000–26.8000	QAL	—	—	0.11 (UJ)	NA	—	NA	—	—	—	5.42	—	—
AAB9283	10-01200	36.0000–37.0000	QBO	—	209 (J–)	0.11 (UJ)	NA	—	NA	—	—	—	15.1	—	—
AAB9286	10-01200	48.7000–49.6000	QBO	—	—	0.12 (UJ)	NA	—	NA	—	—	—	15.6	—	—
AAB9347	10-01201	33.3000–33.7000	QBO	939 (U)	295 (J)	—	NA	4.7 (U)	NA	—	—	—	3.17 (J)	4.9 (U)	—
AAB9350	10-01201	48.0000–48.5000	QBO	—	—	—	NA	2.5 (U)	NA	—	—	—	8.15 (J)	—	—
AAB9287	10-01202	15.8000–16.6000	QAL	—	—	—	NA	—	NA	—	—	—	2.63	—	—
AAB9289	10-01202	25.4000–26.2000	QAL	—	—	—	NA	—	NA	—	—	—	4.95	—	51.1 (J)
AAB9293	10-01202	36.0000–36.8000	QBO	—	—	—	NA	2.3 (J)	NA	—	—	—	14.5	—	—
AAB9296	10-01202	48.7000–49.5000	QBO	—	—	—	NA	4.9 (J)	NA	—	2.2 (J–)	—	15.7	—	—
AAB9385	10-01203	13.6000–14.3000	QAL	—	—	—	NA	—	NA	—	—	—	2.04 (U)	—	—
AAB9389	10-01203	27.5000–28.0000	QBO	—	—	—	NA	—	NA	—	—	—	5.59	—	—
AAB9390	10-01203	38.0000–39.5000	QBOG	—	—	—	NA	—	NA	—	—	—	13.4	—	—
AAB9394	10-01203	49.1000–50.0000	QBOG	—	—	—	NA	—	NA	—	—	—	13.5	—	—
AAB9309	10-01204	15.7000–16.4000	QAL	—	—	—	NA	—	NA	—	—	—	3.75 (J+)	—	—
AAB9313	10-01204	25.8000–26.4000	QBO	—	—	—	NA	—	NA	—	—	—	4.9 (U)	—	—
AAB9315	10-01204	35.5000–36.5000	QBO	—	—	—	NA	—	NA	—	—	—	5.61 (U)	—	—
AAB9310	10-01204	47.7000–49.3000	QBO	—	—	—	NA	—	NA	—	—	—	14.8	—	—
AAB9360	10-01205	10.0000–10.5000	QAL	—	—	—	NA	—	NA	—	—	—	2.29 (J–)	—	—
AAB9361	10-01205	14.3000–14.8000	QAL	—	—	—	NA	—	NA	—	—	1.2 (J)	NA	—	—
AAB9363	10-01205	19.5000–20.0000	QAL	—	—	0.11 (U)	NA	—	NA	—	—	—	3.12 (J–)	—	—
AAB9364	10-01205	20.0000–20.9000	QAL	—	—	—	NA	—	NA	—	—	1.1 (J)	NA	—	—
AAB9368	10-01205	39.0000–40.0000	QBO	1350	461 (J–)	0.11 (U)	NA	7.1 (J)	NA	—	—	—	9.37	8.8 (J)	47.9 (J–)
AAB9399	10-01205	49.3000–50.0000	QBO	—	—	0.11 (U)	NA	—	NA	—	—	—	12.9	NA	—
AAB9297	10-01206	15.8000–16.8000	QAL	—	—	—	NA	—	NA	—	—	—	4.54	—	—
AAB9301	10-01206	25.9000–26.8000	QBO	—	—	—	NA	—	NA	—	—	—	5.68	—	—
AAB9300	10-01206	35.7000–36.9000	QBOG	—	—	—	NA	—	NA	—	—	—	14.7	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB9308	10-01206	48.4000–49.3000	QBOG	—	—	—	NA	—	NA	—	—	—	14.8	—	—
AAB9327	10-01207	10.8000–11.5000	QAL	—	—	—	NA	—	NA	—	2 (U)	—	2.1	—	—
AAB9330	10-01207	25.5000–26.1000	QAL	—	—	—	NA	—	NA	—	2.1 (U)	—	10.2	—	—
AAB9333	10-01207	35.9000–36.6000	QBO	1050 (U)	198	—	NA	6.1 (U)	NA	0.73 (U)	2.4 (U)	—	13.2	—	—
AAB9336	10-01207	48.3000–49.3000	QBOG	—	—	—	NA	2.1 (U)	NA	0.77 (U)	2.6 (U)	—	14.5	—	—
AAB9317	10-01208	15.6000–16.6000	QBOF	—	—	—	NA	—	NA	—	—	—	4.09 (U)	—	—
AAB9322	10-01208	26.0000–26.7000	QBOF	—	—	—	NA	—	NA	—	—	—	4.3 (U)	—	—
AAB9324	10-01208	35.7000–36.5000	QBOG	—	—	—	NA	—	NA	—	—	—	5.95	—	—
AAB9326	10-01208	49.0000–50.0000	QBOG	—	—	—	NA	—	NA	—	—	—	14.8	—	—
AAB9351	10-01209	14.0000–14.7000	QAL	—	—	0.11 (U)	NA	—	NA	—	—	—	—	—	82.8 (J–)
AAB9354	10-01209	29.0000–29.6000	QBO	—	—	0.11 (U)	NA	3.9 (J)	NA	0.42 (J)	—	—	3.2 (J)	7 (J)	—
AAB9357	10-01209	37.5000–38.4000	QBO	—	—	0.11 (U)	NA	3.5 (J)	NA	—	—	—	2.07 (J)	7 (J)	43.6 (J–)
AAB9359	10-01209	48.4000–49.2000	QBOG	—	—	0.11 (U)	NA	4.2 (J)	NA	0.52 (J)	—	—	11.1 (J)	—	—
AAB6392	10-01213	6.3000–6.8000	QAL	—	—	—	NA	—	NA	—	—	—	2.94	—	—
AAB6395	10-01213	19.2000–19.7000	QAL	—	—	—	NA	—	NA	—	—	—	—	—	87.4
AAB6404	10-01213	39.2000–39.7000	QBOG	—	—	—	NA	3.9 (U)	NA	0.5 (U)	—	—	7.51	—	—
AAB6403	10-01213	46.8000–47.3000	QBOG	—	—	—	NA	3.9 (U)	NA	0.51 (U)	—	—	8.43	—	—
AAB6363	10-01214	5.0000–6.0000	QAL	—	—	—	NA	—	NA	—	—	1.23 (U)	2.16	—	—
AAB6371	10-01214	25.9000–26.4000	QAL	—	—	—	NA	—	NA	—	—	1.33 (U)	3.77	—	—
AAB6376	10-01214	36.6000–37.1000	QBO	1380 (J)	298 (J–)	—	NA	9.7 (J)	NA	0.32 (UJ)	1.2 (J)	1.48 (U)	10.3	5.4 (U)	40.3
AAB6378	10-01214	49.4000–50.0000	QBOG	—	—	—	NA	—	NA	0.31 (UJ)	—	1.44 (U)	11.8	—	—
AAB6405	10-01215	7.9000–8.4000	QAL	—	—	—	NA	—	NA	—	—	—	1.94 (J)	—	—
AAB6409	10-01215	15.0000–15.9000	QAL	—	—	—	NA	—	NA	—	2.8	0.77 (U)	7.33 (J)	—	—
AAB6569	10-01215	21.7000–22.2000	QAL	—	—	—	NA	—	NA	—	—	—	6.28 (J+)	—	—
AAB6580	10-01215	26.6000–27.1000	QAL	—	—	—	NA	—	NA	—	—	—	9.88 (J+)	—	—
AAB6579	10-01215	46.1000–46.6000	QBOG	982 (J)	—	—	NA	4.2 (J)	NA	1.2 (U)	—	—	3.24 (J)	—	—
AAB6350	10-01217	5.0000–5.5000	QAL	—	—	—	NA	—	NA	—	—	1.24 (U)	—	—	—
AAB6353	10-01217	15.8000–16.3000	QAL	—	—	—	NA	—	NA	—	—	1.26 (U)	—	—	—
AAB6360	10-01217	37.5000–38.2000	QBO	—	—	—	NA	2.9 (J)	NA	—	—	1.35 (U)	—	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB6362	10-01217	48.7000–49.4000	QBOG	—	—	—	NA	2.04 (U)	NA	0.33 (U)	—	1.51 (U)	—	—	—
AAB6379	10-01218	5.9000–6.4000	QAL	—	—	—	NA	—	NA	—	—	—	11.7 (J–)	—	—
AAB6384	10-01218	21.5000–22.0000	QAL	—	—	—	NA	—	NA	—	—	—	2.73 (J–)	—	—
AAB6604	10-01223	16.0000–16.5000	QAL	—	—	—	NA	—	NA	—	—	—	5.23	—	51.5 (J)
AAB6610	10-01223	30.0000–30.5000	QAL	—	—	—	NA	—	NA	—	—	—	3.23 (J)	—	—
AAB6612	10-01223	37.5000–38.0000	QBOG	1970 (J)	417 (J)	—	NA	9 (J)	NA	0.33 (UJ)	—	—	1.03	10.7 (J)	52.7 (J)
AAB6614	10-01223	46.5000–47.0000	QBOG	—	332 (J)	—	NA	3.4 (J)	NA	0.34 (UJ)	—	—	10	—	49.6 (J)
AAB9257	10-01225	16.4000–16.9000	QAL	—	—	—	NA	—	NA	—	—	—	2.07	—	—
AAB9260	10-01225	26.2000–26.9000	QAL	—	—	—	NA	—	NA	—	—	0.77 (U)	4.54	—	68.9
AAB9265	10-01225	41.2000–42.1000	QBOG	1370	—	—	NA	6.7 (J)	NA	0.51 (U)	—	—	12.2	—	—
AAB9267	10-01225	48.5000–49.3000	QBOG	—	—	—	NA	4 (U)	NA	0.52 (U)	—	—	11.5	—	—
AAB3046	10-01226	3.7000–4.7000	QAL	—	—	0.56 (J+)	NA	—	NA	—	—	—	2.1	—	—
AAB3057	10-01226	32.5000–33.0000	QBO	1700 (J–)	210	—	NA	7.2	NA	—	—	—	5.93	4.8 (U)	—
AAB3059	10-01226	43.9000–44.3000	QBOG	—	—	—	NA	2.3 (J)	NA	—	—	—	11.1	—	—
AAB3060	10-01226	49.1000–49.8000	QBOG	—	—	—	NA	—	NA	—	—	—	11.9	—	—
AAB6423	10-01227	3.1000–3.7000	QAL	—	—	—	NA	—	NA	—	—	1.3 (UJ)	—	—	—
AAB6428	10-01227	29.1000–29.6000	QBO	955 (J)	264	—	NA	5.3 (J)	NA	—	1.1 (U)	1.36 (UJ)	0.895 (J)	5.5 (U)	—
AAB6433	10-01227	44.5000–45.0000	QBOG	—	—	—	NA	2.4 (J)	NA	0.33 (U)	—	1.51 (UJ)	—	5.2 (U)	—
AAB6432	10-01227	49.1000–49.9000	QBOG	—	—	—	NA	2.8 (J)	NA	0.32 (U)	1.4 (U)	1.5 (UJ)	—	5.1 (U)	—
AAB3062	10-01228	3.5000–4.2000	QAL	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB3073	10-01228	21.4000–21.8000	QAL	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB3069	10-01228	32.1000–32.5000	QBO	2260	355 (J–)	—	NA	6.3 (J)	NA	0.46 (U)	—	—	1.424 (J)	4.6 (J)	44.3 (J)
AAB3072	10-01228	49.0000–49.8000	QBOG	—	—	—	NA	—	NA	0.96 (U)	—	—	—	—	—
AAB3087	10-01229	3.0000–3.5000	QAL	—	—	—	NA	—	NA	—	—	1.23 (U)	2.28 (J)	—	—
AAB6414	10-01229	28.0000–28.2000	QBO	—	—	—	NA	—	NA	—	—	1.39 (U)	8.16 (J)	—	—
AAB6421	10-01229	35.0000–35.8000	QBOG	—	—	—	NA	—	NA	—	—	1.39 (UJ)	—	—	—
AAB6420	10-01229	47.5000–47.8000	QBOG	—	—	—	NA	2.46 (U)	NA	0.39 (U)	—	1.82 (U)	12.7 (J)	—	—
AAB6434	10-01230	4.0000–4.5000	QAL	—	—	0.11 (U)	NA	—	NA	—	—	1.26 (UJ)	—	—	—
AAB6439	10-01230	29.0000–29.6000	QBO	—	—	—	NA	5.2 (J)	NA	—	—	1.39 (UJ)	—	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB6446	10-01230	46.6000–49.5500	QBOG	—	—	—	NA	2.24 (U)	NA	0.36 (U)	—	1.66 (UJ)	—	7.2 (U)	—
AAB6444	10-01230	48.5000–49.5000	QBOG	—	—	—	NA	2.31 (U)	NA	0.37 (U)	1.1 (U)	1.71 (UJ)	—	—	—
AAB6461	10-01231	4.0000–4.5000	QAL	—	—	—	NA	—	NA	—	—	1.26 (U)	—	—	—
AAB6465	10-01231	11.1000–11.8000	QAL	—	—	—	NA	—	NA	—	—	1.26 (U)	—	—	—
AAB6472	10-01231	32.0000–32.8000	QBO	—	404 (J–)	—	NA	4.2 (U)	NA	—	1.5 (J)	1.27 (U)	0.926 (J)	—	—
AAB6471	10-01231	48.4000–49.3000	QBOG	—	—	—	NA	2.18 (U)	NA	0.35 (U)	—	1.62 (U)	—	—	—
AAB3074	10-01232	4.1000–4.6000	QAL	—	—	—	NA	—	NA	—	—	1.26 (U)	—	—	—
AAB3080	10-01232	21.5000–21.9000	QAL	—	—	—	NA	—	NA	—	—	1.36 (U)	—	—	—
AAB3085	10-01232	41.8000–42.3000	QBOG	—	—	—	NA	3 (J)	NA	0.34 (U)	—	1.57 (U)	—	—	—
AAB3086	10-01232	49.4000–50.0000	QBOG	—	—	0.12 (U)	NA	2.23 (U)	NA	0.36 (U)	—	1.65 (U)	—	—	—
AAB6454	10-01233	28.6000–29.5000	QBO	—	—	—	NA	2.9 (J)	NA	—	—	1.35 (U)	6.6	—	—
AAB6460	10-01233	40.0000–40.8000	QBOG	—	—	—	NA	7.4 (J)	NA	0.36 (UJ)	—	1.66 (U)	9.12	—	—
AAB6459	10-01233	48.7000–49.5000	QBOG	—	—	—	NA	2.06 (U)	NA	0.33 (UJ)	—	1.52 (U)	11.1	—	—
AAB6473	10-01234	3.7000–4.3000	QAL	—	—	—	NA	—	NA	—	—	1.27 (U)	—	—	—
AAB6478	10-01234	23.4000–23.9000	QAL	—	—	—	NA	—	NA	—	—	1.39 (U)	—	—	—
AAB6484	10-01234	30.0000–30.8000	QBOG	—	—	—	NA	4.2 (J)	NA	—	—	1.36 (U)	—	—	—
AAB6483	10-01234	48.2000–49.1000	QBOG	—	—	—	NA	3.1 (J)	NA	0.4 (U)	—	1.83 (U)	—	—	—
AAB6485	10-01235	3.5000–4.5000	QAL	—	—	—	NA	—	NA	—	—	1.32 (U)	—	—	—
AAB6492	10-01235	33.1000–34.4000	QBO	—	—	—	NA	3.4 (J)	NA	0.31 (U)	—	1.44 (U)	—	—	—
AAB6500	10-01235	43.6000–44.1000	QBOG	—	—	—	NA	2.6 (J)	NA	0.33 (U)	—	1.53 (U)	—	—	—
AAB6498	10-01235	48.9000–49.4000	QBOG	—	224 (J)	—	NA	3.1 (J)	NA	0.33 (U)	—	1.51 (U)	—	—	—
AAB6126	10-01236	2.8000–3.4000	SOIL	—	—	—	NA	—	NA	—	—	1.33 (U)	—	—	—
AAB6151	10-01236	30.0000–31.2000	QBO	—	—	—	NA	2.2 (J)	NA	—	—	1.31 (U)	—	—	—
AAB6157	10-01237	2.5000–3.1000	QAL	—	—	—	NA	—	NA	—	—	1.27 (U)	—	—	—
AAB6162	10-01237	23.5000–24.1000	QBO	887 (J)	269	—	NA	5.3 (J)	NA	—	—	1.37 (U)	—	8.4 (U)	—
AAB6166	10-01237	41.6000–42.2000	QBOG	—	—	—	NA	—	NA	0.31 (U)	—	1.44 (U)	—	5 (U)	70.4
AAB6168	10-01237	49.4000–50.0000	QBOG	—	—	—	NA	3.9 (J)	NA	0.32 (U)	—	1.48 (U)	—	6 (U)	—
AAB6198	10-01238	4.4000–5.0000	QAL	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB6205	10-01238	23.1000–23.7000	QAL	—	—	—	NA	—	NA	—	—	—	—	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB6211	10-01238	38.8000–39.4000	QBOG	—	—	—	NA	2.43 (U)	NA	0.38 (U)	—	—	—	—	—
AAB6214	10-01238	49.4000–50.0000	QBOG	—	—	—	NA	2.62 (U)	NA	0.41 (U)	—	—	—	—	—
AAB6181	10-01239	0.0000–0.6000	SOIL	—	—	—	NA	—	NA	—	—	—	3.07	—	—
AAB6169	10-01239	2.5000–3.1000	QAL	—	—	—	NA	—	NA	—	—	—	2.99	—	—
AAB6180	10-01239	49.4000–50.0000	QBOG	—	—	—	NA	—	NA	0.7 (UJ)	—	—	14.99	—	—
AAB6182	10-01240	3.1000–3.7000	QAL	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB6186	10-01240	19.0000–19.6000	QAL	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB6193	10-01240	36.6000–37.6000	QBOG	—	—	—	NA	2.45 (U)	NA	0.38 (U)	—	—	—	—	—
AAB6197	10-01240	49.4000–50.0000	QBOG	—	—	—	NA	2.74 (U)	NA	0.43 (U)	—	—	—	—	—
AAB2991	10-01241	3.5000–4.0000	QAL	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB3002	10-01241	22.0000–22.3000	QAL	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB3003	10-01241	33.9000–34.3000	QBO	—	—	NA	NA	2.4 (U)	NA	0.37 (U)	—	—	1.52 (J)	6.1 (J)	—
AAB3001	10-01241	49.1000–49.6000	QBOG	—	—	—	NA	2.46 (U)	NA	0.38 (U)	—	—	—	—	—
AAB3019	10-01242	4.1000–4.7000	QAL	—	—	—	NA	—	NA	—	—	1.23 (U)	—	—	—
AAB3032	10-01242	6.2000–6.8000	QAL	—	—	—	NA	—	NA	—	—	1.23 (U)	—	—	—
AAB3033	10-01242	30.3000–30.9000	QBO	1260 (J)	454 (J–)	—	NA	16	NA	0.34 (U)	1.3 (J)	1.55 (U)	2.224 (J)	5.8 (J)	44.5 (J)
AAB3030	10-01242	46.5000–47.3000	QBOG	—	—	—	NA	3.6 (J)	NA	0.31 (UJ)	—	1.43 (U)	—	—	—
AAB3034	10-01243	4.1000–4.6000	QAL	—	—	—	NA	—	NA	—	—	—	2.94	—	—
AAB3045	10-01243	25.9000–26.5000	QAL	—	—	—	NA	—	NA	—	—	—	6.29	—	—
AAB3042	10-01243	36.8000–37.3000	QBO	1110 (J)	—	—	NA	3.6 (J)	NA	0.68 (U)	—	—	8.49	—	—
AAB3044	10-01243	48.7000–49.0000	QBOG	—	—	—	NA	—	NA	0.66 (U)	—	—	16.31	—	—
AAB3004	10-01244	4.3000–4.9000	QAL	—	—	—	NA	—	NA	—	—	1.25 (U)	—	—	—
AAB3018	10-01244	12.5000–13.1000	QAL	—	—	—	NA	—	NA	—	—	1.24 (U)	—	—	—
AAB3017	10-01244	32.0000–32.5000	QAL	—	—	—	NA	—	NA	—	—	1.44 (U)	1.843 (J)	—	—
AAB3016	10-01244	49.1000–49.8000	QBOG	—	—	—	NA	—	NA	0.31 (U)	—	1.43 (U)	—	—	—
AAB2833	10-01245	2.2000–2.5000	QAL	—	—	—	NA	—	NA	—	—	—	3.44 (J)	—	51.1 (J)
AAB2844	10-01245	13.0000–13.6000	QAL	—	—	—	NA	—	NA	—	—	—	5.39 (J)	—	—
AAB2839	10-01245	28.0000–28.6000	QAL	—	—	—	NA	—	NA	—	—	—	6.43 (J)	—	—
AAB2843	10-01245	49.4000–50.0000	QBOG	—	—	—	NA	2.1 (J–)	NA	0.77 (J–)	—	—	13.8 (J)	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB2885	10-01246	3.4000–4.1000	QAL	—	—	—	NA	—	NA	—	—	—	3.24 (J)	—	—
AAB6125	10-01246	9.4000–10.0000	QAL	—	—	—	NA	—	NA	—	—	—	5.4	—	—
AAB6122	10-01246	41.7000–42.3000	QBO	2200 (J–)	—	—	NA	8.2 (J)	NA	0.88 (J)	—	—	9.8 (J–)	5.9 (J–)	—
AAB6124	10-01246	49.4000–50.0000	QBO	—	—	—	NA	—	NA	0.41 (UJ)	—	—	14.8	—	—
AAB2861	10-01247	0.8000–1.4000	SOIL	—	—	—	NA	—	NA	—	—	—	2.8	—	—
AAB2863	10-01247	10.9000–11.1000	QAL	—	—	—	NA	—	NA	—	—	—	NA	—	—
AAB2883	10-01247	26.0000–27.0000	QAL	—	—	—	NA	—	NA	—	—	—	5.96 (J)	—	—
AAB2882	10-01247	49.4000–50.0000	QBO	—	—	—	NA	—	NA	0.75 (J–)	—	—	5.32 (J)	—	—
AAB6129	10-01248	3.4000–4.0500	QAL	—	—	—	NA	—	NA	—	—	—	4.6	—	—
AAB6143	10-01248	29.4000–30.0000	QAL	—	—	—	NA	—	NA	—	—	—	6.3	—	—
AAB6139	10-01248	44.0000–44.6000	QBO	1250 (J–)	209 (J–)	—	NA	5.4 (J–)	NA	0.39 (UJ)	—	—	7.6	7 (J–)	—
AAB6141	10-01248	50.4000–51.0000	QBO	—	—	—	NA	—	NA	0.51 (J–)	—	—	14.9	—	—
AAB2845	10-01249	0.9000–1.5000	SOIL	—	—	—	NA	—	NA	—	—	—	4.3	—	—
AAB2851	10-01249	25.4000–26.0000	QAL	—	—	—	NA	—	NA	—	—	—	5.8	—	—
AAB2857	10-01249	46.8000–47.5000	QBO	—	—	—	NA	—	NA	0.67 (UJ)	—	—	14	—	—
AAB2856	10-01249	49.4000–50.0000	QBO	—	—	—	NA	—	NA	0.68 (UJ)	—	—	14.3	—	—
AAB6215	10-01250	3.3000–3.9000	QBOF	759 (J–)	216 (J–)	—	NA	2.4 (J–)	NA	0.61 (UJ)	—	—	2.05 (J–)	4.9 (J–)	—
AAB6222	10-01250	25.5000–26.1000	QBOF	740 (J–)	215 (J–)	—	NA	3.3 (J–)	NA	0.64 (UJ)	—	—	2.49 (J–)	—	—
AAB6226	10-01250	40.7000–41.3000	QBOG	—	—	—	NA	—	NA	0.69 (UJ)	—	—	15.4 (J–)	—	—
AAB6227	10-01250	49.4000–50.0000	QBOG	—	—	—	NA	—	NA	0.75 (UJ)	—	—	13.2 (J–)	—	—
AAB6258	10-01251	3.1000–3.8000	QBOF	—	—	—	NA	—	NA	0.6 (U)	—	—	2.7	—	—
AAB6264	10-01251	28.9000–29.5000	QBOF	1090 (J)	—	—	NA	4.6 (J)	NA	0.67 (U)	—	—	6.69	6.1 (J–)	—
AAB6268	10-01251	44.0000–44.6000	QBOG	—	—	—	NA	2.7 (J)	NA	0.71 (U)	—	—	14.27	—	—
AAB6270	10-01251	49.4000–50.0000	QBOG	1090 (J)	—	—	NA	2.4 (J)	NA	0.75 (U)	—	—	14.91	—	—
AAB6228	10-01252	3.4000–4.0000	QBOF	1010 (J)	—	—	NA	2.15 (U)	NA	0.33 (U)	—	—	—	9.1 (J)	—
AAB6232	10-01252	15.4000–16.6000	QBOF	—	—	—	NA	2.1 (U)	NA	0.33 (U)	—	—	—	—	—
AAB6241	10-01252	40.9000–41.5000	QBOG	—	—	—	NA	2.39 (U)	NA	0.37 (U)	—	—	—	5.1 (J)	—
AAB6243	10-01252	49.4000–50.0000	QBOG	—	—	—	NA	2.69 (U)	NA	0.42 (U)	—	—	—	5.3 (J)	—
AAB6244	10-01253	3.5000–4.1000	QBOF	907 (J)	212	—	NA	2.6 (J)	NA	—	—	1.24 (U)	—	6.8 (J)	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB6251	10-01253	26.5000–27.1000	QBOF	1020 (J)	—	—	NA	3.7 (J)	NA	—	1.4 (J)	1.4 (U)	0.898 (J)	—	—
AAB6257	10-01253	37.5000–38.1000	QBOG	—	—	—	NA	2.5 (J)	NA	—	—	1.34 (U)	—	—	—
AAB6256	10-01253	49.4000–50.0000	QBOG	—	—	—	NA	2.14 (U)	NA	0.34 (U)	—	1.58 (U)	—	—	—
AAB6271	10-01254	3.1000–4.3000	QBOF	910 (J)	—	—	NA	3.1 (J)	NA	0.62 (U)	—	—	5.55	6.2 (J–)	—
AAB6281	10-01254	28.4000–29.3000	QBOF	1480	—	—	NA	5.9 (J)	NA	0.67 (U)	—	—	4.77	9 (J–)	50.1
AAB6289	10-01254	33.0000–33.6000	QBOF	933 (J)	—	—	NA	4 (J)	NA	0.64 (U)	—	—	10.23	—	—
AAB6288	10-01254	49.4000–50.0000	QBOG	—	—	—	NA	—	NA	0.73 (U)	—	—	17.28	—	—
AAB6501	10-01255	3.6000–4.2000	QBOF	—	—	—	NA	—	NA	—	—	—	6.37 (J–)	—	—
AAB6511	10-01255	20.0000–20.4000	QBOF	—	—	—	NA	—	NA	—	—	—	2.76 (J–)	—	—
AAB6507	10-01255	28.7000–29.3000	QBOF	—	—	—	NA	—	NA	—	—	—	2.76 (J–)	—	—
AAB6510	10-01255	48.7000–49.4000	QBOF	—	—	—	NA	—	NA	—	—	—	5.03 (J–)	—	—
AAB6565	10-01256	3.9000–4.6000	QBOF	841 (J)	221 (J+)	—	NA	3.4 (U)	NA	0.68 (U)	—	—	0.88	6.2 (J)	—
AAB8647	10-01256	28.5000–29.0000	QBOF	1140	—	—	NA	4.6 (J)	NA	0.56 (U)	—	—	7.12	5.7 (J)	—
AAB8652	10-01256	35.0000–35.8000	QBOF	—	—	—	NA	3.4 (U)	NA	0.51 (U)	—	—	3.84	—	—
AAB8651	10-01256	47.4000–48.1000	QBOF	—	—	—	NA	3.6 (U)	NA	1.2 (U)	—	—	4.63	—	—
AAB6537	10-01257	3.6000–4.2000	QBOF	775 (J)	—	—	NA	4.5 (J)	NA	0.53 (U)	—	—	0.93	5.9 (J)	—
AAB6551	10-01257	20.0000–20.8000	QBOF	843 (J)	—	—	NA	3.3 (J)	NA	0.54 (U)	—	—	3.14	—	—
AAB6546	10-01257	28.4000–29.1000	QBOF	1060 (J)	—	—	NA	3.5 (J)	NA	0.54	—	—	2.79	—	—
AAB6550	10-01257	48.5000–49.4000	QBOF	—	—	—	NA	2.2 (J)	NA	0.57 (U)	—	—	5.01	—	—
AAB8653	10-01258	3.5000–4.1000	QBOF	1330 (J)	352 (J)	—	NA	7.5 (J)	NA	0.76 (J)	—	—	7.46	8.7 (J)	—
AAB8666	10-01258	15.0000–15.8000	QBOF	1350 (J)	231 (J)	—	NA	3.6 (J)	NA	0.51 (UJ)	—	—	3.5	6.6 (J)	—
AAB8661	10-01258	28.5000–29.1000	QBOF	1220 (J)	—	—	NA	3.8 (J)	NA	0.53 (UJ)	—	—	3.44	—	—
AAB8665	10-01258	48.6000–49.4000	QBOF	—	—	—	NA	—	NA	0.57 (UJ)	—	—	3.93	—	—
AAB6512	10-01259	2.8000–3.7000	SOIL	—	—	—	NA	—	NA	—	—	—	5.49 (J–)	—	—
AAB6525	10-01259	15.2000–16.0000	QBOF	1190	253	—	NA	5.5 (J)	NA	0.81 (U)	—	—	2.97	7.8 (J)	—
AAB6520	10-01259	28.5000–29.2000	QBOF	—	—	—	NA	3.3 (U)	NA	0.42 (U)	—	—	3.4	—	—
AAB6524	10-01259	48.6000–49.5000	QBOF	—	—	—	NA	4.7 (J)	NA	1 (U)	—	—	4.51	—	—
AAB6552	10-01261	2.8000–3.8000	SOIL	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB6563	10-01261	15.0000–15.8000	QBOF	1220	237 (J+)	—	NA	4.8 (J)	NA	0.7 (U)	—	—	2.39	7.7 (J)	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB6558	10-01261	25.6000–26.2000	QBOF	1090	—	—	NA	4.5 (J)	NA	0.55 (U)	—	—	1.37	—	—
AAB6562	10-01261	48.4000–49.3000	QBOF	—	—	—	NA	3.5 (U)	NA	0.45 (U)	—	—	3.36	—	—
AAB8668	10-01262	2.7000–3.3000	SOIL	—	—	—	NA	—	NA	—	—	—	6.19	—	—
AAB8679	10-01262	15.0000–15.8000	QBOF	1510	304	—	NA	NA	NA	0.88 (U)	—	—	5.65	10.4 (J)	—
AAB8674	10-01262	29.5000–29.8000	QBOF	1200 (J)	196	—	NA	5.1 (J)	NA	0.51 (U)	—	—	4.14	7.3 (J)	—
AAB8678	10-01262	47.3000–48.3000	QBOF	—	—	—	NA	3.9 (U)	NA	0.5 (U)	—	—	—	—	—
AAB6526	10-01263	3.1000–4.0000	QBOF	1020 (J)	268 (J+)	—	NA	4.8 (J)	NA	0.83 (U)	—	—	1.48 (J)	7 (J)	—
AAB6536	10-01263	16.0000–16.7000	QBOF	976 (J)	199 (J+)	—	NA	3.6 (J)	NA	0.44 (U)	—	—	3.35 (J)	5.5 (J)	—
AAB6532	10-01263	28.9000–29.6000	QBOF	795 (J)	—	—	NA	3.3 (U)	NA	0.97 (U)	—	—	3.23 (J)	—	—
AAB6535	10-01263	41.5000–42.0000	QBOF	—	—	—	NA	3.5 (U)	NA	0.6 (U)	—	—	2.89 (J)	—	—
AAB2893	10-01264	3.5000–4.1000	QBOF	744 (J–)	230 (J–)	—	NA	2.8 (J–)	NA	0.52 (J–)	—	—	2.65 (J)	6.3 (J–)	—
AAB2905	10-01264	9.0000–9.5000	QBOF	919 (J–)	—	—	NA	3.1 (J)	NA	0.43 (U)	—	—	2.93 (J)	7.6 (J–)	—
AAB2904	10-01264	36.5000–37.0000	QBOF	1690 (J–)	—	—	NA	4.8 (J)	NA	0.54 (U)	—	—	11.5 (J)	—	—
AAB2903	10-01264	48.2000–49.0000	QBOG	—	—	—	NA	2.2 (J)	NA	0.4 (UJ)	—	—	15.1 (J)	—	—
AAB2935	10-01265	3.0000–3.5000	SOIL	—	—	—	NA	—	NA	—	—	—	2.95 (U)	—	—
AAB2947	10-01265	28.6000–28.9000	QBOF	896 (J)	277	—	NA	4.9 (J)	NA	—	—	1.35 (U)	1.587 (J)	7.7 (U)	—
AAB2944	10-01265	36.5000–37.0000	QBOF	—	—	—	NA	—	NA	—	—	1.34 (U)	—	—	—
AAB2946	10-01265	48.5000–49.0000	QBOG	—	—	—	NA	—	NA	0.31 (U)	—	1.45 (U)	—	4.8 (J)	—
AAB2949	10-01266	3.0000–3.5000	SOIL	—	—	—	NA	—	NA	20.3 (U)	—	0.79 (U)	2.82 (J)	—	—
AAB2962	10-01266	16.2000–16.8000	QBOF	1350	299	—	NA	4.4 (J)	NA	20.7 (U)	—	—	4.25 (J)	9.9 (J)	—
AAB2958	10-01266	40.2000–40.8000	QBOG	—	—	—	NA	—	NA	21.9 (U)	—	—	14.3 (J)	—	—
AAB2959	10-01266	49.3000–50.0000	QBOG	—	—	—	NA	—	NA	23.8 (U)	—	—	15.9 (J)	—	—
AAB2979	10-01268	4.1000–4.6000	QBOF	1360	282	—	NA	4.7 (J)	NA	20.7 (U)	—	—	2.73 (J)	10.9 (J)	—
AAB2990	10-01268	20.0000–20.5000	QBOF	1800	—	—	NA	5.5 (J)	NA	0.36 (U)	—	—	1.1 (J)	8.9 (J)	—
AAB2988	10-01268	39.3000–39.8000	QBOF	—	—	—	NA	2.5 (J)	NA	0.35 (U)	—	—	1.56 (J)	5.3 (J)	—
AAB2989	10-01268	49.0000–49.5000	QBOG	—	—	—	NA	2.25 (U)	NA	0.35 (U)	—	—	—	—	—
AAB2906	10-01269	3.5000–4.0000	QBOF	1030 (J–)	233 (J–)	—	NA	3.5 (J–)	NA	0.35 (UJ)	—	—	4.3	8.3 (J–)	—
AAB2916	10-01269	14.0000–14.5000	QBOF	1370 (J–)	303 (J–)	—	NA	5.6 (J–)	NA	0.42 (UJ)	—	—	4.8	11.2 (J–)	—
AAB2917	10-01269	26.5000–27.0000	QBOF	1700 (J–)	310 (J–)	—	NA	5.8 (J–)	NA	0.42 (J–)	—	—	4.8	15 (J–)	44.5 (J–)

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB2915	10-01269	47.5000–48.0000	QBOG	—	—	—	NA	2.1 (UJ)	NA	0.43 (UJ)	—	—	16	—	—
AAB2963	10-01270	4.0000–4.8000	QBOF	753 (J)	208	—	NA	2.13 (U)	NA	0.33 (U)	—	—	—	6.9 (J)	—
AAB2978	10-01270	34.6000–34.8000	QBOF	1020 (J)	237	—	NA	3.6 (J)	NA	0.36 (U)	—	—	0.996	6.3 (J)	—
AAB2973	10-01270	40.6000–41.0000	QBOG	—	—	—	NA	—	NA	0.66 (UJ)	—	—	10.6 (J–)	—	—
AAB2977	10-01270	45.5000–46.0000	QBOG	—	—	—	NA	2.35 (U)	NA	0.36 (U)	—	—	—	—	—
AAB2920	10-01271	3.5000–4.0000	QBOF	898 (J–)	230 (J–)	—	NA	3.1 (J–)	NA	0.6 (UJ)	—	—	3.45 (U)	5.8 (J)	—
AAB2928	10-01271	21.8000–22.3000	QBOF	1310 (J–)	219 (J–)	—	NA	3.7 (J–)	NA	0.62 (UJ)	—	—	5.01	5.4 (J–)	—
AAB2934	10-01271	38.3000–39.0000	QBOF	—	—	—	NA	3 (J–)	NA	0.63 (UJ)	—	—	7.5	—	—
AAB2933	10-01271	48.0000–48.6000	QBOG	—	—	—	NA	—	NA	0.68 (UJ)	—	—	15.9	—	—
AAB8685	10-01285	22.5000–23.5000	QBOF	924	—	—	NA	2.5 (J)	NA	—	—	—	—	5.2	—
AAB8680	10-01285	29.0000–29.5000	QBOF	—	—	—	NA	2.7 (U)	NA	—	—	—	—	4.8 (J)	—
AAB8722	10-01285	30.0000–30.7000	QBOF	—	—	—	NA	—	NA	—	—	—	0.944	—	—
AAB8719	10-01285	46.6000–47.2000	QBOF	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB8691	10-01286	4.2000–4.6000	QBOF	—	214	—	NA	3.1 (J)	NA	—	—	—	—	—	—
AAB8728	10-01286	15.0000–15.4000	QBOF	1550	301	—	NA	5.4	NA	—	—	—	2.76	9.3	43.9
AAB8697	10-01286	24.0000–24.4000	QBOF	752	—	—	NA	2.1 (J)	NA	—	—	—	1.51	—	—
AAB8727	10-01286	49.1000–49.6000	QBOF	—	—	—	NA	—	NA	—	—	—	1.82	—	—
AAB8715	10-01287	3.5000–4.1000	QBOF	1230	289	—	NA	4.7	NA	—	—	—	1.02	8.4	45.2
AAB9210	10-01287	10.0000–10.8000	QBOF	1050	281	—	NA	3.3 (J)	NA	—	—	—	2.04	5.9	53.4
AAB9204	10-01287	29.1000–30.0000	QBOF	854	—	—	NA	2.7 (J)	NA	—	—	—	2.43	—	—
AAB9209	10-01287	48.5000–49.1000	QBOF	—	—	—	NA	—	NA	—	—	—	5.82	—	—
AAB9429	10-01288	4.2000–5.0000	QBOF	857 (J)	332 (J+)	—	NA	6 (J+)	NA	—	—	—	1.99 (J)	6.4 (J)	—
AAB9433	10-01288	22.5000–23.5000	QBOF	875 (J)	—	—	NA	6.5 (J+)	NA	—	—	—	2.61 (J)	—	—
AAB9438	10-01288	46.2000–47.0000	QBOF	—	—	—	NA	—	NA	—	—	—	3.43	—	—
AAB9439	10-01288	47.8000–48.5000	QBOF	—	—	—	NA	—	NA	—	—	—	6.07	—	—
AAB9224	10-01289	3.3000–4.1000	QBOF	782 (J)	234 (J)	—	NA	—	NA	—	—	—	5.15	6.2 (J)	—
AAB9227	10-01289	11.4000–12.1000	QBOF	1100 (J)	321 (J)	—	NA	4.1 (J)	NA	—	—	—	2.03	6.9 (J)	49.6 (J)
AAB9231	10-01289	28.9000–29.3000	QBOF	1220 (J)	—	—	NA	2.8 (J)	NA	—	—	—	3.46	5.6 (J)	—
AAB9234	10-01289	48.5000–49.4000	QBOF	—	—	—	NA	—	NA	—	—	—	6.83	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB8701	10-01290	4.1000–4.5000	QBOF	—	—	—	NA	2.6 (J)	NA	—	—	—	1.04	—	—
AAB8714	10-01290	15.0000–15.4000	QBOF	1370	264	—	NA	3.2 (J)	NA	—	—	—	1.64	7.9	40.4
AAB8709	10-01290	29.0000–29.4000	QBOF	1050	222	—	NA	3 (J)	NA	—	—	—	2.89	—	—
AAB8712	10-01290	48.0000–48.5000	QBOF	—	—	—	NA	—	NA	—	—	—	5.21	5.5 (J)	—
AAB9211	10-01291	2.8000–3.7000	SOIL	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB9223	10-01291	15.0000–15.8000	QBOF	1120 (J)	274 (J)	—	NA	2.6 (J)	NA	—	—	—	2.39	6.9 (J)	—
AAB9216	10-01291	28.2000–29.0000	QBOF	1120 (J)	—	—	NA	2.4 (J)	NA	—	—	—	3.39	5.6 (J)	—
AAB9222	10-01291	48.5000–49.5000	QBOF	—	—	—	NA	—	NA	—	—	—	8.57	—	—
AAB9235	10-01293	2.5000–3.9000	SOIL	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB9247	10-01293	10.0000–10.8000	QBOF	961 (J)	235 (J+)	—	NA	7.5 (J+)	NA	—	—	—	2.14 (J)	6.5 (J)	—
AAB9242	10-01293	28.7000–29.4000	QBOF	953 (J)	—	—	NA	5.4 (J+)	NA	—	—	—	2.83 (J)	—	—
AAB9246	10-01293	48.6000–49.6000	QBOF	—	—	—	NA	5.9 (J+)	NA	—	—	—	8.59 (J)	—	—
AAB9269	10-01294	15.0000–15.9000	QBOF	—	—	—	NA	—	NA	0.89 (U)	—	—	1.88 (U)	—	—
AAB9271	10-01294	26.5000–27.1000	QBOF	1060 (J)	606 (J+)	—	NA	4 (J)	NA	1.1 (U)	—	—	4.57 (U)	8.2 (J)	—
AAB9274	10-01294	36.6000–37.4000	QBOG	741 (J)	334 (J+)	—	NA	2.1 (J)	NA	1 (U)	—	—	4.8 (U)	5.8 (J)	—
AAB9277	10-01294	48.7000–49.4000	QBOG	—	—	—	NA	4.2 (J)	NA	1.2 (U)	—	—	13.3	—	—
AAB6292	10-02210	6.0000–6.6000	SOIL	—	—	—	NA	—	NA	—	—	—	3.37	—	—
AAB6307	10-02210	11.9000–12.5000	QAL	—	—	—	NA	—	NA	—	—	—	4.9	—	—
AAB6299	10-02210	18.0000–18.6000	QAL	—	—	—	NA	—	NA	—	—	—	4.3	—	—
AAB6304	10-02210	40.0000–40.6000	QBO	—	—	—	NA	3.5 (J)	NA	—	—	—	0.74 (J)	—	—
AAB6306	10-02210	49.0000–49.8000	QBOG	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB6338	10-02211	13.8000–14.3000	QAL	—	—	—	NA	—	NA	—	—	1.25 (U)	—	—	—
AAB6349	10-02211	16.3000–16.8000	QAL	—	—	—	NA	—	NA	—	—	1.28 (U)	—	—	—
AAB6343	10-02211	31.4000–31.9000	QAL	—	—	—	NA	—	NA	—	—	1.35 (U)	—	—	—
AAB6348	10-02211	49.5000–50.0000	QBOG	—	—	—	NA	2.06 (U)	NA	0.33 (U)	—	1.53 (U)	—	—	—
AAB6308	10-02212	3.6000–4.2000	QAL	—	—	—	NA	—	NA	—	—	1.28 (U)	3.271	—	—
AAB6313	10-02212	22.9000–23.5000	QAL	—	—	—	NA	—	NA	—	—	1.24 (U)	—	—	—
AAB6317	10-02212	37.2000–37.8000	QBOG	—	—	—	NA	2.7 (U)	NA	—	—	1.39 (U)	12.2 (J)	—	—
AAB6320	10-02212	49.4000–50.0000	QBOG	—	—	—	NA	3.7 (U)	NA	0.34 (U)	—	1.55 (U)	13 (J)	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB6321	10-02216	7.5000–8.5000	QAL	—	—	—	NA	—	NA	—	—	1.29 (U)	—	—	—
AAB6336	10-02216	17.5000–18.2000	QAL	—	—	—	NA	—	NA	—	—	1.27 (U)	—	—	—
AAB6330	10-02216	27.5000–28.0000	QAL	—	—	—	NA	—	NA	—	—	1.33 (U)	—	—	—
AAB6335	10-02216	47.5000–47.9000	QBOG	—	—	—	NA	2.05 (U)	NA	0.33 (U)	—	1.52 (U)	—	—	—
AAB6587	10-02219	28.4000–28.9000	QAL	—	—	—	NA	—	NA	—	—	—	2.93	—	—
AAB6594	10-02219	46.9000–47.4000	QBOG	—	—	—	NA	5.2 (J)	NA	0.64 (UJ)	—	—	8.31	—	—
AAB6583	10-02220	14.0000–14.5000	QAL	—	—	—	NA	—	NA	—	—	—	6.2	—	—
AAB6584	10-02220	17.0000–17.5000	QAL	—	—	—	NA	—	NA	—	—	—	6.7	—	—
AAB9428	10-02220	18.0000–18.6000	QAL	—	—	—	NA	—	NA	—	—	—	7.76 (J+)	—	—
AAB6600	10-02220	37.0000–37.5000	QBO	868	248	—	NA	3 (J)	NA	—	—	—	2.9	6.9	—
AAB6603	10-02220	49.4000–50.0000	QBOG	—	198 (J)	—	NA	3.4 (J)	NA	0.34 (UJ)	—	—	9.85	—	44.5 (J)
AAB8642	10-02221	14.2000–15.0000	QAL	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB9422	10-02221	28.8000–29.5000	QAL	—	—	—	NA	—	NA	—	—	—	3.49 (J)	—	—
AAB9424	10-02221	35.3000–36.0000	QBOG	—	—	—	NA	4.1 (U)	NA	—	—	—	8.17 (J)	—	—
AAB9427	10-02221	49.2000–50.0000	QBOG	—	—	—	NA	5.7 (J+)	NA	—	—	—	12.2 (J)	—	—
AAB9251	10-02222	25.4000–26.1000	QAL	—	—	—	NA	—	NA	—	—	—	2.76	—	—
AAB9253	10-02222	40.6000–41.6000	QBOG	—	—	—	NA	—	NA	—	—	—	7.97	—	—
AAB9256	10-02222	48.1000–49.0000	QBOG	—	—	—	NA	—	NA	—	—	—	8.45	—	—
AAB6615	10-02224	14.3000–15.0000	QAL	—	—	—	NA	—	NA	—	—	—	—	—	—
AAB6617	10-02224	24.0000–25.0000	QAL	—	—	—	NA	—	NA	—	—	—	2.44 (J)	—	—
AAB6623	10-02224	37.5000–38.3000	QBOG	—	—	—	NA	3.9 (J)	NA	—	—	—	6.27 (J)	—	44.5
AAB8641	10-02224	49.2000–50.0000	QBOG	—	—	—	NA	—	NA	0.33 (U)	—	—	7.27 (J)	—	—
RE10-07-5492	10-601160	0.8000–2.8000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5491	10-601160	42.0000–44.0000	QBOG	—	—	—	NA	3.3	—	0.65 (U)	—	—	NA	—	—
RE10-07-5490	10-601160	59.0000–60.8000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5496	10-601161	43.0000–45.0000	QBOG	804	221	—	NA	4.3	—	0.67 (U)	—	—	NA	—	—
RE10-07-5495	10-601161	58.2000–60.0000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5502	10-601162	0.0000–2.1000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5501	10-601162	41.3000–43.3000	QBOG	824	220	—	NA	4.3	—	0.66 (U)	—	—	NA	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
RE10-07-5500	10-601162	59.0000–61.5000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5506	10-601163	13.0000–14.8000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5505	10-601163	49.5000–51.5000	QBOG	—	214	—	NA	3.6	—	0.7 (U)	—	—	NA	—	43
RE10-07-5512	10-601164	14.0000–16.0000	QAL	—	—	—	NA	—	0.00106 (J)	—	—	—	NA	—	161 (J+)
RE10-07-5513	10-601164	19.0000–21.0000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5511	10-601164	39.0000–40.5000	QBOG	2030	—	—	NA	6.7	—	0.62 (U)	—	—	NA	5.1	—
RE10-07-5510	10-601164	52.0000–54.0000	QBOG	—	235	—	NA	2.7	—	0.69 (U)	—	—	NA	—	40.6
RE10-07-5548	10-601165	4.7000–6.7000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5547	10-601165	30.2000–32.2000	QAL	—	—	—	NA	—	0.0025 (J)	—	—	—	NA	—	—
RE10-07-5552	10-601166	5.0000–7.0000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5551	10-601166	29.5000–31.5000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5556	10-601167	20.2000–22.2000	QBO	1280	233	—	NA	4.1	—	0.54 (U)	—	—	NA	7.4	—
RE10-07-5555	10-601167	34.5000–36.5000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5560	10-601168	21.0000–24.0000	QBO	885	—	—	NA	2.2	0.0026 (J)	0.54 (U)	—	—	NA	—	—
RE10-07-5559	10-601168	30.0000–32.0000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5564	10-601169	10.0000–12.0000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5563	10-601169	30.0000–32.0000	QAL	—	—	—	NA	—	0.0022 (J)	—	—	—	NA	—	—
RE10-07-5568	10-601170	20.4000–22.4000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5567	10-601170	62.0000–64.0000	QBOG	—	—	—	NA	—	—	0.71 (UJ)	—	—	NA	—	—
RE10-07-5572	10-601171	42.0000–44.0000	QBO	—	—	—	NA	—	—	0.58 (UJ)	—	—	NA	—	—
RE10-07-5571	10-601171	62.0000–64.0000	QBOG	—	—	—	NA	—	—	0.73 (UJ)	—	—	NA	—	—
RE10-07-5576	10-601172	26.2000–28.2000	QBO	777	—	—	0.25 (J)	—	—	0.52 (UJ)	—	—	NA	—	—
RE10-07-5575	10-601172	58.0000–60.0000	QBOG	—	—	—	0.27 (J)	—	—	0.68 (UJ)	—	—	NA	—	—
RE10-07-5580	10-601173	19.8000–21.8000	QAL	—	—	—	0.32 (J)	—	—	—	—	—	NA	—	—
RE10-07-5579	10-601173	61.5000–63.5000	QBOG	—	201 (J–)	—	0.28 (J)	—	—	0.7 (UJ)	—	—	NA	—	—
RE10-07-5584	10-601174	30.0000–31.7000	QBOG	—	—	—	0.21 (J)	—	0.0022 (J)	0.53 (UJ)	—	—	NA	—	—
RE10-07-5583	10-601174	61.0000–63.0000	QBOG	—	—	—	0.22 (J)	—	—	0.73 (UJ)	—	—	NA	—	—
RE10-07-5588	10-601175	32.0000–34.0000	QBO	—	—	—	0.14 (J)	—	—	0.53 (UJ)	—	—	NA	—	—
RE10-07-5587	10-601175	62.0000–64.0000	QBOG	—	—	—	0.23 (J)	—	—	0.69 (UJ)	—	—	NA	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
RE10-07-5592	10-601176	27.1000–29.1000	QBO	877	—	—	0.2 (J)	—	—	0.52 (UJ)	—	—	NA	—	—
RE10-07-5591	10-601176	58.0000–60.0000	QBOG	—	—	—	0.34 (J)	—	—	0.67 (UJ)	—	—	NA	—	—
RE10-07-5596	10-601177	35.9000–37.9000	QBOG	—	—	—	NA	2.7	—	0.59 (UJ)	—	—	NA	—	—
RE10-07-5595	10-601177	61.5000–63.5000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5600	10-601178	14.0000–16.0000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5599	10-601178	60.2000–62.2000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5604	10-601179	37.0000–39.0000	QBOG	—	—	—	NA	2.4	—	0.61 (U)	—	—	NA	—	—
RE10-07-5603	10-601179	60.8000–62.8000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5608	10-601180	33.0000–35.0000	QBOG	1450	—	—	NA	5.2	—	0.56 (UJ)	—	—	NA	—	—
RE10-07-5607	10-601180	48.0000–50.0000	QBOG	—	—	—	NA	—	—	0.67 (UJ)	—	—	NA	—	—
RE10-07-5612	10-601181	14.5000–16.5000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5611	10-601181	30.0000–32.0000	QAL	—	—	—	NA	—	0.0023 (J)	—	—	—	NA	—	—
RE10-07-5616	10-601182	33.0000–35.0000	QBOG	—	—	—	0.15 (J)	—	—	0.54 (UJ)	—	—	NA	—	—
RE10-07-5615	10-601182	58.0000–60.0000	QBOG	—	—	—	0.26 (J)	—	—	0.66 (UJ)	—	—	NA	—	—
RE10-07-5899	10-601239	19.9000–21.9000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5898	10-601239	30.2000–32.2000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5904	10-601240	37.0000–39.0000	QBOG	—	—	—	0.22 (J)	2.1 (J)	—	0.61 (UJ)	—	—	NA	—	—
RE10-07-5903	10-601240	60.5000–62.5000	SOIL	—	—	—	0.51 (J)	—	—	—	—	—	NA	—	—
RE10-07-5909	10-601241	15.8000–17.8000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5908	10-601241	26.9000–28.9000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5913	10-601242	26.0000–28.0000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5919	10-601243	31.9000–33.9000	QAL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-07-5918	10-601243	48.0000–56.0000	QBOG	—	—	—	NA	—	—	0.63 (U)	—	—	NA	—	—
RE10-07-5924	10-601244	32.5000–34.5000	QBOG	1160 (J–)	—	—	NA	4.6 (J–)	—	0.58 (U)	—	—	NA	4.7	—
RE10-07-5923	10-601244	48.0000–50.0000	QBOG	—	—	—	NA	—	—	0.63 (U)	—	—	NA	—	—
RE10-07-5929	10-601245	6.0000–8.0000	QAL	—	—	—	0.48 (J)	—	—	—	—	—	NA	—	—
RE10-07-5928	10-601245	25.0000–27.6000	QAL	—	—	—	0.86	—	—	—	—	—	NA	—	—
RE10-07-5934	10-601246	16.3000–18.3000	QAL	—	—	—	0.91	—	—	—	—	—	NA	—	—
RE10-07-5933	10-601246	26.6000–28.6000	QAL	—	—	—	0.55 (J)	—	—	—	—	—	NA	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
RE10-07-5939	10-601247	13.7000–15.7000	QAL	—	—	—	1.1	—	—	—	—	—	NA	—	—
RE10-07-5938	10-601247	28.7000–30.7000	QAL	—	—	—	1.1	—	—	—	—	—	NA	—	—
RE10-07-5944	10-601248	19.8000–21.8000	QAL	—	—	—	0.77	—	—	—	—	—	NA	—	—
RE10-07-5943	10-601248	42.0000–44.0000	QBOG	—	—	—	0.19 (J)	—	—	0.64 (U)	—	—	NA	—	—
RE10-07-5949	10-601249	20.2000–22.2000	QAL	—	—	—	0.47 (J)	—	—	—	—	—	NA	—	—
RE10-07-5948	10-601249	32.0000–34.0000	QBOG	1070	—	—	0.23 (J)	4.8	—	0.63 (U)	—	—	NA	—	—
RE10-07-5954	10-601250	27.0000–29.0000	QAL	—	—	—	0.69	—	—	—	—	—	NA	—	—
RE10-07-5953	10-601250	42.0000–44.0000	QBOG	—	—	—	0.14 (J)	—	—	0.65 (U)	—	—	NA	—	—
RE10-07-5959	10-601251	7.0000–9.0000	QAL	—	—	—	0.7	—	—	—	—	—	NA	—	—
RE10-07-5958	10-601251	42.0000–44.0000	QBOG	—	—	—	0.18 (J)	—	—	0.67 (U)	—	—	NA	—	—
RE10-07-5964	10-601252	33.0000–35.0000	QBOG	—	196 (J)	—	0.22 (J)	2.6	—	0.62 (U)	—	—	NA	—	—
RE10-07-5963	10-601252	38.0000–40.0000	QBOG	—	—	—	0.23 (J)	—	—	0.61 (U)	—	—	NA	—	—
RE10-07-5969	10-601253	27.0000–29.0000	QBO	844	199 (J)	—	0.25 (J)	2.8	—	0.56 (U)	—	—	NA	—	—
RE10-07-5968	10-601253	30.4000–32.4000	QBOG	1130	—	—	0.19 (J)	2.8	—	0.57 (U)	—	—	NA	4.6	—
RE10-07-5974	10-601254	26.8000–28.8000	QAL	—	—	—	0.79	—	—	—	—	—	NA	—	—
RE10-07-5973	10-601254	38.0000–40.0000	QBOG	—	—	—	0.16 (J)	2.4	—	0.55 (U)	—	—	NA	—	—
RE10-07-5979	10-601255	7.6000–9.6000	SOIL	—	—	—	0.46 (J)	—	0.0022 (J)	—	—	—	NA	—	—
RE10-07-5978	10-601255	32.7000–34.7000	QAL	—	—	—	0.82	—	—	—	—	—	NA	—	—
RE10-07-5984	10-601256	10.0000–12.0000	SOIL	—	—	—	0.49 (J)	—	—	—	—	—	NA	—	—
RE10-07-5983	10-601256	36.7000–38.7000	QBOG	823	—	—	0.25 (J)	3	—	0.54 (U)	—	—	NA	—	—
RE10-07-5989	10-601257	21.3000–23.3000	QAL	—	—	—	0.39 (J)	—	—	—	—	—	NA	—	—
RE10-07-5988	10-601257	31.0000–33.0000	QAL	—	—	—	0.48 (J)	—	—	—	—	—	NA	—	—
RE10-07-6000	10-601259	13.0000–19.5000	QAL	—	—	—	1.3	—	—	—	—	—	NA	—	—
RE10-07-5999	10-601259	28.8000–30.8000	QAL	—	—	—	0.82	—	—	—	—	—	NA	—	—
RE10-07-5998	10-601259	51.0000–53.0000	QBOG	—	—	—	0.49 (J)	2.4	—	0.72 (U)	—	—	NA	—	—
RE10-07-6291	10-601319	0.0000–0.2500	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-08-9965	10-603263	0.0000–1.0000	SOIL	—	—	—	NA	—	—	1.68 (U)	—	—	NA	—	—
RE10-08-9966	10-603263	1.5000–2.0000	SOIL	—	—	—	NA	—	—	1.59 (U)	—	—	NA	—	—
RE10-08-9967	10-603264	0.0000–1.0000	SOIL	—	—	—	NA	—	0.000756 (J)	—	—	—	NA	—	—

Table 6.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Perchlorate	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBO BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**na**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**na**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
RE10-08-9968	10-603264	1.5000–2.0000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—
RE10-08-9969	10-603265	0.0000–1.0000	SOIL	—	—	0.219	NA	—	—	—	—	—	NA	—	—
RE10-08-9970	10-603265	1.5000–3.2000	SOIL	—	—	—	NA	—	—	—	—	—	NA	—	—

Note: Results are in mg/kg.

[a] BVs are from LANL 1998, 059730.

[b] — = Not detected or not detected above BV.

[c] NA = Not analyzed.

[d] na = Not available.

Table 6.2-4
Summary of Organic Chemicals Detected in Alluvium, Soil and Tuff at Consolidated Unit 10-002(a)-99

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acetone	Benzene	Benzoic Acid	Bis(2-ethylhexyl)phthalate	Bromobenzene	Bromoform	Butanone[2-]	Butylbenzene[sec-]	Butylbenzene[tert-]	Butylbenzylphthalate	Carbon Tetrachloride
Organic Chemical Detects per Sample, Standard UOM = mg/kg															
AAB9278	10-01200	16.1000–16.8000	QAL	—[a]	0.002 (J)	—	—	—	—	—	—	—	—	—	—
AAB9281	10-01200	26.1000–26.8000	QAL	—	0.014 (J)	—	—	—	—	—	—	—	—	—	—
AAB9283	10-01200	36.0000–37.0000	QBO	—	0.013 (J)	0.006 (J)	—	—	—	—	—	—	—	—	—
AAB9337	10-01201	11.1000–11.8000	QAL	—	0.004 (J)	—	—	—	—	—	—	—	—	—	—
AAB9341	10-01201	16.9000–17.5000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9342	10-01201	19.2000–20.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9296	10-01202	48.7000–49.5000	QBO	—	0.022 (J)	—	—	—	—	0.008 (J)	—	—	—	—	—
AAB9313	10-01204	25.8000–26.4000	QBO	—	—	—	—	—	—	—	—	—	—	—	—
AAB9315	10-01204	35.5000–36.5000	QBO	—	—	—	—	—	—	—	—	—	—	—	—
AAB9310	10-01204	47.7000–49.3000	QBO	—	—	—	—	—	—	—	—	—	—	—	—
AAB9300	10-01206	35.7000–36.9000	QBOG	—	—	—	2.1 (J)	—	—	—	—	—	—	—	—
AAB9308	10-01206	48.4000–49.3000	QBOG	—	—	—	0.082 (J)	—	—	—	0.007 (J)	—	—	—	—
AAB6378	10-01214	49.4000–50.0000	QBOG	—	NA[b]	NA	—	0.18 (J–)	NA	NA	NA	NA	NA	—	NA
AAB3046	10-01226	3.7000–4.7000	QAL	—	NA	NA	—	—	NA	NA	NA	NA	NA	—	NA
AAB6471	10-01231	48.4000–49.3000	QBOG	0.088 (J–)	NA	NA	—	—	NA	NA	NA	NA	NA	—	NA
AAB6169	10-01239	2.5000–3.1000	QAL	—	NA	NA	—	0.028 (J)	NA	NA	NA	NA	NA	—	NA
AAB6182	10-01240	3.1000–3.7000	QAL	—	NA	NA	—	0.025 (J–)	NA	NA	NA	NA	NA	—	NA
AAB6186	10-01240	19.0000–19.6000	QAL	—	NA	NA	—	0.025 (J–)	NA	NA	NA	NA	NA	—	NA
AAB3017	10-01244	32.0000–32.5000	QAL	—	NA	NA	—	0.27 (J)	NA	NA	NA	NA	NA	—	NA
AAB6122	10-01246	41.7000–42.3000	QBO	—	NA	NA	—	2.4 (J)	NA	NA	NA	NA	NA	—	NA
AAB6270	10-01251	49.4000–50.0000	QBOG	—	NA	NA	—	30	NA	NA	NA	NA	NA	—	NA
AAB6228	10-01252	3.4000–4.0000	QBOF	—	NA	NA	—	—	NA	NA	NA	NA	NA	—	NA
AAB6281	10-01254	28.4000–29.3000	QBOF	—	NA	NA	—	0.19 (J)	NA	NA	NA	NA	NA	—	NA
AAB6288	10-01254	49.4000–50.0000	QBOG	—	NA	NA	—	0.34 (J)	NA	NA	NA	NA	NA	—	NA
AAB6551	10-01257	20.0000–20.8000	QBOF	—	NA	NA	0.056 (J)	—	NA	NA	NA	NA	NA	—	NA
AAB6550	10-01257	48.5000–49.4000	QBOF	—	NA	NA	0.06 (J)	0.37 (J)	NA	NA	NA	NA	NA	—	NA
AAB2915	10-01269	47.5000–48.0000	QBOG	—	NA	NA	—	0.14 (J)	NA	NA	NA	NA	NA	—	NA
AAB2920	10-01271	3.5000–4.0000	QBOF	—	NA	NA	—	—	NA	NA	NA	NA	NA	—	NA
AAB2928	10-01271	21.8000–22.3000	QBOF	—	NA	NA	—	—	NA	NA	NA	NA	NA	—	NA

Table 6.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acetone	Benzene	Benzoic Acid	Bis(2-ethylhexyl)phthalate	Bromobenzene	Bromoform	Butanone[2-]	Butylbenzene[sec-]	Butylbenzene[tert-]	Butylbenzylphthalate	Carbon Tetrachloride
Organic Chemical Detects per Sample, Standard UOM = mg/kg															
AAB2934	10-01271	38.3000–39.0000	QBOF	—	NA	NA	—	—	NA	NA	NA	NA	NA	—	NA
AAB2933	10-01271	48.0000–48.6000	QBOG	—	NA	NA	—	—	NA	NA	NA	NA	NA	—	NA
AAB9429	10-01288	4.2000–5.0000	QBOF	—	—	—	—	—	—	—	—	—	—	—	—
AAB9438	10-01288	46.2000–47.0000	QBOF	—	0.082 (J)	—	—	—	—	—	—	—	—	—	—
AAB9439	10-01288	47.8000–48.5000	QBOF	—	—	—	—	—	—	—	—	—	—	—	—
AAB9235	10-01293	2.5000–3.9000	SOIL	—	—	—	—	—	—	—	—	—	—	0.09 (J)	—
AAB6330	10-02216	27.5000–28.0000	QAL	—	NA	NA	—	—	NA	NA	NA	NA	NA	—	NA
AAB6581	10-02219	16.3000–16.8000	QAL	—	NA	NA	—	—	NA	NA	NA	NA	NA	—	NA
AAB6585	10-02219	20.3000–20.8000	QAL	—	NA	NA	—	—	NA	NA	NA	NA	NA	—	NA
AAB8642	10-02221	14.2000–15.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9248	10-02222	15.7000–16.5000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9251	10-02222	25.4000–26.1000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9253	10-02222	40.6000–41.6000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
AAB9256	10-02222	48.1000–49.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
AAB6615	10-02224	14.3000–15.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB6617	10-02224	24.0000–25.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB6623	10-02224	37.5000–38.3000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
AAB8641	10-02224	49.2000–50.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5492	10-601160	0.8000–2.8000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5496	10-601161	43.0000–45.0000	QBOG	—	0.011 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5512	10-601164	14.0000–16.0000	QAL	—	0.0257 (J)	—	—	—	—	—	0.00293 (J)	—	—	—	0.153 (J–)
RE10-07-5547	10-601165	30.2000–32.2000	QAL	—	0.0078 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5551	10-601166	29.5000–31.5000	QAL	—	0.0065 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5556	10-601167	20.2000–22.2000	QBO	—	0.0061 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5555	10-601167	34.5000–36.5000	QAL	—	0.0056 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5560	10-601168	21.0000–24.0000	QBO	—	0.0099 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5559	10-601168	30.0000–32.0000	QAL	—	0.0054 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5564	10-601169	10.0000–12.0000	SOIL	—	0.0071 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5563	10-601169	30.0000–32.0000	QAL	—	0.0074 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5568	10-601170	20.4000–22.4000	QAL	—	0.0079 (J)	—	—	—	—	—	—	0.00068 (J)	0.00071 (J)	—	—
RE10-07-5567	10-601170	62.0000–64.0000	QBOG	—	0.017 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5572	10-601171	42.0000–44.0000	QBO	—	0.0086 (J)	—	—	—	—	—	—	—	—	—	—

Table 6.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acetone	Benzene	Benzoic Acid	Bis(2-ethylhexyl)phthalate	Bromobenzene	Bromoform	Butanone[2-]	Butylbenzene[sec-]	Butylbenzene[tert-]	Butylbenzylphthalate	Carbon Tetrachloride
Organic Chemical Detects per Sample, Standard UOM = mg/kg															
RE10-07-5571	10-601171	62.0000–64.0000	QBOG	—	0.013 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5580	10-601173	19.8000–21.8000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5584	10-601174	30.0000–31.7000	QBOG	—	0.01 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5583	10-601174	61.0000–63.0000	QBOG	—	0.0095 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5588	10-601175	32.0000–34.0000	QBO	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5599	10-601178	60.2000–62.2000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5603	10-601179	60.8000–62.8000	SOIL	—	0.0046 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5611	10-601181	30.0000–32.0000	QAL	—	0.0089 (J)	—	—	—	—	—	—	—	—	—	—
RE10-07-5918	10-601243	48.0000–56.0000	QBOG	—	—	—	—	—	—	—	0.0084 (J)	—	—	—	—
RE10-07-5998	10-601259	51.0000–53.0000	QBOG	—	—	—	—	—	0.00046 (J–)	—	—	—	—	—	—
RE10-07-6291	10-601319	0.0000–0.2500	SOIL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-08-9970	10-603265	1.5000–3.2000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—

Table 6.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Chlorobenzene	Chloroform	Chlorophenol[2-]	Di-n-butylphthalate	Dichlorobenzene[1,2-]	Dichlorobenzene[1,3-]	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Diethylphthalate	Dimethyl Phthalate	Isopropyltoluene[4-]	Methyl-2-pentanone[4-]
Organic Chemical Detects per Sample, Standard UOM = mg/kg															
AAB9278	10-01200	16.1000–16.8000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9281	10-01200	26.1000–26.8000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9283	10-01200	36.0000–37.0000	QBO	0.006 (J)	—	—	—	—	—	—	0.007	—	—	—	—
AAB9337	10-01201	11.1000–11.8000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9341	10-01201	16.9000–17.5000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9342	10-01201	19.2000–20.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9296	10-01202	48.7000–49.5000	QBO	—	—	—	—	—	—	—	—	—	—	—	—
AAB9313	10-01204	25.8000–26.4000	QBO	—	—	—	—	—	—	—	—	—	—	—	—
AAB9315	10-01204	35.5000–36.5000	QBO	—	—	—	—	—	—	—	—	—	—	—	—
AAB9310	10-01204	47.7000–49.3000	QBO	—	—	—	—	—	—	—	—	—	—	—	—
AAB9300	10-01206	35.7000–36.9000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
AAB9308	10-01206	48.4000–49.3000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
AAB6378	10-01214	49.4000–50.0000	QBOG	NA	NA	—	—	—	—	NA	NA	—	—	NA	NA
AAB3046	10-01226	3.7000–4.7000	QAL	NA	NA	—	—	—	—	NA	NA	15	—	NA	NA
AAB6471	10-01231	48.4000–49.3000	QBOG	NA	NA	0.16 (J)	—	—	—	NA	NA	—	—	NA	NA
AAB6169	10-01239	2.5000–3.1000	QAL	NA	NA	—	—	—	—	NA	NA	—	—	NA	NA
AAB6182	10-01240	3.1000–3.7000	QAL	NA	NA	—	—	—	—	NA	NA	—	—	NA	NA
AAB6186	10-01240	19.0000–19.6000	QAL	NA	NA	—	—	—	—	NA	NA	—	—	NA	NA
AAB3017	10-01244	32.0000–32.5000	QAL	NA	NA	—	—	—	—	NA	NA	—	—	NA	NA
AAB6122	10-01246	41.7000–42.3000	QBO	NA	NA	—	—	—	—	NA	NA	—	—	NA	NA
AAB6270	10-01251	49.4000–50.0000	QBOG	NA	NA	—	—	—	—	NA	NA	—	—	NA	NA
AAB6228	10-01252	3.4000–4.0000	QBOF	NA	NA	—	—	—	—	NA	NA	26	—	NA	NA
AAB6281	10-01254	28.4000–29.3000	QBOF	NA	NA	—	—	—	—	NA	NA	—	—	NA	NA
AAB6288	10-01254	49.4000–50.0000	QBOG	NA	NA	—	—	—	—	NA	NA	—	—	NA	NA
AAB6551	10-01257	20.0000–20.8000	QBOF	NA	NA	—	—	—	—	NA	NA	—	—	NA	NA
AAB6550	10-01257	48.5000–49.4000	QBOF	NA	NA	—	—	—	—	NA	NA	—	—	NA	NA
AAB2915	10-01269	47.5000–48.0000	QBOG	NA	NA	—	—	—	—	NA	NA	—	0.08 (J)	NA	NA
AAB2920	10-01271	3.5000–4.0000	QBOF	NA	NA	—	0.73 (J)	—	—	NA	NA	—	—	NA	NA
AAB2928	10-01271	21.8000–22.3000	QBOF	NA	NA	—	1 (J)	—	—	NA	NA	—	—	NA	NA

Table 6.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Chlorobenzene	Chloroform	Chlorophenol[2-]	Di-n-butylphthalate	Dichlorobenzene[1,2-]	Dichlorobenzene[1,3-]	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Diethylphthalate	Dimethyl Phthalate	Isopropyltoluene[4-]	Methyl-2-pentanone[4-]
Organic Chemical Detects per Sample, Standard UOM = mg/kg															
AAB2934	10-01271	38.3000–39.0000	QBOF	NA	NA	—	0.26 (J)	—	—	NA	NA	—	—	NA	NA
AAB2933	10-01271	48.0000–48.6000	QBOG	NA	NA	—	0.24 (J)	—	—	NA	NA	—	—	NA	NA
AAB9429	10-01288	4.2000–5.0000	QBOF	—	—	—	0.42	—	—	—	—	—	—	—	—
AAB9438	10-01288	46.2000–47.0000	QBOF	—	—	—	—	—	—	—	—	—	—	—	—
AAB9439	10-01288	47.8000–48.5000	QBOF	—	—	—	—	—	—	—	—	—	—	—	—
AAB9235	10-01293	2.5000–3.9000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—
AAB6330	10-02216	27.5000–28.0000	QAL	NA	NA	—	—	—	—	NA	NA	—	—	NA	NA
AAB6581	10-02219	16.3000–16.8000	QAL	NA	NA	—	—	—	—	NA	NA	0.31 (J–)	—	NA	NA
AAB6585	10-02219	20.3000–20.8000	QAL	NA	NA	—	—	—	—	NA	NA	0.3 (J)	—	NA	NA
AAB8642	10-02221	14.2000–15.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9248	10-02222	15.7000–16.5000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9251	10-02222	25.4000–26.1000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB9253	10-02222	40.6000–41.6000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
AAB9256	10-02222	48.1000–49.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
AAB6615	10-02224	14.3000–15.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB6617	10-02224	24.0000–25.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
AAB6623	10-02224	37.5000–38.3000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
AAB8641	10-02224	49.2000–50.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5492	10-601160	0.8000–2.8000	SOIL	—	—	—	0.0346 (J)	—	—	—	—	—	—	—	—
RE10-07-5496	10-601161	43.0000–45.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5512	10-601164	14.0000–16.0000	QAL	—	0.0236	—	—	—	—	0.000375 (J)	—	—	—	—	—
RE10-07-5547	10-601165	30.2000–32.2000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5551	10-601166	29.5000–31.5000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5556	10-601167	20.2000–22.2000	QBO	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5555	10-601167	34.5000–36.5000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5560	10-601168	21.0000–24.0000	QBO	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5559	10-601168	30.0000–32.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5564	10-601169	10.0000–12.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5563	10-601169	30.0000–32.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5568	10-601170	20.4000–22.4000	QAL	—	—	—	—	—	—	—	—	—	—	0.0011 (J)	0.0027 (J)
RE10-07-5567	10-601170	62.0000–64.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5572	10-601171	42.0000–44.0000	QBO	—	—	—	—	—	—	—	—	—	—	—	—

Table 6.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Chlorobenzene	Chloroform	Chlorophenol[2-]	Di-n-butylphthalate	Dichlorobenzene[1,2-]	Dichlorobenzene[1,3-]	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Diethylphthalate	Dimethyl Phthalate	Isopropyltoluene[4-]	Methyl-2-pentanone[4-]
Organic Chemical Detects per Sample, Standard UOM = mg/kg															
RE10-07-5571	10-601171	62.0000–64.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5580	10-601173	19.8000–21.8000	QAL	—	—	—	—	0.00019 (J)	0.00022 (J)	—	—	—	—	—	—
RE10-07-5584	10-601174	30.0000–31.7000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5583	10-601174	61.0000–63.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5588	10-601175	32.0000–34.0000	QBO	—	—	—	—	—	0.00018 (J)	—	—	—	—	—	—
RE10-07-5599	10-601178	60.2000–62.2000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5603	10-601179	60.8000–62.8000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5611	10-601181	30.0000–32.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5918	10-601243	48.0000–56.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5998	10-601259	51.0000–53.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-6291	10-601319	0.0000–0.2500	SOIL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-08-9970	10-603265	1.5000–3.2000	SOIL	—	—	—	0.0404 (J)	—	—	—	—	—	—	—	—

Table 6.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Naphthalene	Phenol	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,3-]+Xylene[1,4-]
Organic Chemical Detects per Sample, Standard UOM = mg/kg															
AAB9278	10-01200	16.1000–16.8000	QAL	—	—	—	—	—	—	—	—	—	—	—	NA
AAB9281	10-01200	26.1000–26.8000	QAL	—	—	—	—	—	—	—	—	—	—	—	NA
AAB9283	10-01200	36.0000–37.0000	QBO	—	—	—	—	0.006 (J)	—	—	0.006 (J)	—	—	—	NA
AAB9337	10-01201	11.1000–11.8000	QAL	—	0.13	—	—	—	—	—	—	—	—	—	NA
AAB9341	10-01201	16.9000–17.5000	QAL	—	0.013	—	—	—	—	—	—	—	—	—	NA
AAB9342	10-01201	19.2000–20.0000	QAL	—	0.009	—	—	—	—	—	—	—	—	—	NA
AAB9296	10-01202	48.7000–49.5000	QBO	—	—	—	—	—	—	—	—	—	—	—	NA
AAB9313	10-01204	25.8000–26.4000	QBO	0.005 (J)	—	—	—	—	—	—	—	—	—	—	NA
AAB9315	10-01204	35.5000–36.5000	QBO	0.004 (J)	—	—	—	—	—	—	—	—	—	—	NA
AAB9310	10-01204	47.7000–49.3000	QBO	0.008	—	—	—	—	—	—	—	—	—	—	NA
AAB9300	10-01206	35.7000–36.9000	QBOG	—	—	—	—	—	—	—	—	—	—	0.006	NA
AAB9308	10-01206	48.4000–49.3000	QBOG	—	—	—	—	—	—	—	—	—	—	—	NA
AAB6378	10-01214	49.4000–50.0000	QBOG	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB3046	10-01226	3.7000–4.7000	QAL	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6471	10-01231	48.4000–49.3000	QBOG	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6169	10-01239	2.5000–3.1000	QAL	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6182	10-01240	3.1000–3.7000	QAL	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6186	10-01240	19.0000–19.6000	QAL	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB3017	10-01244	32.0000–32.5000	QAL	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6122	10-01246	41.7000–42.3000	QBO	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6270	10-01251	49.4000–50.0000	QBOG	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6228	10-01252	3.4000–4.0000	QBOF	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6281	10-01254	28.4000–29.3000	QBOF	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6288	10-01254	49.4000–50.0000	QBOG	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6551	10-01257	20.0000–20.8000	QBOF	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6550	10-01257	48.5000–49.4000	QBOF	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB2915	10-01269	47.5000–48.0000	QBOG	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB2920	10-01271	3.5000–4.0000	QBOF	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB2928	10-01271	21.8000–22.3000	QBOF	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB2934	10-01271	38.3000–39.0000	QBOF	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 6.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Naphthalene	Phenol	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,3-]+Xylene[1,4-]
Organic Chemical Detects per Sample, Standard UOM = mg/kg															
AAB2933	10-01271	48.0000–48.6000	QBOG	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB9429	10-01288	4.2000–5.0000	QBOF	—	—	—	—	—	—	—	—	—	—	—	NA
AAB9438	10-01288	46.2000–47.0000	QBOF	0.011	—	—	—	—	—	—	—	—	—	—	NA
AAB9439	10-01288	47.8000–48.5000	QBOF	0.022	—	—	—	—	—	—	—	—	—	—	NA
AAB9235	10-01293	2.5000–3.9000	SOIL	—	—	—	—	—	—	—	—	—	—	—	NA
AAB6330	10-02216	27.5000–28.0000	QAL	NA	—	0.05 (J–)	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6581	10-02219	16.3000–16.8000	QAL	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB6585	10-02219	20.3000–20.8000	QAL	NA	—	—	NA	NA	NA	NA	NA	NA	NA	NA	NA
AAB8642	10-02221	14.2000–15.0000	QAL	0.012 (J)	—	—	—	—	—	—	—	—	—	—	NA
AAB9248	10-02222	15.7000–16.5000	QAL	0.012	—	—	—	—	—	—	—	—	—	—	NA
AAB9251	10-02222	25.4000–26.1000	QAL	0.029	—	—	—	—	—	—	—	—	—	—	NA
AAB9253	10-02222	40.6000–41.6000	QBOG	0.018	—	—	—	—	—	—	—	—	—	—	NA
AAB9256	10-02222	48.1000–49.0000	QBOG	0.028	—	—	—	—	—	—	—	—	—	—	NA
AAB6615	10-02224	14.3000–15.0000	QAL	0.009 (J)	—	—	—	—	—	—	—	—	—	—	NA
AAB6617	10-02224	24.0000–25.0000	QAL	0.011 (J)	—	—	—	—	—	—	—	—	—	—	NA
AAB6623	10-02224	37.5000–38.3000	QBOG	0.012 (J)	—	—	—	—	—	—	—	—	—	—	NA
AAB8641	10-02224	49.2000–50.0000	QBOG	0.014 (J)	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5492	10-601160	0.8000–2.8000	SOIL	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5496	10-601161	43.0000–45.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5512	10-601164	14.0000–16.0000	QAL	—	—	—	0.000722 (J)	0.00673	0.222	0.0673 (J–)	0.000427 (J)	0.000395 (J)	—	NA	—
RE10-07-5547	10-601165	30.2000–32.2000	QAL	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5551	10-601166	29.5000–31.5000	QAL	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5556	10-601167	20.2000–22.2000	QBO	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5555	10-601167	34.5000–36.5000	QAL	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5560	10-601168	21.0000–24.0000	QBO	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5559	10-601168	30.0000–32.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5564	10-601169	10.0000–12.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5563	10-601169	30.0000–32.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5568	10-601170	20.4000–22.4000	QAL	—	—	—	—	—	—	—	—	—	0.0023 (J)	—	NA
RE10-07-5567	10-601170	62.0000–64.0000	QBOG	—	—	—	—	—	—	—	—	—	0.00075 (J)	—	NA
RE10-07-5572	10-601171	42.0000–44.0000	QBO	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5571	10-601171	62.0000–64.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	NA

Table 6.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Methylene Chloride	Naphthalene	Phenol	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,3-]+Xylene[1,4-]
Organic Chemical Detects per Sample, Standard UOM = mg/kg															
RE10-07-5580	10-601173	19.8000–21.8000	QAL	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5584	10-601174	30.0000–31.7000	QBOG	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5583	10-601174	61.0000–63.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5588	10-601175	32.0000–34.0000	QBO	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5599	10-601178	60.2000–62.2000	SOIL	—	—	—	—	0.00031 (J)	—	0.0032 (J)	—	0.00065 (J)	—	—	NA
RE10-07-5603	10-601179	60.8000–62.8000	SOIL	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5611	10-601181	30.0000–32.0000	QAL	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5918	10-601243	48.0000–56.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-5998	10-601259	51.0000–53.0000	QBOG	—	—	—	—	—	—	—	—	—	—	—	NA
RE10-07-6291	10-601319	0.0000–0.2500	SOIL	—	—	—	—	—	—	—	—	—	—	NA	0.000279 (J)
RE10-08-9970	10-603265	1.5000–3.2000	SOIL	—	—	—	—	—	—	—	—	—	—	NA	—

Note: Units are mg/kg.

[a] — = Not detected.

[b] NA = Not analyzed.

Table 6.2-5
Summary of Radionuclides above BVs/FVs in Alluvium, Soil and Tuff at Consolidated Unit 10-002(a)-99

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Europium-152	Gross alpha/beta	Gross beta	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Radionuclides Detected above BVs/FVs, Standard UOM = pCi/g											
QAL BV[a]				**1.65**	**na[b]**	**na**	**na**	**1.31**	**2.59**	**0.2**	**2.29**
QBO BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
QBOF BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
QBOG BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
SOIL BV[a]				**1.65**	**na**	**na**	**na**	**1.31**	**2.59**	**0.2**	**2.29**
AAB9309	10-01204	15.7000–16.4000	QAL	—[c]	—	NA[d]	NA	4201.4	—	—	—
AAB9360	10-01205	10.0000–10.5000	QAL	NA	NA	NA	NA	29.7	NA	NA	NA
AAB9361	10-01205	14.3000–14.8000	QAL	NA	NA	NA	NA	2432.33	—	—	—
AAB9363	10-01205	19.5000–20.0000	QAL	NA	NA	NA	NA	3570 (J)	NA	NA	NA
AAB9364	10-01205	20.0000–20.9000	QAL	NA	NA	NA	NA	2185.42	—	—	—
AAB9399	10-01205	49.3000–50.0000	QBO	NA	NA	NA	NA	1.1 (J–)	NA	NA	NA
AAB6404	10-01213	39.2000–39.7000	QBOG	NA	NA	NA	NA	0.51 (J+)	NA	NA	NA
AAB6371	10-01214	25.9000–26.4000	QAL	NA	NA	NA	NA	0.48	NA	NA	NA
AAB6376	10-01214	36.6000–37.1000	QBO	NA	NA	NA	NA	0.53	NA	NA	NA
AAB6409	10-01215	15.0000–15.9000	QAL	NA	NA	NA	NA	11.76 (J+)	—	—	—
AAB6569	10-01215	21.7000–22.2000	QAL	—	0.37	NA	NA	1226.8	—	—	—
AAB6580	10-01215	26.6000–27.1000	QAL	—	—	NA	NA	2930	—	—	—
AAB6604	10-01223	16.0000–16.5000	QAL	0.0777 (J)	NA	NA	NA	—	—	—	—
AAB9257	10-01225	16.4000–16.9000	QAL	NA	NA	NA	NA	10.7 (J–)	NA	NA	NA
AAB9265	10-01225	41.2000–42.1000	QBOG	NA	NA	NA	NA	12.7 (J–)	NA	NA	NA
AAB3057	10-01226	32.5000–33.0000	QBO	NA	NA	NA	NA	2.3 (J+)	NA	NA	NA

Table 6.2-5 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Europium-152	Gross alpha/beta	Gross beta	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Radionuclides Detected above BVs/FVs, Standard UOM = pCi/g											
QAL BV[a]				**1.65**	**na[b]**	**na**	**na**	**1.31**	**2.59**	**0.2**	**2.29**
QBO BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
QBOF BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
QBOG BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
SOIL BV[a]				**1.65**	**na**	**na**	**na**	**1.31**	**2.59**	**0.2**	**2.29**
AAB3059	10-01226	43.9000–44.3000	QBOG	NA	NA	NA	NA	0.7 (J+)	NA	NA	NA
AAB3062	10-01228	3.5000–4.2000	QAL	NA	NA	NA	NA	5.21 (J)	NA	NA	NA
AAB3073	10-01228	21.4000–21.8000	QAL	NA	NA	NA	NA	0.35	NA	NA	NA
AAB3069	10-01228	32.1000–32.5000	QBO	NA	NA	NA	NA	1.06	NA	NA	NA
AAB3072	10-01228	49.0000–49.8000	QBOG	NA	NA	NA	NA	0.52	NA	NA	NA
AAB6434	10-01230	4.0000–4.5000	QAL	NA	NA	NA	NA	7.42 (J)	NA	NA	NA
AAB6446	10-01230	46.6000–49.5500	QBOG	NA	NA	NA	NA	1.35 (J)	NA	NA	NA
AAB6461	10-01231	4.0000–4.5000	QAL	NA	NA	NA	NA	1.38	NA	NA	NA
AAB6447	10-01233	3.7000–4.3000	QAL	NA	NA	NA	NA	0.94 (J)	NA	NA	NA
AAB6454	10-01233	28.6000–29.5000	QBO	NA	NA	NA	NA	0.43 (J–)	NA	NA	NA
AAB6485	10-01235	3.5000–4.5000	QAL	NA	NA	NA	NA	1.19 (J+)	NA	NA	NA
AAB6492	10-01235	33.1000–34.4000	QBO	NA	NA	NA	NA	4.44 (J+)	NA	NA	NA
AAB6500	10-01235	43.6000–44.1000	QBOG	NA	NA	NA	NA	3.37 (J+)	NA	NA	NA
AAB6498	10-01235	48.9000–49.4000	QBOG	NA	NA	NA	NA	8.17 (J+)	NA	NA	NA
AAB6126	10-01236	2.8000–3.4000	SOIL	NA	NA	NA	NA	0.84 (J–)	NA	NA	NA
AAB6157	10-01237	2.5000–3.1000	QAL	NA	NA	NA	NA	0.96 (J–)	NA	NA	NA
AAB6169	10-01239	2.5000–3.1000	QAL	NA	NA	NA	NA	7.97	NA	NA	NA

Table 6.2-5 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Europium-152	Gross alpha/beta	Gross beta	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Radionuclides Detected above BVs/FVs, Standard UOM = pCi/g											
QAL BV[a]				**1.65**	**na[b]**	**na**	**na**	**1.31**	**2.59**	**0.2**	**2.29**
QBO BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
QBOF BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
QBOG BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
SOIL BV[a]				**1.65**	**na**	**na**	**na**	**1.31**	**2.59**	**0.2**	**2.29**
AAB2991	10-01241	3.5000–4.0000	QAL	NA	NA	NA	NA	9.44	NA	NA	NA
AAB3019	10-01242	4.1000–4.7000	QAL	NA	NA	NA	NA	4.19	NA	NA	NA
AAB3032	10-01242	6.2000–6.8000	QAL	NA	NA	NA	NA	26.22	NA	NA	NA
AAB2861	10-01247	0.8000–1.4000	SOIL	NA	NA	NA	NA	3.26	NA	NA	NA
AAB6129	10-01248	3.4000–4.0500	QAL	NA	NA	NA	NA	1.27	NA	NA	NA
AAB2845	10-01249	0.9000–1.5000	SOIL	NA	NA	NA	NA	1.75 (J–)	NA	NA	NA
AAB6215	10-01250	3.3000–3.9000	QBOF	NA	NA	NA	NA	0.77 (J)	NA	NA	NA
AAB6226	10-01250	40.7000–41.3000	QBOG	—	0.716 (J–)	NA	NA	—	5.15 (J–)	0.22 (J–)	5.11 (J–)
AAB6241	10-01252	40.9000–41.5000	QBOG	NA	NA	NA	NA	1.62	NA	NA	NA
AAB6537	10-01257	3.6000–4.2000	QBOF	NA	NA	NA	NA	340.02	NA	NA	NA
AAB6552	10-01261	2.8000–3.8000	SOIL	NA	NA	NA	NA	1.8	NA	NA	NA
AAB8678	10-01262	47.3000–48.3000	QBOF	NA	NA	NA	NA	0.65	NA	NA	NA
AAB2893	10-01264	3.5000–4.1000	QBOF	NA	NA	NA	NA	2.54 (J)	NA	NA	NA
AAB9433	10-01288	22.5000–23.5000	QBOF	NA	NA	NA	NA	1.05 (J–)	NA	NA	NA
AAB9211	10-01291	2.8000–3.7000	SOIL	NA	NA	NA	NA	1.18 (J–)	NA	NA	NA
AAB9247	10-01293	10.0000–10.8000	QBOF	NA	NA	NA	NA	3.39 (J–)	NA	NA	NA
AAB9246	10-01293	48.6000–49.6000	QBOF	NA	NA	NA	NA	3.19 (J–)	NA	NA	NA

Table 6.2-5 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Europium-152	Gross alpha/beta	Gross beta	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Radionuclides Detected above BVs/FVs, Standard UOM = pCi/g											
QAL BV[a]				**1.65**	**na[b]**	**na**	**na**	**1.31**	**2.59**	**0.2**	**2.29**
QBO BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
QBOF BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
QBOG BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
SOIL BV[a]				**1.65**	**na**	**na**	**na**	**1.31**	**2.59**	**0.2**	**2.29**
AAB9271	10-01294	26.5000–27.1000	QBOF	NA	NA	NA	NA	1.19	NA	NA	NA
AAB6292	10-02210	6.0000–6.6000	SOIL	NA	NA	NA	NA	0.83 (J+)	NA	NA	NA
AAB6307	10-02210	11.9000–12.5000	QAL	NA	NA	NA	NA	2908.2	—	—	—
AAB6299	10-02210	18.0000–18.6000	QAL	NA	NA	NA	NA	1378	—	—	—
AAB6306	10-02210	49.0000–49.8000	QBOG	NA	NA	NA	NA	0.66 (J)	NA	NA	NA
AAB6338	10-02211	13.8000–14.3000	QAL	NA	NA	NA	NA	3.3	NA	NA	NA
AAB6349	10-02211	16.3000–16.8000	QAL	NA	NA	NA	NA	255.05	NA	NA	NA
AAB6343	10-02211	31.4000–31.9000	QAL	NA	NA	NA	NA	0.64	NA	NA	NA
AAB6348	10-02211	49.5000–50.0000	QBOG	NA	NA	NA	NA	0.86	NA	NA	NA
AAB6308	10-02212	3.6000–4.2000	QAL	NA	NA	NA	NA	8.14 (J)	NA	NA	NA
AAB6585	10-02219	20.3000–20.8000	QAL	—	NA	NA	NA	1053	—	—	—
AAB6583	10-02220	14.0000–14.5000	QAL	NA	NA	NA	NA	37.2	NA	NA	NA
AAB6584	10-02220	17.0000–17.5000	QAL	NA	NA	NA	NA	40,325.8	NA	NA	NA
AAB9428	10-02220	18.0000–18.6000	QAL	—	—	NA	NA	18,654	—	—	2.498
AAB9422	10-02221	28.8000–29.5000	QAL	NA	NA	NA	NA	0.921	NA	NA	NA
AAB9248	10-02222	15.7000–16.5000	QAL	NA	NA	NA	NA	1.14 (J)	NA	NA	NA
0110-96-0062	10-10040	0.0000–0.3300	SOIL	NA	NA	NA	NA	2.9	NA	NA	NA

Table 6.2-5 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Europium-152	Gross alpha/beta	Gross beta	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Radionuclides Detected above BVs/FVs, Standard UOM = pCi/g											
QAL BV[a]				**1.65**	**na[b]**	**na**	**na**	**1.31**	**2.59**	**0.2**	**2.29**
QBO BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
QBOF BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
QBOG BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
SOIL BV[a]				**1.65**	**na**	**na**	**na**	**1.31**	**2.59**	**0.2**	**2.29**
0110-96-0066	10-10044	0.0000–0.3300	SOIL	NA	NA	NA	NA	2.4	NA	NA	NA
0110-96-0097	10-10064	0.0000–0.3300	SOIL	NA	NA	NA	NA	2.1	NA	NA	NA
0110-96-0125	10-10104	0.0000–0.3300	SOIL	NA	NA	NA	NA	67	NA	NA	NA
0110-96-0126	10-10105	0.0000–0.3300	SOIL	NA	NA	NA	NA	18.5	NA	NA	NA
0110-96-0144	10-10142	1.6700–2.1700	SOIL	NA	NA	NA	NA	92	NA	NA	NA
RE10-07-5492	10-601160	0.8000–2.8000	SOIL	NA	NA	NA	NA	21.2 (J+)	NA	NA	NA
RE10-07-5502	10-601162	0.0000–2.1000	SOIL	NA	NA	NA	NA	7.13 (J+)	NA	NA	NA
RE10-07-5506	10-601163	13.0000–14.8000	QAL	NA	NA	NA	NA	466	NA	NA	NA
RE10-07-5512	10-601164	14.0000–16.0000	QAL	NA	NA	NA	NA	1310	NA	NA	NA
RE10-07-5513	10-601164	19.0000–21.0000	QAL	NA	NA	NA	NA	86.2	NA	NA	NA
RE10-07-5510	10-601164	52.0000–54.0000	QBOG	NA	NA	NA	NA	1.36	NA	NA	NA
RE10-07-5914	10-601242	1.0000–3.0000	SOIL	NA	NA	NA	NA	4.22	NA	NA	NA
RE10-07-6291	10-601319	0.0000–0.2500	SOIL	—	—	19	319	193	—	—	—
RE10-08-9973	10-601319	1.500–2.0000	SOIL	NA	NA	NA	NA	2.89	NA	NA	NA
RE10-08-9965	10-603263	0.0000–1.0000	SOIL	4.48	—	12.7	44.6	15	—	—	—
RE10-08-9966	10-603263	1.5000–2.0000	SOIL	0.505	—	12.1	27.3	0.768	—	—	—
RE10-08-9967	10-603264	0.0000–1.0000	SOIL	3	—	21.9	62.5	6.06	—	—	—

Table 6.2-5 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cesium-137	Europium-152	Gross alpha/beta	Gross beta	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Radionuclides Detected above BVs/FVs, Standard UOM = pCi/g											
QAL BV[a]				**1.65**	**na[b]**	**na**	**na**	**1.31**	**2.59**	**0.2**	**2.29**
QBO BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
QBOF BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
QBOG BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
SOIL BV[a]				**1.65**	**na**	**na**	**na**	**1.31**	**2.59**	**0.2**	**2.29**
RE10-08-9968	10-603264	1.5000–2.0000	SOIL	—	—	9.14	36.6	0.221	—	—	—
RE10-08-9969	10-603265	0.0000–1.0000	SOIL	0.352	—	11.4	42	0.531	—	—	—
RE10-08-9970	10-603265	1.5000–3.2000	SOIL	—	—	10.8	40.2	—	—	—	—

Note: Results are in pCi/g.

[a] BVs are from LANL 1998, 059730.

[b] — = Not detected or not detected above BV.

[c] NA = Not analyzed.

[d] na = Not available.

Table 6.2-6
Summary of Radionuclides Detected in
Biota Collected from Consolidated Unit 10-002(a)-99

Sample ID	Location ID	Depth (ft)	Media	Strontium-90
0110-96-0031	10-10033	0–0	Vegetation	63.3
0110-96-0032	10-10034	0–0	Vegetation	118
0110-96-0033	10-10035	0–0	Vegetation	83.8
0110-96-0034	10-10036	0–0	Vegetation	158
0110-96-0035	10-10037	0–0	Vegetation	14.1
0110-96-0036	10-10038	0–0	Vegetation	45.3
0110-96-0037	10-10034	0–0	Vegetation	199

Note: Results are in pCi/g.

Table 6.3-1
Summary of Samples Collected and Analyses Requested for Alluvium, Soil, and Tuff at SWMU 10-004(a)

Sample ID	Location ID	Depth (ft)	Media	Explosive compounds	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB9448	10-01272	23.7–24.5	QBOF	—*	19821	—	19878	19316	19878	19316	—
AAB9451	10-01272	36.0–37.0	QBOF	—	19821	—	19878	19316	19878	19316	—
AAB9454	10-01272	49.2–50.0	QBOG	—	19821	—	19878	19316	19878	19316	—
AAB9455	10-01273	2.5–3.3	QAL	—	19850	—	20068	—	20068	—	—
AAB9461	10-01273	27.5–28.3	QBOF	—	19850	—	20068	—	20068	—	—
AAB9464	10-01273	36.0–36.8	QBOF	—	19850	—	20068	—	20068	—	—
AAB9465	10-01273	49.2–50.0	QBOG	—	19850	—	20068	—	20068	—	—
AAB9477	10-01274	2.5–3.4	QAL	—	19898	—	20077	19420	20077	19420	—
AAB9480	10-01274	18.5–20.0	QBOF	—	19898	—	20077	19420	20077	19420	—
AAB9484	10-01274	27.5–28.3	QBOF	—	19898	—	20077	19420	20077	19420	—
AAB9487	10-01274	49.0–50.0	QBOG	—	19898	—	20077	19420	20077	19420	—
AAB9466	10-01275	5.0–5.8	QBOF	19420	19898	—	20077	19420	20077	19420	—
AAB9469	10-01275	14.2–15.0	QBOF	19420	19898	—	20077	19420	20077	19420	—
AAB9474	10-01275	34.2–35.0	QBOF	19420	19898	—	20077	19420	20077	19420	—
AAB9476	10-01275	49.2–50.0	QBOG	19420	19898	—	20077	19420	20077	19420	—
AAB9488	10-01276	2.5–3.6	QAL	—	19898	—	20077	19420	20077	19420	—
AAB9489	10-01276	14.2–15.0	QBOF	—	19898	—	20077	19420	20077	19420	—
AAB9494	10-01276	34.2–35.0	QBOF	—	19898	—	20077	19420	20077	19420	—
AAB9497	10-01276	49.0–50.0	QBOG	—	19898	—	20077	19420	20077	19420	—
AAB9498	10-01277	2.5–3.5	QAL	19460	20067	—	—	19460	—	19460	—
AAB9506	10-01277	22.5–23.3	QBOF	19460	20067	—	—	19460	—	19460	—
AAB9509	10-01277	38.0–39.0	QBOF	19460	20067	—	—	19460	—	19460	—

Table 6.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Explosive compounds	Metals	Perchlorate	Strontium-90	SVOC	Uranium	VOC	Wet Chem
AAB9511	10-01277	61.5–62.5	QBOG	19460	20067	—	—	19460	—	19460	—
AAB9512	10-01278	2.5–3.7	QAL	19487	20079	—	20082	19487	20082	19487	—
AAB9517	10-01278	19.2–20.0	QBOF	19487	20079	—	20082	19487	20082	19487	—
AAB9520	10-01278	33.0–33.7	QBOF	19487	20079	—	20082	19487	20082	19487	—
AAB9523	10-01278	49.0–50.0	QBOG	19487	20079	—	20082	19487	20082	19487	—
AAB9524	10-01279	3.0–4.0	QAL	19503	20088	—	20083	19503	20083	19503	—
AAB9527	10-01279	14.0–15.0	QBOF	19503	20088	—	20083	19503	20083	19503	—
AAB9533	10-01279	38.5–39.4	QBOF	19503	20088	—	20083	19503	20083	19503	—
AAB9535	10-01279	49.0–50.0	QBOF	19503	20088	—	20083	19503	20083	19503	—
RE10-07-5679	10-601190	25.0–27.0	QAL	07—568	07—569	07—569	07—569	07—568	—	07—569	07—569
RE10-07-5678	10-601190	62.0–64.0	SOIL	07—568	07—569	07—569	07—569	07—568	—	07—569	07—569
RE10-07-5684	10-601191	9.0–11.0	QAL	07—515	07—518	07—518	07—518	07—515	—	07—516	07—518
RE10-07-5683	10-601191	30.0–32.0	QAL	07—515	07—518	07—518	07—518	07—515	—	07—516	07—518
RE10-07-5690	10-601192	4.0–6.0	SOIL	07—515	07—518	07—518	07—518	07—515	—	07—516	07—518
RE10-07-5689	10-601192	42.0–44.0	QBOG	07—515	07—518	07—518	07—518	07—515	—	07—516	07—518
RE10-07-5688	10-601192	66.5–68.5	SOIL	07—515	07—518	07—518	07—518	07—515	—	07—516	07—518
RE10-07-5694	10-601193	56.0–58.0	QBOG	07—758	07—759	07—759	07—759	07—758	—	07—759	07—759
RE10-07-5693	10-601193	62.0–64.0	SOIL	07—758	07—759	07—759	07—759	07—758	—	07—759	07—759
RE10-07-5699	10-601194	30.0–32.4	QAL	07—568	07—569	07—569	07—569	07—568	—	07—569	07—569
RE10-07-5698	10-601194	60.5–62.5	SOIL	07—568	07—569	07—569	07—569	07—568	—	07—569	07—569

Note: Numbers in analyte columns are request numbers.

*— = Analysis not requested.

Table 6.3-2
Inorganic, Organic, and Radionuclide
COPCs for SWMU 10-004(a)

COPCs	Media
Inorganics	
Aluminum	Tuff
Antimony	Soil, alluvium, tuff
Arsenic	Tuff
Barium	Tuff
Beryllium[a]	Soil
Beryllium	Tuff
Cadmium[a]	Soil, alluvium
Cadmium	Tuff
Calcium[b]	Tuff
Chromium	Tuff
Copper	Tuff
Cyanide (total)	Soil, alluvium, tuff
Iron	Tuff
Lead	Tuff
Magnesium[a]	Soil
Magnesium	Tuff
Manganese	Tuff
Mercury	Tuff
Molybdenum	Soil, alluvium, tuff
Nickel	Tuff
Selenium	Tuff
Silver	Alluvium
Thallium	Soil, alluvium
Uranium	Alluvium
Uranium[c]	Tuff
Vanadium	Tuff
Zinc	Tuff
Organics	
Acetone	Soil, alluvium, tuff
Butylbenzene[n-]	Soil
Butylbenzene[sec-]	Soil
Butylbenzene[tert-]	Soil
Dichlorobenzene[1,2-]	Soil
Dichlorobenzene[1,3-]	Soil
Dichlorobenzene[1,4-]	Soil
Di-n-butylphthalate	Tuff
Isopropyltoluene[4-]	Soil
Methylene Chloride	Soil, alluvium, tuff
Trimethylbenzene[1,2,4-]	Soil

Table 6.3-2 (continued)

Trimethylbenzene[1,3,5-]	Soil
Radionuclides	
Strontium-90	Soil, alluvium

[a] Beryllium, cadmium, and magnesium were eliminated as COPCs because the maximum observed concentrations were within the chemical-specific background range.

[b] Calcium was eliminated as a COPC because it was detected infrequently within range of background and calcium is considered an essential nutrient (EPA 1989, 008021).

[c] Uranium was eliminated as a COPC because the highest analytical result was a non-detected concentration within the chemical-specific background range.

Table 6.3-3
Summary of Inorganic Chemicals above BVs in Alluvium, Soil, and Tuff at SWMU 10-004(a)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB9448	10-01272	23.7000–24.5000	QBOF	6370	10.2 (UJ)	2.6	77.9	—[b]	0.82 (U)	1920	4.7	6.2	NA[c]	9850	—
AAB9451	10-01272	36.0000–37.0000	QBOF	5030	10.1 (UJ)	1.4 (J)	36.5 (J)	—	0.81 (U)	—	3.4	5 (J)	NA	7630	—
AAB9454	10-01272	49.2000–50.0000	QBOG	—	12.1 (UJ)	—	—	—	0.97 (U)	—	—	—	NA	—	—
AAB9455	10-01273	2.5000–3.3000	QAL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9461	10-01273	27.5000–28.3000	QBOF	11,200	—	2.7	109	—	—	2000	6.9	—	NA	12,300	—
AAB9464	10-01273	36.0000–36.8000	QBOF	5520	—	—	43.5	—	—	—	—	—	NA	5010	—
AAB9465	10-01273	49.2000–50.0000	QBOG	—	—	1.1 (J)	—	—	—	—	—	—	NA	—	—
AAB9477	10-01274	2.5000–3.4000	QAL	—	4.7 (UJ)	—	—	—	0.59 (U)	—	—	—	NA	—	—
AAB9480	10-01274	18.5000–20.0000	QBOF	5350	5 (UJ)	1.3 (J)	38.1 (J–)	—	0.62 (U)	—	4.5 (U)	—	NA	6260 (J)	—
AAB9484	10-01274	27.5000–28.3000	QBOF	8820	5.2 (UJ)	3.2 (J)	78.6 (J–)	—	0.65 (U)	—	7.3 (U)	4.1 (J–)	NA	10,400 (J)	—
AAB9487	10-01274	49.0000–50.0000	QBOG	—	5.3 (UJ)	—	—	—	0.66 (U)	—	—	—	NA	—	—
AAB9466	10-01275	5.0000–5.8000	QBOF	—	4.9 (UJ)	0.62 (J)	—	—	0.61 (U)	—	3 (J)	—	NA	5390 (J)	—
AAB9469	10-01275	14.2000–15.0000	QBOF	4800 (J+)	5 (UJ)	1.1 (J)	33.1 (J)	—	0.62 (U)	—	3.7 (J)	—	NA	5210 (J)	—
AAB9474	10-01275	34.2000–35.0000	QBOF	5140 (J+)	4.9 (UJ)	1.6 (J)	33.5 (J)	—	0.62 (U)	—	4.3 (J)	—	NA	6830 (J)	—
AAB9476	10-01275	49.2000–50.0000	QBOG	—	5.9 (UJ)	—	—	—	0.74 (U)	—	—	—	NA	—	—
AAB9488	10-01276	2.5000–3.6000	QAL	—	4.8 (UJ)	—	—	—	0.61 (U)	—	—	—	NA	—	—
AAB9489	10-01276	14.2000–15.0000	QBOF	5900 (J+)	5.5 (J–)	1.8 (J)	43.8	—	0.61 (U)	—	5.5 (J)	—	NA	6350 (J)	—
AAB9494	10-01276	34.2000–35.0000	QBOF	7250	4.9 (UJ)	2.3 (J–)	36.9 (J–)	—	0.61 (U)	—	4 (U)	—	NA	6430 (J)	—
AAB9497	10-01276	49.0000–50.0000	QBOG	—	6.4 (UJ)	0.77 (J–)	—	—	0.8 (U)	—	—	—	NA	—	—
AAB9498	10-01277	2.5000–3.5000	QAL	—	13.7 (J–)	—	—	—	0.78 (U)	—	—	—	NA	—	—
AAB9506	10-01277	22.5000–23.3000	QBOF	—	9.8 (U)	0.85 (U)	—	—	0.87 (U)	—	—	—	NA	—	—
AAB9509	10-01277	38.0000–39.0000	QBOF	4550	10.4 (U)	1.2 (U)	36.4 (U)	—	0.93 (U)	—	11.4	—	NA	5700	—
AAB9511	10-01277	61.5000–62.5000	QBOG	11,000	12 (UJ)	2.5 (U)	89.3	4.6	0.96 (U)	2860	6	12.4	NA	9410	27.5 (J)
AAB9512	10-01278	2.5000–3.7000	QAL	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9517	10-01278	19.2000–20.0000	QBOF	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9520	10-01278	33.0000–33.7000	QBOF	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9523	10-01278	49.0000–50.0000	QBOG	—	—	—	—	—	—	—	—	—	NA	—	—
AAB9524	10-01279	3.0000–4.0000	QAL	—	9.5 (U)	—	—	—	0.76 (U)	—	—	—	NA	—	—
AAB9527	10-01279	14.0000–15.0000	QBOF	—	9.9 (U)	0.93 (J)	—	—	0.79 (U)	—	3	—	NA	3990	—

Table 6.3-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Copper	Cyanide (Total)	Iron	Lead
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg															
QAL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
QBOF BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
QBOG BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**3.96**	**0.5**	**3700**	**13.5**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**14.7**	**0.5**	**21,500**	**22.3**
AAB9533	10-01279	38.5000–39.4000	QBOF	3620	9.9 (U)	0.98 (J)	—	—	1 (J)	—	3	4.4 (J)	NA	6810	—
AAB9535	10-01279	49.0000–50.0000	QBOF	—	12.7 (U)	—	—	—	1 (U)	—	—	—	NA	—	—
RE10-07-5679	10-601190	25.0000–27.0000	QAL	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—
RE10-07-5678	10-601190	62.0000–64.0000	SOIL	—	—	—	—	—	—	—	—	—	0.59 (U)	—	—
RE10-07-5684	10-601191	9.0000–11.0000	QAL	—	—	—	—	—	—	—	—	—	0.53 (UJ)	—	—
RE10-07-5683	10-601191	30.0000–32.0000	QAL	—	—	—	—	—	—	—	—	—	0.55 (UJ)	—	—
RE10-07-5690	10-601192	4.0000–6.0000	SOIL	—	—	—	—	—	—	—	—	—	0.52 (UJ)	—	—
RE10-07-5689	10-601192	42.0000–44.0000	QBOG	5170	0.61 (UJ)	0.57 (J)	47.8	—	—	—	—	—	—	—	—
RE10-07-5688	10-601192	66.5000–68.5000	SOIL	—	—	—	—	—	0.42	—	—	—	0.59 (UJ)	—	—
RE10-07-5694	10-601193	56.0000–58.0000	QBOG	8200	0.68 (UJ)	0.77 (J)	41.4	1.6	—	—	2.7	17.4	0.68 (UJ)	—	—
RE10-07-5693	10-601193	62.0000–64.0000	SOIL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5699	10-601194	30.0000–32.4000	QAL	—	—	—	—	—	—	—	—	—	—	—	—
RE10-07-5698	10-601194	60.5000–62.5000	SOIL	—	—	—	—	2.7	—	—	—	—	0.59 (U)	—	—

Table 6.3-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg														
QAL BV[a]				**4610**	**671**	**0.1**	**na[d]**	**15.4**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBOF BV[a]*				**739**	**189**	**0.1**	**na**	**2**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB9448	10-01272	23.7000–24.5000	QBOF	1290	381	—	NA	5.2 (J)	0.72 (J)	—	—	4.15	8.3 (J)	44.8
AAB9451	10-01272	36.0000–37.0000	QBOF	1120	260	—	NA	5.8 (J)	0.44 (U)	—	—	4.88	6.6 (J)	—
AAB9454	10-01272	49.2000–50.0000	QBOG	—	—	—	NA	4 (U)	0.52 (U)	—	—	12	—	—
AAB9455	10-01273	2.5000–3.3000	QAL	—	—	—	NA	—	—	—	0.84 (U)	2.04 (U)	—	—
AAB9461	10-01273	27.5000–28.3000	QBOF	1810	463	0.52 (J+)	NA	5.8 (J)	0.94 (U)	—	—	3.72 (U)	17	55.6
AAB9464	10-01273	36.0000–36.8000	QBOF	856 (J)	216	0.69 (J+)	NA	—	0.92 (U)	—	—	5.58	5.3 (J)	—
AAB9465	10-01273	49.2000–50.0000	QBOG	—	—	0.55 (J+)	NA	—	1.1 (U)	—	—	14.6	—	—
AAB9477	10-01274	2.5000–3.4000	QAL	—	—	—	NA	—	—	1.1 (J–)	—	—	—	—
AAB9480	10-01274	18.5000–20.0000	QBOF	—	285 (J–)	—	NA	—	—	—	—	3.75	6.6 (J–)	—
AAB9484	10-01274	27.5000–28.3000	QBOF	1450 (U)	345 (J–)	—	NA	4.2 (J–)	—	—	—	3.43	12.5 (J–)	43.5 (J–)
AAB9487	10-01274	49.0000–50.0000	QBOG	—	—	—	NA	—	—	—	—	15.1	—	—
AAB9466	10-01275	5.0000–5.8000	QBOF	—	190 (J–)	—	NA	—	—	—	—	1.83 (U)	—	—
AAB9469	10-01275	14.2000–15.0000	QBOF	—	—	—	NA	—	—	—	—	1.9 (U)	5.2 (J)	—
AAB9474	10-01275	34.2000–35.0000	QBOF	877 (J)	255 (J–)	—	NA	2.9 (J)	2 (U)	—	—	4.15	5.7 (J)	—
AAB9476	10-01275	49.2000–50.0000	QBOG	—	—	0.13 (UJ)	NA	—	—	—	—	16	—	—
AAB9488	10-01276	2.5000–3.6000	QAL	—	—	—	NA	—	—	—	—	1.87 (U)	—	—
AAB9489	10-01276	14.2000–15.0000	QBOF	920 (J)	217 (J–)	—	NA	3.4 (J)	—	—	—	2.81	6.2 (J)	—
AAB9494	10-01276	34.2000–35.0000	QBOF	975 (J)	190 (J–)	—	NA	—	—	—	—	5.54	6.4 (J–)	—
AAB9497	10-01276	49.0000–50.0000	QBOG	—	—	0.13 (J–)	NA	2.1 (UJ)	—	—	—	16.3	—	—
AAB9498	10-01277	2.5000–3.5000	QAL	—	—	—	NA	—	—	—	—	NA	—	—
AAB9506	10-01277	22.5000–23.3000	QBOF	—	—	—	NA	3.3 (U)	0.43 (U)	—	—	NA	—	—
AAB9509	10-01277	38.0000–39.0000	QBOF	919 (U)	210 (J)	—	NA	9.7	0.45 (U)	—	—	NA	4.9 (U)	—
AAB9511	10-01277	61.5000–62.5000	QBOG	1960	322 (J)	—	NA	6.5 (U)	0.54 (U)	—	—	NA	10.4 (U)	68.2 (J+)
AAB9512	10-01278	2.5000–3.7000	QAL	—	—	—	NA	—	—	—	—	2.66 (U)	—	—
AAB9517	10-01278	19.2000–20.0000	QBOF	—	—	—	NA	—	—	—	—	2.44 (U)	—	—
AAB9520	10-01278	33.0000–33.7000	QBOF	—	—	—	NA	—	—	—	—	4.8 (U)	—	—
AAB9523	10-01278	49.0000–50.0000	QBOG	—	—	—	NA	—	—	—	—	15.8	—	—
AAB9524	10-01279	3.0000–4.0000	QAL	—	—	—	NA	—	—	—	—	2.22	—	—
AAB9527	10-01279	14.0000–15.0000	QBOF	—	—	—	NA	3.3 (U)	0.43 (U)	—	—	2.03	—	—

Table 6.3-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Vanadium	Zinc
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg														
QAL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
QBOF BV[a]				**739**	**189**	**0.1**	**na**	**2**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
QBOG BV[a]				**739**	**189**	**0.1**	**na**	**2**	**0.3**	**1**	**1.22**	**0.72**	**4.59**	**40**
SOIL BV[a]				**4610**	**671**	**0.1**	**na**	**15.4**	**1.52**	**1**	**0.73**	**1.82**	**39.6**	**48.8**
AAB9533	10-01279	38.5000–39.4000	QBOF	777 (J)	226 (J)	—	NA	3.7 (J)	0.43 (U)	—	—	7.07	6.1 (J)	—
AAB9535	10-01279	49.0000–50.0000	QBOF	—	—	—	NA	5 (J)	1 (J)	—	—	14.3	—	—
RE10-07-5679	10-601190	25.0000–27.0000	QAL	—	—	—	0.52 (J)	—	—	—	—	NA	—	—
RE10-07-5678	10-601190	62.0000–64.0000	SOIL	—	—	—	0.52 (J)	—	—	—	—	NA	—	—
RE10-07-5684	10-601191	9.0000–11.0000	QAL	—	—	—	0.55	—	—	—	—	NA	—	—
RE10-07-5683	10-601191	30.0000–32.0000	QAL	—	—	—	0.56	—	—	—	—	NA	—	—
RE10-07-5690	10-601192	4.0000–6.0000	SOIL	—	—	—	0.39 (J)	—	—	—	—	NA	—	—
RE10-07-5689	10-601192	42.0000–44.0000	QBOG	—	218	—	0.17 (J)	—	—	—	—	NA	—	—
RE10-07-5688	10-601192	66.5000–68.5000	SOIL	—	—	—	0.44 (J)	—	—	—	—	NA	—	—
RE10-07-5694	10-601193	56.0000–58.0000	QBOG	1000	—	—	0.22 (J)	2.8	0.68 (UJ)	—	—	NA	—	—
RE10-07-5693	10-601193	62.0000–64.0000	SOIL	6220	—	—	0.57 (J)	—	—	—	1.2 (U)	NA	—	—
RE10-07-5699	10-601194	30.0000–32.4000	QAL	—	—	—	0.61	—	—	—	—	NA	—	—
RE10-07-5698	10-601194	60.5000–62.5000	SOIL	—	—	—	0.6	—	—	—	—	NA	—	—

Note: Results are in mg/kg.

[a] BVs are from LANL 1998, 059730.

[b] — = Not detected or not detected above BV.

[c] NA = Not analyzed.

[d] na = Not available.

Table 6.3-4
Summary of Organic Chemicals Detected in Alluvium, Soil, and Tuff at SWMU 10-004(a)

Sample ID	Location ID	Depth (ft)	Media	Acetone	Butylbenzene[n-]	Butylbenzene[sec-]	Butylbenzene[tert-]	Di-n-butylphthalate	Dichlorobenzene[1,2-]	Dichlorobenzene[1,3-]	Dichlorobenzene[1,4-]	Isopropyltoluene[4-]	Methylene Chloride	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]
Organic Chemical Detects per Sample, Standard UOM = mg/kg															
AAB9487	10-01274	49.0000–50.0000	QBOG	0.032 (J)	—*	—	—	—	—	—	—	—	—	—	—
AAB9466	10-01275	5.0000–5.8000	QBOF	0.003 (J)	—	—	—	—	—	—	—	—	—	—	—
AAB9469	10-01275	14.2000–15.0000	QBOF	0.006 (J)	—	—	—	—	—	—	—	—	—	—	—
AAB9474	10-01275	34.2000–35.0000	QBOF	0.004 (J)	—	—	—	—	—	—	—	—	—	—	—
AAB9512	10-01278	2.5000–3.7000	QAL	—	—	—	—	—	—	—	—	—	0.004 (J)	—	—
AAB9517	10-01278	19.2000–20.0000	QBOF	—	—	—	—	—	—	—	—	—	0.004 (J)	—	—
AAB9520	10-01278	33.0000–33.7000	QBOF	—	—	—	—	—	—	—	—	—	0.004 (J)	—	—
AAB9523	10-01278	49.0000–50.0000	QBOG	—	—	—	—	—	—	—	—	—	0.005 (J)	—	—
AAB9524	10-01279	3.0000–4.0000	QAL	0.04 (J)	—	—	—	—	—	—	—	—	—	—	—
AAB9533	10-01279	38.5000–39.4000	QBOF	—	—	—	—	45 (J)	—	—	—	—	—	—	—
AAB9535	10-01279	49.0000–50.0000	QBOF	—	—	—	—	60 (J)	—	—	—	—	—	—	—
RE10-07-5678	10-601190	62.0000–64.0000	SOIL	—	0.001 (J)	0.00051 (J)	0.00046 (J)	—	0.00074 (J)	0.00064 (J)	0.00079 (J)	0.00067 (J)	0.0051 (J)	0.0013 (J)	0.00074 (J)
RE10-07-5684	10-601191	9.0000–11.0000	QAL	0.013 (J)	—	—	—	—	—	—	—	—	0.0054	—	—
RE10-07-5683	10-601191	30.0000–32.0000	QAL	0.0099 (J)	—	—	—	—	—	—	—	—	0.0031 (J)	—	—
RE10-07-5690	10-601192	4.0000–6.0000	SOIL	0.008 (J)	—	—	—	—	—	—	—	—	0.003 (J)	—	—
RE10-07-5689	10-601192	42.0000–44.0000	QBOG	0.015 (J)	—	—	—	—	—	—	—	—	0.0045 (J)	—	—
RE10-07-5688	10-601192	66.5000–68.5000	SOIL	0.01 (J)	—	—	—	—	—	—	—	—	0.0048 (J)	—	—
RE10-07-5699	10-601194	30.0000–32.4000	QAL	—	—	—	—	—	—	—	—	—	0.0033 (J)	—	—

Note: Units are mg/kg.
*— = Not detected.

Table 6.3-5
Summary of Radionuclides above
BVs/FVs in Alluvium at SWMU 10-004(a)

Sample ID	Location ID	Depth (ft)	Media	Strontium-90
QAL BV*				**1.31**
AAB9488	10-01276	2.5–3.6	QAL	0.78

Note: Results are in pCi/g.
* BVs are from LANL 1998, 059730.

Table 6.4-1
Summary of Samples Collected and Analyses Requested for Soil and Tuff at AOCs 10-009 and C-10-001

Sample ID	Location ID	Depth (ft)	Media	Explosive Compounds	Metals	Perchlorate	Strontium-90	SVOC	VOC	Wet Chem
0110-95-0006	10-10017	0.0–0.08	SOIL	—*	—	—	862	—	—	—
0110-95-0007	10-10018	1.25–1.33	SOIL	—	—	—	862	—	—	—
0110-95-0008	10-10019	1.58–1.75	SOIL	—	—	—	862	—	—	—
0110-95-0009	10-10020	0.0–0.08	SOIL	—	—	—	862	—	—	—
RE10-07-5390	10-601132	0.0–1.0	SOIL	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5391	10-601132	1.0–2.0	SOIL	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5392	10-601133	0.0–0.5	SOIL	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5393	10-601133	1.5–2.0	SOIL	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5394	10-601134	0.0–0.5	SOIL	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5395	10-601134	1.5–2.0	SOIL	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5396	10-601135	0.0–0.5	SOIL	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5397	10-601135	1.5–2.0	SOIL	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5398	10-601136	0.0–0.5	SOIL	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5399	10-601136	1.5–2.0	SOIL	07-506	07-507	07-507	07-507	07-506	07-508	07-507
RE10-07-5421	10-601147	8.0–10.2	SOIL	07-512	07-514	07-514	07-514	07-512	07-513	07-514
RE10-07-5420	10-601147	28.0–30.5	QBO	07-512	07-514	07-514	07-514	07-512	07-513	07-514
RE10-07-5425	10-601148	14.0–16.0	SOIL	07-512	07-514	07-514	07-514	07-512	07-513	07-514
RE10-07-5424	10-601148	31.0–33.0	SOIL	07-512	07-514	07-514	07-514	07-512	07-513	07-514
RE10-07-5429	10-601149	0.0–3.0	SOIL	07-512	07-514	07-514	07-514	07-512	07-513	07-514
RE10-07-5428	10-601149	30.0–32.0	QBO	07-512	07-514	07-514	07-514	07-512	07-513	07-514
RE10-07-5432	10-601150	0.0–0.5	SOIL	07-512	07-514	07-514	07-514	07-512	07-513	07-514
RE10-07-5434	10-601150	4.0–6.0	SOIL	07-512	07-514	07-514	07-514	07-512	07-513	07-514

Table 6.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Explosive compounds	Metals	Perchlorate	Strontium-90	SVOC	VOC	Wet Chem
RE10-07-5433	10-601150	29.0–32.0	QBO	07-512	07-514	07-514	07-514	07-512	07-513	07-514
RE10-07-5437	10-601151	20.8–22.8	QBO	07-512	07-514	07-514	07-514	07-512	07-513	07-514
RE10-07-5436	10-601151	30.5–32.5	QBO	07-512	07-514	07-514	07-514	07-512	07-513	07-514

Note: Numbers in analyte columns are request numbers.

*— = Analysis not requested.

Table 6.4-2
Summary of COPCs
Identified at AOC 10-009 (includes C-10-001)

COPCs	Media
Inorganics	
Aluminum	Tuff
Antimony	Tuff
Arsenic	Tuff
Barium	Tuff
Chromium	Tuff
Cyanide (total)	Soil, tuff
Iron	Tuff
Magnesium	Tuff
Manganese	Tuff
Molybdenum	Soil, tuff
Nickel	Tuff
Selenium	Tuff
Vanadium	Tuff
Organics	
Toluene	Soil
Radionuclides	
Strontium-90	Soil

Table 6.4-3
Summary of Inorganic Chemicals above BVs in Soil and Tuff at AOCs 10-009 and C-10-001

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Chromium	Cyanide (Total)	Iron	Magnesium	Manganese	Molybdenum	Nickel	Selenium	Vanadium
Inorganic Chemicals above BVs per Sample, Standard UOM = mg/kg																
QBO BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**2.6**	**0.5**	**3700**	**739**	**189**	**na[b]**	**2**	**0.3**	**4.59**
SOIL BV[a]				**29,200**	**0.83**	**8.17**	**295**	**19.3**	**0.5**	**21,500**	**4610**	**671**	**na**	**15.4**	**1.52**	**39.6**
RE10-07-5390	10-601132	0.0000–1.0000	SOIL	—[c]	—	—	—	—	0.52 (U)	—	—	—	NA[d]	—	—	—
RE10-07-5391	10-601132	1.0000–2.0000	SOIL	—	—	—	—	—	0.51 (U)	—	—	—	NA	—	—	—
RE10-07-5392	10-601133	0.0000–0.5000	SOIL	—	—	—	—	—	0.52 (U)	—	—	—	NA	—	—	—
RE10-07-5393	10-601133	1.5000–2.0000	SOIL	—	—	—	—	—	0.51 (UJ)	—	—	—	NA	—	—	—
RE10-07-5394	10-601134	0.0000–0.5000	SOIL	—	—	—	—	—	0.52 (UJ)	—	—	—	NA	—	—	—
RE10-07-5395	10-601134	1.5000–2.0000	SOIL	—	—	—	—	—	0.52 (UJ)	—	—	—	NA	—	—	—
RE10-07-5396	10-601135	0.0000–0.5000	SOIL	—	—	—	—	—	0.52 (U)	—	—	—	NA	—	—	—
RE10-07-5397	10-601135	1.5000–2.0000	SOIL	—	—	—	—	—	0.52 (U)	—	—	—	NA	—	—	—
RE10-07-5398	10-601136	0.0000–0.5000	SOIL	—	—	—	—	—	0.52 (U)	—	—	—	NA	—	—	—
RE10-07-5399	10-601136	1.5000–2.0000	SOIL	—	—	—	—	—	0.52 (U)	—	—	—	NA	—	—	—
RE10-07-5421	10-601147	8.0000–10.2000	SOIL	—	—	—	—	—	0.52 (U)	—	—	—	0.56	—	—	—
RE10-07-5420	10-601147	28.0000–30.5000	QBO	3640	0.54 (UJ)	0.97 (J)	42.5	3.7 (U)	0.54 (U)	5670	904	191	0.62	2.7	—	6.2
RE10-07-5425	10-601148	14.0000–16.0000	SOIL	—	—	—	—	—	—	—	—	—	0.61	—	—	—
RE10-07-5424	10-601148	31.0000–33.0000	SOIL	—	—	—	—	—	0.58 (U)	—	—	—	0.59	—	—	—
RE10-07-5429	10-601149	0.0000–3.0000	SOIL	—	—	—	—	—	0.53 (U)	—	—	—	0.4 (J)	—	—	—
RE10-07-5428	10-601149	30.0000–32.0000	QBO	4990	—	1.3	45.3	3.5 (U)	0.53 (U)	6450	1070	201	0.44 (J)	3.5	—	8.5
RE10-07-5432	10-601150	0.0000–0.5000	SOIL	—	—	—	—	—	0.52 (U)	—	—	—	0.55	—	—	—
RE10-07-5434	10-601150	4.0000–6.0000	SOIL	—	—	—	—	—	0.53 (U)	—	—	—	0.43 (J)	—	—	—
RE10-07-5433	10-601150	29.0000–32.0000	QBO	4590	—	1.2	54.6	3 (U)	0.53 (U)	6070	1190	232	0.47 (J)	3.7	—	6.7
RE10-07-5437	10-601151	20.8000–22.8000	QBO	7360	—	1.3	60.3	4.2 (U)	0.55 (U)	7840	1380	246	0.44 (J)	5.2	—	8.2
RE10-07-5436	10-601151	30.5000–32.5000	QBO	—	0.52 (UJ)	—	44	—	0.52 (U)	3860	—	—	0.27 (J)	—	0.52 (UJ)	—

Note: Results are in mg/kg.

[a] BVs are from LANL 1998, 059730.

[b] na = Not available.

[c] — = Not detected or not detected above BV.

[d] NA = Not analyzed.

Table 6.4-4
Summary of Organic Chemicals Detected in Soil and Tuff at AOCs 10-009 and C-10-001

Sample ID	Location ID	Depth (ft)	Media	Toluene
RE10-07-5390	10-601132	0.0–1.0	SOIL	0.00041 (J)
RE10-07-5391	10-601132	1.0–2.0	SOIL	0.00054 (J)
RE10-07-5397	10-601135	1.5–2.0	SOIL	0.00079 (J)
RE10-07-5432	10-601150	0.0–0.5	SOIL	0.00052 (J)

Note: Units are mg/kg.

Table 6.4-5
Summary of Radionuclides above BVs/FVs in Soil at AOCs 10-009 and C-10-001

Sample ID	Location ID	Depth (ft)	Media	Strontium-90
Soil BV*				1.31
0110-95-0006	10-10017	0.0–0.08	SOIL	12.8
0110-95-0009	10-10020	0.0–0.08	SOIL	5.69

Note: Results are in pCi/g.

* BVs are from LANL 1998, 059730.

Appendix A

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

A-1.0 ACRONYMS AND ABBREVIATIONS

%D	percent detection
%R	percent recovery
%RSD	percent relative standard deviation
ALARA	as low as reasonably achievable
AOC	area of concern
ARMS II	Aerial Radiological Measuring Survey
asl	above sea level
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
AUF	area use factor
bgs	below ground surface
BMP	best management practice
BV	background value
CCV	continuing calibration verification
CD	compact disc
CEARP	Comprehensive Environmental Assessment and Response Program
CME	Central Mine Equipment
COC	chain of custody
COPC	chemicals of potential concern
COPEC	chemical of potential ecological concern
cpm	counts per minute
C_{sat}	soil saturation concentration
CST	Chemical Science and Technology (a Laboratory division)
CVAA	cold vapor atomic absorption
CWDR	chemical waste disposal request
D&D	decontamination and decommissioning
DAF	dilution attenuation factor
DER	duplicate error ratio
DGPS	differential global positioning system
dpm/g	disintegration[s] per minute per gram of soil
DOE	Department of Energy (U.S.)
DOT	Department of Transportation (U.S.)

dpm	disintegration[s] per minute
DU	depleted uranium
DX	Dynamic Experimentation (a Laboratory Division)
EDL	estimated detection limit
Eh	oxidation/reduction potential
EM	electromagnetic
EMU	elctromagnetic unit
EP	Environmental Programs (a LANL directorate)
EPA	Environmental Protection Agency (U.S.)
EPC	exposure point concentration
EQL	estimated quantitation limit
ESL	ecological screening level
eV	electron volt
FUSRAP	Formerly Utilized Sites Remedial Action Program
FV	fallout value
GC/MS	gas chromatography–mass spectrometry
GFAA	graphite furnace atomic absorption
GIS	Geographic Information System
GPC	gas proportional counting
GPR	ground-penetrating radar
GPS	global positioning system
HAS	hollow-stem auger
HE	high explosives
HI	hazard index
HIR	historical investigation report
HMX	high-melting explosive [1,3,5,7-teranitro-1,3,5,7-tetrazacyclo-octane]
HQ	hazard quotient
HR	home range
HSA	hollow-stem auger
IA	interim action
ICV	initial calibration verification
ICS	interference check sample
ID	identification
I.D.	inside diameter

IDL	instrument detection limit
IDW	investigation-derived waste
IWD	integrated work document
K_d	grain-size distribution coefficient
K_{oc}	octanol carbon adsorption coefficient
K_{ow}	octanol/water partition coefficient
KPA	kinetic phosphorescence analysis
LAL	lower acceptance level
LANL	Los Alamos National Laboratory
LASL	Los Alamos Scientific Laboratory (Laboratory's name before January 1, 1981)
LC-MS	Liquid chromatography-mass spectrometry
LCS	laboratory control sample
LOAEL	lowest observed adverse effect level
MDC	minimum detectable concentration
MDL	method detection limit
mm Hg	millimeter(s) mercury
MRAL	mobile radiological analytical laboratory
MS	matrix spike
NMED	New Mexico Environment Department
NMSA	New Mexico Statutes Annotated
NOAEL	no observed adverse effect level
O.D.	outside diameter
PAUF	population area use factor
PB	preparation blank
PID	photoionization detector
PPE	personal protective equipment
pCi/g	picoCuries per gram
ppm	part per million
PQL	practical quantitation limit
PRG	preliminary remediation goals
QA/QC	quality assurance/quality control
Qal	Quaternary alluvium
Qbt	Quaternary Member of Bandelier Tuff
Qbo	Otowi Member

Qbog	Guaje Pumice
RCA	radiological contamination area
RCRA	Resource Conservation and Recovery Act
RCT	radiological control technician
RESRAD	radioactive residual materials (computer model)
RfD	reference dose
RFI	RCRA facility investigation
RL	reporting limit
RPD	relative percent difference
RPF	Records Processing Facility (an Environmental Programs Directorate)
RWP	radiological work permit
SAL	screening action level
SF	slope factor
SMO	Sample Management Office (an EP Directorate organization)
SOP	standard operating procedure
SOW	statement of work
SSHASP	site-specific health and safety plan
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
T&E	threatened and endangered
TA	technical area
TAL	target analyte list
TCLP	toxicity characteristic leaching procedure
TD	total depth
TVR	toxicity reference value
UAL	upper acceptance level
UCL	upper confidence limit
µg/g	micrograms per gram
VCA	voluntary corrective action
VOC	volatile organic compound
WCSF	waste characterization strategy form
WPF	waste profile form

A-2.0 GLOSSARY

Administrative authority (AA)—The Director of the New Mexico Environment Department, the U.S. Environmental Protection Agency, or the U.S. Department of Energy, as appropriate.

Alluvium—Clay, silt, sand, and gravel transported by water and deposited on streambeds, flood plains, and alluvial fans.

Area of concern (AOC)—Areas at the Laboratory that might warrant further investigation for releases based on past facility waste management activities.

Background value (BV)—The upper tolerance limits (UTLs) of background sample results, calculated as the upper 95% confidence limit for the 95th percentile**.** When a UTL cannot be calculated, either the detection limit or the maximum reported value is used as a BV; BVs are used as simple threshold numbers to identify potentially contaminated site sample results that are greater than background levels in that geological sample medium (or group of media)**.** All inorganic chemicals and radionuclides have BVs.

Baseline risk assessment (also known as risk assessment)—A site-specific analysis of the potential adverse effects of hazardous substances that are released from a site in the absence of any control or mitigation actions**.** A baseline risk assessment consists of four steps: data collection and analysis, exposure assessment, toxicity assessment, and risk characterization.

Calibration—Process used to identify the relationship between the true (reference) analyte concentration or other variable and the response of a measurement instrument, chemical analysis method, or other measurement system.

Chemical of potential concern (COPC)—Chemical, detected at a site, that has the potential to adversely affect human and/or ecological receptors due to its concentration, distribution, and mechanism of toxicity. A COPC remains a concern until exposure pathways and receptors are evaluated in a site-specific risk assessment.

Curie—The special unit of radioactivity. One curie equals 3.70×10^{10} nuclear transformations per second.

Data validation—Systematic process that applies a defined set of performance-based criteria to a body of data and that may result in qualification of the data. The data validation process is performed independently of the analytical laboratory that generates the data set and occurs before conclusions are drawn from the data. The process may comprise a standardized data review (routine data validation) and/or a problem-specific data review (focused data validation).

Department of Energy (DOE)—Federal agency that sponsors energy research and regulates nuclear materials for weapons production.

Depleted uranium—Uranium that has been depleted to less than 0.72% uranium-235.

Detection limit—Minimum concentration that can be determined by a single measurement of an instrument. A detection limit implies a specified statistical confidence that the analytical concentration is greater than zero.

Dose—Quantity of radiation that is absorbed, per unit of mass, by the body or by any portion of the body.

Ecological screening level (ESL)—An organism’s exposure-response threshold for a given chemical constituent. The concentration of a substance in a particular medium corresponds to a hazard quotient (HQ) of 1.0 for a given organism below which no risk is indicated.

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

Estimated detection limit (EDL)—The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine analytical-laboratory operating conditions. Sample estimated detection limits are highly matrix-dependent, and the specified estimated detection limits might not always be achievable. EDLs are for inorganic chemicals.

Estimated quantitation limit (EQL)—The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine analytical-laboratory operating conditions. Sample estimated quantitation limits are highly matrix-dependent, and the specified estimated quantitation limits might not always be achievable. EQLs are for organic chemicals.

Exposure pathway—Mode by which a receptor may be exposed to contaminants in environmental media (e.g., drinking water, ingesting food, or inhaling dust).

Fallout radionuclides—Radionuclides that are present at globally elevated levels in the environment as a result of the fallout from atomic weapons tests. The Laboratory background data sets consist of environmental surveillance samples taken from marginal and regional locations for the following radionuclides associated with fallout: tritium, cesium-137, americium-241, plutonium-238, plutonium-239/240, and strontium-90. Samples were collected from regional and marginal locations in the vicinity of the Laboratory that are (1) representative of geological media found within Laboratory boundaries and (2) were not impacted by Laboratory operations.

Field blank (also known as field reagent blank)—A blank sample either prepared in the field or carried to the sampling site, exposed to sampling conditions (e.g., bottle caps removed, preservatives added), and returned to a laboratory for analysis in the same manner in which environmental samples are analyzed. Used to identify the presence of contamination potentially added during the sampling and analysis process.

Field duplicate—A second sample collected as near as possible to the original sample.

Gamma radiation—A form of electromagnetic, high-energy radiation emitted from a nucleus. Gamma rays are essentially the same as x-rays and require heavy shielding, such as concrete or steel, to be blocked.

Groundwater—Water in a subsurface saturated zone; water beneath the regional water table.

Hazardous and Solid Waste Amendments (HSWA)—The Hazardous and Solid Waste Amendments of 1984 (Public Law No. 98-616, 98 Stat. 3221), which amended the Resource Conservation and Recovery Act of 1976, 42 U.S.C. § 6901 et seq.

Hydraulic conductivity—The rate at which water moves through a medium in a unit of time under a unit hydraulic gradient through a unit area measured perpendicular to the direction of flow.

Method blank—An analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing and which is prepared and analyzed in the same manner as the corresponding environmental samples. The method blank is used to assess the potential for contamination to the sample during preparation and analysis.

Method detection limit (MDL)—The minimum concentration of a substance that can be measured and reported with a known statistical confidence that the analyte concentration is greater than zero. The MDL is determined from analysis of samples of a given matrix type that contain the analyte after subjecting the sample to the usual preparation and analyses. The MDL is used to establish detection status.

Minimum detectable activity (MDA)—For the analysis of radionuclides, the MDA is the lowest detectable radioactivity for a given analytical technique. The following equation shall be used to calculate the MDA unless otherwise noted or approved by the Laboratory:

$$MDA = \frac{4.65(BKG)^{0.5} + 2.71}{2.22 \times EFF \times V \times T_S \times Y}$$

where BKG = the total background counts,
EFF = the fraction detector efficiency,
V = the volume or unit weight,
T_s = the *sample* count duration, and
Y = the fractional *chemical* recovery obtained from the *tracer* recovery.

Depending on the type of analysis, other terms may also be required in the denominator (e.g., gamma abundance).

Model—A simplified or idealized conception of a system or process, which can be written as a mathematical formulation (mathematical model)

No further action (NFA)—A recommendation that no further investigation or remediation is warranted based on specific criteria.

Nondetect—Sample result that is less than the MDL. The analytical laboratory reports nondetects as undetected at the EQL.

Perched groundwater—Groundwater that lies above the regional water table and is separated from it by an unsaturated zone.

Potential release site (PRS)—A potentially contaminated site at Los Alamos National Laboratory. PRSs are further divided into solid waste management units (SWMUs) and areas of contamination (AOCs).

Quality assurance (QA)—All those planned and systematic actions necessary to provide adequate confidence that a facility, structure, system, or component will perform satisfactorily in service.

Quality control (QC)—(1) All those actions necessary to control and verify the features and characteristics of a material, process, product, or service to specified requirements. QC is the process through which actual quality performance is measured and compared with standards. (2) All methods and procedures used to obtain accurate and reliable results from environmental sampling and analysis. Includes rules for when, where, and how samples are taken; sample storage, preservation and transport; and the use of blanks, duplicates, and split samples during the analysis.

Radionuclide—A nuclide (species of atom) that exhibits radioactivity.

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

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

Recharge—The process by which water is added to the zone of saturation, either directly from the overlying unsaturated zone or indirectly by way of another material in the saturated zone.

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

Release—Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of hazardous waste or hazardous constituents into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles that contain any hazardous wastes or hazardous constituents).

Reporting limit (RL)— The numerical value that an analytical laboratory (in conjunction with its client) selects to determine if a target analyte is detected. Results below the RL are considered not detected, while results greater than the RL are considered detected. The RLs are not necessarily based on instrument sensitivity. RLs can be established at the instrument detection limit, method detection limit, estimated quantitation limit, or contract-required detection limit.

Resource Conservation and Recovery Act (RCRA)—The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976. (40 CFR 270.2)

Runoff—The portion of the precipitation on a drainage area that is discharged from the area either by sheet flow or adjacent stream channels.

Run-on—Surface water flowing onto an area as a result of runoff occurring higher up the slope.

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

Screening assessment—A process designed to determine whether contamination detected in a particular medium at a site may present a potentially unacceptable human-health and/or ecological risk. The assessment utilizes screening levels that are either human-health or ecologically based concentrations derived by using chemical-specific toxicity information and standardized exposure assumptions below which no additional actions are generally warranted.

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

Site characterization—Defining the pathways and methods of migration of the hazardous waste or constituents, including the media affected, the extent, direction and speed of the contaminants, complicating factors influencing movement, concentration profiles, etc. (U.S. Environmental Protection Agency 1994)

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

Solid waste management unit (SWMU)—Any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which solid wastes have been routinely and systematically released. This definition includes regulated units (i.e., landfills, surface impoundments, waste piles, and land treatment units), but does not include passive leakage or one-time spills from production areas and units in which wastes have not been managed (e.g., product storage areas).

Standard operating procedure (SOP)—A document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps, and that is officially approved as the method for performing certain routine or repetitive tasks.

Stratigraphy—The science dealing with the succession, age, composition, and history of strata.

Target analyte—An element, chemical, or parameter, the concentration, mass, or magnitude of which is designed to be quantified by use of a particular test method.

Technical area (TA)—At Los Alamos National Laboratory, an administrative unit of operational organization. There are currently 49 active TAs spread over 43 square miles.

Topography—The physical configuration of the land surface in an area.

Tuff—A compacted deposit of volcanic ash and dust that contains rock and mineral fragments accumulated during an eruption.

U.S. Department of Energy (DOE)—Federal agency that sponsors energy research and regulates nuclear materials for weapons production.

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

A-3.0 METRIC CONVERSION TABLE

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

A-4.0 DATA QUALIFIER DEFINITIONS

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

Appendix B

Field Methods

B-1.0 INTRODUCTION

This appendix summarizes the field methods used during the 2007 investigation of the Bayo Canyon Aggregate Area. All activities were conducted in accordance with applicable Los Alamos National Laboratory (LANL or the Laboratory) procedural requirements. The Laboratory procedures may be found at the following URL: http://erproject.lanl.gov/documents/procedures.html. The activities described in the approved investigation work plan (LANL 2005, 092083) were conducted from July to October 2007.

The following sections provide a brief description of the field methods used during the 2007 Bayo Canyon Aggregate Area investigation. Table B-1.0-1 provides a summary of the specific field methods followed during the investigation, and Table B-1.0-2 lists the general methods and procedures followed during the investigation.

B-2.0 FIELD METHODS

B-2.1 Geodetic Surveys

A geodetic survey was conducted to locate historical surface and subsurface sampling locations. The historical borehole locations were used as the basis to demarcate the borings drilled for the 2007 investigation. Subsequent surveys were conducted at the completion of the drilling and sampling campaign to establish the spatial coordinates for all sampling locations, trenches, and boreholes. Geodetic surveys were conducted using a Trimble 5700 differential global positioning system (DGPS). The survey data were collected by a licensed surveyor and conform to Laboratory Information Architecture (IA) project standards IA-CB02, “GIS Horizontal Spatial Reference System,” and IA-D802, “Geospatial Positioning Accuracy Standard for A/E/C and Facility Management.” All coordinates are expressed as New Mexico State Plane Coordinate System, Central Zone, North American Datum 1983, U.S. survey feet.

B-2.2 Geophysical Surveys

The 2007 geophysical surveys were conducted between July and August 2007. The purpose of the surveys were (1) to investigate the distribution of shrapnel dispersed during explosive testing at Consolidated Unit 10-001(a)-99; (2) to confirm the removal of underground structures and to locate any possible remaining buried structures associated with Consolidated Unit 10-002(a)-99 and Solid Waste Management Unit (SWMU) 10-004(a); (3) to investigate the presence of possible buried debris at Area of Concern (AOC) 10-009; and (4) to define the lateral extent and depth of debris buried at SWMU 10-007. The methodologies used to conduct the 2007 geophysical surveys are discussed below.

B-2.2.1 Shrapnel Survey

The shrapnel survey was conducted across a 37-acre area surrounding the two shot pads at Consolidated Unit 10-001(a)-99. A 200-ft^2 grid was established over the proposed survey area to guide survey activities. The shrapnel geophysical survey used a TM-5emu coordinated with a global positioning system (GPS). The TM-5emu geophysical survey system consists of a Norand 602 computer, a Minelab F1B2 electromagnetic sensor module, two 18-in. sensor coils, an EMUDAS program, and various ancillary devices. The equipment is mounted to a polyvinyl chloride frame and walked across the survey area. The TM-5emu system was selected for the Technical Area (TA) 10 shrapnel survey because it has the ability to detect smaller metallic items in a variety of geologic settings. The survey was used to delineate geophysical anomalies attributed to shallow subsurface metallic content. The anomalies are inferred to be shrapnel derived from historical firing site operations. For the Bayo Canyon survey, geodetic coordinates were acquired at 1-s intervals to allow for adequate spatial sampling relative to walking speed. All geographic data are presented in New Mexico State Plane Coordinate System, Central Zone, North American Datum 1983, U.S. survey feet.

B-2.2.2 Landfill and Buried Structure Identification Surveys

The geophysical survey used to identify buried structures and/or debris at Consolidated Unit 10-002(a)-99, SWMU 10-004(a), and AOC 10-009 employed electromagnetic (EM) geophysical methods including EM31 (terrain conductivity) and EM61 (high-sensitivity metal detector) instrumentation. If necessary, ground-penetrating radar (GPR) and radio frequency pipe locater instruments were used to better define the extent and/or presence of EM anomalies. All geophysical survey instruments were integrated with a GPS to allow real-time navigation along planned survey routes.

The EM surveys were conducted using a hand-held digital broadband EM sensor that uses the relationship among electric fields, magnetic fields, and electrical current to detect changes in subsurface conductivity. EM31 and EM61 data were recorded at approximately 2-ft intervals along lines spaced approximately 10 ft apart. Higher resolution coverage was completed in selected target areas using 5-ft line spacing. Geodetic coordinates were recorded at 1-s intervals using an integrated GPS.

A GPR uses the transmission and reflection of radio waves to image objects beneath the ground surface. The radio waves respond to changes in the electrical properties of the earth or buried materials. Line locations were chosen based on historical locations of target features, such as suspected buried tanks and pipes.

B-2.3 Radiological Surveys

Radiological walk-over surveys were conducted between July 22 and October 10, 2007, at Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMU 10-004(a), and AOC 10-009. The purpose of the radiological survey at Consolidated Unit 10-001(a)-99 was to determine if areas of elevated radiation correlated to locations with a high density of shrapnel. Radiological surveys were also conducted at Consolidated Unit 10-002(a)-99, SWMU 10-004(a), and AOC 10-009 to identify areas of elevated radiation attributable to structure locations or releases, to bound the extent of surface radiological contamination, and to guide placement of borehole or surface sampling locations. The surveys were performed using a GPS coupled to radiological instrumentation. A diamond-shaped pancake Geiger-Müeller (G-M) detector array was used for the radiological surveys because strontium-90 (a high-energy beta emitter) and depleted uranium (an alpha, beta, and gamma emitter) are the target radionuclides at former TA-10, and the G-M is capable of detecting alpha, beta, and gamma radiation.

Each GPS radiological survey system consisted of a Ludlum Model 2221 rate meter/scaler with a Ludlum Model 44-94 G-M detector coupled to a Trimble ProXRS mapping grade GPS. The Ludlum Model 2221 was operated in fast response rate meter mode, allowing for count rates tagged with corresponding coordinates to be collected at 1-s intervals. The radiological survey systems were carried in backpacks with the detectors held approximately 6 in. above the ground surface. Each detector line spacing was approximately 5 ft, and the walking survey speed was approximately 2.5 ft/s. At the end of each survey day, the field data were downloaded to a laptop computer and processed on-site using a combination of Trimble Pathfinder Office and ESRI ArcView Geographic Information System (GIS) computer applications.

B-2.4 Surface Sampling

Surface samples were collected from 0 to 0.5 ft using the spade-and-scoop method in accordance with Standard Operating Procedure (SOP) 06.09, Spade and Scoop Method for Collection of Soil Samples. The samples were collected using stainless-steel shovels or spoons and homogenized in stainless-steel bowls.

Shallow-subsurface samples were collected from 1.5 to 2.0 ft using the hand auger method in accordance with SOP-06.10, Hand Auger and Thin-Wall Tube Sampler. The material was placed in stainless-steel bowls and handled in the same manner as surface soil samples.

The surface and shallow-subsurface samples were placed in appropriate sample containers and submitted for laboratory analysis of the following chemical suites: strontium-90; target analyte list (TAL) metals; explosive compounds; pH; cyanide; perchlorate; volatile organic compounds (VOCs); semivolatile organic compounds (SVOCs); and gross alpha, beta, and gamma radiation. A subset of the surface samples collected from Consolidated Unit 10-001(a)-99 was also submitted for isotopic uranium analysis.

All sample collection activities were coordinated with the Sample Management Office (SMO). Upon collection, samples remained in the controlled custody of the field team at all times until delivered to the SMO.

Standard quality assurance/quality control (QA/QC) samples (field duplicates and rinsate samples) were also collected in accordance with SOP-01.05, Field Quality Control Samples. QA/QC samples (field duplicates and rinsate blanks) were collected at a rate of 1 per every 10 analytical samples collected (10% frequency). Field trip blanks were obtained from the SMO for use on all days in which VOC samples were collected.

B-2.5 Drilling, Screening Core, and Borehole Logging

For the 2007 drilling investigation, 55 boreholes were drilled to depths ranging from 30 ft to 68.5 ft below ground surface (bgs) to further characterize the site. A Construction Mine Equipment (CME) 85 hollow-stem auger (HSA) drill rig was employed for all drilling using 4.25-in.-inner-diameter (I.D.) and nominal 8.25-in.-outer-diameter (O.D.) augers. A hex-rod core retrieval system and 4-in.-O.D. stainless-steel core barrels were used for sampling. A nominal 9-in.-diameter drill bit was used for all borings. During HSA drilling, continuous core was recovered using stainless-steel core barrels through the center of the 4.25-in. drill string. At locations where elevated radiological contamination was expected, Lexan core barrel liners were used to prevent contamination of the core barrel and cross-contamination at depth between samples. Core was collected at 5-ft intervals.

At the surface, cuttings and core were surveyed for radioactivity and VOCs, and the core was visually inspected and lithologically logged following SOP-12.01, Field Logging, Handling, and Documentation of Borehole Materials. A detailed lithologic log was completed for each boring by a qualified geologist and classified in accordance with Unified Soil Classification System, American Society for Testing and Materials D2487 and D2488, or American Geological Institute “Methods for Soil and Rock Classification.” The borehole logs are presented in Appendix C (on compact disk [CD] included with this document).

All drilling equipment was dry decontaminated after use at each borehole. Rinsate blanks on drilling equipment were collected at a frequency of 1 per every 10 analytical samples collected.

All drill cuttings generated during sampling activities were placed in appropriate waste containers (waste wranglers, rolloff bins, or 55-gal. drums) and staged in a less than 90-d waste storage area. Waste remained on-site pending receipt of the results of waste characterization, which was based on analytical results from core samples, augmented by direct sampling, if necessary. The waste characterization strategy form for the Bayo Canyon Aggregate Area is included in Appendix E.

B-2.6 Collection of Soil and Rock Characterization Samples

Continuous core was recovered for purposes of collecting subsurface soil and tuff. Core was collected from the split-spoon core barrel in accordance with SOP-6.24, Sample Collection from Split-Spoon Samplers and Shelby-Tube Samplers. The core was described for lithologic and structural features per SOP-9.10, Field Sampling of Core and Cuttings for Geological Analysis, and SOP-12.01, Field Logging, Handling, and Documentation of Borehole Materials. The borehole logs are provided in Appendix C (on CD).

A minimum of two samples were collected for laboratory analyses from each of the boreholes drilled during the 2007 investigation. The sampling intervals were selected based on data requirements in the approved work plan (LANL 2005, 092083) and/or

- the depth of the highest field-screening result, if applicable;
- the depth of geologically significant features;
- the discretion of the field geologist; and
- the total depth of the borehole.

Core material was placed in the appropriate sampling containers, labeled, documented, and preserved (as appropriate) for transport to the Laboratory's SMO. Samples were submitted to the radiation screening laboratory for gross-alpha, -beta, and -gamma analyses before shipment by the SMO to ensure compliance with U.S. Department of Transportation (DOT) requirements.

Samples were submitted for laboratory analysis of the following analytical suites: strontium-90, isotopic uranium (selected samples), TAL metals, explosive compounds, pH, cyanide, perchlorate, VOCs, SVOCs, and gross-alpha, -beta, and -gamma radiation. Two core sections each from borehole locations 10-601259 and 10-601164 were analyzed for saturated and unsaturated hydraulic conductivity, porosity, and bulk density. Field duplicates and rinsate blanks were submitted for the same suite of analyses as the investigation samples in accordance with SOP-01.05, Field Quality Control Samples.

The drilling equipment was field screened and tested for alpha and beta radiation by a qualified radiological control technician (RCT) and decontaminated using dry methods after each borehole or as necessary based on field-screening results.

B-2.7 Field Screening

Surface and subsurface samples and cores, cuttings, and excavated material were screened for gross-alpha and -beta radiation. Screening was performed using an Eberline E600 with either a 380AB or SHP360 probe (or equivalent) and an ESP-1 rate meter with a 210 probe (or equivalent) in accordance with SOP-10.07, Field Monitoring for Surface and Volume Radioactivity Levels. The probe was held less than 1 in. away from the medium. Measurements were made by conducting a quick scan to find the location with the highest initial reading and then collecting a 1-min reading at that location to determine gross-alpha and -beta radiation levels. Soil and core material was sampled and logged only after radiological field-screening measurements were established so appropriate precautions could be taken before the sample was collected. Field personnel collected and recorded background measurements for gross-alpha and gross-beta radiation daily. Field-screening measurements are presented in Appendix C.

Organic vapor monitoring of surface and subsurface samples was performed using a MiniRae 2000, Model PGM-7600 photoionization detector (PID) with an 11.7 electron volt (eV) bulb immediately after sample retrieval. In addition, headspace vapor screening for VOCs was performed on recovered surface and subsurface media in accordance with SOP-06.33, Headspace Vapor Screening with a Photoionization Detector. Samples were placed in a glass container and covered with aluminum foil. The container was sealed, gently shaken, and allowed to equilibrate for 5 min. It was then screened by inserting the PID probe into the container and measuring and recording any detected vapors. The workers' breathing zone was also monitored using the MiniRae 2000. Field-screening measurements are presented in Table 4.2-2 of the investigation report.

B-2.8 Borehole Abandonment

Abandonment of investigation boreholes was conducted according to procedures outlined in SOP-5.03, Monitoring Well and RFI Borehole Abandonment. Boreholes were abandoned with bentonite grout by filling upward from the bottom via tremie pipe to within 2 ft of the surface. The remainder was filled with concrete to surface grade. After 24 h, the backfilled level was checked for settling and additional cement was added, as needed. The placement of backfill materials was documented with regard to volume (calculated and actual), intervals of placement, and additives used to enhance backfilling.

B-2.9 Excavation of Exploratory Test Pits

Exploratory test pits were excavated using a backhoe at AOC 10-009 to identify the location and physical extent of the AOC 10-009 suspected landfill and to characterize the type of debris found (if present). Test pits at SWMU 10-007 were dug to confirm the physical extent of the debris landfill, to verify the depth to debris, and to characterize the physical, chemical, and radiological characteristics by sampling the debris.

Test pits were dug to 5 and 12 ft bgs, and material debris composed primarily of concrete was sampled and analyzed for VOCs (toxicity characteristic leaching procedure [TCLP]), SVOCs (TCLP), metals (TCLP), gross-alpha, -beta, and -gamma radioactivity, strontium-90, perchlorate, cyanide, and high explosives. Field screening for VOCs and radiological contamination of the excavation and excavated materials was conducted as necessary.

B-2.10 Decontamination of Equipment

Drilling and sampling equipment was decontaminated to minimize the potential for cross-contamination between borehole sampling locations. Dry decontamination methods were used whenever possible. Decontamination procedures followed SOP-1.08, Field Decontamination of Drilling and Sampling Equipment. All equipment including survey equipment and heavy equipment, such as backhoes, excavators, forklifts, drill rigs, etc., were screened by an RCT and released following DOT regulations before entering and exiting the site.

B-2.11 Field Instrument Calibration

Instrument calibration and/or function check was completed daily. Several environmental factors affected the field instrument’s integrity, including air temperature, atmospheric pressure, wind speed, and humidity. Calibration of the PID was conducted by the site-safety officer. Calibration of the Eberline E-600 was conducted by the RCT. All calibrations were performed according to the manufacturers' specifications and requirements.

B-2.11.1 PID Calibration

The PID was calibrated both to ambient air and a standard reference gas (100 parts per million [ppm] isobutylene). The ambient-air calibration determined the zero point of the instrument sensor calibration curve in ambient air. Calibration with the standard reference gas determined a second point of the sensor calibration curve. Each calibration was within 3% of 100 ppm isobutylene, qualifying the instrument for use.

All daily calibration procedures for the MiniRae 2000, Model PGM-7600 PID met the manufacturer's specifications for standard reference gas calibration and the requirements of Quality Procedure (QP) 5.2, Control of Measuring and Test Equipment.

B-2.11.2 Eberline E-600 Instrument Calibration

The Eberline E-600 was calibrated daily by the RCT before local background levels for radioactivity were measured. The instrument was calibrated using plutonium-239 and chloride-36 sources for alpha and beta emissions, respectively. The following five checks were performed as part of the calibration procedures: calibration date, physical damage, battery, response to a source of radioactivity, and background. All calibrations performed for the Eberline E-600 met the manufacturer's specifications, the requirements of QP-5.2, and the applicable radiation detection instrument manual.

B-2.12 Site Demobilization and Restoration

Because of the pending waste removal from the waste storage area, site demobilization will be completed in two phases: (1) following completion of drilling, sampling, and well-installation activities and (2) following receipt of waste-characterization results and demobilization of waste containers.

During the first phase of demobilization, the following tasks were performed.

- Drilling equipment using dry decontamination methods was decontaminated. All drilling, sampling, and other equipment was smeared by an RCT and released.
- All drilling, sampling equipment, and materials were removed from the site.
- All temporary fencing and postings emplaced during site mobilization and setup were removed.
- A post-job geodetic survey to permanently stake all borings and document all borings whose locations deviated during execution of the fieldwork was performed.

During the second phase of demobilization, all waste containers will be removed and the waste containment storage areas will be dismantled.

To ensure that the site was properly restored to prejob conditions, the following tasks were performed:

- Disturbed/excavated slopes were regraded to predisturbed condition.
- Disturbed areas were reseeded with native seed mix (applicable only to areas that supported grass and shrubs before disturbance from field activities).

- The required best management practices were installed and secured to maintain effectiveness of reseeding, drainage, and erosion-control efforts.
- All investigation-related debris was cleaned up from the site.

A closeout checklist is in process to ensure that demobilization from the site is complete in accordance with SOP-1.12, Field Site Closeout Check List.

B-3.0 REFERENCES

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

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), November 23, 2005. "Response to the Notice of Disapproval for the Investigation Work Plan for the Bayo Canyon Aggregate Area and Revision to Same," Los Alamos National Laboratory letter (ER2005-0885) to J.P. Bearzi (NMED-HWB) from D. McInroy (ENV-ERS Deputy Program Director) and D. Gregory (DOE Federal Project Director), Los Alamos, New Mexico. (LANL 2005, 092083)

Table B-1.0-1
List of Applicable Procedures for Execution of the Bayo Canyon Aggregate Area Investigation

Document Number	Document Title/Description
LIG 402-10-01A.2 (Superseded LIG 402-10-01A Rev 1)	Lightning Safety
LIR 230-03-01 Rev 5	Facility Management Work Control
LIR 300-00-08 Rev 1	Startup/Restart of Laboratory Facilities/Activities
LIR 401-10-01 Rev 2	Stop Work and Restart
ISD 101-6.0 (Superseded LIR 402-1000-01 Rev 1)	Personal Protective Equipment
LIR 402-1320-01.4 (Superseded LIR 402-1320-01 Rev 2)	Vehicle and Pedestrian Safety
ISD 101-15.0 (Superseded LIR 402-530-00 Rev 2)	Biological safety
ISD 101-13.0 (Superseded LIR 402—600-1.3 Rev 1)	Electrical Safety
LIR 402-820-01 Rev 1	Noise and Temperature Stress
LIR 402-840-01 Rev 0	Welding, Cutting, and Other Spark-or-Flame Producing Operations
ISD 101-3.1 (Superseded LIR 402-860-01 Rev 1)	Lockout/Tagout for Personal Safety
ISD 101-17.0 (Superseded LIR 402-880-01 Rev 5)	Excavation/Soil Disturbance Permit Process
LIR 402-910-01.7 (Superseded LIR 402-910-01 Rev 6)	LANL Fire Protection Program
ISD 101-25.0 (Superseded LIR 402-1120-01.1)	Cranes, Hoists, Lifting Devices and Rigging Equipment
LIR 403-00-01.4 (Revision of LIR 403-00-01 Rev 3)	LANL Emergency Management
LIR 404-00-02.4 (Revision of LIR 404-00-02 Rev 3)	General Waste Management Requirements
IP 300-SID (Superseded LPR 300-00-00 Rev 1)	Integrated Safety Management
SOP-01.01, Rev 2, ICN 1	General Instructions for Field Investigations
SOP-01.02, Rev 1, ICN 1	Sample Container and Preservation
SOP-01.03, Rev 4	Handling, Packaging and Transporting Samples
SOP-01.04, Rev 6	Sample Control and Field Documentation (includes Class)
SOP-01.05 Rev 1 ICN 1	Field Quality Control Samples
SOP-01.06 Rev 2	Management of ER Project Wastes
SOP-01.08 Rev 2	Field Decontamination of Drilling and Sampling Equipment
SOP-01.10 Rev 2	Waste Characterization
SOP-01.12 Rev 0 ICN 2	Field Site Closeout Checklist
SOP-3.11 Rev 2	Coordinating and Evaluating Geodetic Surveys
SOP-05.03 Rev 3	Monitoring Well and RFI Borehole Abandonment
SOP-06.09 Rev 2	Spade and Scoop Methods for the Collection of Soil Samples
SOP-06.10 Rev 3	Hand Auger and Thin-Wall Tube Sampler
SOP-06.26 Rev 2	Core Barrel Sampling for Subsurface Earth Materials
SOP-6.33 Rev 0	Headspace Vapor Screening with a Photoionization Detector
SOP-09.10 Rev 0	Field Sampling of Core and Cuttings for Geological Analysis
SOP-12.01 Rev 4	Field Logging, Handling, and Documentation of Borehole Materials

Table B-1.0-2
Summary of Investigation Methods for the
Bayo Canyon Aggregate Area Investigation

Method	Summary
Spade-and-scoop collection of soil samples	This method was used to collect surface (i.e., 0–6 in.) soil or fill samples. A hole was dug to the desired depth, as prescribed in the work plan, and a discrete grab sample was collected. The sample was homogenized in a decontaminated stainless steel bowl before transferring to the appropriate sample containers.
Core-barrel sampling	The core barrel is a cylindrical barrel split lengthwise so the two halves can be separated to expose the core sample. The stainless-steel core barrel (3-in. I. D., 5 ft long) is pushed directly into the subsurface media using an HSA drilling rig. A continuous length of core is extracted with the core barrel. Once extracted, the section of core was screened for radioactivity and organic vapors, photographed, and described in a geologic log. If located within a targeted sampling interval, a portion of the core was then collected for fixed laboratory analysis.
Field logging, handling, and documentation of borehole materials	Upon reaching the surface, core barrels were immediately opened for field-screening, logging, and sampling. Logging of borehole materials included run number, core recovery percentage, depth interval (in 5-ft increments), field-screening results, lithological and structural description, and a photograph. Once the core material was logged, selected samples were taken from discrete intervals of the core. All borehole material not sampled was then disposed of as waste.
Headspace vapor screening	Every 5-ft interval an individual soil, rock, or sediment sample was field screened for VOCs by placing a portion of the sample in a glass container with a foil-sealed cover. The container was sealed, gently shaken, and allowed to equilibrate for 5 min. The sample was then screened by inserting a PID probe, equipped with an 11.7-eV lamp, into the container, measuring and recording any detected vapors.
Handling, packaging, and shipping of samples	Samples were sealed and labeled before they were packed in ice, and sample containers and the containers used for transport were examined to ensure they were free of external contamination. Samples were packaged so as to minimize the possibility of breakage during transportation. After environmental samples were collected, packaged, and preserved, they were transported to the SMO. A split of each sample was sent to an SMO-approved radiation screening laboratory under chain of custody (COC). Once radiation screening results were received, the SMO then sent the corresponding analytical samples to fixed laboratories for full analysis.
Containers and preservation of samples	Specific requirements/processes for sample containers, preservation techniques, and holding times were based on U.S. Environmental Protection Agency guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample were printed in the sample collection logs provided by the SMO (size and type of container, preservatives, etc.). All samples were preserved by placing them in insulated containers with ice to maintain a temperature of 4°C.
Sample control and field documentation	The collection, screening, and transport of samples were documented on standard forms generated by the SMO. These forms included sample collection logs, COC forms, and sample container labels. Collection logs were completed at the time of sample collection and were signed by the sampler and a reviewer who verified the logs for completeness and accuracy. Corresponding labels were initialed and applied to each sample container, and custody seals were placed around container lids or openings. The COC forms were completed and assigned to verify that the samples were not left unattended.
GPR, EM31 and pipe locator surveys	Ground-penetrating radar, EM31, and RD400/PDL2 radio frequency pipe locator surveys were performed to confirm bed locations along with any unknown anomalies that may have been present. Surveys were performed in accordance with subcontractor supplied, Laboratory-approved SOPs.

Table B-1.0-2 (continued)

Method	Summary
Coordinating and evaluating geodetic surveys	Geodetic surveys focused on obtaining survey data of acceptable quality for use during project investigations. Geodetic surveys were conducted with a Trimble 5700 DGPS. The survey data conformed to Laboratory Information Architecture project standards IA-CB02, “GIS Horizontal Spatial Reference System,” and IA-D802, “Geospatial Positioning Accuracy Standard for A/E/C/ and Facility Management.” All coordinates are expressed New Mexico State Plane Coordinate System, Central Zone, North American Datum 1983, U.S. survey feet. All elevation data are reported relative to the National Geodetic Vertical Datum of 1983.
Management, characterization, and storage of investigation-derived waste (IDW)	IDW was managed, characterized, and stored in accordance with an approved waste characterization strategy form that documents site history, field activities, and the characterization approach for each waste stream managed. Waste characterization complied with on-site or off-site waste acceptance criteria, as appropriate. All stored IDW was be marked with appropriate signage and labels, as appropriate. Drummed IDW was stored on pallets to prevent deterioration of containers. Means to store, control, and transport each potential waste type and classification was determined before field operations began. A waste storage area was established before waste was generated. Each container of waste generated was individually labeled as to waste classification, item identification number, and radioactivity (if applicable), immediately following containerization. All waste was segregated by classification and compatibility to prevent cross-contamination.
Field QC samples	Field QC samples were collected as directed in the Compliance Order on Consent as follows: *Field Duplicate*: At a frequency of 10%; collected at the same time as a regular sample and submitted for the same analyses. *Equipment Rinsate Blank*: At a frequency of 10%; collected by rinsing sampling equipment with deionized water, which is collected in a sample container and submitted for laboratory analysis. *Trip Blanks*: Required for all field events that include the collection of samples for VOC analysis. Trip-blank containers are filled with certified clean sand and are opened and kept with the other sample containers during the sampling process.
Field decontamination of drilling and sampling equipment	Dry decontamination was the preferred method of decontamination used to minimize the generation of liquid waste. Dry decontamination included the use of a wire brush or other tool for removal of soil or other material adhering to the sampling equipment, followed by use of a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes.

Appendix C

2007 Investigation Geodetic
Survey Coordinates and Borehole Logs
(on CD included with this document)

Appendix D

Photographs of Field Activities

Geophysical and Radiological Surveys Conducted at Bayo Canyon Aggregate Area

Figure D-1 **EM31 and EM61 geophysical survey instruments coupled with a global positioning system (GPS) used to identify subsurface anomalies at various locations in Bayo Canyon**

Figure D-2 TM-5emu geophysical survey instrument used to survey shrapnel distribution at Consolidated Unit 10-001(a)-99. View to north of Otowi Mesa in background.

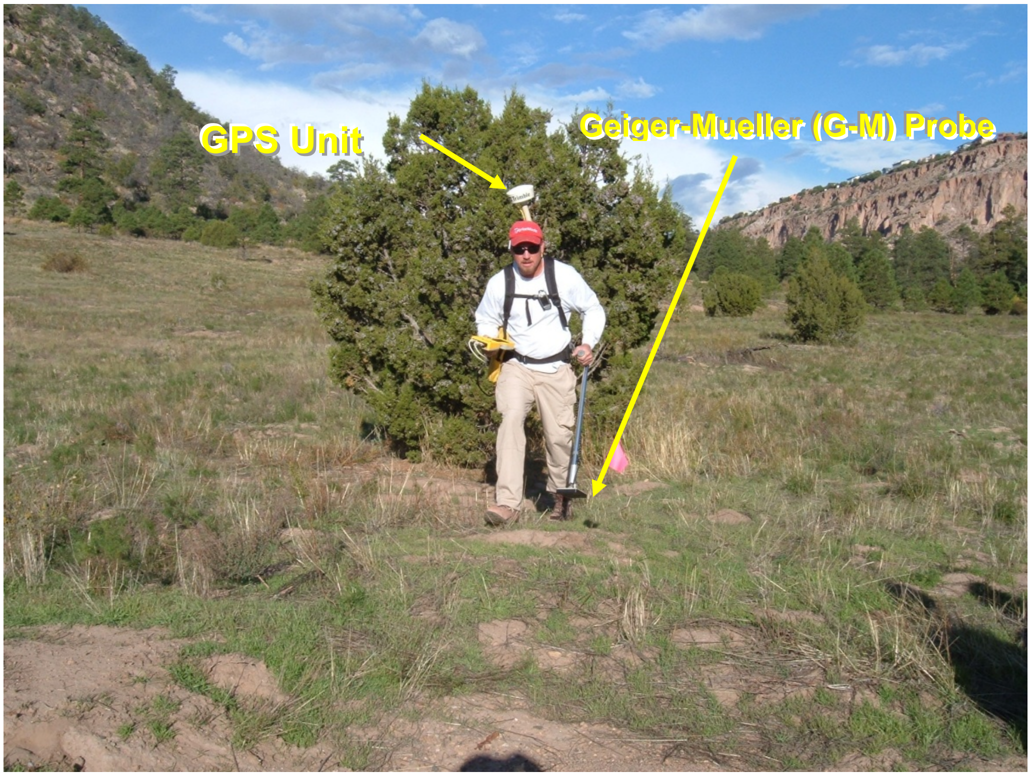


Figure D-3 Beta and gamma radiological survey equipment coupled with a GPS

Figure D-4 Closeup of G-M detector array used to collected radiological survey data

Surface and Shallow Subsurface Sampling at Bayo Canyon Aggregate Area

Figure D-5 Examples of surface and shallow subsurface sampling at various locations in Bayo Canyon. Surface samples were collected from soil, quaternary alluvium, and welded tuff (Qbt 3).

Representative Lithologic Contacts and Geological Units at Bayo Canyon Aggregate Area

Figure D-6 BH-51 (10-601149), 0–4 ft below ground surface (bgs), Quaternary alluvium

Figure D-7 Laminated to bedded sand, silt, clay, and pumice fragments typical of Quaternary alluvium deposits in Bayo Canyon

Figure D-8 Laminated to bedded sand, silt, clay, and pumice fragments typical of Quaternary alluvium deposits in Bayo Canyon

Figure D-9 Large welded tuff boulder in quaternary alluvium deposits at BH-40 (10-601179)

Figure D-10 Large welded tuff boulder in quaternary alluvium and contact with Otowi Member of the Bandelier Tuff at BH-36 (10-601175) from 24 to 29 ft bgs

Figure D-11 Guaje Pumice Bed deposit at 45–50 ft bgs in BH-11 (10-601244)

Figure D-12 Closeup of Guaje Pumice Bed deposit at 45–50 ft bgs in BH-11 (10-601244)

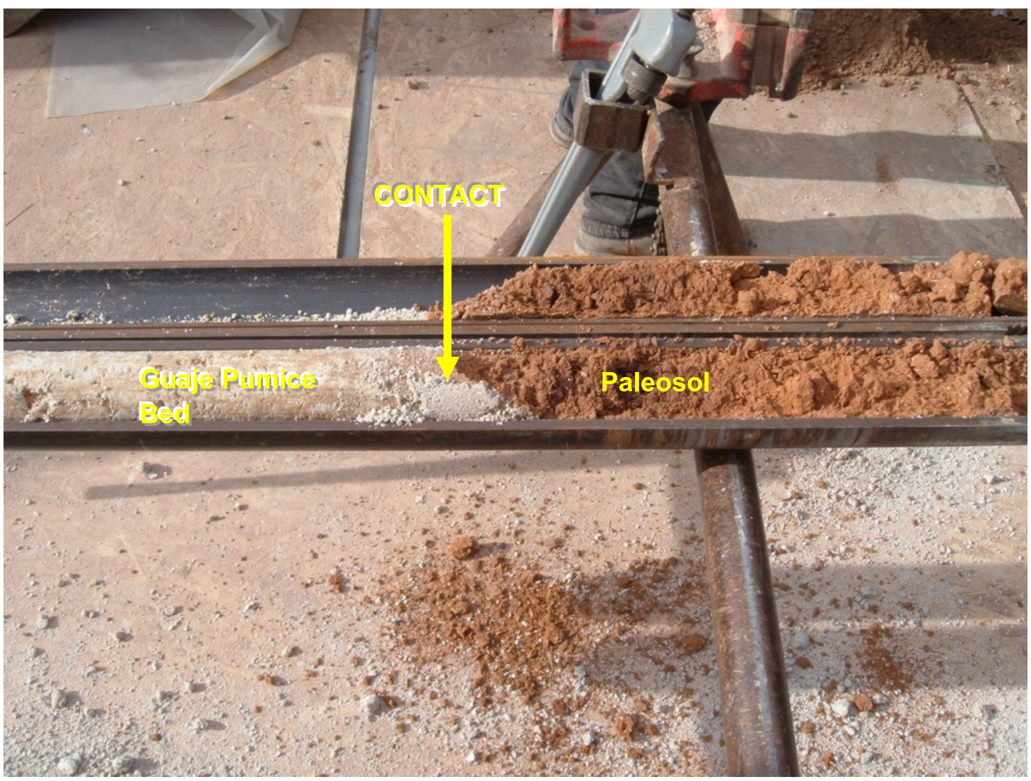


Figure D-13 Contact between Guaje Pumice Bed and palesol above Cerros del Rio basalt

Figure D-14 BH-44 (10-601192), 64–68.5 ft bgs, borehole refusal in palesol above Cerros del Rio basalt

Figure D-15 Closeup of palesol above Cerros del Rio basalt

Figure D-16 **Using lexan liner to collect geotechnical samples and to prevent radiological contamination of the core barrel**

Activities Conducted to
Locate Solid Waste Management Unit 10-006 at Bayo Canyon Aggregate Area

Figure D-17 Investigation area at the western edge of Consolidated Unit 10-001(a)-99

Figure D-18 Auger holes dug to investigate the subsurface (up to 3 ft bgs) in the investigation area

Figure D-19 Test pits dug to investigate the subsurface (up to 3 ft bgs) in the investigation area

Figure D-20 Five auger holes and three test pits dug to investigate the subsurface (up to 3 ft bgs) in the SWMU 10-006 investigation area

Figure D-21 A depression in the ground north of Consolidated Unit 10-001(a)-99 was investigated to find possible evidence of potential SWMU 10-006 burn pits, charred debris, etc. No usual findings were encountered in the subsurface.

Appendix E

Investigation-Derived Waste Management

E-1.0 INTRODUCTION

This appendix contains the available waste management and disposal documentation for waste streams generated during the 2007 Bayo Canyon Aggregate Area investigation conducted by Los Alamos National Laboratory (the Laboratory). The waste characterization strategy form (WCSF) was prepared to identify the anticipated waste streams, characterization method, on-site waste management, and final disposition options. The waste profile forms (WPFs) were prepared for the waste streams generated.

E-2.0 SUMMARY

The waste streams generated at the Bayo Canyon Aggregate Area during the 2007 investigation activities are outlined in Table E-2.0-1. (Note: Waste management is still in progress for one of the waste streams and final documentation has not yet been generated.)

The drill cuttings and core are stored in rolloff bins and were originally staged on-site in a less-than-90-d storage area surrounded by gated and locked 8-ft chainlink fencing pending waste analysis. Once a nonhazardous waste determination was made, the waste area was downgraded. The waste is currently being handled as low-level radioactive waste pending disposal. The locked and gated fenced area is maintained to prevent public access to the area.

E-3.0 WCSF

The WCSF was prepared before investigation-derived waste (IDW) generation following Standard Operating Procedure (SOP) 01.06, Management of ER Project Waste, and SOP-01.10, Waste Characterization. The WCSF and amendment to the WCSF were written and approved as follows.

- WCSF EP2007-0349 (dated July 10, 2007) describes the waste generated during borehole drilling, soil sampling, field screening, and other waste-generating field activities.
- Amendment #1 to WCSF EP2007-0349, written and approved on October 22, 2007, added an additional waste stream—soil and debris (waste stream 9)—and more detail on waste analysis and changed types of waste in waste streams 1 and 2.

A copy of the signed WCSF and the amendment to the WCFS is included on compact disk (CD) as Attachment E-1.

E-4.0 WPFs

Five WPFs were prepared for the following IDW and associated disposal destinations.

- WPF #40518 (dated 12/06/2007, waste stream 2) characterizes a drum containing contact waste (personal protective equipment [PPE], plastic sheeting, and sampling equipment) generated during borehole drilling, soil sampling, and field-screening activities. A total of 0.5 yd^3 of this waste was produced and transported to Technical Area (TA) 54 for disposal.
- WPF #40543 (dated 12/19/2007, waste stream 9) characterizes a drum containing soil and PPE from limited radiologically contaminated soil removal activities generated during characterization sampling. A total of 0.1 yd^3 of this waste was transported to TA-54 for disposal.

- WPF #40544 (dated 12/19/2007, waste stream 9) characterizes a drum containing rock, soil, and PPE from limited radiologically contaminated soil removal activities generated during characterization sampling. A total of 0.1 yd^3 of this waste was transported to TA-54 for disposal.
- WPF #40450 (dated 11/14/2007, waste stream 1) characterizes a U.S. Department of Transportation-approved rolloff bin or wrangler bag containing investigation-derived drill cuttings and core generated during borehole drilling, soil sampling, and field-screening activities. Of this waste, approximately 4 yd^3 was transported to TA-54 for disposal.
- WPF #40451 (dated 11/27/07, waste stream 2) characterizes drums containing contact waste (PPE, plastic sheeting, and sampling equipment) generated during borehole drilling, soil sampling, and field screening activities. A total of 6 yd^3 of this waste was produced and transported to TA-54 for disposal.

The five WPFs are included in Attachment E-1 on the CD included with this document.

E-5.0 CHEMICAL WASTE DISPOSAL REQUESTS

Five chemical waste disposal request (CWDR) forms were prepared for the following IDW and associated disposal destinations.

- CWDR# 3022192, Item ID# 10054679 (contact waste) Manifest# 64497 for WPF# 40518 identifies one 55-gal. drum, which was transported and received at TA-54 on January 17, 2008.
- CWDR# 3022266, Item ID# 10054303 (soil and contact waste from hot spot removal), Manifest # 64638 for WPF# 40543 identifies one 30-gal. drum, which was transported and received at TA-54 on January 17, 2008.
- CWDR# 3022266, Item ID# 10054305 (rock soil, and contact waste from hot spot removal), Manifest # 64638 for WPF# 40544 identifies one 30-gal. drum, which was transported and received at TA-54 on January 17, 2008.
- CWDR# 3022147, Item ID# 10054599, 10054690, 10054675, and 10054676 (drill cuttings in wrangler bags), Manifest # 64488 for WPF# 40450 identifies four approximately 1 yd^3 wrangler bags, which were transported and received at TA-54 on January 17, 2008.
- CWDR# 3022169, item ID# 10054677, 10054678, 10054680, 10054689, 10054692, 10054694, 10054697, and 10054699 (contact waste including plastic PPE, gloves booties, sheeting, and sampling wipes and swipes), Manifest # 64498 for WPF# 40451 identifies eight 30- and 55-gal. drums, which were transported and received at TA-54 on January 17, 2008.

The CWDRs and manifests are included in Attachment E-1 on the CD included with this document.

Table E-2.0-1
Waste Streams Generated During the 2007 Bayo Canyon Aggregate Area Investigation

Barcode (ID Number)	Waste Storage Container	Waste Type	Approximate Volumes (yd^3)	Waste Deposal Status
10090928 (0327.12)	20-yd^3 rolloff bin	Drill cuttings, core, plastic sheeting (waste streams 1 and 2)	18	Pending
10090926 (0120.12)	20-yd^3 rolloff bin		18	Pending
10090927 (0526.12)	12-yd^3 rolloff bin		10	Pending
10090929 (0209.12)	20-yd^3 rolloff bin	Drill cuttings, core, plastic sheeting (waste streams 1 and 2)	18	Pending
10090920 (0534.12)	12-yd^3 rolloff bin		10	Pending
10090919 (0531.12)	12-yd^3 rolloff bin		10	Pending
10090923 (09917.12)	20-yd^3 rolloff bin	Contact waste including wood debris, fencing, buckets, concrete (waste stream 2)	18	Pending
10054679	55-gal. drum	Contact waste, PPE, plastic sheeting (waste stream 9)	0.5	TA-54 disposal
10054303	30-gal. drum	Soil and debris from sample area (waste stream 9)	0.1	TA-54 disposal
10054305	30-gal. drum	Soil and debris from sample area (waste stream 1)	0.1	TA-54 disposal
10054599	Wrangler bag	Drill cuttings and core (waste stream 1)	1	TA-54 disposal
10054690	Wrangler bag	Drill cuttings and core (waste stream 1)	1	TA-54 disposal
10054675	Wrangler bag	Drill cuttings and core (waste stream 1)	1	TA-54 disposal
10054676	Wrangler bag	Drill cuttings and core (waste stream 1)	1	TA-54 disposal
		Total Volume of Waste Produced	**106.7**	

Attachment E-1

Waste Documentation
(on CD included with this document)

Appendix F

Analytical Program

F-1.0 INTRODUCTION

This appendix discusses the analytical methods and data-quality review for samples collected during investigations (1994, 1995, 1996, and 2007) of the Bayo Canyon Aggregate Area (former Technical Area [TA] 10) at Los Alamos National Laboratory (the Laboratory). Additionally, this appendix summarizes the effects of data-quality issues on the acceptability of the analytical data.

Quality assurance (QA), quality control (QC), and data validation procedures were implemented in accordance with the “Quality Assurance Project Plan Requirements for Sampling and Analysis” (LANL 1996, 054609), and the Los Alamos National Laboratory’s statements of work (SOWs) for analytical laboratories (LANL 1995, 049738; LANL 2000, 071233). The results of the QA/QC procedures were used to estimate the accuracy, bias, and precision of the analytical measurements. Samples for QC include method blanks, matrix spikes (MSs), laboratory control samples (LCSs), internal standards, initial calibration verifications (ICVs) and continuing calibration verifications (CCVs), surrogates, and tracers.

The type and frequency of laboratory QC analyses are described in the SOWs for analytical laboratories (LANL 1995, 049738; LANL 2000, 071233). Other QC factors, such as sample preservation and holding times, were also assessed in accordance with the requirements outlined in standard operating procedure (SOP) 01.02, Sample Containers and Preservation.

The following SOPs were used for data validation:

- SOP-15.01, Routine Validation of Volatile Organic Data
- SOP-15.02, Routine Validation of Semivolatile Organic Data
- SOP-15.04, Routine Validation of High Explosives Data
- SOP-15.05, Routine Validation of Inorganic Data
- SOP-15.06, Routine Validation of Gamma Spectroscopy Data
- SOP-15.07, Routine Validation of Chemical Separation Alpha Spectrometry, Gas Proportional Counting, and Liquid Scintillation Data

A routine data validation was performed for each data package (also referred to as request numbers), and analytical data were reviewed and evaluated based on U.S. Environmental Protection Agency (EPA) National Functional Guidelines, where applicable (EPA 1994, 048639; EPA 1999, 066649). As a result of the data validation and assessment efforts, qualifiers are assigned to the analytical records as appropriate. The data-qualifier definitions are provided in Table F-1.0-1.

F-2.0 ANALYTICAL DATA ORGANIZATION AND VINTAGE

The Bayo Canyon Aggregate Area consists of Consolidated Units 10-001(a)-99 and 10-002(a)-99, Solid Waste Management Unit (SWMU) 10-004(a), and Areas of Concern (AOC) C-10-001 and 10-009. For purposes of analytical data presentation and review, the Bayo Canyon Aggregate Area analytical data are provided as four separate databases corresponding to the four main areas investigated: Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMU 10-004(a), and AOC 10-009, which includes analytical data from AOC C-10-001.

F-2.1 Historical Laboratory Screening Data and Sample Documentation

Samples collected before 1995–1996 were analyzed internally at the Laboratory's Chemical Science and Technology (CST) on-site and off-site laboratories. Historical data, analyzed on-site by CST, have been determined by the Laboratory to be screening-level quality data only and are not used for decision-making purposes; therefore, CST on-site data are removed from reporting data sets used for assessing site contamination and/or risk and presented separately as screening data. Data analyzed off-site by CST are determined to be of sufficient quality for decision-making purposes only if complete data packages can be located and the analytical data are reviewed and revalidated to current QA standards. Table F-2.1-1 presents a crosswalk between the data needs identified in the approved work plan, the historical data set, and the revalidated data set, where changes were made as a result of revalidation.

Historical samples were collected within the Bayo Canyon Aggregate Area in 1994, 1995, and 1996, and many of these samples were submitted, all or in part, for analysis either to a CST on-site or off-site laboratory. All analytical data processed on-site in a CST mobile laboratory (e.g., Radvan, Chemvan) were removed from the reporting data sets. For investigation analytical data processed in a CST off-site laboratory, sample documentation was requested and the data validation package, if available, was reviewed. Data packages for CST off-site analytical data associated with historical field QC samples, however, were not requested because these samples were determined to add no value to the representative data set for the Bayo Canyon Aggregate Area.

Details regarding the quality review of vintage analytical data representative of the Bayo Canyon Aggregate Area are summarized in the following subsections.

F-2.1.1 Consolidated Unit 10-001(a)-99

Analytical data associated with 114 historical samples were processed on-site by CST in a mobile laboratory. These data were removed from the Consolidated Unit 10-001(a)-99 reporting data set as the data are screening level only and not suitable for decision-making purposes.

Analytical data associated with 29 samples processed off-site by CST were removed from the Consolidated Unit 10-001(a)-99 reporting data set for one or more of the following reasons: (1) complete data packages were requested to verify sample quality and results but are not available, (2) analytical data are associated with historical quality control (QC) samples, or (3) samples were processed on-site by the Laboratory's Dynamic Experimentation (DX) laboratory, and the resulting data are screening level only and not suitable for decision-making purposes.

All remaining analytical results associated with historical sampling at Consolidated Unit 10-001(a)-99 are included in the reporting data set and reviewed further, along with data collected during the 2007 investigation.

F-2.1.2 Consolidated Unit 10-002(a)-99

Analytical data associated with 368 historical samples were processed on-site by CST in a mobile laboratory. These data were removed from the Consolidated Unit 10-002(a)-99 reporting data set because the data are screening level only and not suitable for decision-making purposes.

Analytical data associated with 96 samples processed off-site by CST were removed from the Consolidated Unit 10-002(a)-99 reporting data set for one or more of the following reasons: (1) complete data packages were requested to verify sample quality and results but were not available, (2) analytical data are associated with historical QC samples, or (3) samples were processed on-site by the DX laboratory, and the resulting data are screening level only and not suitable for decision-making purposes.

All remaining analytical results associated with historical sampling at Consolidated Unit 10-002(a)-99 are included in the reporting data set and reviewed further, along with data collected during the 2007 investigation.

F-2.1.3 SWMU 10-004(a)

Analytical data associated with 35 historical samples were processed on-site by CST in a mobile laboratory. These data were removed from the SWMU 10-004(a) reporting data set because the data are screening level only and not suitable for decision-making purposes.

Analytical data associated with eight samples processed off-site by CST were removed from the SWMU 10-004(a) reporting data set because complete data packages were not available to verify sample quality and results.

All remaining analytical results associated with historical sampling at SWMU 10-004(a) are included in the reporting data set and reviewed further, along with data collected during the 2007 investigation.

F-2.1.4 AOC 10-009

All analytical results associated with historical sampling at AOC 10-009 are included in the reporting data set and reviewed further, along with data collected during the 2007 investigation. No analytical data (historical or current) are associated with AOC C-10-001.

F-3.0 INORGANIC CHEMICAL ANALYTICAL METHODS

Bayo Canyon Aggregate Area samples collected during historical investigations as well as the 2007 investigation were analyzed by one or more of the following inorganic chemical methods: target analyte list (TAL) metals, uranium, perchlorate, and wet chemistry. Samples were analyzed for TAL metals using EPA SW-846 Methods 6010, 6010B, 6020, 7040, 7060, 7420, 7470A, 7471, 7471A, 7740, and 7840. Other analytical methods included wet-chemistry EPA SW-846 Methods 9010 and 9012A for cyanide, EPA SW-846 Method 6850 for perchlorate, and generic kinetic phosphorescence analysis (KPA) for uranium (historical samples only). The analytical methods used for inorganic chemicals are listed in Table F-3.0-1.

At Consolidated Unit 10-001(a)-99, a total of 177 samples (1994 and 2007 vintage) were submitted for analysis of TAL metals, 97 samples (1994 vintage only) were submitted for analysis of uranium, 52 samples (2007 vintage only) were submitted for analysis of perchlorate, and 63 samples (1994 and 2007 vintage) were submitted for analysis of total cyanide.

At Consolidated Unit 10-002(a)-99, a total of 405 samples (1994 and 2007 vintage) were submitted for analysis of TAL metals; 271 samples (1994 vintage only) were submitted for analysis of uranium, 92 samples (2007 vintage only) were submitted for analysis of perchlorate, and 96 samples (1994 and 2007 vintage) were submitted for analysis of total cyanide.

At SWMU 10-004(a), a total of 42 samples (1994 and 2007 vintage) were submitted for analysis of TAL metals; 27 samples (1994 vintage only) were submitted for analysis of uranium, 11 samples (2007 vintage only) were submitted for analysis of perchlorate, and 11 samples (2007 vintage only) were submitted for analysis of total cyanide.

At AOC 10-009, a total of 21 samples were collected during the 2007 investigation, and all were submitted for analysis of TAL metals, perchlorate, and total cyanide. No historical samples were submitted for inorganic chemical analysis.

Several samples collected during the 2007 investigation were also submitted for pH and/or geotechnical analysis. A total of 176 samples collected from the Bayo Canyon Aggregate Area were analyzed for pH by wet-chemistry methods. Four samples collected from AOC 10-009 were submitted for geotechnical analysis by the following methods: American Society for Testing and Materials (ASTM) Method D2216V for gravimetric and volumetric moisture content, ASTM Method D2434 for saturated hydraulic conductivity, ASTM Method D2937 for density, and Methods of Soil Analysis Method 18-1986 for calculated total porosity.

Tables H-3.1-1, H-4.1-1, H-5.1-1, and H-6.1-1 in Appendix H summarize, by data set, all samples collected and the analyses requested from the Bayo Canyon Aggregate Area. All inorganic chemical results are provided on a DVD provided in Appendix G.

F-3.1 Inorganic Chemical QA/QC Samples

To assess the accuracy and precision of inorganic chemical analyses, LCSs, preparation blanks (PBs), MS samples, laboratory duplicate samples, interference check samples (ICSs), and serial dilution samples were analyzed as part of the Bayo Canyon Aggregate Area investigations. Each of these QA/QC sample types is defined in the analytical services SOWs (LANL 1995, 049738; LANL 2000, 071233) and is described briefly in the sections below. For some of the analyses performed before the 1995 SOW was implemented, slightly different QA/QC procedures may have been followed.

The LCS serves as a monitor of the overall performance of each step during the analysis, including sample digestion. Following Laboratory SOP guidance, analytical results were qualified according to National Functional Guidelines (EPA 1994, 048639) if the individual LCS recovery indicated an unacceptable bias in the measurement of individual analytes. For inorganic chemicals in soil/tuff, LCS percent recoveries (%R) should fall into the control limits of 75%–125% (LANL 1995, 049738; LANL 2000, 071233).

Preparation blanks are used to measure bias and potential cross-contamination. All inorganic chemical results for the PB should be below the method detection limit (MDL).

The accuracy of inorganic chemical analyses is also assessed using MS samples. These samples are designed to provide information about the effect of the sample matrix on the sample preparation procedures and analytical technique. The MS acceptance criteria are 75%–125%, inclusive for all spiked analytes (LANL 1995, 049738; LANL 2000, 071233).

Laboratory duplicate samples assess the precision of inorganic chemical analyses. All relative percent differences (RPDs) between the sample and laboratory duplicate should be ±35% (LANL 1995, 049738; LANL 2000, 071233).

ICSs assess the accuracy of the analytical laboratory's interelement and background correction factors used for inductively coupled plasma emission spectroscopy. The ICS %R should be within the acceptance range of 80%–120%. The QC acceptance limits are ±20%.

Serial dilution samples measure potential physical or chemical interferences and correspond to a sample dilution ratio of 1:5. The chemical concentration in the undiluted sample must be at least 50 times the

MDL (100 times for inductively coupled plasma mass spectroscopy) for valid comparison. For sufficiently high concentrations, the RPD should be within 10%.

Details regarding the quality of the inorganic analytical data included in each Bayo Canyon Aggregate Area data set are summarized in the following subsections.

F-3.1.1 Consolidated Unit 10-001(a)-99

Inorganic chemical data for soil/tuff from Consolidated Unit 10-001(a)-99 that were rejected included

- the full suite of TAL metal results in four historical samples because the sample holding times were exceeded;
- the full suite of TAL metal results in three historical samples because MS %R values were in the range of 125%–150%, exceeding the acceptable range;
- two barium, two cyanide, seven lead, four silver, and four manganese results because the MS %R values were less than 30%; and
- 79 mercury results and 11 cyanide results because the samples were analyzed after a period equal to or greater than twice the holding time had elapsed.

Inorganic chemical data for soil/tuff from Consolidated Unit 10-001(a)-99 that were qualified as estimated (J) included

- 353 results for 20 TAL metals, 4 results for cyanide, 1 result for perchlorate, and 46 results for uranium because the reported result was between the estimated detection limit (EDL) and the MDL;
- 12 lead and 4 uranium results because both the sample and duplicate sample results were greater than or equal to 5 times the reporting limit (RL) and the duplicate RPD exceeded 35%;
- 13 results for 9 TAL metals because the serial dilution sample RPD exceeded 35%; and
- 54 results for 15 TAL metals because the MS analyses were performed on a non-Laboratory sample.

Inorganic chemical data for soil/tuff from Consolidated Unit 10-001(a)-99 that were qualified as estimated biased low (J–) included

- 214 results for 11 TAL metals because the MS %R values were greater than 30% but less than the lower acceptance level (LAL) of 75%;
- 20 calcium results, 4 magnesium results, 12 potassium results, 4 sodium results, 8 vanadium results, and 7 zinc results because the associated LCS %R was below the lower warning limit but was greater than or equal to the LAL of 75%; and
- 541 TAL metal results for 55 samples because the sample holding times were exceeded.

Inorganic chemical data for soil/tuff from Consolidated Unit 10-001(a)-99 that were qualified as estimated biased high (J+) included

- 85 results for 9 TAL metals because MS %R values were greater than 150%;
- 2 magnesium results, 4 manganese results, and 2 potassium results because the MS %R values exceeded the upper acceptance level (UAL) but were less than 150%;

- 19 barium results, 4 beryllium results, 8 cadmium results, and 19 lead results because the associated LCS %R values exceeded the upper warning limit; and
- 17 silver results because the associated ICS %R values were between 50% and 80%.

A total of 496 inorganic chemical results were qualified as not detected (U) because either (1) the analytical laboratory qualified the analyte as not detected or (2) in comparison with the preparation blank, the sample result was greater than the EDL but less than or equal to 5 times the concentration of the related analyte in the blank.

A total of 304 inorganic chemical results were qualified as estimated and not detected (UJ) for one of the following reasons: the MS analyses were performed on a non-Laboratory sample, the MS %R values were greater than 150%, the MS %R values were greater than 30% but less than the LAL of 75%, the LCS %R values were below the lower warning limit but greater than or equal to the LAL of 75%, or the holding times were exceeded.

The rejected data reduced the number of sample results by 8%; however, the loss of these data did not substantially affect the assessment of risk or the nature and extent of inorganic chemicals at Consolidated Unit 10-001(a)-99. All other qualified data were used to evaluate the nature and extent of contamination (Appendix H) and the risk-screening assessments (Appendix I).

F-3.1.2 Consolidated Unit 10-002(a)-99

Inorganic chemical data for soil/tuff from Consolidated Unit 10-002(a)-99 that were rejected included

- the full suite of TAL metal results in 15 historical samples because the sample holding times were exceeded;
- 357 inorganic chemical results for TAL metals, cyanide, and uranium because MS %R values were in the range of 125%–150%, exceeding the acceptable range;
- 3 barium, 2 cyanide, 2 lead, 42 manganese, and 10 silver results because the MS %R values were less than 30%;
- 4 historical mercury results because the PBs, initial calibration blanks, or cross-contamination blanks were not analyzed with the samples; and
- 193 historical mercury results because the samples were analyzed after a period equal to or greater than twice the holding time had elapsed.

Inorganic chemical data for soil/tuff from Consolidated Unit 10-002(a)-99 that were qualified as estimated (J) included

- 1976 results for 27 inorganic chemicals (23 TAL metals plus cyanide, molybdenum, perchlorate and uranium) because the reported result was between the EDL and the MDL;
- 426 results for 23 inorganic chemicals (22 TAL metals plus uranium) because both the sample and duplicate sample results were greater than or equal to 5 times the RL and the duplicate RPD exceeded 35%;
- 11 chromium results and 1 sodium result because either the sample and/or duplicate sample results were greater than or equal to 5 times the RL and the difference between the samples exceeded 2 times the RL;
- 89 results for 17 TAL metals because the serial dilution samples were not analyzed;

- 30 results for 9 TAL metals because the serial dilution sample RPD exceeded criteria;
- 16 historical uranium results because the MS analyses were performed on non-Laboratory samples; and
- 2 historical antimony results because MS %R values were greater than 30% but less than the LAL of 75%.

Inorganic chemical data for soil/tuff from Consolidated Unit 10-002(a)-99 that were qualified as estimated biased low (J–) included

- 279 results for 17 TAL metals because MS %R values were greater than 30% but less than the LAL of 75%;
- 13 aluminum results, 24 calcium results, 22 iron results, 10 magnesium results, 21 potassium results, 6 sodium results, 9 uranium results, 23 vanadium results, and 7 zinc results because the associated LCS %R values were below the lower warning limit but were greater than or equal to the LAL of 75%; and
- 520 TAL metal results associated with 42 historical samples because the sample holding times were exceeded.

Inorganic chemical data for soil/tuff from Consolidated Unit 10-002(a)-99 that were qualified as estimated biased high (J+) included

- 4 beryllium results because the associated ICV or CCV was recovered above the upper warning limit but was less than or equal to the UAL;
- 63 results for 12 TAL metals because MS %R values were greater than 150%;
- 1 antimony result, 6 arsenic results, 20 lead results, and 19 manganese results because the MS %R values exceeded the UAL of 125% but were below 150%; and
- 26 aluminum results, 3 arsenic results, 9 calcium results, 8 nickel results, 4 potassium results, 20 sodium results, and 4 uranium results because the associated LCS %R values exceeded the upper warning limit.

A total of 2074 inorganic chemical results were qualified as not detected (U) because either (1) the analytical laboratory qualified the analyte as not detected or (2) in comparison with the PB, the sample result was greater than the EDL but less than or equal to 5 times the concentration of the related analyte in the blank.

A total of 672 inorganic chemical results were qualified as estimated and not detected (UJ) for one of the following reasons: the duplicate sample analyzed was a non-Laboratory sample, a serial dilution sample was not analyzed with the samples, the MS %R values were greater than 150%, the MS %R values were greater than 30% but less than the LAL of 75%, the LCS %R values were below the lower warning limit but were greater than or equal to the LAL of 75%, or the holding times were exceeded.

The rejected data reduced the number of sample results by 10%; however, the loss of these data did not substantially affect the assessment of risk or the nature and extent for inorganic chemicals at Consolidated Unit 10-002(a)-99. All other qualified data were used to evaluate the nature and extent of contamination (Appendix H) and the risk-screening assessments (Appendix I).

F-3.1.3 SWMU 10-004(a)

Inorganic chemical data for soil/tuff from SWMU 10-004(a) that were rejected included

- the full suite of TAL metal results in 4 historical samples because the data validator identified quality deficiencies;
- 4 cadmium and 5 silver results because the MS %R values were less than 30%; and
- 20 historical mercury results because the samples were analyzed after a period equal to or greater than twice the holding time had elapsed.

Inorganic chemical data for soil/tuff from SWMU 10-004(a) that were qualified as estimated (J) included

- 235 results for 21 inorganic chemicals (19 TAL metals plus cyanide and molybdenum) because the reported result was between the EDL and the MDL;
- 14 iron results, 7 lead results, 4 manganese results, and 6 zinc results because both the sample and duplicate sample results were greater than or equal to 5 times the RL and the duplicate RPD exceeded 35%;
- 7 chromium results and 4 lead results because either the sample and/or duplicate sample results were greater than or equal to 5 times the RL and the difference between the samples exceeded 2 times the RL; and
- 1 chromium result, 1 calcium result, 2 sodium results, and 1 iron result because the serial dilution sample RPD exceeded criteria.

Inorganic chemical data for soil/tuff from SWMU 10-004(a) that were qualified as estimated biased low (J–) included

- 57 results for 11 TAL metals because the MS %R values were greater than 30% but less than the LAL of 75%;
- 2 historical arsenic results because the LCS %R values were below the lower limit but were greater than or equal to the LAL of 75%; and
- 1 mercury and 1 cyanide result because the sample holding times were exceeded.

Inorganic chemical data for soil/tuff from SWMU 10-004(a) that were qualified as estimated biased high (J+) included

- seven aluminum results because the MS %R values were greater than 150%;
- four zinc results because the MS %R values exceeded the UAL of 125% but were less than 150%; and
- three mercury results and four potassium results because the LCS %R values exceeded the upper warning limit.

A total of 211 inorganic chemical results were qualified as not detected (U) because either (1) the analytical laboratory qualified the analyte as not detected or (2) in comparison with the preparation blank, the sample result was greater than the EDL but less than or equal to 5 times the concentration of the related analyte in the blank.

A total of 53 inorganic chemical results were qualified as estimated and not detected (UJ) for one of the following reasons: the sample and/or duplicate sample results were greater than or equal to 5 times the

RL and the difference between the samples exceeded 2 times the RL, the MS %R values were greater than 30% but less than the LAL of 75%, the LCS %R values were below the lower warning limit but were equal to or exceeded the LAL of 75%, or the holding times were exceeded.

The rejected data reduced the number of sample results by 12%; however, the loss of these data did not substantially affect the assessment of risk or determination of nature and extent for inorganic chemicals at SWMU 10-004(a). All other qualified data were used to evaluate the nature and extent of contamination (Appendix H) and the risk-screening assessments (Appendix I).

F-3.1.4 AOC 10-009

No inorganic chemical data for soil/tuff from AOC 10-009 were rejected.

Inorganic chemical data for soil/tuff from AOC 10-009 that were qualified as estimated (J) included

- 8 arsenic results, 12 cadmium results, 10 mercury results, 6 molybdenum results, 6 selenium results, 21 silver results, and 12 thallium results because the reported result was between the EDL and the MDL.

Inorganic chemical data for soil/tuff from AOC 10-009 that were qualified as estimated biased low (J−) included

- 16 antimony and 11 selenium results because the MS %R values were greater than 30% but less than the LAL of 75%; and
- 1 cyanide result because the LCS %R values were below the lower warning limit but were equal to or exceeded the LAL of 75%.

A total of 135 inorganic chemical results were qualified as not detected (U) because either (1) the analytical laboratory qualified the analyte as not detected or (2) in comparison with the PB, the sample result was greater than the EDL but less than or equal to 5 times the concentration of the related analyte in the blank.

Twelve results for antimony (five results), cyanide (three results), and selenium (four results) were qualified as estimated and not detected (UJ) because the MS %R values were greater than 30% but less than the LAL of 75%.

All inorganic data collected from AOC 10-009 were used to evaluate the nature and extent of contamination (Appendix H) and the risk-screening assessments (Appendix I).

F-4.0 ORGANIC CHEMICAL ANALYSIS METHODS

Bayo Canyon Aggregate Area samples collected during historical investigations as well as the 2007 investigation were analyzed for high explosives (HE), semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs). Samples were analyzed using SW-846 Methods 8260 and 8260B (VOCs), 8270 and 8270C (SVOCs), and 8321A and 8330 (HE). All QC procedures were followed as required by the analytical laboratory SOWs (LANL 1995, 049738; LANL 2000, 071233). The analytical methods used for organic chemicals are listed in Table F-3.0-1.

At Consolidated Unit 10-001(a)-99, a total of 75 samples (1994 and 2007 vintage) were submitted for analysis of HE, 74 samples (1994 and 2007 vintage) were submitted for analysis of SVOCs, and 68 samples (1994 and 2007 vintage) were submitted for analysis of VOCs.

At Consolidated Unit 10-002(a)-99, a total of 152 samples (1994 and 2007 vintage) were submitted for analysis of HE, 381 samples (1994 and 2007 vintage) were submitted for analysis of SVOCs, and 168 samples (1994 and 2007 vintage) were submitted for analysis of VOCs.

At SWMU 10-004(a), a total of 27 samples (1994 and 2007 vintage) were submitted for analysis of HE, 38 samples (1994 and 2007 vintage) were submitted for analysis of SVOCs, and 38 samples (1994 and 2007 vintage) were submitted for analysis of VOCs.

At AOCs 10-009 and C-10-001, a total of 21 samples were collected during the 2007 investigation, and all were submitted for analysis of HE, SVOCs, and VOCs. No historical samples were submitted for organic analysis.

Tables H-3.1-1, H-4.1-1, H-5.1-1, and H-6.1-1 (Appendix H) summarize, by data set, all samples collected from the Bayo Canyon Aggregate Area and the analyses requested. All organic chemical results are provided on CD in Appendix G.

F-4.1 Organic Chemical QA/QC Samples

The QC samples are designed to produce a qualitative measure of the reliability of a specific part of an analytical procedure. The methods for validating organic chemical results on the basis of the various QA/QC sample types are specified in the SOPs. Because some of the analyses may have been performed before the current SOWs were implemented (LANL 1995, 049738; LANL 2000, 071233), slightly different QA/QC procedures may have been followed. The validation of organic chemical data using QA/QC samples and other methods may have resulted in the rejection of the data or the assignment of various qualifiers to individual sample results.

Calibration verifications, LCSs, method blanks, surrogates, and internal standards were analyzed to assess the accuracy and precision of organic chemical analyses. Each of these QA/QC sample types is defined in the analytical services SOWs (LANL 1995, 049738; LANL 2000, 071233) and the applicable analytical methods, and summarized below.

Calibration verification is the establishment of a quantitative relationship between the response of the analytical instrument and the concentration of the target analyte. There are two aspects of calibration verification: initial and continuing. The initial calibration verifies the linearity of the calibration curve as well as the individual calibration standards used to perform the calibration. The continuing calibration verifies that the initial calibration is still linear and valid. The continuing calibration also serves to determine that analyte identification criteria, such as retention times and spectral matching, are being met.

The LCS is a sample of the same matrix that has been spiked with the target analytes and serves to monitor the overall performance. Following Laboratory SOP guidance, analytical results were qualified according to National Functional Guidelines (EPA 1999, 066649) if the individual LCS recoveries were not within method-specific acceptance criteria.

A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing and which is extracted and analyzed in the same manner as the corresponding environmental samples. Method blanks are used to assess the potential for sample contamination during extraction and analysis.

A surrogate compound (surrogate) is an organic chemical used in the analyses of organic target analytes. The surrogate is similar in composition and behavior to the target analytes but is not normally found in environmental samples. Surrogates are added to every blank, sample, and spike to evaluate the efficiency with which analytes are recovered during extraction and analysis. The recovery percentage of the surrogates must be within specified ranges, or the sample may be rejected or assigned a qualifier.

Internal standards are chemical compounds added to every blank, sample, and standard extract at a known concentration. Internal standards are used as the basis for quantitation of target analytes. The %R for internal standards should be within the range of 50%–200%.

Details regarding the quality of the organic analytical data included in each Bayo Canyon Aggregate Area data set are summarized in the following subsections.

F-4.1.1 Consolidated Unit 10-001(a)-99

Organic chemical data for soil/tuff from Consolidated Unit 10-001(a)-99 that were rejected included

- the full suite of HE results in 11 historical samples and the results for all HE analytes (except high-melting explosive) in another 4 historical samples because the associated retention time shifted by more than 0.05 min from the mid-level standard of the initial calibration;
- 408 SVOC results and 372 VOC results in 6 historical samples because either the required calibration information was unavailable or the samples were analyzed on an expired calibration;
- the full suite of HE results in 1 historical sample, 1 result for amino-2,6-dinitrotoluene[4-], and 272 SVOC results in 4 historical samples because the data validator identified quality deficiencies; and
- 2 butanone[2-] results because the analyte was analyzed with a relative response factor of less than 0.05.

Organic chemical data for soil/tuff from Consolidated Unit 10-001(a)-99 that were qualified as estimated (J) included

- 50 VOC and 6 SVOC results because the concentrations were less than the estimated quantitation limit (EQL) but greater than the MDL;
- 1 ethylbenzene result, 2 isopropyltoluene[4-] results, and 1 toluene result because the associated internal standard area counts were less than 50% but greater than 10% of the previous continuing calibration standard;
- 3 toluene results because the associated sample concentration was greater than 5 times/10 times the amount in the method blank; and
- 1 acetone result because the initial calibration curve exceeded the percent relative standard deviation (%RSD) criteria and/or the continuing calibration standard exceeded the percent detection (%D) criteria.

A total of 8523 organic chemical results were qualified as not detected (U) for one of the following reasons: (1) the analytical laboratory qualified the analyte as not detected, (2) the associated sample concentration was less than 5 times/10 times the amount in the method blank, or (3) the associated mass spectrum did not meet method specifications.

A total of 718 organic chemical results were qualified as estimated and not detected (UJ) for one of the following reasons: (1) the analytical laboratory qualified the analyte as not detected, (2) the %RSD criteria and/or the continuing calibration standard exceeded the %D criteria, (3) associated internal standard area counts were less than 50% but greater than 10% of the previous continuing calibration standard, or (4) extraction holding times were exceeded by more than 2 times.

The rejected data reduced the number of sample results by 13%; however, the loss of these data did not substantially affect the assessment of risk or the nature and extent of organic chemicals at Consolidated Unit 10-001(a)-99. All other qualified data were used in the evaluation of the nature and extent of contamination (Appendix H) and the risk-screening assessments (Appendix I).

F-4.1.2 Consolidated Unit 10-002(a)-99

Organic chemical data for soil/tuff from Consolidated Unit 10-002(a)-99 that were rejected included

- 30 HE results in 3 historical samples because the required retention time documentation was unavailable;
- 637 HE results because the associated retention time shifted by more than 0.05 min from the mid-level standard of the initial calibration;
- 56 HE results and 1701 SVOC results because the data validator identified quality deficiencies;
- 474 SVOC results for 7 historical samples because the required LCS documentation was unavailable;
- 255 SVOC results for 5 historical samples because at least 1 sample surrogate %R was less than 10%;
- 1 benzo(g,h,i)perylene result because the required mass spectrum documentation was unavailable;
- 610 SVOC results and 121 VOC results because the sample analysis exceeded 2 times the method published holding time requirement;
- 136 SVOC results for 2 historical samples because analytical holding times were exceeded;
- 61 VOC results for 1 historical sample because the required surrogate information was unavailable; and
- 2 carbon tetrachloride results and 2 trichloroethane[1,1,1-] results because the associated analytes did not have a valid 5-point calibration and/or a standard at the RL.

Organic chemical data for soil/tuff from Consolidated Unit 10-002(a)-99 that were qualified as estimated (J) included

- 12 SVOC and 43 VOC results because the concentrations were less than the EQL but greater than the MDL;
- 1 acetone result, 2 bis(2-ethylhexyl)phthalate results, and 4 di-n-butylphthalate results because the associated sample concentration was greater than 5 times/10 times the amount in the method blank; and
- 6 acetone results, 2 benzoic acid results, 1 butanone[2-] result, and 5 methylene chloride results because the initial calibration curve exceeded the %RSD criteria and/or the continuing calibration standard exceeded the %D criteria.

Organic chemical data for soil/tuff from Consolidated Unit 10-002(a)-99 that were qualified as estimated biased low (J–) included

- one bis(2-ethylhexyl)phthalate result and one diethylphthalate result because at least two sample surrogate %Rs in the same fraction were less than the LAL but greater than 10%;
- one acenaphthene result and one bis(2-ethylhexyl)phthalate result because at least one sample surrogate %R was less than 10%; and
- one result for each of bis(2-ethylhexyl)phthalate, bromobenzene, carbon tetrachloride, phenol, and trichloroethane[1,1,1-] because extraction/analytical holding times were exceeded by less than 2 times the published method holding time requirement.

A total of 30,814 organic chemical results were qualified as not detected (U) for one of the following reasons: (1) the analytical laboratory qualified the analyte as not detected, (2) the associated sample concentration was less than 5 times/10 times the amount in the method blank, or (3) the associated mass spectrum did not meet method specifications.

A total of 3955 organic chemical results were qualified as estimated and not detected (UJ) for one of the following reasons: (1) the %RSD criteria and/or the continuing calibration standard exceeded the %D criteria, (2) extraction/analytical holding times were exceeded by less than 2 times the published method holding time requirement, (3) associated internal standard area counts were less than 50% but greater than 10% of the previous continuing calibration standard, (4) LCS %R values were less than the LAL but greater than10%, or (5) at least 2 sample surrogate %R values in the same fraction were less than the LAL but greater than 10%.

The rejected data reduced the number of sample results by 11%; however, the loss of these data did not substantially affect the assessment of risk or the nature and extent of organic chemicals at Consolidated Unit 10-002(a)-99. All other qualified data were used in the evaluation of the nature and extent of contamination (Appendix H) and the risk-screening assessments (Appendix I).

F-4.1.3 SWMU 10-004(a)

Organic chemical data for soil/tuff from SWMU 10-004(a) that were rejected included

- 40 HE results in 4 historical samples because the required retention time documentation was unavailable;
- 52 HE results because the associated retention time shifted by more than 0.05 min from the mid-level standard of the initial calibration;
- 40 HE results and 195 SVOC results because the sample analysis exceeded 2 times the method-published holding time requirement;
- 813 SVOC results because the data validator identified quality deficiencies; and
- 1 butanone[2-] result because the analyte was analyzed with a relative response factor of less than 0.05.

Organic chemical data for soil/tuff from SWMU 10-004(a) that were qualified as estimated (J) included

- 2 di-n-butylphthalate results and 25 VOC results because the concentrations were less than the EQL but greater than the MDL;

- 1 acetone result because the associated sample concentration was greater than 5 times/10 times the amount in the method blank; and
- 3 acetone results because initial calibration curves exceeded the %RSD criteria and/or the continuing calibration standards exceeded the %D criteria.

A total of 3915 organic chemical results were qualified as not detected (U) because either (1) the analytical laboratory qualified the analyte as not detected or (2) the associated sample concentration was less than 5 times/10 times the amount in the method blank.

A total of 230 organic chemical results were qualified as estimated and not detected (UJ) because the %RSD criteria and/or the continuing calibration standard exceeded the %D criteria.

The rejected data reduced the number of sample results by 27%; however, the loss of these data did not substantially affect the risk assessment of the nature and extent of organic chemicals at SWMU 10-004(a). All other qualified data were used in the evaluation of the nature and extent of contamination (Appendix H) and the risk-screening assessments (Appendix I).

F-4.1.4 AOC 10-009

No organic chemical data for soil/tuff from AOC 10-009 were rejected.

Four toluene results were J-qualified because the concentrations were less than the EQL but greater than the MDL.

A total of 2930 organic chemical results were qualified as not detected (U) because either (1) the analytical laboratory qualified the analyte as not detected or (2) the associated sample concentration was less than 5 times/10 times the amount in the method blank.

A total of 216 organic chemical results were qualified as estimated and not detected (UJ) because either (1) the %RSD criteria and/or the continuing calibration standard exceeded the %D criteria or (2) the associated internal standard area counts were less than 50% but greater than 10% of the previous continuing calibration standard.

All organic chemical data collected from AOC 10-009 were used in the evaluation of the nature and extent of contamination (Appendix H) and the risk-screening assessments (Appendix I).

F-5.0 RADIONUCLIDE ANALYSIS METHODS

Bayo Canyon Aggregate Area samples collected during historical investigations as well as the 2007 investigation were analyzed by one or more of the following radionuclide methods: (1) gamma spectroscopy (EPA Method 901.1 and generic gamma spectroscopy); (2) isotopic uranium, plutonium, and/or americium-241 (HASL Method 300); (3) strontium-90 (EPA Method 905); and (4) gross-alpha/-beta (EPA Method 900).

At Consolidated Unit 10-001(a)-99, a total of 4 samples (1994 vintage only) were submitted for gamma spectroscopy analysis, 20 samples (2007 vintage only) were submitted for isotopic uranium analysis, and 156 samples (1994 and 2007 vintage) were submitted for the analysis of strontium-90.

At Consolidated Unit 10-002(a)-99, a total of 18 samples (1994, 1996, and 2007 vintage) were submitted for gamma spectroscopy analysis, 15 samples (1994 and 2007 vintage only) were submitted for isotopic uranium analysis, 384 samples (1994, 1996, and 2007 vintage) were submitted for strontium-90 analysis, 2 Quaternary alluvium samples (2007 vintage) were submitted for isotopic plutonium analysis, and 1 soil sample (2007 vintage) was submitted for the analysis of americium-241 and gross-alpha/-beta.

At SWMU 10-004(a), a total of 38 samples (1994 and 2007 vintage) were submitted for the analysis of strontium-90.

At AOCs 10-009 and C-10-001, a total of 25 samples (1995 and 2007 vintage) were submitted for the analysis of strontium-90.

Tables H-3.1-1, H-4.1-1, H-5.1-1, and H-6.1-1 (Appendix H) summarize, by data set, all samples collected from the Bayo Canyon Aggregate Area and the analyses requested. All radionuclide results are provided on CD (Appendix G).

F-5.1 Radionuclide QA/QC Samples

The minimum detectable concentration (MDC) for each radionuclide in PBs, method blanks, laboratory duplicates, tracer/carrier recovery, LCSs, and MS samples were analyzed as part of the Bayo Canyon Aggregate Area investigations to assess the accuracy and precision of radionuclide analyses. These QA/QC qualifiers and sample types for radionuclides are defined in the analytical services SOWs (LANL 1995, 049738; LANL 2000, 071233), are described in the applicable SOPs and are discussed briefly below. Because some of the analyses were performed before the 1995 SOW was implemented, slightly different QA/QC procedures may have been followed. The validation of radionuclide data using QA/QC samples and other methods may have resulted in the rejection of data or the assignment of various qualifiers to individual sample results.

The MDC for each radionuclide is defined as the minimum activity concentration that the analytical laboratory equipment can detect in 95% of the analyzed samples and is used to assess analytical performance.

PBs and method blanks are used to measure bias and assess potential cross-contamination of samples during preparation and analysis. Blank results should be less than the MDC for each radionuclide.

Laboratory duplicates are used to assess or demonstrate acceptable laboratory method precision at the time of analysis as well as to assess the long-term precision of an analytical method on various matrices. For radionuclide analyses, duplicate results are used to calculate a duplicate error ratio (DER). The DER is based on 1 standard deviation of the sample and the duplicate sample and should be less than 4.

The LCS serves as a monitor of the overall performance of each step during the analysis, and the acceptance criteria for LCSs are method-specific. For radionuclide methods, LCS %R values should fall into the control limits of 80%–120%.

The accuracy of radionuclide analyses is also assessed using MS samples. These samples are designed to provide information about the effect of the sample matrix on the sample preparation procedures and analytical technique. The MS %R values should be within the acceptance range of 75%–125%; however, if the sample result is more than 4 times the amount of the spike added, these acceptance criteria do not apply.

Details regarding the quality of the radionuclide analytical data included in each Bayo Canyon Aggregate Area data set are summarized in the following subsections.

F-5.1.1 Consolidated Unit 10-001(a)-99

No radionuclide data for soil/tuff from Consolidated Unit 10-001(a)-99 were rejected.

A total of 180 radionuclide results were reported as not detected (U or UJ). Of these, 173 radionuclide results were reported as not detected (U) because either (1) the sample concentration was less than 3 times the total propagated uncertainty or (2) the sample concentration was less than the MDC. Seven strontium-90 results were qualified as estimated and not detected (UJ) because the LCS %R values were less than the LAL but greater than 10%. All other radionuclide results (60) were reported as detections without further qualification.

All radionuclide data collected from Consolidated Unit 10-001(a)-99 were used in the evaluation of the nature and extent of contamination (Appendix H) and the risk-screening assessments (Appendix I).

F-5.1.2 Consolidated Unit 10-002(a)-99

Radionuclide data for soil/tuff from Consolidated Unit 10-002(a)-99 that were rejected included

- six historical strontium-90 results because the associated LCSs %R values were less than 10%; and
- six historical strontium-90 results because the associated DER exceeded 4.

Radionuclide data for soil/tuff from Consolidated Unit 10-002(a)-99 that were qualified as estimated (J) included

- six historical strontium-90 results because the required duplicate documentation was unavailable; and
- one cesium-137 result, four strontium-90 results, and one uranium-238 result because the associated DER exceeded 2 but was less than 4.

Radionuclide data for soil/tuff from Consolidated Unit 10-002(a)-99 that were qualified as estimated biased low (J–) included

- one result each for europium-152, strontium-90, uranium-234, uranium-235, and uranium-238 because the method holding times were exceeded;
- one strontium-90 result because the associated MS %R value was less than the LAL of 75% but greater than 10%; and
- nine strontium-90 results because the associated LCS %R values were less than the LAL of 80% but greater than 10%.

Radionuclide data for soil/tuff from Consolidated Unit 10-002(a)-99 that were qualified as estimated biased high (J+) included

- three strontium-90 results because the associated MS %R values exceeded the UAL of 125%; and
- eight strontium-90 results, three uranium-234 results, three uranium-235 results, and three uranium-238 results because the associated LCS %R values exceeded the UAL of 120%.

A total of 385 radionuclide results were reported as not detected (U) for one of the following reasons: (1) the sample concentration was less than 3 times the total propagated uncertainty, (2) the sample concentration was less than the MDC, or (3) the sample concentration was less than or equal to 5 times the amount in the method blank. In addition, one americium-241 result was reported as estimated and not detected (UJ) because the LCS %R values were less than the LAL but greater than 10%.

The rejected data reduced the number of sample results by 2%, and the loss of these data did not substantially affect the assessment of radioactive dose or of the nature and extent of radionuclides at Consolidated Unit 10-002(a)-99. All other qualified data were used in the evaluation of the nature and extent of contamination (Appendix H) and the risk-screening assessments (Appendix I).

F-5.1.3 SWMU 10-004(a)

No radionuclide data for soil/tuff from SWMU 10-004(a) were rejected.

Out of 38 strontium-90 results, 37 were reported as not detected (U) because either (1) the sample concentration was less than 3 times the total propagated uncertainty or (2) the sample concentration was less than the MDC. The remaining strontium-90 result was reported as a detection without further qualification.

F-5.1.4 AOC 10-009

Two historical strontium-90 results were rejected because the required MDC or total propagated uncertainty documentation was unavailable.

Out of 23 strontium-90 results, 19 were reported as not detected (U) because the sample concentration was less than the MDC. The remaining four strontium-90 results were reported as detections without further qualification.

F-6.0 REFERENCES

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

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

EPA (U.S. Environmental Protection Agency), February 1994. "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review," EPA-540/R-94/013, Office of Emergency and Remedial Response, Washington, D.C. (EPA 1994, 048639)

EPA (U.S. Environmental Protection Agency), October 1999. "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review," EPA540/R-99/008, Office of Emergency and Remedial Response, Washington, D.C. (EPA 1999, 066649)

LANL (Los Alamos National Laboratory), July 1995. “Statement of Work (Formerly Called "Requirements Document") - Analytical Support, (RFP number 9-XS1-Q4257), (Revision 2 - July, 1995),” Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1995, 049738)

LANL (Los Alamos National Laboratory), March 1996. “Quality Assurance Project Plan Requirements for Sampling and Analysis,” Los Alamos National Laboratory document LA-UR-96-441, Los Alamos, New Mexico. (LANL 1996, 054609)

LANL (Los Alamos National Laboratory), December 2000. “University of California, Los Alamos National Laboratory (LANL), I8980SOW0-8S, Statement of Work for Analytical Laboratories,” Rev. 1, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2000, 071233)

Table F-1.0-1
Data-Qualifier Definitions

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

Table F-2.1-1
Crosswalk between Data Needs Identified in the Approved Work Plan, Historical Data, and Revalidated Data

Data Need Identified in Investigation Work Plan	Sample ID	Location ID	Analyte	Revalidated Result	Revalidated Reporting Qualifier	Initial Result	Initial Reporting Qualifier	Units	Depth (ft bgs)	Comment
Consolidated Unit 10-001(a)-99										
Lateral extent of cadmium north and south of boreholes 10-01281 and 10-01282	AAB9556	10-01281	Cadmium	1.7		1.7		mg/kg	2.5–3.3	Changes have no impact on lateral extent; decreasing vertical trend
	AAB9558	10-01281	Cadmium	2.4		2.4		mg/kg	12.5–13.3	
	AAB9563	10-01281	Cadmium	2.1	UJ	2.1		mg/kg	27.5–28.5	
	AAB9567	10-01281	Cadmium	0.67	J	0.67	U	mg/kg	49.0–50.0	
Lateral extent of strontium-90 north and south of borehole 10-01281	AAB9556	10-01281	Strontium-90	-0.626	UJ	0.626		mg/kg	2.5–3.3	Changes have no impact
	AAB9558	10-01281	Strontium-90	0.0145	UJ	0.0145	U	mg/kg	12.5–13.3	
	AAB9563	10-01281	Strontium-90	-0.0022	UJ	0.0022	U	mg/kg	27.5–28.5	
	AAB9567	10-01281	Strontium-90	-0.242	UJ	0.242	U	mg/kg	49.0–50.0	
Lateral extent of cadmium north and south of boreholes 10-01281 and 10-01282	AAB9544	10-01282	Cadmium	1.4		1.4		mg/kg	2.5–3.5	Changes have no impact on lateral extent; cadmium is below BV[a] or DL[b] in 2007 boreholes
	AAB9546	10-01282	Cadmium	0.63	J	0.63	U	mg/kg	12.5–13.5	
	AAB9549	10-01282	Cadmium	1	J	1	U	mg/kg	29.0–30.0	
	AAB9554	10-01282	Cadmium	0.76	J	0.76	U	mg/kg	49.0–50.0	
Consolidated Unit 10-002(a)-99 (Central Area)										
Lateral extent of naphthalene detected at boreholes 10-01201 and 10-02221	AAB9337	10-01201	Naphthalene	0.13		0.13		mg/kg	11.1–11.8	No naphthalene detected in deeper 2007 boreholes; decreasing vertical trend
	AAB9341	10-01201	Naphthalene	0.013		0.013		mg/kg	16.9–17.5	
	AAB9342	10-01201	Naphthalene	0.009		0.009		mg/kg	19.2–20.0	
	AAB9347	10-01201	Naphthalene	REJECTED		0.39	U	mg/kg	33.3–33.7	

Table F-2.1-1 (continued)

Data Need Identified in Investigation Work Plan	Sample ID	Location ID	Analyte	Revalidated Result	Revalidated Reporting Qualifier	Initial Result	Initial Reporting Qualifier	Units	Depth (ft bgs)	Comment
Vertical extent of cadmium at borehole 10-01205 and the lateral extent of cadmium northwest of this location	AAB9360	10-01205	Cadmium	3.3		3.3		mg/kg	10.0–10.5	No change
	AAB9361	10-01205	Cadmium	1.1		1.1		mg/kg	14.3–14.8	
	AAB9363	10-01205	Cadmium	1.3		1.3		mg/kg	19.5–20.0	
	AAB9364	10-01205	Cadmium	0.81	U	0.81	U	mg/kg	20.0–20.9	
	AAB9368	10-01205	Cadmium	2.7		2.7		mg/kg	39.0–40.0	
	AAB9399	10-01205	Cadmium	1.2		1.2		mg/kg	49.3–50.0	
Lateral extent of beryllium, particularly to the northwest of borehole 10-01209 and east of borehole 10-02220	AAB9351	10-01209	Beryllium	0.56	U	0.56	U	mg/kg	14.0–14.7	No change
	AAB9354	10-01209	Beryllium	0.72	U	0.72	U	mg/kg	29.0–29.6	
	AAB9357	10-01209	Beryllium	0.52	U	0.52	U	mg/kg	37.5–38.4	
	AAB9359	10-01209	Beryllium	2.2		2.2		mg/kg	48.4–49.2	
Lateral extent of antimony and zinc to the west of borehole 10-01213	AAB6392	10-01213	Antimony	9.6	U	9.6	U	mg/kg	6.3–6.8	Change has no impact
	AAB6395	10-01213	Antimony	10.4	J	10.4	U	mg/kg	19.2–19.7	
	AAB6404	10-01213	Antimony	18.6		18.6		mg/kg	39.2–39.7	
	AAB6403	10-01213	Antimony	11.7	U	11.7	U	mg/kg	46.8–47.3	
	AAB6392	10-01213	Zinc	24.1		24.1		mg/kg	6.3–6.8	No change
	AAB6395	10-01213	Zinc	87.4		87.4		mg/kg	19.2–19.7	
	AAB6404	10-01213	Zinc	25.1		25.1		mg/kg	39.2–39.7	
	AAB6403	10-01213	Zinc	21.5		21.5		mg/kg	46.8–47.3	
Vertical extent of ethylbenzene and xylene at borehole 10-01294	AAB9269	10-01294	Ethylbenzene	0.005	U	0.005	U	mg/kg	15–15.9	No change
	AAB9271	10-01294	Ethylbenzene	0.006	U	0.006	U	mg/kg	26.5–27.1	
	AAB9272	10-01294	Ethylbenzene	0.006	U	0.006	U	mg/kg	26.5–27.1	
	AAB9274	10-01294	Ethylbenzene	0.035		0.035		mg/kg	36.6–37.4	
	AAB9277	10-01294	Ethylbenzene	0.027		0.027		mg/kg	48.7–49.4	
	AAB9269	10-01294	Xylene (Total)	0.006	U	0.006	U	mg/kg	15–15.9	No change
	AAB9271	10-01294	Xylene (Total)	0.006	U	0.006	U	mg/kg	26.5–27.1	

Table F-2.1-1 (continued)

Data Need Identified in Investigation Work Plan	Sample ID	Location ID	Analyte	Revalidated Result	Revalidated Reporting Qualifier	Initial Result	Initial Reporting Qualifier	Units	Depth (ft bgs)	Comment
	AAB9272	10-01294	Xylene (Total)	0.016		0.016		mg/kg	26.5–27.1	
	AAB9274	10-01294	Xylene (Total)	0.014		0.014		mg/kg	36.6–37.4	
Lateral extent of beryllium, particularly to the northwest of borehole 10-01209 and east of borehole 10-02220	AAB6583	10-02220	Beryllium	0.53	J	0.53	U	mg/kg	14.0–14.5	Changes have no impact; many 2007 boreholes with valid data surround this location
	AAB6584	10-02220	Beryllium	1.1	J	1.1	U	mg/kg	17.0–17.5	
	AAB9428	10-02220	Beryllium	0.92	J	0.92	U	mg/kg	18.0–18.6	
	AAB6600	10-02220	Beryllium	0.95		0.95		mg/kg	37.0–37.5	
	AAB6603	10-02220	Beryllium	3	J	3		mg/kg	49.4–50.0	
Confirmation of the highest strontium-90 concentrations at borehole 10-02220	AAB6583	10-02220	Strontium-90	37.2		37.2		mg/kg	14.0–14.5	No change
	AAB6584	10-02220	Strontium-90	40325.8		40325.8		mg/kg	17.0–17.5	
	AAB9428	10-02220	Strontium-90	18654		18654		mg/kg	18.0–18.6	
	AAB6600	10-02220	Strontium-90	0.315	U	0.315	U	mg/kg	37.0–37.5	
Lateral extent of naphthalene detected at boreholes 10-01201 and 10-02221	AAB8642	10-02221	Naphthalene	0.4	U	0.4	U	mg/kg	14.2–15.0	No change
Consolidated Unit 10-002(a)-99 (Outside Central Area)										
Lateral extent of beryllium north, west, and south of boreholes 10-01228 and 10-01232	AAB3062	10-01228	Beryllium	0.26	J	0.26	U	mg/kg	3.5–4.2	Changes have no impact on lateral extent; beryllium is below BV or DL in surrounding 2007 boreholes
	AAB3073	10-01228	Beryllium	2.3		2.3		mg/kg	21.4–21.8	
	AAB3069	10-01228	Beryllium	2.5	J	2.5		mg/kg	32.1–32.5	
	AAB3072	10-01228	Beryllium	0.35	J	0.35	U	mg/kg	49.0–49.8	
	AAB3074	10-01232	Beryllium	0.25	J	0.25	U	mg/kg	4.1–4.6	
	AAB3080	10-01232	Beryllium	2.2		2.2		mg/kg	21.5–21.9	
	AAB3085	10-01232	Beryllium	0.63	J	0.63	U	mg/kg	41.8–42.3	
	AAB3086	10-01232	Beryllium	0.58	J	0.58	U	mg/kg	49.4–50.0	

Table F-2.1-1 (continued)

Data Need Identified in Investigation Work Plan	Sample ID	Location ID	Analyte	Revalidated Result	Revalidated Reporting Qualifier	Initial Result	Initial Reporting Qualifier	Units	Depth (ft bgs)	Comment
Lateral extent of chromium, copper, lead, and mercury north of borehole 10-01242	AAB3033	10-01242	Chromium	3.8		3.8	J	mg/kg	30.3–30.9	Changes have no impact on lateral extent; chromium is below BV or DL in surrounding 2007 boreholes
	AAB3019	10-01242	Chromium	2.8		2.8	J	mg/kg	4.1–4.7	
	AAB3030	10-01242	Chromium	1.5	J	1.5	U	mg/kg	46.5–47.3	
	AAB3032	10-01242	Chromium	20.6		20.6	J	mg/kg	6.2–6.8	
	AAB3033	10-01242	Copper	9.1		9.1		mg/kg	30.3–30.9	Changes have no impact on lateral extent; copper bounded in surrounding 2007 boreholes
	AAB3019	10-01242	Copper	2.8	J	2.8	U	mg/kg	4.1–4.7	
	AAB3030	10-01242	Copper	1.5	J	1.5	U	mg/kg	46.5–47.3	
	AAB3032	10-01242	Copper	14.7		14.7		mg/kg	6.2–6.8	
	AAB3033	10-01242	Lead	28.6		28.6		mg/kg	30.3–30.9	Changes have no impact on lateral extent; lead is below BV or DL in surrounding 2007 boreholes
	AAB3019	10-01242	Lead	12.1		12.1		mg/kg	4.1–4.7	
	AAB3030	10-01242	Lead	3.7		3.7		mg/kg	46.5–47.3	
	AAB3032	10-01242	Lead	52.6		52.6		mg/kg	6.2–6.8	
	AAB3033	10-01242	Mercury	REJECTED		0.06	U	mg/kg	30.3–30.9	Changes have no impact on lateral extent; mercury is below BV or DL in surrounding 2007 boreholes
	AAB3019	10-01242	Mercury	REJECTED		0.1	U	mg/kg	4.1–4.7	
	AAB3030	10-01242	Mercury	REJECTED		0.06	U	mg/kg	46.5–47.3	
	AAB3032	10-01242	Mercury	REJECTED		0.28		mg/kg	6.2–6.8	
Lateral extent of beryllium and cadmium northwest of borehole 10-01244 and northeast of borehole 10-01266	AAB3018	10-01244	Beryllium	0.4	J	0.4	U	mg/kg	12.5–13.1	Changes have no impact on lateral extent; beryllium is below BV or DL in surrounding 2007 boreholes
	AAB3017	10-01244	Beryllium	2.8		2.8		mg/kg	32.0–32.5	
	AAB3004	10-01244	Beryllium	0.63	J	0.63	U	mg/kg	4.3–4.9	
	AAB3016	10-01244	Beryllium	0.6	J	0.6	U	mg/kg	49.1–49.8	
	AAB3018	10-01244	Cadmium	0.52	U	0.52	U	mg/kg	12.5–13.1	Changes have no impact on lateral extent; cadmium is below BV or DL in surrounding 2007 boreholes
	AAB3017	10-01244	Cadmium	1.2	U	1.2		mg/kg	32.0–32.5	
	AAB3004	10-01244	Cadmium	0.4	U	0.4	U	mg/kg	4.3–4.9	
	AAB3016	10-01244	Cadmium	1	U	1	U	mg/kg	49.1–49.8	

Table F-2.1-1 (continued)

Data Need Identified in Investigation Work Plan	Sample ID	Location ID	Analyte	Revalidated Result	Revalidated Reporting Qualifier	Initial Result	Initial Reporting Qualifier	Units	Depth (ft bgs)	Comment
Lateral extent of beryllium north of borehole 10-01251 and west of 10-01254	AAB6264	10-01251	Beryllium	1.4		1.4	J	mg/kg	28.9–29.5	Changes have no impact; many 2007 boreholes with valid data surround this location
	AAB6258	10-01251	Beryllium	0.46	J	0.46	U	mg/kg	3.1–3.8	
	AAB6268	10-01251	Beryllium	2.4		2.4	J	mg/kg	44.0–44.6	
	AAB6270	10-01251	Beryllium	2.5		2.5	J	mg/kg	49.4–50.0	
Vertical extent of bis(2-ethylhexy)phthalate at borehole 10-01251	AAB6264	10-01251	Bis(2-ethylhexyl)phthalate	0.38	U	0.38	U	mg/kg	28.9–29.5	No change
	AAB6258	10-01251	Bis(2-ethylhexyl)phthalate	0.35	U	0.35	U	mg/kg	3.1–3.8	
	AAB6268	10-01251	Bis(2-ethylhexyl)phthalate	0.41	U	0.41	U	mg/kg	44.0–44.6	
	AAB6270	10-01251	Bis(2-ethylhexyl)phthalate	30		30		mg/kg	49.4–50.0	
Lateral extent of cadmium south of borehole 10-01253	AAB6251	10-01253	Cadmium	0.61	U	0.61	U	mg/kg	26.5–27.1	Change has no impact
	AAB6244	10-01253	Cadmium	0.48	U	0.48	U	mg/kg	3.5–4.1	
	AAB6257	10-01253	Cadmium	2.3	U	2.3		mg/kg	37.5–38.1	
	AAB6256	10-01253	Cadmium	0.55	U	0.55	U	mg/kg	49.4–50.0	
Lateral extent of beryllium north of borehole 10-01251 and west of 10-01254	AAB6281	10-01254	Beryllium	2		2	J	mg/kg	28.4–29.3	Changes have no impact; many 2007 boreholes with valid data surround this location
	AAB6271	10-01254	Beryllium	0.91	J	0.91	U	mg/kg	3.1–4.3	
	AAB6289	10-01254	Beryllium	1.7		1.7	J	mg/kg	33.0–33.6	
	AAB6288	10-01254	Beryllium	0.98	J	0.98	U	mg/kg	49.4–50.0	
Lateral extent of strontium-90 north of borehole 10-01257	AAB6551	10-01257	Strontium-90	-0.21	U	-0.21	U	pCi/g	20.0–20.8	No change
	AAB6546	10-01257	Strontium-90	0.33	U	0.33	U	pCi/g	28.4–29.1	
	AAB6537	10-01257	Strontium-90	340.02		340.02		pCi/g	3.6–4.2	
	AAB6550	10-01257	Strontium-90	0.13	U	0.13	U	pCi/g	48.5–49.4	
Lateral extent of antimony north and south of borehole 10-01259 and south of 10-01262	AAB6525	10-01259	Antimony	10.1	U	10.1	U	mg/kg	15.2–16.0	Changes have no impact on lateral extent; antimony is below BV or DL in surrounding 2007 boreholes
	AAB6512	10-01259	Antimony	REJECTED		9.6	U	mg/kg	2.8–3.7	
	AAB6520	10-01259	Antimony	9.7	U	9.7	U	mg/kg	28.5–29.2	
	AAB6524	10-01259	Antimony	14.9		14.9		mg/kg	48.6–49.5	

Table F-2.1-1 (continued)

Data Need Identified in Investigation Work Plan	Sample ID	Location ID	Analyte	Revalidated Result	Revalidated Reporting Qualifier	Initial Result	Initial Reporting Qualifier	Units	Depth (ft bgs)	Comment
Lateral extent of antimony north and south of borehole 10-01259 and south of 10-01262	AAB8679	10-01262	Antimony	18.8		18.8		mg/kg	15.0–15.8	Changes have no impact on lateral extent; antimony is below BV or DL in surrounding 2007 boreholes
	AAB8668	10-01262	Antimony	12.2	J	12.2	U	mg/kg	2.7–3.3	
	AAB8674	10-01262	Antimony	11.3	U	11.3	U	mg/kg	29.5–29.8	
	AAB8678	10-01262	Antimony	11.5	U	11.5	U	mg/kg	47.3–48.3	
Lateral extent of beryllium and cadmium northwest of borehole 10-01244 and northeast of borehole 10-01266	AAB2962	10-01266	Beryllium	0.87	J	0.87	U	mg/kg	16.2–16.8	Changes have no impact; beryllium values are below BV
	AAB2949	10-01266	Beryllium	0.84	J	0.84	U	mg/kg	3.0–3.5	
	AAB2958	10-01266	Beryllium	0.33	J	0.33	U	mg/kg	40.2–40.8	
	AAB2959	10-01266	Beryllium	0.36	J	0.36	U	mg/kg	49.3–50.0	
	AAB2962	10-01266	Cadmium	0.52	U	0.52	U	mg/kg	16.2–16.8	No change
	AAB2949	10-01266	Cadmium	0.51	U	0.51	U	mg/kg	3.0–3.5	
	AAB2958	10-01266	Cadmium	0.55	U	0.55	U	mg/kg	40.2–40.8	
	AAB2959	10-01266	Cadmium	0.6	U	0.6	U	mg/kg	49.3–50.0	
Lateral extent of arsenic north and east of borehole 10-01269	AAB2916	10-01269	Arsenic	1.4	J-	1.4	U	mg/kg	14.0–14.5	Changes have no impact on lateral extent; arsenic is below BV or DL in surrounding 2007 boreholes
	AAB2917	10-01269	Arsenic	2.2	J-	2.2	U	mg/kg	26.5–27.0	
	AAB2906	10-01269	Arsenic	0.44	UJ	0.44	U	mg/kg	3.5–4.0	
	AAB2915	10-01269	Arsenic	0.53	UJ	0.53	U	mg/kg	47.5–48.0	
Lateral extent of di-n-butylphthalate south of borehole 10-01271	AAB2928	10-01271	Di-n-butylphthalate	1	J	1		mg/kg	21.8–22.3	Changes have no impact on lateral extent; di-n-butylphthalate is not detected in 2007 boreholes
	AAB2920	10-01271	Di-n-butylphthalate	0.73	J	0.73		mg/kg	3.5–4.0	
	AAB2934	10-01271	Di-n-butylphthalate	0.26	J	0.5	U	mg/kg	38.3–39.0	
	AAB2933	10-01271	Di-n-butylphthalate	0.24	J	0.39	U	mg/kg	48.0–48.6	
Lateral extent of strontium-90 north and south of borehole 10-01289	AAB9227	10-01289	Strontium-90	REJECTED		158		pCi/g	11.4–12.1	Changes have no impact on lateral extent; strontium-90 is below MDA[c] in surrounding 2007 boreholes
	AAB9231	10-01289	Strontium-90	REJECTED		0.0454	U	pCi/g	28.9–29.3	
	AAB9224	10-01289	Strontium-90	0.342	U	0.342	U	pCi/g	3.3–4.1	
	AAB9234	10-01289	Strontium-90	REJECTED		0.754		pCi/g	48.5–49.4	

Table F-2.1-1 (continued)

Data Need Identified in Investigation Work Plan	Sample ID	Location ID	Analyte	Revalidated Result	Revalidated Reporting Qualifier	Initial Result	Initial Reporting Qualifier	Units	Depth (ft bgs)	Comment
Lateral extent of copper south of borehole 10-01293	AAB9247	10-01293	Copper	9		9		mg/kg	10.0–10.8	Changes have no impact on lateral extent; copper is below BV or DL in surrounding 2007 boreholes
	AAB9235	10-01293	Copper	15.5		15.5		mg/kg	2.5–3.9	
	AAB9242	10-01293	Copper	2.7	J	2.7	U	mg/kg	28.7–29.4	
	AAB9246	10-01293	Copper	1.9	J	1.9	U	mg/kg	48.6–49.6	
Lateral extent of strontium-90 south of borehole 10-01293	AAB9247	10-01293	Strontium-90	3.39	J-	3.39		pCi/g	10.0–10.8	Changes have no impact on lateral extent; strontium-90 is below MDA in surrounding 2007 boreholes
	AAB9235	10-01293	Strontium-90	-0.706	U	0.706	U	pCi/g	2.5–3.9	
	AAB9242	10-01293	Strontium-90	0.191	U	0.191	U	pCi/g	28.7–29.4	
	AAB9246	10-01293	Strontium-90	3.19	J-	3.19		pCi/g	48.6–49.6	
SWMU 10-004(a)										
Lateral extent of mercury north of borehole 10-01273 and east of 10-01274	AAB9455	10-01273	Mercury	REJECTED		0.72		mg/kg	2.5–3.3	Changes have no impact
	AAB9461	10-01273	Mercury	0.52	J+	0.52		mg/kg	27.5–28.3	
	AAB9464	10-01273	Mercury	0.69	J+	0.69		mg/kg	36.0–36.8	
	AAB9465	10-01273	Mercury	0.55	J+	0.55		mg/kg	49.2–50.0	
Lateral extent of bis(2-ethylhexyl)phthalate east of borehole 10-01274 and south of borehole 10-01275	AAB9480	10-01274	Bis(2-ethylhexyl)phthalate	REJECTED		0.35	U	mg/kg	18.5–20	Changes have no impact on lateral extent; bis(2-ethylhexyl)phthalate is not detected in surrounding 2007 boreholes
	AAB9481	10-01274	Bis(2-ethylhexyl)phthalate	REJECTED		1.1		mg/kg	18.5–20	
	AAB9477	10-01274	Bis(2-ethylhexyl)phthalate	REJECTED		0.34	U	mg/kg	2.5–3.4	
	AAB9484	10-01274	Bis(2-ethylhexyl)phthalate	REJECTED		0.36	U	mg/kg	27.5–28.3	
Lateral extent of mercury north of borehole 10-01273 and east of 10-01274	AAB9484	10-01274	Mercury	0.1	U	0.1	UJ	mg/kg	27.5–28.3	Change has no impact
Lateral extent of bis(2-ethylhexyl)phthalate east of borehole 10-01274 and south of borehole 10-01275	AAB9469	10-01275	Bis(2-ethylhexyl)phthalate	REJECTED		0.35	U	mg/kg	14.2–15	Changes have no impact on lateral extent; bis(2-ethylhexyl)phthalate is not detected in surrounding 2007 boreholes
	AAB9474	10-01275	Bis(2-ethylhexyl)phthalate	REJECTED		0.35	U	mg/kg	34.2–35	
	AAB9476	10-01275	Bis(2-ethylhexyl)phthalate	REJECTED		0.44	U	mg/kg	49.2–50	
	AAB9466	10-01275	Bis(2-ethylhexyl)phthalate	REJECTED		0.54		mg/kg	5–5.8	

Table F-2.1-1 (continued)

Data Need Identified in Investigation Work Plan	Sample ID	Location ID	Analyte	Revalidated Result	Revalidated Reporting Qualifier	Initial Result	Initial Reporting Qualifier	Units	Depth (ft bgs)	Comment
Vertical extent of beryllium at borehole 10-01277	AAB9498	10-01277	Beryllium	0.15	U	0.15	U	mg/kg	2.5–3.5	No change
	AAB9506	10-01277	Beryllium	0.19	U	0.19	U	mg/kg	22.5–23.3	
	AAB9509	10-01277	Beryllium	0.82	U	0.82	U	mg/kg	38.0–39.0	
	AAB9511	10-01277	Beryllium	4.6		4.6		mg/kg	61.5–62.5	
Vertical extent of lead at borehole 10-01277	AAB9498	10-01277	Lead	2.7	J	2.7	J	mg/kg	2.5–3.5	No change
	AAB9506	10-01277	Lead	3.7	J	3.7	J	mg/kg	22.5–23.3	
	AAB9509	10-01277	Lead	7.8	J	7.8	J	mg/kg	38.0–39.0	
	AAB9511	10-01277	Lead	27.5	J	27.5	J	mg/kg	61.5–62.5	
Vertical extent of zinc at borehole 10-01277	AAB9498	10-01277	Zinc	21.3	J+	21.3	J	mg/kg	2.5–3.5	Changes have no impact
	AAB9506	10-01277	Zinc	16.1	J+	16.1	J	mg/kg	22.5–23.3	
	AAB9509	10-01277	Zinc	26.5	J+	26.5	J	mg/kg	38.0–39.0	
	AAB9511	10-01277	Zinc	68.2	J+	68.2	J	mg/kg	61.5–62.5	
Lateral extent of cadmium west of boreholes 10-01278 and 10-01279	AAB9517	10-01278	Cadmium	REJECTED		1.2		mg/kg	19.2–20	Changes have no impact on lateral extent; cadmium is below BV or DL in all but one surrounding 2007 boreholes
	AAB9512	10-01278	Cadmium	REJECTED		1.1		mg/kg	2.5–3.7	
	AAB9520	10-01278	Cadmium	REJECTED		0.86	U	mg/kg	33–33.7	
	AAB9523	10-01278	Cadmium	REJECTED		0.95	U	mg/kg	49–50	
	AAB9527	10-01279	Cadmium	0.79	U	0.79	U	mg/kg	14.0–15.0	
	AAB9524	10-01279	Cadmium	0.76	U	0.76	U	mg/kg	3.0–4.0	
	AAB9533	10-01279	Cadmium	1	J	1	U	mg/kg	38.5–39.4	
	AAB9535	10-01279	Cadmium	1	U	1	U	mg/kg	49.0–50.0	

[a] BV = Background value.

[b] DL = Detection limit.

[c] MDA = Minimum detectable activity.

Table F-3.0-1
Analytical Methods for Inorganic, Organic, and Radionuclide Analyses for Bayo Canyon Aggregate Area Samples

Analytical Method	Analytical Description	Analytical Suite
EPA 900	Gas proportional counting (GPC)	Gross alpha/-beta
EPA 901.1	Gamma spectroscopy	Cesium-134, cesium-137, cobalt-60, europium-152, ruthenium-106, sodium-22
EPA 905	GPC	Strontium-90
EPA SW-846: 6010/6010B	Inductively coupled plasma emission spectroscopy—atomic emission spectroscopy	Aluminum, antimony, arsenic, barium, beryllium ,boron, calcium, cadmium, cobalt, chromium, copper, iron, lead, lithium, magnesium, manganese, mercury, nickel, potassium, selenium, silicon, silver, sodium, thallium, titanium, uranium, vanadium, and zinc (TAL metals)
EPA SW-846:6020	Inductively coupled plasma mass spectrometry	Aluminum, antimony, arsenic, barium, beryllium, boron, calcium, cadmium, cobalt, chromium, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silicon, silver, sodium, thallium, titanium, vanadium, and zinc (TAL metals)
EPA SW-846:6850	Liquid chromatography–mass spectrometry/mass spectrometry	Perchlorate
EPA SW-846:7040	Graphite furnace atomic absorption (GFAA)	Antimony
EPA SW-846:7060	GFAA	Arsenic
EPA SW-846:7420	Colorimetric method	Lead
EPA SW-846:7470A	Cold vapor atomic absorption (CVAA)	Mercury
EPA SW-846:7471	CVAA	Mercury
EPA SW-846:7471A	CVAA	Mercury
EPA SW-846:7740	GFAA	Selenium
EPA SW-846:7840	GFAA	Thallium
EPA SW-846: 8260 and 8260B	Gas chromatography-mass spectrometry (GC/MS)	VOCs
EPA SW-846: 8270 and 8270C	GC/MS	SVOCs
EPA SW-846: 8321A and 8330	High performance liquid chromatography	HE
EPA SW-846:9010 and 9012A	Automated colorimetric/off-line distillation	Total cyanide
Generic: gamma spectroscopy	Gamma spectroscopy	Americium-241, cesium-134, cesium-137, cobalt-60, europium-152, ruthenium-106, sodium-22, strontium-90, uranium-235
Generic: KPA	Kinetic phosphorescence	Uranium
HASL Method 300	Chemical separation alpha spectrometry	Isotopic uranium, isotopic plutonium, americium-241

Appendix G

Analytical Suites and Results and Analytical Reports
(on DVD and CD included with this document)

Appendix H

Analytical Data Review and Assessment

H-1.0 INTRODUCTION

This appendix summarizes the data collected in support of the environmental characterization of the Bayo Canyon Aggregate Area located at former Technical Area (TA) 10, within Los Alamos County and near Los Alamos National Laboratory (the Laboratory). The Bayo Canyon Aggregate Area consists of Consolidated Units 10-001(a)-99 and 10-002(a)-99, Solid Waste Management Units (SWMUs) 10-004(a) and 10-006, and Areas of Concern (AOCs) C-10-001 and 10-009. Consolidated Unit 10-001(a)-99 consists of SWMUs 10-001(a)–(d), 10-005, and AOCs 10-001(e) and 10-008. Consolidated Unit 10-002(a)-99 consists of SWMUs 10-002(a) and 10-002(b), 10-003(a)–(o), 10-004(b), and 10-007.

This appendix provides a detailed review and assessment of the Bayo Canyon Aggregate Area final reporting data set. The data set is used to identify chemicals of potential concern (COPCs) and assess the nature and extent of contamination at each consolidated unit, SWMU, and AOC. The final reporting data set and the identified COPCs are also evaluated in the human health and ecological risk screening assessments presented in Appendix I.

The final reporting data set evaluated in this appendix includes the compiled analytical results of historical sampling activity as well as the 2007 investigation. Only those data determined to be of decision-making quality following the data-quality assessment (Appendix F) are included in the final reporting data set. For this report, the historical data were revalidated to current data-quality standards. Therefore, analytical results and qualifiers for historical data presented in this document are not identical to the analytical results and qualifiers for the historical data used to develop the approved Bayo Canyon investigation work plan and the historical investigation report (HIR). All of the Bayo Canyon Aggregate Area investigation data (including those data excluded from the final reporting data set) are presented in Appendix G (provided on DVD). A summary of historical sampling activities at the Bayo Canyon Aggregate Area that contribute data to the final reporting data set is presented below and in section 2.2 of this document; additional details of the previous investigations are presented in the approved work plan for the Bayo Canyon Aggregate Area (LANL 2005, 089659; LANL 2005, 092083) and in the Bayo Canyon HIR (LANL 2005, 089658).

A principal objective of the data review and assessment is to evaluate the spatial distribution of COPCs and to determine if the nature and extent of COPCs are defined by the existing data. For the assessment presented below, the nature and extent of COPCs are defined if the data show a decreasing concentration or activity trend vertically and laterally. Chemicals are frequently detected at estimated (J-qualified) concentrations at or near the estimated quantitation limit (EQL) for organic chemicals and the estimated detection limit (EDL) for inorganic chemicals. (A more in-depth discussion of laboratory analytical methods and associated qualifiers is presented in Appendix F). J-qualified concentrations and concentrations at or near the EQL and EDL are considered “trace” concentrations. An organic or inorganic COPC concentration that decreases to trace levels is sufficient to demonstrate that the extent is defined.

Consolidated Units 10-001(a)-99 and 10-002(a)-99) and SWMU 10-004(a) are geographically distinct and have different operational and investigation histories, and each will be reviewed and evaluated separately in this appendix. Because AOC C-10-001 is contained entirely within the boundary of AOC 10-009, the two AOCs are evaluated together.

H-1.1 Bayo Canyon Aggregate Area Overview

Former TA-10 underwent decontamination and decommissioning (D&D), including razing all structures and removing some soil and shrapnel. D&D activities began in 1960 and were completed in 1963; all explosives testing ceased in 1961. The site was released to Los Alamos County in 1967 but has remained under the administrative control of the U.S. Department of Energy (DOE).

Qualified analytical data representative of the consolidated units, SWMU, and AOCs include analytical results obtained from one or more samples collected during the following investigations/activities.

- **1994 Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) activity (surface sampling):** The objective of the Phase I RFI was to determine if residual RCRA chemicals, particularly barium, beryllium, or lead, exist in surficial deposits near the firing pads [SWMUs 10-001(a)–(d)] and to confirm that no human health or ecological risks were associated with the radiological constituents found in previous investigations (LANL 1995, 049974, p. v). Seventy-eight surface soil samples were collected on a grid with 500-ft intervals over 400 acres along the length of Bayo Canyon and on the adjacent mesa in areas suspected to be impacted by operations. Thirty-two sediment samples were collected from the stream channel that runs through Bayo Canyon.
- **1994 RFI activity (subsurface sampling):** The objective of the Phase I investigation associated with the subsurface disposal aggregate SWMUs 10-002(a) and (b), 10-003(a)–(o), 10-004(a) and (b), 10-005, and 10-007 was to characterize the nature, concentrations, and lateral and vertical extent of potential subsurface contamination related to historical activities at the site (LANL 1996, 054617, p. 4). A total of 93 boreholes in 11 drilling arrays were drilled in the vicinity of the radiochemistry laboratory. Two boreholes were completed as monitoring wells BCO-1 (total depth [TD] 67.9 ft below ground surface [bgs]) and BCM-1 (TD 68.0 ft bgs). Both monitoring wells are dry.
- **1995 voluntary corrective action (VCA):** A VCA, including a beta/gamma radiological survey, surface sampling and removal of radioactive material, was conducted at AOC C-10-001, an area with two known locations of radiologically contaminated soil. Subsurface samples were collected to evaluate the extent of subsurface contamination and the appropriate means of removal.
- **1996 interim action (IA) (soil and vegetation sampling):** An IA was conducted to address radioactive contamination of vegetation in the Central Area [part of Consolidated Unit 10-002(a)-99] of Bayo Canyon. Surface and subsurface soil and vegetation samples were collected.
- **2007 investigation**: A comprehensive investigation was conducted at all sites comprising the Bayo Canyon Aggregate Area. Soil, alluvium, and tuff surface and subsurface sampling as well as trenching and extensive geophysical and radiological surveys were conducted in an effort to complete the characterization of contamination associated with the consolidated units, SWMU, and AOCs and to evaluate corrective measures for the landfill (SWMU 10-007) and subsurface elevated strontium-90 within the Central Area of Consolidated Unit 10-002(a)-99. In addition, an effort was made to locate SWMU 10-006, which are potential burn sites of unknown location. The SWMU was not identified during the 2007 investigation, and the site was not sampled, as discussed in section H-4.

H-2.0 IDENTIFICATION OF COPCs

This section describes the COPC identification process applied to the final reporting data set for the component consolidated units, SWMUs, and AOCs in the Bayo Canyon Aggregate Area. Note that all data tables referenced in this appendix are from the main text of the investigation report.

In soil, sediment, and tuff, COPCs are identified differently for inorganic chemicals, organic chemicals, and radionuclides. An inorganic chemical is initially identified as a COPC if at least one result or the analytical detection limit exceeds the background values (BVs). If additional comparisons with the background data set demonstrate that inorganic chemical concentrations are within the range of background concentrations, the chemicals are eliminated as COPCs. If there are no associated BVs, the chemicals are retained as COPCs if detected in site samples.

There are no BVs for organic chemicals; therefore, any organic chemical detected in site samples is designated as a COPC.

Radionuclides are divided into fallout radionuclides and naturally occurring radionuclides. The fallout radionuclides include tritium, strontium-90, cesium-137, plutonium-238, plutonium-239/240, and americium-241. Fallout values (FVs) for the fallout radionuclides apply to the top 0 to 6 in. of soil, sediment, or alluvium. If the activity of a fallout radionuclide exceeds the FV in a sample from the top 6 in., it is initially identified as a COPC. If additional comparisons with the background data set demonstrate that sample activities are within the range of background activities, the radionuclide is eliminated as a COPC. Fallout radionuclides detected in samples collected below 6 in. or detected in tuff are designated as COPCs. Naturally occurring radionuclides (i.e., europium-152, uranium-234, uranium-235, and uranium-238) detected at activities above their respective BVs in site samples are initially identified as COPCs. If additional comparisons with the background data set demonstrate that sample activities are within the range of background activities, the radionuclide is eliminated as a COPC. For all radionuclides, if there is no associated BV/FV for the radionuclide and it is detected in site samples, it is designated as a COPC.

Background data are available for soil (all soil horizons, designated by the media codes ALLH or SOIL); sediment (medium code SED), quaternary alluvium (medium code QAL); and several geologic units, including Bandelier Tuff (media codes QBT3, QBO, QBOF, and QBOG) (LANL 1998, 059730). Note that QBOF is a media code used historically that is equivalent to the current QBO media code and is compared to QBO for BVs (Broxton and Reneau 1995, 049726). QBOG is specific to the Guaje Pumice Bed in the Otowi Member of the Bandelier Tuff. Several other media codes and applicable BVs are defined for other media types identified at the Laboratory but not encountered during Bayo Canyon Aggregate Area investigations.

In some cases, individual analytical results are qualified as “rejected” because of data-quality issues. Rejected analytical results are not included in the following data review, the evaluation of nature and extent, or the risk-screening assessments in Appendix I. Data-quality issues, data qualifiers, and rejected analytical results are discussed in Appendix F. Data qualifier definitions are provided in Appendix A.

H-3.0 COPCs FOR CONSOLIDATED UNIT 10-001(a)-99

The following subsections present discussions of the inorganic, organic, and radionuclide COPCs identified at Consolidated Unit 10-001(a)-99, the former firing sites.

H-3.1 Inorganic Chemicals in Soil, Sediment, and Tuff

Samples of soil, sediment, and tuff were collected during historical (pre-2007) investigations at Consolidated Unit 10-001(a)-99 and were analyzed for target analyte list (TAL) metals, total uranium, and cyanide (in one sample only). Samples of soil, alluvium, and tuff were also collected during the 2007 investigation at Consolidated Unit 10-001(a)-99 and were analyzed for pH, TAL metals, perchlorate, and cyanide (analytical order code WET_CHEM). Table 6.1-1 of the investigation report summarizes all samples collected and their associated analyses that are representative of current site conditions at Consolidated Unit 10-001(a)-99. Most of the 2007 samples were collected at existing sampling locations, primarily to define the vertical extent of previously identified contamination and to replace historical data that did not meet data-quality requirements. In general, only data from the 2007 investigation are included in the reporting data set for those locations and depth intervals sampled during both the previous and the 2007 investigations because the newer data set is generally more comprehensive and representative of current site conditions. As a result, some historical data that led to the identification of the data requirements presented in the investigation work plan have been superseded and therefore do not appear in this investigation report. However, the samples that were proposed to fulfill the data requirements were collected, and the data are included in the reporting data set, figures, and data tables. The originally identified requirements are presented in the following text for completeness.

H-3.1.1 Inorganic COPCs in Soil

Thirteen inorganic chemicals were initially identified as COPCs in soil at Consolidated Unit 10-001(a)-99. Table 6.1-2 lists the initial and retained inorganic COPCs for the site. Analytical results are presented in Table 6.1-3.

- Copper, lead, thallium, uranium, and zinc were detected in site samples at concentrations exceeding the chemical-specific range of background data and are retained as COPCs.
- Antimony, cyanide, mercury, and silver were not detected in site samples; however, the detection limits for some samples exceeded the BV and the range of background concentrations and are retained as COPCs.
- Molybdenum and perchlorate are retained as COPCs because they were detected in site samples and there is no established BV.
- Cadmium was eliminated as a COPC because the maximum detected concentration of cadmium was within the range of BVs.
- Calcium was detected above the range of background data in three samples. Because calcium was detected infrequently above background and is an essential nutrient, it was eliminated as a COPC (EPA 2004, 087478).

H-3.1.2 Inorganic COPCs in Sediment

Four inorganic chemicals, including antimony, cadmium, selenium, and uranium, were identified as COPCs in sediment at Consolidated Unit 10-001(a)-99. Analytical results for the COPCs in sediment are presented in Table 6.1-3.

- Cadmium and uranium were detected at concentrations above the BV (there is no range of background concentrations for these chemicals in sediment), and both are retained as COPCs.
- Antimony and selenium were not detected in site samples; however, the detection limits for some samples exceeded the BV, and both are retained as COPCs.

H-3.1.3 Inorganic COPCs in Tuff

Twenty-two inorganic chemicals were initially identified as COPCs in tuff at Consolidated Unit 10-001(a)-99. Table 6.1-2 lists the initial and retained inorganic COPCs in tuff for the site. Analytical results are presented in Table 6.1-3.

- Aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, magnesium, manganese, nickel, selenium, uranium, and vanadium are present in site samples at concentrations exceeding the chemical-specific range of background data (or the BV for chemicals without a background data set) and are retained as COPCs.
- Cyanide, mercury, and silver were not detected in site samples; however, the detection limits for some samples exceeded the BV, and therefore these chemicals are retained as COPCs.
- Molybdenum is retained as a COPC because it was detected in site samples and there is no established BV.
- Potassium was eliminated as a COPC because the maximum detected concentration in site samples is within the range of background.
- Calcium and iron were detected above the range of background in fewer than 10 samples and were eliminated as COPCs. In addition, calcium can be eliminated as a COPC because it is an essential nutrient (EPA 2004, 087478).

H-3.2 Organic Chemicals in Soil, Sediments, and Tuff

Samples of soil, sediment, and tuff were collected during historical (pre-2007) investigations at Consolidated Unit 10-001(a)-99 and were analyzed for explosive compounds (HE), semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs). Samples of soil and tuff collected during the 2007 investigation at Consolidated Unit 10-001(a)-99 were also analyzed for HE, SVOCs, and VOCs. Table 6.1-1 summarizes all samples collected and their associated analyses representative of current site conditions at Consolidated Unit 10-001(a)-99.

H-3.2.1 Organic COPCs in Soil

Fourteen organic chemicals were detected in soil samples collected at Consolidated Unit 10-001(a)-99 and are designated as COPCs. The list of organic COPCs for Consolidated Unit 10-001(a)-99 is presented in Table 6.1-2. Analytical results are presented in Table 6.1-4.

- Acetone; benzoic acid; 1,3-dichlorobenzene; 1,4-dichlorobenzene; diethylphthalate; ethylbenzene; 4-isopropyltoluene; methylene chloride; pyrene; toluene; 1,1,2-trichloro-1,2,2-trifluoroethane; 1,1,1-trichloroethane; 1,2,4-trimethylbenzene; and total xylene were detected in soil samples and are retained as COPCs.

H-3.2.2 Organic COPCs in Sediment

Two organic chemicals detected in sediment samples collected at Consolidated Unit 10-001(a)-99 are designated as COPCs. The sediment COPCs for Consolidated Unit 10-001(a)-99 are summarized in Table 6.1-2. Analytical results are presented in Table 6.1-4.

- Benzo(g,h,i)perylene and diethylphthalate were detected in sediment samples and are retained as COPCs.

H-3.2.3 Organic COPCs in Tuff

Six organic chemicals were detected in tuff samples collected at Consolidated Unit 10-001(a)-99 and are designated as COPCs. The list of organic COPCs in tuff is presented in Table 6.1-2. Analytical results are presented in Table 6.1-4.

- Acetone; 1,2-dichlorobenzene; 1,3-dichlorobenzene; 1,4-dichlorobenzene; toluene; and 1,3,5-trimethylbenzene were detected in tuff samples and are retained as COPCs.

H-3.3 Radionuclides in Soil, Sediment, and Tuff

Samples of soil, sediment, and tuff were collected during historical (pre-2007) investigations at Consolidated Unit 10-001(a)-99 and were analyzed for strontium-90. A small subset of soil samples was analyzed by gamma spectroscopy for americium-241, cesium-137, cobalt-60, europium-152, ruthenium-106, and sodium-22. Samples of soil and tuff were collected during the 2007 investigation at Consolidated Unit 10-001(a)-99 and were analyzed for strontium-90. Based on field observations, 10 additional surface soil and shallow-subsurface soil samples not specified by the approved work plan (LANL 2005, 092083) were analyzed for isotopes of uranium (uranium-234, uranium-235, and uranium-238); this deviation from the work plan is discussed in more detail in section 3.5. Table 6.1-1 summarizes all samples collected and their associated analyses that are representative of current site conditions at Consolidated Unit 10-001(a)-99.

H-3.3.1 Radionuclide COPCs in All Media

Only uranium-238 was detected at an activity above the BV in Consolidated Unit 10-001(a)-99, and it is the only radionuclide COPC identified for the site. Analytical results are presented in Table 6.1-5.

H-4.0 COPCs FOR CONSOLIDATED UNIT 10-002(a)-99

The following sections include discussions of the inorganic, organic, and radionuclide COPCs identified at Consolidated Unit 10-002(a)-99.

H-4.1 Inorganic Chemicals in Soil, Alluvium, and Tuff

Samples of soil, alluvium, and tuff were collected during historical (pre-2007) investigations at Consolidated Unit 10-002(a)-99 and were analyzed for TAL metals plus uranium. Samples of soil, alluvium, and tuff were also collected during the 2007 investigation and analyzed for pH, TAL metals, perchlorate, and cyanide (analytical order code WET_CHEM). Table 6.2-1 summarizes all samples collected and their associated analyses that are representative of current site conditions at Consolidated Unit 10-002(a)-99.

H-4.1.1 Inorganic COPCs in Soil and Alluvium

Sixteen inorganic chemicals were initially identified as COPCs in soil and alluvium at Consolidated Unit 10-002(a)-99. Table 6.2-2 lists the initial and retained inorganic COPCs in soil and alluvium for the site. Analytical results are presented in Table 6.2-3.

- Antimony, arsenic, beryllium, cadmium, copper, lead, mercury, silver, thallium, uranium, and zinc were detected at concentrations exceeding the chemical-specific range of background and are retained as COPCs.

- Cyanide and selenium were not detected above BVs; however, the detection limits for some samples exceeded the BVs and the range of background concentrations. Therefore, cyanide and selenium are retained as COPCs.
- Molybdenum and perchlorate are retained as COPCs because they were detected but have no BV.
- Chromium is eliminated as a COPC because the maximum detected concentration was within the range of background.

H-4.1.2 Inorganic COPCs in Tuff

Twenty-four inorganic chemicals were initially identified as COPCs in tuff at Consolidated Unit 10-002(a)-99. Table 6.2-2 lists the initial and retained inorganic COPCs in tuff for the site. Analytical results are presented in Table 6.2-3.

- Aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, magnesium, manganese, nickel, selenium, silver, uranium, vanadium, and zinc were detected at concentrations exceeding the BVs and the chemical-specific range of background and are retained as COPCs.
- Cyanide, mercury, and thallium were not detected above BVs; however, the detection limits for some samples exceeded the BVs and these three chemicals are retained as COPCs.
- Molybdenum and perchlorate are retained as COPCs because they were detected but have no BV.
- Calcium and iron were detected infrequently above the range of background and are eliminated as COPCs. In addition, calcium can be eliminated as a COPCs because it is an essential nutrient (EPA 2004, 087478).

H-4.2 Organic Chemicals in Soil, Alluvium, and Tuff

Samples of soil, alluvium, and tuff were collected during historical (pre-2007) investigations at Consolidated Unit 10-002(a)-99 and were analyzed for HE, SVOCs, and VOCs. Samples of soil, alluvium, and tuff were collected during the 2007 investigation at Consolidated Unit 10-002(a)-99 and were also analyzed for HE, SVOCs, and VOCs. Table 6.2-1 summarizes all samples collected and their associated analyses that are representative of current site conditions at Consolidated Unit 10-002(a)-99.

H-4.2.1 Organic COPCs in Soil and Alluvium

Twenty-six organic chemicals were detected in soil and alluvium samples collected at Consolidated Unit 10-002(a)-99 and are designated as COPCs. The complete list of soil COPCs for Consolidated Unit 10-002(a)-99 is presented in Table 6.2-2. Analytical results are presented in Table 6.2-4.

- Acetone; bis(2-ethylhexyl)phthalate; 2-butanone; sec-butylbenzene; tert-butylbenzene; butylbenzylphthalate; carbon tetrachloride; chloroform; di-n-butylphthalate; 1,2-dichlorobenzene; 1,3-dichlorobenzene; 1,1-dichloroethane; diethylphthalate; 4-isopropyltoluene; 4-methyl-2-pentanone; methylene chloride; naphthalene; phenol; tetrachloroethene; toluene; 1,1,2-trichloro-1,2,2-trifluoroethane; 1,1,1-trichloroethane; trichloroethene; 1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; and 1,3-xylene+1,4-xylene were detected in soil and alluvium samples and are retained as COPCs.

H-4.2.2 Organic COPCs in Tuff

Twenty organic chemicals were detected in tuff samples collected at Consolidated Unit 10-002(a)-99 and are designated as COPCs. The complete list of soil COPCs for Consolidated Unit 10-002(a)-99 is presented in Table 6.2-2. Analytical results are presented in Table 6.2-4.

- Acenaphthene; acetone; benzene; benzoic acid; bis(2-ethylhexyl)phthalate; bromobenzene; bromoform; 2-butanone; chlorobenzene; 2-chlorophenol; di-n-butylphthalate; 1,3-dichlorobenzene; 1,1-dichloroethene; diethylphthalate; dimethyl phthalate; methylene chloride; toluene; trichloroethene; 1,3,5-trimethylbenzene; and total xylene were detected in tuff samples and are retained as COPCs.

H-4.3 Radionuclides in Soil, Alluvium, Tuff, and Biota

Samples of soil, alluvium, and tuff were collected during historical (pre-2007) investigations at Consolidated Unit 10-002(a)-99 and were analyzed for strontium-90, uranium-234, uranium-235, and uranium-238, and a suite of radionuclides by gamma spectroscopy including americium-241, cesium-134, cesium-137, cobalt-60, europium-152, ruthenium-106, and sodium-22. One pre-2007 sample was also analyzed for plutonium-238, plutonium-239 and plutonium-240. In addition, samples of chamisa were collected in 1996 and analyzed for strontium-90.

Samples of soil, alluvium, and tuff were collected during the 2007 investigation at Consolidated Unit 10-002(a)-99 and were analyzed for strontium-90. One sample was analyzed for a larger suite of radionuclides, including americium-241, cesium-134, cesium-137, cobalt-60, europium-152, ruthenium-106, sodium-22, and uranium-234, uranium-235, and uranium-238. Table 6.2-1 summarizes all samples collected and their associated analyses that are representative of current site conditions at Consolidated Unit 10-002(a)-99.

H-4.3.1 Radionuclide COPCs in All Media

Six radionuclides were detected above BVs/FVs in various media and are designated as COPCs at Consolidated Unit 10-002(a)-99. The complete list of radionuclide COPCs for Consolidated Unit 10-002(a)-99 is presented in Table 6.2-2. Analytical results for soil, alluvium, and tuff are presented in Table 6.2-5. Analytical results for biota (vegetation) are presented in Table 6.2-6.

- Cesium-137 was detected in one alluvium sample at a depth of 16 ft bgs. This fallout radionuclide is retained as a COPC.
- Strontium-90 was detected at activities greater than the FV in surface soil samples and was detected in samples of alluvium and tuff at depths greater than 0.5 ft. In addition, strontium-90 was detected in vegetation samples. Strontium-90 is therefore retained as a COPC.
- Uranium-234, uranium-235, and uranium-238 were detected above BVs in site samples and are therefore retained as COPCs.
- Europium-152 was detected in site samples and no BV has been established for this naturally occurring radionuclide. Therefore, it is retained as a COPC.

H-5.0 COPCs FOR SWMU 10-004(a)

The following subsections present discussions of the inorganic, organic, and radionuclide COPCs identified at SWMU 10-004(a).

H-5.1 Inorganic Chemicals in Soil, Alluvium, and Tuff

Samples of alluvium and tuff were collected during historical (pre-2007) investigations at SWMU 10-004(a) and were analyzed for TAL metals and total uranium. Samples of soil, alluvium, and tuff were collected during the 2007 investigation at SWMU 10-004(a) and were analyzed for pH, TAL metals, perchlorate, and total cyanide (analytical order code WET_CHEM). Table 6.3-1 summarizes all samples collected and their associated analyses that are representative of current site conditions at SWMU 10-004(a).

H-5.1.1 Inorganic COPCs in Soil and Alluvium

Eight inorganic chemicals were initially identified as COPCs in soil and alluvium at SWMU 10-004(a). Table 6.3-2 lists the initial and retained inorganic COPCs for SWMU 10-004(a). Analytical results are presented in Table 6.3-3.

- Antimony is retained as a COPC because it was detected at a concentration that exceeds the range of background.
- Cyanide was not detected; however, the detection limits for multiple samples exceeded the BV (there is no published range of background concentrations), and cyanide is retained as a COPC.
- Molybdenum is retained as a COPC because it was detected but has no BV.
- Silver was detected at a concentration exceeding the BV (there is no published range of background concentrations) and is retained as a COPC.
- Thallium is retained as a COPC because the detection limit for one sample exceeded the range of background.
- Beryllium, cadmium, and magnesium are eliminated as COPCs because the maximum detected concentrations were within the chemical-specific background range.

H-5.1.2 Inorganic COPCs in Tuff

Twenty-one inorganic chemicals were initially identified as COPCs in tuff (Qbof and Qbog) at SWMU 10-004(a). Table 6.3-2 lists the initial and retained inorganic COPCs in tuff for SWMU 10-004(a). Analytical results are presented in Table 6.3-3.

- Aluminum, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, uranium, vanadium, and zinc are retained as COPCs because they were detected in at least one sample at a concentration above the range of the chemical-specific background data set or above the BV for chemicals that do not have a background data set.
- Antimony and cyanide are retained as COPCs because the detection limit for multiple samples was greater than the BV.
- Molybdenum was retained as a COPC because it was detected in site samples but has no BV.

- Calcium was detected above BV in three samples, two within the range and one less than 2 times the maximum background concentration. Calcium is eliminated as a COPC because it was detected infrequently above background and is an essential nutrient (EPA 2004, 087478).

H-5.2 Organic Chemicals in Soil, Alluvium, and Tuff

Samples of alluvium and tuff were collected during historical (pre-2007) investigations at SWMU 10-004(a) and were analyzed for HE, SVOCs, and VOCs. Samples of soil, alluvium, and tuff were collected during the 2007 investigation at SWMU 10-004(a) and were also analyzed for HE, SVOCs, and VOCs. Table 6.3-1 summarizes all samples collected and their associated analyses that are representative of current site conditions at SWMU 10-004(a).

H-5.2.1 Organic COPCs in Soil and Alluvium

Eleven organic chemicals were detected in soil and alluvium samples collected at SWMU 10-004(a) and are designated as COPCs. The complete list of initial and retained soil and alluvium COPCs for SWMU 10-004(a) is presented in Table 6.3-2. Analytical results are presented in Table 6.3-4.

- Acetone; n-butylbenzene; sec-butylbenzene; tert-butylbenzene; 1,2-dichlorobenzene; 1,3-dichlorobenzene; 1,4-dichlorobenzene; 4-isopropyltoluene; methylene chloride; 1,2,4-trimethylbenzene; and 1,3,5-trimethylbenzene were detected in soil and alluvium samples and are retained as COPCs.

H-5.2.2 Organic COPCs in Tuff

Three organic chemicals were detected in tuff samples collected at SWMU 10-004(a) and are designated as COPCs. Table 6.3-2 presents the complete list of organic COPCs for SWMU 10-004(a) tuff. Table 6.3-4 presents organic analytical results for the site.

- Acetone; di-n-butylphthalate; and methylene chloride were detected in tuff samples and are retained as COPCs.

H-5.3 Radionuclides in Soil, Alluvium, and Tuff

Samples of alluvium and tuff were collected during historical (pre-2007) investigations at SWMU 10-004(a) and were analyzed for strontium-90. Samples of soil, alluvium, and tuff were collected during the 2007 investigation at SWMU 10-004(a) and were also analyzed for strontium-90. Table 6.3-1 summarizes all samples collected for strontium-90 analysis that are representative of current site conditions at SWMU 10-004(a). Analytical results are presented in Table 6.3-5.

- Strontium-90 was detected in one alluvial sample at a depth greater than 0.5 ft and is retained as a COPC.

H-6.0 COPCs FOR AOCs 10-009 AND C-10-001

The following subsections present discussions of the inorganic, organic, and radionuclide COPCs identified at AOCs 10-009 and C-10-001.

H-6.1 Inorganic Chemicals in Soil and Tuff

All soil and tuff samples collected were analyzed for pH, TAL metals, total cyanide (i.e., WET_CHEM), and perchlorate for the 2007 sampling event. No samples were collected for inorganic chemical analysis prior to the 2007 investigation. A summary of all the qualified samples collected to date and their associated analyses that are representative of the current site conditions at AOCs 10-009 and C-10-001 is provided in Table 6.4-1.

H-6.1.1 Inorganic COPCs in Soil

Cyanide and molybdenum were the only inorganic chemicals initially identified as COPCs. The complete list of COPCs for soil at AOCs 10-009 and C-10-001 is presented in Table 6.4-2. Analytical results are presented in Table 6.4-3.

- Total cyanide was not detected in soil but is retained as a COPC because the detection limit is above the BV.
- Molybdenum is retained as a COPC because it was detected but has no BV.

H-6.1.2 Inorganic COPCs in Tuff

Thirteen inorganic chemicals were initially identified as COPCs in tuff (Qbo) at AOCs 10-009 and C-10-001. Table 6.4-2 lists the inorganic COPCs for the site.

- Aluminum, arsenic, barium, iron, magnesium, manganese, nickel, and vanadium are retained as COPCs because they were detected in at least one sample at a concentration above the range of chemical-specific background.
- Cyanide was not detected; however, the detection limit for multiple samples exceeded the BV (there is no published range of background concentrations), and cyanide is retained as a COPC.
- Antimony, chromium, and selenium were not detected but had detection limits in excess of the BV (and range of background data, if available). Therefore, these three inorganic chemicals are retained as COPCs in tuff.
- Molybdenum was retained as a COPC because it was detected but has no established BV.

H-6.2 Organic Chemicals in Soil and Tuff

The soil and tuff samples collected during the 2007 investigation were analyzed for HE, SVOCs, and VOCs. Organic samples were not collected at AOCs 10-009 and C-10-001 before 2007. Table 6.4-1 summarizes all samples collected and their associated analyses that are representative of current site conditions at AOCs 10-009 and C-10-001. Table 6.4-2 lists the organic COPCs for the site.

H-6.2.1 Organic COPCs in Soil

Toluene was detected in soil at AOCs 10-009 and C-10-001 and is retained as a COPC. Analytical results are presented in Table 6.4-4.

H-6.2.2 Organic COPCs in Tuff

No organic COPCs were detected in tuff samples at AOCs 10-009 and C-10-001.

H-6.3 Radionuclides in Soil and Tuff

Samples of soil and tuff were collected during historical (pre-2007) investigations at AOCs 10-009 and C-10-001 and analyzed for strontium-90. Samples of soil and tuff (Qbo) were collected during the 2007 investigation at AOC 10-009 and were also analyzed for strontium-90. The complete list of radiological COPCs for AOCs 10-009 and C-10-001 is presented in Table 6.4-2. Analytical results are presented in Table 6.4-5.

- Strontium-90 was detected at activities above the FV in two soil samples from the pre-2007 events and is retained as a COPC; no strontium-90 was detected in tuff samples.

H-7.0 NATURE AND EXTENT OF CONTAMINATION AT CONSOLIDATED UNIT 10-001(a)-99

The following sections present a review of the historical (pre-2007) investigation results and data requirements identified for Consolidated Unit 10-001(a)-99 in the approved investigation work plan (LANL 2005, 092083) for the Bayo Canyon Aggregate Area, and an analysis of the nature and extent of contamination at Consolidated Unit 10-001(a)-99.

H-7.1 Previous Results and Data Requirements for Consolidated Unit 10-001(a)-99

Grid sampling over the entire Consolidated Unit 10-001(a)-99 area identified isolated surface (0 to 0.33 ft bgs) locations containing inorganic chemicals above BVs, strontium-90 above the FV, and detected organic chemicals.

Cadmium, copper, lead, mercury, and zinc were detected at concentrations above the BV in one or more surface samples collected from 14 locations. Nitrobenzene was detected in three surface samples; high-melting explosive (HMX [1,3,5,7-teranitro-1,3,5,7-tetrazacyclo-octane]) was detected in one surface sample. Two surface samples contained strontium-90 concentrations above the FV. Grid samples were only collected from the surface. As a result, the vertical extent of contamination for these chemicals is not defined.

In addition to the grid samples, four boreholes (locations 10-01281 through 10-01284) were drilled to a depth of 50 ft and sampled at Consolidated Unit 10-001(a)-99, specifically targeting former SWMU 10-005. Samples from two boreholes (locations 10-01281 and 10-01282) contained cadmium at concentrations above the BV; however, cadmium was not detected at depths greater than 28.5 ft. Trichlorofluoromethane was also detected in one sample at borehole location 10-01284. Strontium-90 was detected at borehole location 10-01281 at a depth of 2.5 ft.

The additional analytical data requirements for Consolidated Unit 10-001(a)-99 identified in the approved investigation work plan (LANL 2005, 092083, p. 8) included

- the vertical extent of cadmium, copper, lead, mercury, and zinc contamination at surface locations containing these inorganic chemicals at concentrations above BVs;
- the vertical extent of nitrobenzene and HMX contamination at surface locations containing these organic chemicals at concentrations above detection limits;
- the vertical extent of strontium-90 contamination at surface locations containing this radionuclide at concentrations above FVs;
- the lateral extent of strontium-90 north and south of borehole location 10-01281;

- the lateral extent of cadmium north and south of borehole locations 10-01281 and 10-01282; and
- the presence and distribution of perchlorate and cyanide across the site.

In addition, field observations made during the 2007 investigation indicated the possibility that residual depleted uranium existed near the former firing sites in Bayo Canyon and called for further characterization of isotopic uranium across the site. Section 3.5 of the investigation report presents a more detailed discussion.

H-7.2 Nature and Extent of Contamination in Soil, Alluvium, and Tuff

The spatial distribution and the nature and extent of contamination based on the data requirements reviewed above are discussed in the following subsections.

H-7.2.1 Inorganic Chemicals

A total of 23 inorganic COPCs are identified in the soil, sediment, and tuff at Consolidated Unit 10-001(a)-99. The distribution of inorganic chemicals detected above BVs across all of Consolidated Unit 10-001(a)-99 is shown in Plate 1. Figure 6.1-1 of the investigation report shows the distribution of inorganic chemicals in the boreholes within SWMU 10-005 on a larger scale.

Cadmium decreases from the maximum concentration (in the pre-2007 data set) of 1.1 mg/kg, detected at location 10-01022 in a sample collected from a depth of 0.0–0.33 ft, to a concentration below the BV at a depth of 1.5–2.0 ft. Cadmium was not detected at concentrations above the BV in any of the 2007 surface and shallow-subsurface samples. Therefore, the extent of cadmium across Consolidated Unit 10-001(a)-99 is defined.

Low concentrations of cadmium (ranging from 0.63 mg/kg to 2.4 mg/kg) were detected in borehole locations 10-01281 and 10-01282 at SWMU 10-005 during the pre-2007 investigations. Cadmium was detected below the BV in 2007 borehole locations 10-601156 and 10-601157, north and south of borehole locations 10-01281 and 10-01282. Cadmium was not detected above BVs at any other 2007 boreholes drilled at SWMU 10-005. The extent of cadmium in the subsurface at SWMU 10-005 is defined.

Copper decreases from the maximum concentration (in the pre-2007 data set) of 50.8 mg/kg detected at location 10-01034 at a depth of 0.0–0.33 ft to a concentration below the BV at a depth of 1.5–2.0 ft. Copper was not detected above the BV in any of the 2007 surface and shallow-subsurface samples. The extent of copper is defined.

Lead was detected at concentrations slightly above the BV at several pre-2007 surface sampling locations, including 10-01002, 10-01003, 10-01004, 10-01022, 10-01041, 10-01061, 10-01062, and 10-01663. The maximum lead concentration (28.3 mg/kg, which is essentially equivalent to the maximum background value of 28 mg/kg) occurred in the surface soil sample collected at 10-01002. This location and location 10-01003 could not be resampled because of access issues. The second highest lead concentration (26.7 mg/kg) occurred in the surface soil sample collected at location 10-01022. Lead was not detected above the BV in any of the 2007 surface and shallow-subsurface sampling locations, including location 10-01022. The extent of lead is defined.

Mercury was detected at a concentration of 0.52 mg/kg at location 10-01022 in a pre-2007 sample collected from a depth of 0.0–0.33 ft but was not detected in any other pre-2007 sample. The detection limits for a few samples were at or slightly above the BV. Mercury was not detected above the BV in any of the 2007 samples. The extent of mercury is defined.

Zinc was detected at concentrations above the BV at several pre-2007 surface sampling locations including 10-01003, 10-01004, 10-01017, 10-01034, and 10-01039. The maximum zinc concentration (668 mg/kg) was detected in the surface soil sample collected at 10-01039. Zinc was detected at a concentration (79.3 mg/kg) above the range of BVs in only one of the 2007 samples. This sample was collected from location 10-01014 at a depth of 0–0.5 ft. The sample collected from the 1.5–2.0-ft interval at this same location was below the BV. The extent of zinc is defined.

Perchlorate was detected in a single 2007 sample at 0.0023 mg/kg; cyanide was not detected above the BV in any of the 2007 samples. No evidence of a release of either of these COPCs was found, and the extent is defined.

H-7.2.2 Organic Chemicals

A total of 17 organic COPCs were identified in the soil, sediment, and tuff at Consolidated Unit 10-001(a)-99. The distribution of organic chemicals detected across all of Consolidated Unit 10-001(a)-99 is shown in Plate 2 and Figure 6.1-1.

The Bayo Canyon Aggregate Area investigation work plan identified HMX and nitrobenzene as the only organic chemicals requiring further characterization. The only detected concentration of HMX was 1.56 mg/kg and occurred at location 10-01619. Nitrobenzene was detected at a concentration of approximately 0.1 mg/kg at locations 10-01001, 10-01023, and 10-01619. Neither of these chemicals was detected in any of the 2007 samples, and the extent is defined.

Benzoic acid was detected in a single 2007 sample collected at location 10-01053 from a depth of 0.0–0.5 ft and at a low concentration (0.733 mg/kg) that decreased with depth. Therefore, the extent of benzoic acid is defined.

All other organic chemicals were detected infrequently and near the EQLs. No evidence of a release was found, and the extent of all organic chemicals is defined at Consolidated Unit 10-001(a)-99.

H-7.2.3 Radionuclides

Uranium-238 is the only radionuclide COPC identified at Consolidated Unit 10-001(a)-99 in the reporting data set. According to the approved Bayo Canyon Aggregate Area investigation work plan (LANL 2005, 092083), strontium-90 was the only radionuclide requiring further characterization. The distribution of radionuclides detected across all Consolidated Unit 10-001(a)-99 is shown in Plate 1.

Strontium-90 was detected above the FV at two pre-2007 surface sampling locations (10-01012 and 10-01066) at activities of 1.67 pCi/g and 6.26 pCi/g, respectively. In addition, strontium-90 was detected in a single borehole (location 10-01281). The activity was 0.626 pCi/g and occurred in a sample collected from 2.5–3.3 ft. Strontium-90 was not detected in any of the 2007 samples, and none of the analytical detection limits exceeded the FV. The extent of strontium-90 is defined.

Uranium-238 was detected at an activity above the BV in one sample, location 10-01033, at Consolidated Unit 10-001(a)-99. The activity decreased to a level below BV at a depth of 1.5–2.0 ft. The extent of uranium-238 is defined.

H-8.0 NATURE AND EXTENT OF CONTAMINATION AT CONSOLIDATED UNIT 10-002(a)-99

Consolidated Unit 10-002(a)-99 covers a large geographic region and is complex. To facilitate the analysis of contaminant distributions and to focus on defining the data requirements, the approved investigation work plan divided the site into the Central Area and areas within Consolidated Unit 10-002(a)-99 exclusive of the Central Area. That division is retained in the sections below to further facilitate the analysis of the nature and extent of contamination at the site.

The Central Area consists of multiple, now-removed liquid disposal pits and lines and SWMU 10-007, the debris landfill. The area outside the Central Area consists of the former radiochemistry building and associated facilities as well as SWMU 10-002(a), located west of the Central Area (Plate 3). Note that the fenced area shown on the plate encompasses the entire Central Area and portions of Consolidated Unit 10-002(a)-99 outside of the Central Area.

H-8.1 Consolidated Unit 10-002(a)-99, Central Area

The following sections present a review of the historical (pre-2007) investigation results and data requirements identified for the Consolidated Unit 10-002(a)-99 Central Area in the approved investigation work plan for the Bayo Canyon Aggregate Area (LANL 2005, 092083), and an analysis of the nature and extent of contamination at the site.

H-8.1.1 Previous Results and Data Requirements for Consolidated Unit 10-002(a)-99, Central Area

Four arrays of boreholes were installed within the Central Area. An array of nine boreholes was centered on liquid disposal pit 10-41 [SWMU 10-003(a)]. Similarly, a five-borehole array was centered on manhole 10-50 [SWMU 10-003(g)]. In addition, a 10-borehole and an 8-borehole array were centered on known contaminant locations identified during the Formerly Utilized Sites Remedial Action Program investigation (Mayfield et al. 1979, 011717).

Antimony, beryllium, cadmium, mercury, and zinc were detected at concentrations above the BV in one or more boreholes. Samples collected from borehole location 10-01213 between 19.2 and 39.2 ft bgs contained antimony and zinc at concentrations above the BV; samples collected from greater depths did not contain these chemicals at concentrations above the BV. Samples collected throughout borehole location 10-01205 contained cadmium at concentrations above the BV; the sample from a depth of 26.5 ft in borehole location 10-01294 contained mercury at a concentration above the BV. Beryllium was detected at concentrations above the BV in samples collected from borehole location 10-01209 (48.4–49.2 ft) and 10-02220 (49.4–50.0 ft). Some of the inorganic chemical analyses yielded elevated mercury detection limits above the BV. No perchlorate or cyanide data were collected at Consolidated Unit 10-002(a)-99 during previous investigations.

Ethylbenzene and xylene were both detected in the two deepest samples (36.6–37.4 ft bgs and 49.4–50 ft bgs) at borehole location 10-01294. In addition, a sample collected from a depth of 17.5 ft bgs in borehole location 10-01201 and another sample collected from a depth of 36 ft bgs in borehole location 10-02221 contained detected concentrations of naphthalene; naphthalene was not detected in deeper samples in either borehole.

Strontium-90 was detected at activities greater than 100 pCi/g in multiple samples collected throughout the Consolidated Unit 10-002(a)-99 Central Area, with samples collected from borehole location 10-02220 containing the highest activities of strontium-90 (up to approximately 40,000 pCi/g at 17.0–17.5 ft). However, clearly decreasing strontium-90 activities in samples collected from borehole locations

10-02220 to 10-02210 indicated that the extent of strontium-90 contamination in the Central Area was defined.

Total uranium was detected in the subsurface in all boreholes and nearly all surface soil samples at concentrations above the BV. The Phase I RFI (LANL 1996, 054332, p. 19) attributed the uranium concentrations to a high percentage of pumice fragments in the samples. Uranium concentrations contained in samples collected from a depth of approximately 40 to 50 ft bgs yielded 2 to 3 times the concentration of uranium contained in samples collected from shallower depths. This depth corresponds to the approximate depth where the Qal stratum contacts the Qbo, Qbof, or Qbog strata and indicates that the elevated uranium concentrations are representative of formation geochemistry rather than a release.

The additional analytical data requirements for the Central Area of Consolidated Unit 10-002(a)-99, identified in the approved Bayo Canyon investigation work plan (LANL 2005, 092083, p. 10), included

- the lateral extent of antimony and zinc to the west of borehole location 10-01213;
- the vertical extent of cadmium at borehole location 10-01205 and the lateral extent of cadmium northwest of this location;
- the lateral extent of mercury to the north of borehole location 10-01294;
- additional mercury data from across the site to improve the mercury data set;
- the lateral extent of beryllium, particularly to the northwest of borehole location 10-01209 and east of borehole location 10-02220;
- the presence and distribution of perchlorate and cyanide across the site;
- the vertical extent of ethylbenzene and xylene at borehole location 10-01294;
- the lateral extent of naphthalene at borehole locations 10-01201 and 10-02221;
- confirmation of the highest strontium-90 concentrations at borehole location 10-02220 as a result of the significance and age of the existing data; and
- confirmation of the lateral extent of strontium-90 contamination to the west and north of array 1.

H-8.1.2 Nature and Extent of Contamination in Soil, Alluvium, Tuff, and Biota

The spatial distribution and the nature and extent of contamination based on the data requirements reviewed above are discussed in the following subsections.

H-8.1.2.1 Inorganic Chemicals

The distribution of inorganic chemicals detected above BVs within the Central Area of Consolidated Unit 10-002(a)-99 is shown in Plate 3.

The antimony and zinc concentrations above BV (10.4 mg/kg and 87.4 mg/kg, respectively) detected in borehole location 10-01213 decrease laterally to the west to below the BV in samples collected from borehole location 10-601241 at intervals of 15.8–17.8 ft and 26.9–28.9 ft and borehole location 10-601243 at sampling intervals of 32–33.9 ft and 48–56 ft bgs. The extent of antimony and zinc is defined in the Central Area.

Cadmium was detected at a concentration of 1.2 mg/kg at the TD (50 ft) of borehole location 10-01205. Cadmium decreases to a level below the BV in samples collected from intervals of 43–45 and 58.2–60 ft bgs in borehole location 10-601161, near borehole location 10-01205. In addition, cadmium decreases to a concentration of 0.61 mg/kg in the surface sample collected at borehole location 10-601162 northwest of borehole location 10-01205 and to below the BV at depth. The extent of cadmium is defined.

The mercury detected at borehole location 10-01294 during the pre-2007 investigation decreases to below the detection limit in samples collected from depths of 0.8–2.8 ft and 42.0–44.0 ft at borehole location 10-601160, north of borehole location 10-01294. In addition, the pre-2007 mercury data set was impacted by the rejection of a significant number of results because of analytical problems. During the 2007 investigation, 111 mercury samples were collected throughout Consolidated Unit 10-002(a)-99, inclusive of all locations in the Central Area, at various depths. Mercury was not detected above the BV in any of the 2007 samples. The extent of mercury in the Central Area is defined.

Beryllium decreases from 2.6 mg/kg at a depth of approximately 50 ft in borehole location 10-01294 to a concentration below the BV at a similar depth in borehole location 10-601160 to the north. Beryllium concentrations of approximately 3 mg/kg at approximately 50 ft in the cluster of boreholes, including 10-02220, 10-601163 and 10-601164, decrease to approximately 2 mg/kg at similar depths in the group of borehole locations including 10-02219, 10-02221,10-02224, 10-601259, and 10-601162 surrounding the cluster. Beryllium is not detected at depths greater than 50 ft. The extent of beryllium is defined.

Cyanide was detected at only three scattered locations (10-02220, 10-601244, and 10-601242) and at concentrations below the BV. All other sampling results were nondetected but had detection limits slightly above the BV. There is no evidence of a release of cyanide in the Central Area, and the extent is defined.

Perchlorate was detected at three scattered locations, 10-601181, 10-601255, and 10-601164, and at concentrations below the EQL (0.0023 mg/kg, 0.0022 mg/kg, and 0.0011 mg/kg, respectively). There is no evidence of a release of perchlorate in the Central Area, and the extent is defined.

H-8.1.2.2 Organic Chemicals

The distribution of organic chemicals within the Central Area of Consolidated Unit 10-002(a)-99 is shown in Plate 4.

The pre-2007 data indicating ethylbenzene and xylene were detected in samples from borehole location 10-01294 were rejected after data-quality revalidation for this report. Borehole location 10-601160, near borehole location 10-01294, was sampled at 0.8–2.8 ft, 42–44 ft, and 59.0–60.8 ft; neither ethylbenzene nor xylene was detected in any of the samples. Furthermore, ethylbenzene is not detected in any of the other Central Area samples, and xylene was detected in only one pre-2007 sample near the EQL. No evidence of a release was found, and the extent of both chemicals is defined.

Naphthalene was detected in samples from multiple depths in borehole location 10-01201. Naphthalene was not detected in any sample collected from the group of borehole locations including 10-01205, 10-01225, 10-01202, 10-01200, 10-01204, and 10-601161 that surround borehole location 10-01201. In addition, the pre-2007 data indicating that naphthalene was detected in a sample from borehole location 10-02221 were rejected after reevaluation and validation for this report. Naphthalene was not detected in 2007 borings located near location 10-02221. The extent of naphthalene is defined.

H-8.1.2.3 Radionuclides

The distribution of radionuclides with activities above BVs, FV, or detection limits in the Central Area within Consolidated Unit 10-002(a)-99 is shown in Plate 5.

Borehole location 10-601164 was drilled approximately 4 ft southeast of borehole location 10-02220 to confirm the high levels of strontium-90 detected previously at borehole location 10-02220. The strontium-90 activities detected at 10-02220 were 37.2 pCi/g in the 14–14.5-ft interval; 40,325.8 pCi/g in the 17–17.5-ft interval; and 18,654 pCi/g in the 18–18.6-ft interval. Strontium-90 was not detected above background levels in samples collected from the 37.0–37.5-ft or 49.4–50-ft intervals at borehole location 10-02220. The strontium-90 activities detected in borehole location 10-601164 were 1310 pCi/g in the 14–16-ft interval, 86.2 pCi/g in the 19–21-ft interval, and 1.36 pCi/g in the 52–54-ft interval. The highest activity of strontium-90 in any of the 2007 samples was 1310 pCi/g. In addition, strontium-90 was detected at an activity of 466 pCi/g (the second highest result in the 2007 data set) in the sample collected from the 13–14.8-ft interval in borehole location 10-601163, approximately 5 ft northeast of borehole location 10-02220 and was not detected at depths greater than 2 ft in borehole location 10-601162, approximately 15 ft northwest of borehole location 10-02220. The 2007 data confirm that the highest activities of strontium-90 occur in the interval between approximately 14 ft and 25 ft bgs in a spatially restricted area between borehole locations 10-01215 and 10-02220, with activities decreasing with depth and laterally from this area. It is important to note that the pre-2007 samples were analyzed for strontium-90 by gamma spectroscopy; the 2007 samples were analyzed using the more accurate gas proportional counting method. The different method and the natural radioactive decay that has occurred over the last 13 yr may explain why the activities are now substantially lower (approximately 30 times) than previously detected.

Array 1 consists of borehole locations 10-01200 through 10-01209. Multiple samples collected from borehole location 10-01205 contained strontium-90 at activities greater than 2000 pCi/g. Borehole location 10-01209 and 2007-investigation borehole locations 10-601161 and 10-601162 are north, west, and east of array 1 borehole location 10-01205. Strontium-90 activity decrease to 7.13 pCi/g in a surface sample at borehole location 10-601162 and to below the minimum detectable activity in all other samples collected from these three boreholes.

Elsewhere in the Central Area, strontium-90 activities range from nondetects to approximately 20 pCi/g and decrease with depth and laterally from locations with elevated activities.

The mean activity of strontium-90 from seven biota samples collected from chamisa plants within the Central Area is 97.4 pCi/g.

H-8.2 Consolidated Unit 10-002(a)-99, Exclusive of the Central Area

The following sections present a review of the historical (pre-2007) investigation results and data requirements identified for Consolidated Unit 10-002(a)-99 outside of the Central Area in the approved investigation work plan for the Bayo Canyon Aggregate Area (LANL 2005, 092083), and an analysis of the nature and extent of contamination within the area.

H-8.2.1 Previous Results and Data Requirements for Consolidated Unit 10-002(a)-99, Exclusive of the Central Area

Seven additional borehole arrays were drilled within Consolidated Unit 10-002(a)-99 outside of the Central Area.

Inorganic chemicals were detected at concentrations above BVs in samples collected from the three borehole arrays that targeted the liquid waste disposal and septic system SWMUs. A single shallow sample collected at borehole location 10-01244 and another single shallow sample collected at borehole location 10-01266 contained beryllium and cadmium at concentrations above their BVs. A single shallow sample collected at borehole location 10-01242 contained chromium, copper, lead, and mercury at concentrations above BVs. A single sample collected at borehole location 10-01266 from a depth of 16.2–16.8 ft contained arsenic at a concentration greater than the BV. In addition, two samples collected at borehole location 10-01228 from depths of 21.4–21.8 ft and 32.1–32.5 ft, and a sample collected at borehole location 10-01232 (21.5–21.9 ft) in the northernmost array, contained beryllium at concentrations above the BV. Decreasing concentrations in the pre-2007 site data demonstrate that the vertical extent of inorganic chemicals was defined.

Samples collected from borehole locations 10-01251 (44.0–44.6 ft) and 10-01254 (28.4–29.3 ft) contained beryllium at concentrations above the BV; samples collected from borehole location 10-01253 (37.5–38.1 ft) contained cadmium at concentrations above the BV.

Three samples collected from borehole location 10-01271 contained detectable concentrations of di-n-butylphthalate. In addition, the sample collected from 49.4–50.0 ft in borehole location 10-01251 contained a detectable concentration of bis(2-ethylhexyl)phthalate.

Samples collected at borehole locations 10-01259 and 10-01262 from depths of 48.6–49.5 ft and 15.0–15.8 ft contained antimony at concentrations above the BV. In addition, a sample collected from a depth of 2.5–3.9 ft from borehole location 10-01293 contained copper at a concentration above the BV. Single samples collected at borehole location 10-01288 contained detectable concentrations of acetone (at a depth of 46.2–47.0 ft) and di-n-butylphthalate (at a depth of 4.2–5.0 ft). Pentachlorophenol and phenol were also detected once each in a single sample collected from a depth of 3.6–4.2 ft at borehole location 10-01257. Pre-2007 site data defined the nature and extent of inorganic and organic chemicals.

Strontium-90 was detected above the FV in several surface samples collected from the borehole arrays around SWMU 10-002(b). A sample collected from a depth of 3.6 ft bgs at borehole location 10-01257 contained strontium-90 at an activity of 340 pCi/g. Decreasing concentrations in the existing site data define the extent of strontium-90 vertically and to the east, west, and south; no boreholes are located directly north of this location. Strontium-90 was detected in borehole location 10-01293 at an activity of 3.39 pCi/g at a depth of 10 ft bgs and at an activity of 3.19 pCi/g at 48.6 ft bgs. Decreasing concentration trends in the existing site data define the extent of strontium-90 at this location vertically and to the north, east, and west. A sample collected from a depth of 11.4–12.1 ft at borehole location 10-01289 contained strontium-90 at an activity of 158 pCi/g. Decreasing concentrations in the pre-2007 site data also define the extent of strontium-90 at this location vertically and to the east and west.

The additional analytical data requirements for Consolidated Unit 10-002(a)-99 outside of the Central Area identified in the approved investigation work plan (LANL 2005, 092083, p.12) included

- lateral extent of beryllium and cadmium northwest of borehole location 10-01244 and northeast of borehole location 10-01266;
- lateral extent of chromium, copper, lead, and mercury north of borehole location 10-01242;
- lateral extent of arsenic north and east of borehole location 10-01269;
- lateral extent of d-n-butylphthalate south of borehole location 10-01271;
- lateral extent of beryllium north, west, and south of borehole locations 10-01228 and 10-01232;

- lateral extent of beryllium north of borehole location 10-01251 and west of 10-01254;
- lateral extent of cadmium south of borehole location 10-01253;
- vertical extent of bis(2-ethylhexyl)phthalate at borehole location 10-01251;
- lateral extent of antimony north and south of borehole location 10-01259 and south of 10-01262;
- lateral extent of copper south of borehole location 10-01293;
- lateral extent of strontium-90 north of borehole location 10-01257;
- lateral extent of strontium-90 north and south of borehole location 10-01289;
- lateral extent of strontium-90 south of borehole location 10-01293; and
- the presence and distribution of perchlorate and cyanide across the site.

H-8.2.2 Nature and Extent of Contamination in Soil, Alluvium, and Tuff

The spatial distribution and the nature and extent of contamination based on the data requirements reviewed above are discussed in the following subsections. Also discussed are data results from the sampling of two localized areas of elevated radiological activity discovered in 2007 south of the former radiochemistry building.

H-8.2.2.1 Inorganic Chemicals

The distribution of inorganic chemicals detected above BVs outside of the Central Area of Consolidated Unit 10-002(a)-99 is shown in Plates 3 and 6 and in Figures 6.2-1 and 6.2-3.

Beryllium concentrations of 4.1 mg/kg detected in the sample from the 30.3–30.9-ft interval in borehole location 10-01242 and 2.8 mg/kg in the sample from the 32–32.5-ft interval in borehole location 10-01244 decrease to concentrations of 1.8 mg/kg in the sample from the 27.0–29.0-ft interval and 2.3 mg/kg in a sample from the 33.0–35.0-ft interval in borehole locations 10-601253 and 10-601252. These boreholes are located to the northeast and northwest of borehole locations 10-01242 and 10-01244. In addition, beryllium concentrations (all less than 2.5 mg/kg) detected in borehole locations 10-01226, 10-01228, and 10-01232 (all of which are neighbors in a historical sampling array) decrease to below the BV in borehole locations 10-601248, 10-601250, and 10-601251 to the north, east, and south of the array boreholes.

Two 2007 borehole locations, 10-601178 and 10-601177, were located 10 ft north and 10 ft west of historical borehole location 10-01251 and sampled at two depths. Beryllium was detected at 2.6 mg/kg at borehole location 10-601177, within the range of background. Beryllium was not detected above the BV for other collected samples. Borehole location 10-601178 is west of historical borehole location 10-01254. Beryllium was not detected above the BV in collected samples from this location. Data-quality revalidation removed beryllium results above the BV from historical borehole location 10-01266. Furthermore, beryllium was not detected above the BV in samples collected from 2007 borehole location 10-601256 to the northeast of borehole location 10-01266. The extent of beryllium is defined outside of the Central Area of Consolidated Unit 10-002(a)-99.

Cadmium results for two pre-2007 samples were previously classified as analytical detections: in the sample collected from a depth of 32.0–32.5 ft in borehole location 10-01244, the result was 1.2 mg/kg, and at borehole location 10-01253, the cadmium concentration in the 37.5–38.1-ft sample was 2.3 mg/kg. After reevaluation and revalidation for this report, the results were reclassified as nondetections. In addition, northwest of borehole location 10-01244 at borehole location 10-601252, cadmium was not detected in any sample and the detection limits were below the BV. Furthermore, cadmium concentrations were below the BV in samples collected from borehole location 10-601180, south of borehole location 10-01253. Data-quality revalidation removed cadmium results above the BV from historical borehole location 10-01266, and cadmium was not detected above the BV in samples collected from 2007 borehole location 10-601256, to the northeast of borehole location 10-01266. The extent of cadmium for Consolidated Unit 10-002(a)-99 outside the Central Area is defined.

The elevated chromium (20.6 mg/kg), copper (9.1 mg/kg), and lead (28.6 mg/kg) concentrations at borehole location 10-01242 decrease to levels below the detection limit (with one detection limit slightly above the BV), to concentrations of 5.7 mg/kg and 2.6 mg/kg (below the BV of 3.96 mg/kg) and to levels below the detection limit, respectively, in borehole location 10-601253 to the north. Copper was detected in borehole location 10-01293, but 2007 borehole location 10-601175 to the south had all nondetects for copper. The mercury result for one pre-2007 sample was previously classified as a detection; in the sample collected from a depth of 6.2–6.8 ft (also in borehole location 10-01242), the mercury result was reported as 0.28 mg/kg. After data-quality revalidation for this report, the result did not meet validation standards and was rejected. Furthermore, mercury was not detected above the BV in borehole location 10-601253. The extent of these inorganic chemicals for Consolidated Unit 10-002(a)-99 outside the Central Area is defined.

Arsenic was detected at concentrations of 1.4 mg/kg and 2.2 mg/kg at location 10-01269 from sampling intervals 14.0–14.5 ft and 26.5–27 ft, respectively. Arsenic was not detected in samples collected from borehole locations 10-601253 to the north and 10-601254 to the east of borehole location 10-01269. The detection limit (1.1 mg/kg) for one analysis in each borehole was slightly above the BV. The extent of arsenic for Consolidated Unit 10-002(a)-99 outside of the Central Area is defined.

Antimony concentrations of 14.9 mg/kg in a sample from a depth of 48.6–49.5 ft in borehole location 10-01259 and 18.8 mg/kg in a sample from a depth of 15–15.8 ft in borehole location 10-01262 decrease to nondetects in samples from borehole locations 10-601170 and 10-601172 (north and south of borehole location 10-01259, respectively) and borehole location 10-601175 (south of borehole location 10-01262). The extent of antimony for Consolidated Unit 10-002(a)-99 outside the Central Area is defined.

Cyanide was detected at two locations (10-601319 and 10-601177) at estimated concentrations below the BV; all other results were nondetections at concentrations slightly above the BV. Perchlorate was detected at four scattered locations and only at trace concentrations. No evidence of a release of cyanide or perchlorate was found at Consolidated Unit 10-002(a)-99 outside of the Central Area.

Additional soil samples (not prescribed in the investigation work plan) were collected as part of the 2007 investigation to characterize two localized areas of elevated radiation identified during the 2007 radiological surveys south of the former radiochemistry building (see insert in Plate 6). Two samples, from the surface and from a depth of approximately 2.0–3.0 ft, were collected at four locations in this area. Lead was detected above the BV in the surface sample at location 10-601319 but decreases to less than the BV at depth. Mercury was detected at 0.219 mg/kg in a surface sample at location 10-603265 but decreases to less than the BV at depth and was not detected above background levels at any other location. The one detection of perchlorate, at a trace concentration, in a surface sample (location 10-603264), decreases to a nondetect at depth and is not detected at any other location. Therefore, all inorganic chemical data results from the sampling at the two localized areas of elevated radiological activity south of the former radiochemistry building show either decreasing trends or no evidence of a release. The extent of inorganic chemicals is defined.

H-8.2.2.2 Organic Chemicals

The distribution of organic chemicals outside of the Central Area of Consolidated Unit 10-002(a)-99 is shown in Plates 4 and 7 and Figures 6.2-2 and 6.2-4.

The di-n-butylphthalate detected at detectable concentrations at borehole location 10-01271 decreases to concentrations below detection limits in samples collected from borehole location 10-601257, south of borehole location 10-01271. The extent of di-n-butylphthalate is defined.

The 30-mg/kg concentration of bis(2-ethylhexyl)phthalate detected at TD (approximately 50 ft) in borehole location 10-01251 decreases to levels below detection limits in samples collected from depths of 60.2–62.2 ft and 61.5–63.5 ft in borehole locations 10-601178 and 10-601177, near borehole location 10-01251. The extent of bis(2-ethylhexyl)phthalate for Consolidated Unit 10-002(a)-99 outside of the Central Area is defined.

Additional soil samples (not prescribed in the investigation work plan) were collected as part of the 2007 investigation to characterize two localized areas of elevated radiation identified during the 2007 radiological surveys south of the former radiochemistry building (see insert in Plate 6). Two samples, from the surface and from a depth of approximately 2.0–3.0 ft, were collected at four locations in this area. Only two organic chemicals (di-n-butylphthalate and xylene[1,3-]+xylene[1,4-]) were detected at trace concentrations each from single locations (10-603265 and 10-601319, respectively) at single depths. No evidence of a release was found.

All other organic chemicals were detected infrequently and typically only at trace concentrations, including data results from the two localized areas of elevated radiological contamination south of the former radiochemistry building. Thus, no evidence of a release was found, and the extent of all organic chemicals is defined for Consolidated Unit 10-002(a)-99 outside of the Central Area.

H-8.2.2.3 Radionuclides

The distribution of radionuclides detected above BVs or FVs outside of the Central Area of Consolidated Unit 10-002(a)-99 is shown in Plate 6 and Figures 6.2-1 and 6.2-3.

The strontium-90 activity of 340.2 pCi/g detected in a sample from a depth of 3.6–4.2 ft in boring 10-01257 decreases to activities below the detection limit in samples collected from 20–22.4 ft and 62–64 ft in borehole 10-601170. One significant pre-2007 strontium-90 result for a sample from borehole location 10-01289 was previously classified as a detection; the activity in the sample collected from a depth of 11.4–12.1 ft was reported as 158 pCi/g. After data-quality revalidation for this report, the result did not meet validation standards and was rejected. Furthermore, strontium-90 was not detected in any sample collected from borehole locations 10-601173 and 10-601182, north and south of borehole location 10-01289. The slightly elevated strontium-90 activities (3.39 pCi/g and 3.19 pCi/g) detected in samples from depths of 10.0–10.8 ft and 48.6–49.6 ft in borehole location 10-01293 decrease to concentrations below the detection limit in samples collected from surrounding borehole locations 10-601175, 10-601182, and 10-601173 at depths ranging from 19.8 to 64.0 ft.

Additional soil samples (not prescribed in the investigation work plan) were collected as part of the 2007 investigation to characterize two localized areas of elevated radiation identified during the 2007 radiological surveys conducted south of the former radiochemistry building (see insert in Plate 6). Two samples, from the surface and from a depth of approximately 2.0–3.0 ft, were collected at four locations in this area. The analytical result from a surface sample collected at location 10-601319 had the highest strontium-90 activity of 193 pCi/g. A sample collected at this same location from 1.5–2.0 ft had a strontium-90 activity of 2.89 pCi/g, a significant decrease in activity. At the second area of elevated radiation, three locations were sampled (10-603263, 10-603264, and 10-603265). The surface samples (0.0–1.0 ft) at location 10-603263 and 10-603264 had reported strontium activities of 15 pCi/g and 6.06 pCi/g, respectively. Samples collected at depth (1.5–2.0 ft) had strontium activities of 0.785 pCi/g and 0.221 pCi/g, respectively. Strontium-90 activities from the two samples collected at downgradient location 10-603265 were less than the FV in the surface sample and nondetect at depth. The strontium-90 analytical results from all samples collected in this area show decreasing activities with depth and downgradient. The extent of strontium-90 contamination is defined south of the former radiochemistry building.

Cesium-137 activities are slightly above FVs in a few surface samples, but all show a decrease in activity at depth or results at depth are nondetect. Thus, for all of Consolidated Unit 10-002(a)-99 outside of the Central Area, the extent of cesium-137 is defined.

H-9.0 NATURE AND EXTENT OF CONTAMINATION AT SWMU 10-004(a)

The following sections present a review of the historical investigation results and data requirements identified for SWMU 10-004(a) in the approved investigation work plan for the Bayo Canyon Aggregate Area (LANL 2005, 092083), and an analysis of the nature and extent of contamination at SWMU 10-004(a).

H-9.1 Previous Results and Data Requirements for SWMU 10-004(a)

A single array consisting of eight boreholes was drilled at SWMU 10-004(a) near the septic tank (structure 10-40, shown in Figure 3.2-3 in the HIR [LANL 2005, 089658]). A single sample contained antimony at a concentration above the BV; the remaining site data define the lateral and vertical extent of this chemical. A single sample from the bottom of borehole location 10-01277 contained beryllium at a concentration above the BV at a depth of 61.5–62.5 ft. Two samples in borehole location 10-01278, collected from depths of 2.5–3.7 ft and 19.2–20 ft, as well as a single sample from borehole location 10-01279 collected from a depth of 14.0–15.0 ft, contained cadmium at concentrations above the BV. A sample collected from the bottom of borehole location 10-01277 at a depth of 61.5–62.5 ft contained lead at a concentration above the BV. Borehole locations 10-01273 and 10-01276 both had several samples collected from depths ranging from 2.5–50 ft that contained mercury at concentrations above the BV. Borehole locations 10-01272 and 10-01277 each had one sample that contained zinc at concentrations above the BV. In addition, borehole locations 10-01274 and 10-01275 each had one sample that contained detected concentrations of bis(2-ethylhexyl)phthalate.

The additional analytical data requirements for SWMU 10-004(a) identified in the approved investigation work plan (LANL 2005, 092083, p.13) included

- vertical extent of beryllium at borehole location 10-01277;
- lateral extent of cadmium west of borehole locations 10-01278 and 10-01279;
- vertical extent of lead at borehole location 10-01277;
- lateral extent of mercury north of borehole location 10-01273 and east of 10-01276;
- vertical extent of zinc at borehole location 10-01277;

- lateral extent of bis(2-ethylhexyl)phthalate east of borehole location 10-01274 and south of borehole location 10-01275; and
- the presence and distribution of perchlorate and cyanide across the site.

H-9.2 Nature and Extent of Contamination in Soil, Alluvium, and Tuff

The spatial distribution and the nature and extent of contamination based on the data requirements reviewed above are discussed in the following subsections.

H-9.2.1 Inorganic Chemicals

A total of 22 inorganic COPCs were identified in the soil, alluvium, and tuff at SWMU 10-004(a). The distribution of inorganic chemicals detected above BVs at SWMU 10-004(a) is shown in Plate 8.

Beryllium decreases from the maximum detected concentration of 4.6 mg/kg at TD of borehole location 10-01277 (62.5 ft bgs) to a level below the BV at a depth of 66.5–68.5 ft bgs in borehole location 10-601192, immediately southeast of borehole location 10-01277. The extent of beryllium is defined at SWMU 10-004(a).

Cadmium decreases from the maximum detected concentration of 1 mg/kg in borehole location 10-01279 at a depth of 38.5–39.4 ft to concentrations below the BV in both samples collected from borehole location 10-601191 (at depths of 9.0–11.0 ft and 30.0–32.0 ft bgs), west of borehole location 10-01279. The extent of cadmium at SWMU 10-004(a) is defined.

Lead decreases from the maximum detected concentration of 27.5 mg/kg at TD of borehole location 10-01277 (62.5 ft bgs) to a level below the BV at a depth of 66.5–68.5 ft bgs in borehole location 10-601192, immediately southeast of borehole location 10-01277. The extent of lead is defined at SWMU 10-004(a).

Mercury decreases from the maximum detected concentration of 0.69 mg/kg in the interval from 36.0–36.8 ft bgs in borehole location 10-01273 to levels below the analytical detection limit in samples collected from depths of 25.0–27.0 ft bgs and 62.0–64 ft bgs in borehole location 10-601190, north of borehole location 10-01273. Note that the pre-2007 data had already demonstrated that the vertical extent of mercury at this location was defined. Mercury decreases from 0.13 mg/kg at TD (50 ft bgs) in borehole location 10-01276 to a level below the analytical detection limit in the sample collected from a depth of 66.5–68.5 ft bgs in borehole location 10-601192, immediately southwest of borehole location 10-01276. Mercury is not detected in any samples collected from borehole locations 10-01272, 10-01274, or 10-01275, east of borehole location 10-01276. The extent of mercury at SWMU 10-004(a) is defined.

Zinc decreases from the maximum detected concentration of 68.2 mg/kg at TD of borehole location 10 01277 (62.5 ft bgs) to a level below the BV at a depth of 66.5–68.5 ft bgs in borehole location, 10-601192, immediately southeast of borehole location 10-01277. The extent of zinc is defined at SWMU 10-004(a).

Perchlorate was not detected in any samples and therefore is not a site COPC. Cyanide was not detected in any samples from SWMU 10-004(a) but had analytical detection limits above the BV. The elevated detection limits ranged from 0.52 mg/kg to 0.68 mg/kg, which is only slightly above the BV of 0.5 mg/kg. Therefore, no evidence was found of a cyanide release.

H-9.2.2 Organic Chemicals

There are a total of 12 organic COPCs in soil, alluvium, and tuff at SWMU 10-004(a). The distribution of organic chemicals at SWMU 10-004(a) is shown in Plate 9.

Bis(2-ethylhexyl)phthalate was not detected in any of the samples collected from the boreholes east of location 10-01274 (borehole location 10-601193) or south of location 10-01275 (borehole location 10-601194). The extent of bis(2-ethylhexyl)phthalate is defined at SWMU 10-004(a). Furthermore, bis(2-ethylhexyl)phthalate was not identified as detected using current data-quality validation standards in any site samples, including the historical (pre-2007) samples and is no longer identified as a COPC for SWMU 10-004(a).

Methylene chloride was identified in the 2007 data as a COPC. Methylene chloride was detected at a maximum concentration of 0.00054 mg/kg in a sample collected from the 9.0–11.0-ft interval in borehole location 10-601191. Methylene chloride decreased to trace levels with depth at this location and is not detected above trace levels at any other location within the SWMU. The extent of methylene chloride is defined.

Di-n-butylphthalate was not identified previously as a COPC at SWMU 10-004(a). However, as a result of data-quality revalidation performed for this report, the di-n-butylphthalate results for two pre-2007 samples from location 10-01279 were requalified as detections. Both results were flagged as estimated, although the concentrations were 45 mg/kg at 38.5 to 39.4 ft bgs and 60 mg/kg at the TD of the borehole (49–50 ft bgs). Di-n-butylphthalate was not detected in any other borehole locations from SWMU 10-004(a), including those closer to the septic tank (i.e., east of location 10-01279). These locations include an adjacent 1995 borehole also drilled to 50 ft bgs (location 10-01278, approximately 10 ft to the east), and a 2007 borehole drilled to 68.5 ft bgs less than 30 ft east of location 10-01279. Samples collected to the west (away from the septic tank) were drilled only to 30 ft bgs; however, the septic tank would have been expected to have more impact on samples collected from shallower depths. Furthermore, no known sources of di-n-butylphthalate from SWMU 10-004(a) exist. Therefore, the extent of di-n-butylphthalate is defined.

All other organic chemicals were detected infrequently and only at trace levels. No evidence of a release was found, and the extent of all organic chemicals is defined at SWMU 10-004(a).

H-9.2.3 Radionuclides

The extent of strontium-90 was previously defined at SWMU 10-004(a), and strontium-90 was not detected in any of the 2007 samples. The distribution of radionuclides detected above BVs or FVs at SWMU 10-004(a) is shown in Plate 8. The extent of radionuclides at SWMU 10-004(a) is defined.

H-10.0 NATURE AND EXTENT OF CONTAMINATION AT AOCS 10-009 AND C-10-001

The following sections present a review of the historical investigation results and data requirements identified for AOCs 10-009 and C-10-001 in the approved investigation work plan for the Bayo Canyon Aggregate Area and an analysis of the nature and extent of contamination at the site.

H-10.1 Previous Results and Data Requirements for AOCs 10-009 and C-10-001

AOC 10-009 is a suspected landfill discovered during routine surface shrapnel characterization activities in Bayo Canyon. The Laboratory fenced the site pending further investigation. AOC C-10-001 consists of two areas within the AOC 10-009 fenced boundary where elevated radiation levels were discovered during routine shrapnel-removal operations in 1994 (LANL 2005, 089658). Strontium-90 activities up to 3518 pCi/g were identified at AOC C-10-001 before the VCA implementation at the site. The maximum activity of strontium-90 in samples collected after removal of contaminated material was 12.8 pCi/g (LANL 1995, 049710, p. 1–2). The site data collected during the VCA defined the nature and extent of residual strontium-90 remaining on-site (LANL 2005, 092083, p.13).

Historically, no data have been collected from AOC 10-009 for hazardous chemical analysis.

The additional data requirements for AOCs 10-009 and C-10-001 identified in the approved investigation work plan (LANL 2005, 092083, p.13) included

- the presence and distribution of inorganic chemicals (including perchlorate and cyanide), organic chemicals, and radionuclides at AOC 10-009; and
- the presence and distribution of inorganic chemicals (including perchlorate and cyanide) and organic chemicals at AOC C-10-001.

H-10.2 Nature and Extent of Contamination in Soil and Tuff

The spatial distribution and the nature and extent of contamination based on the data requirements reviewed above are discussed in the following sections.

H-10.2.1 Inorganic Chemicals

A total of 13 inorganic COPCs are identified in the soil and tuff at AOCs C-10-001 and 10-009. The distribution of inorganic chemicals detected above BVs is shown in Figure 6.4-1.

AOCs C-10-001 and 10-009 are located on the south side of Bayo Canyon, just upslope of the braided stream channel. The only tuff unit identified at AOC 10-009 is the Otowi Member of the Bandelier Tuff (Qbo). The tuff unit is overlain by 20 to 25 ft of alluvium; the contact is gradational and the top of the Qbo is often heavily weathered or reworked. Tuff sampled in canyon bottoms may have a different geochemistry because these environments have more water, which leads to the chemical weathering of tuff. Additionally, it is likely that tuff samples collected from shallow weathered sections may have chemical properties more similar to soil and canyon sediment (LANL 1998, 059730).

Aluminum was detected in four tuff (Qbo) samples. All aluminum concentrations were less than 3 times the BV, and three of the four samples were less than twice the BV. At borehole location 10-601147, the aluminum concentration (3640 mg/kg) was only slightly above the BV (3560 mg/kg) at TD (28–30.5 ft bgs). At borehole locations 10-601149 and 10-601150, aluminum was detected above the BV at TD of the borehole (34 ft bgs), but both results were lower than at shallower sampling depths. Aluminum was detected above the BV from 20.8–22.8 ft bgs at borehole location 10-601151 but was not detected at TD. All aluminum concentrations were significantly below the BV for soil. The aluminum results are likely a result of natural variability in tuff, caused by chemically weathering. The extent of aluminum at AOCs C-10-001 and 10-009 is defined.

Antimony was not detected at concentrations exceeding the BV in soil or tuff samples; however, the analytical detection limits for two samples exceeded the BV. No evidence of an antimony release was found at AOCs C-10-001 and 10-009.

Arsenic was detected above the BV in four Qbo samples. The maximum detected concentration of 1.3 mg/kg occurred in borehole locations 10-601149 and 10-601151. All arsenic concentrations were less than 3 times the BV for tuff. Arsenic concentrations decrease with depth at borehole locations 10-601149, 10-601150, and 10-601151. Arsenic was detected at a concentration of 0.97 mg/kg at TD (28–30.5 ft bgs) in borehole location 10-601147. All arsenic concentrations are significantly below the BV for soil. The extent of arsenic is defined.

Barium was detected above the BV in four Qbo samples from borehole locations 10-601149, 10-601150, and 10-601151. All barium concentrations were less than 3 times the BV and decrease with depth. All barium concentrations were well below the BV for soil. The extent of barium at is defined.

Chromium was not detected in soil or tuff samples collected from AOC 10-009; however, the analytical detection limits for four samples in tuff exceeded the BV. No evidence of a chromium release was found at AOCs C-10-001 and 10-009.

Magnesium was detected in four Qbo samples at concentrations above the BV in borehole locations 10-601147, 10-601149, 10-601150, and 10-601151. All magnesium concentrations were less than twice the BV for Qbo and significantly below the BV for soil. No evidence of a magnesium release was found at AOCs C-10-001 and 10-009.

Manganese was detected in only two tuff samples, at concentrations above the range of background concentrations in borehole locations 10-601149 and 10-601151. Both detections were less than twice the BV for tuff. No evidence of a manganese release was found.

Molybdenum was detected in six soil and five tuff samples at AOCs C-10-001 and 10-009. The concentrations for five Qbo samples and one surface sample are estimated values. All detected concentrations of molybdenum are less than or only slightly higher than the EQL. No evidence of a release of molybdenum was found at AOCs C-10-001 and 10-009.

Nickel was detected in three Qbo samples at concentrations above the range of background concentrations. All detections were less than 3 times the BV for tuff and well below the BV for soil. No evidence of a release of nickel was found.

The analytical detection limit for one selenium analysis slightly exceeded the BV; selenium was not detected in any of the site samples. No evidence of a selenium release was found.

Vanadium was detected in four Qbo samples above the BV; all four concentrations are less than twice the BV. No evidence of a vanadium release was found at AOCs C-10-001 and 10-009.

Cyanide was not detected above the BV in any sample. The analytical detection limit for all samples exceeded the BV by less than 0.1 mg/kg. No evidence of a cyanide release was found.

Perchlorate was not detected in any samples collected from AOCs C-10-001 and 10-009; therefore, the extent is defined.

H-10.2.2 Organic Chemicals

Toluene was detected in soil at AOCs C-10-001 and 10-009. No organic chemicals were detected in tuff. The distribution of organic chemicals is shown in Figure 6.4-2.

Toluene was detected in one surface sample collected from borehole location 10-601150 and three subsurface samples collected from locations 10-601132 and 10-601135. All detected concentrations of toluene were estimated and only slight above the EQL. Toluene was detected at trace concentrations only, and there is no indication of a toluene release.

H-10.2.3 Radionuclides

The extent of strontium-90 was previously characterized at AOC C-10-001, and strontium-90 was not detected in any of 2007 samples collected from AOCs C-10-001 or 10-009. The extent of strontium-90 is defined for AOCs C-10-001 and 10-009. The distribution of radionuclides is shown in Figure 6.4-1.

H-11.0 CONCLUSIONS

The COPCs present within Consolidated Unit 10-001(a)-99 include 23 inorganic chemicals, 17 organic chemicals, and 1 radionuclide in soil, sediment, and tuff. The nature and extent of all COPCs have been defined for this site.

The COPCs present within Consolidated Unit 10-002(a)-99 include 21 inorganic chemicals, 35 organic chemicals, and 6 radionuclides in soil, alluvium, tuff, and vegetation. The nature and extent of all inorganic and organic COPCs have been defined for this site.

The data confirm previous conclusions that the highest activities of strontium-90 occur in the interval between approximately 14 and 25 ft bgs in a spatially restricted area between borehole locations 10-01215 and 10-02220 [within the Central Area of Consolidated Unit 10-002(a)-99], with activities decreasing substantially with depth and laterally from this area. The extent of strontium-90 within the Central Area is defined. The extent of contamination at two localized areas of elevated radiation, identified south of the former radiochemistry building during the 2007 radiological surveys, is also defined for all radionuclides, inorganic chemicals, and organic chemicals.

The COPCs present within SWMU 10-004(a) include 22 inorganic chemicals, 12 organic chemicals, and 1 radionuclide in soil, alluvium, and tuff. The nature and extent of all COPCs have been defined for this site.

The COPCs for AOCs 10-009 and C-10-001 include 13 inorganic chemicals, 1 organic chemical, and 1 radionuclide. The nature and extent of all COPCs have been defined at these AOCs.

H-12.0 REFERENCES

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

Copies of the master reference set are maintained at the New Mexico Environment Department's Hazardous Waste Bureau; the U.S. Department of Energy-Los Alamos Site Office; the Environmental Protection Agency, Region 6; and EP. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

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Appendix I

Risk Assessments

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Attachments

Attachment I-1 Ecological Scoping Checklist for Bayo Canyon Aggregate Area
Attachment I-2 ProUCL Calculation Files (on CD included with this document)

I-1.0 INTRODUCTION

This appendix presents the results of the human health and ecological risk screening evaluations conducted in support of environmental characterization of the Bayo Canyon Aggregate Area [Consolidated Units 10-001(a)-99 and 10-002(a)-99, Solid Waste Management Unit (SWMU) 10-004(a), and Areas of Concern (AOCs) 10-009 and C-10-001] located in Technical Area (TA) 10 at Los Alamos National Laboratory (LANL or the Laboratory) (Figure I-1.0-1). Summary descriptions of the consolidated units, SWMUs, and AOCs comprising TA-10 are included in Section 2.1 of the investigation report.

I-2.0 BACKGROUND

TA-10, located in Bayo Canyon, was formerly used as a firing test site from 1943 to 1961, and the area and all related structures were constructed to test assemblies that contained conventional high explosives (HE), including components made from depleted or natural uranium. The principal former structures associated with TA-10 include a radiochemistry laboratory (TA-10-01), two assembly buildings (TA-10-10 and TA-10-12), an inspection building (TA-10-8), a personnel building (TA-10-21), structures at two detonation control complexes (TA-10-12 and TA-10-15), and adjacent firing pads. TA-10 also included various ancillary facilities associated with waste disposal, particularly for the radiochemistry laboratory, including sanitary and radioactive liquid waste sewage lines, manholes, septic tanks, seepage pits, and solid radioactive waste disposal pits (Mayfield et al. 1979, 011717, p. 12).

All structures and facilities in the TA-10 complex have been removed. Extensive decontamination and decommissioning (D&D) efforts began in 1960 and were completed in 1963. In 1967, the site was released to Los Alamos County but remains under U.S. Department of Energy (DOE) administrative control. Bayo Canyon is currently open to the public and is used for recreational activities. A well-maintained hiking trail exists at the base of the cliff north of Consolidated Unit 10-002(a)-99, and a dirt road runs parallel to the firing sites [Consolidated Unit 10-001(a)-99], terminating in the stream channel near AOC 10-009. The area encompassing the central liquid disposal complex [SWMUs 10-003(a to o)] is posted with monuments to prohibit any excavation activity before 2142. Chainlink fences exist around two debris landfills (SWMU 10-007 and AOC 10-009). The fence around SWMU 10-007 is posted as a radiological contamination area (RCA).

Currently, TA-10 consists of two consolidated units [10-001(a)-99 and 10-002(a)-99], two SWMUs [10-004(a) and 10-006], and two AOCs (C-10-001 and 10-009). The rationale for the consolidation of 10-001(a)-99 and 10-002(a)-99 was based on the operational history, waste streams, geographical proximity, transport mechanisms, and investigation required to assess contamination (LANL 1999, 063175). SMWU 10-006 was not evaluated for risk because it could not be found.

I-2.1 Site Description and Operational History

TA-10 is located in the central portion of Bayo Canyon, situated between Kwage Mesa to the south and Otowi Mesa to the north, approximately 0.5 mi. west of the Los Alamos County sewage treatment plant. Bayo Canyon is located at an elevation of approximately 6000 to 6740 ft above sea level and slopes to the southeast at an approximate 3% grade.

Much of the surface and near surface of TA-10 has been disturbed, either by natural processes such as bioturbation or by human activity (e.g., historical operations and previous remediation activities). The dominant vegetation at TA-10 consists of various native grasses, sagebrush, chamisa, and pine trees.

Bayo Canyon is geographically isolated from the Laboratory. No other SWMUs are located near the TA-10 portion of Bayo Canyon; however, upper portions of Bayo Canyon are potentially impacted by the north section of the Los Alamos townsite. These potential impacts are not addressed in this investigation but will be addressed in the North Canyons investigation report. The work plan for North Canyons (LANL 2001, 071060) was submitted to the New Mexico Environment Department (NMED) and approved (NMED 2005, 091653).

The subsections below describe the consolidated units, SWMUs, and AOCs that comprise TA-10 and their respective operational histories.

I-2.1.1 Consolidated Unit 10-001(a)-99

Consolidated Unit 10-001(a)-99 includes

- SWMUs 10-001 (a,b,c,d): firing sites;
- SWMU 10-005: open surface disposal pit;
- AOC 10-001(e): possible sand pile detonation site; and
- AOC 10-008: satellite firing site (nonradiological).

SWMUs 10-001(a,b,c,d) are the former shot pads that made up two firing sites located in the western third of TA-10. Each consisted of five structures: a battery building (power source), a fire control building, an electronics chamber, an X-unit chamber, and an inspection building.

SWMU 10-005 is a former open disposal pit approximately 62 ft west of the northwest firing point on the south side of the road. The dimensions of the pit are unknown (LANL 1990, 007512, p. 4).

AOC 10-001(e) is a suspected sand pile detonation site adjacent to the TA-10 firing sites; however, the exact location of the site is not known because it was never documented on any of the original area maps. AOC 10-001(e) was approved for no further action by the U.S. Environmental Protection Agency (EPA) (EPA 2005, 088464).

AOC 10-008 is a former satellite firing site located approximately 1400 ft northwest of the primary firing sites [SWMUs 10-001(a,b,c,d)]. During the 1994 interim action (IA), shrapnel was found embedded in the northwestern side of trees in this area (opposite the known primary firing sites) (LANL 1997, 056660.289, p. 1).

I-2.1.2 Consolidated Unit 10-002(a)-99

Consolidated Unit 10-002(a)-99 is a former liquid disposal complex that served the former radiochemistry laboratory (building TA-10-01) at TA-10 and includes

- SWMUs 10-002(a) and (b): solid waste disposal pits;
- SWMUs 10-003(a to o): radiochemistry liquid waste disposal complex;
- SWMU 10-004(b): 540-gal. reinforced concrete sanitary septic tank; and
- SWMU 10-007: building debris landfill

SWMUs 10-002(a) and (b) are the former waste disposal pits used during active radiochemistry laboratory operations from 1945 to 1950 and were known to contain radioactive, inorganic chemical, and organic chemical wastes. All wastes were removed and the pits backfilled with uncontaminated shot pad building debris and site soil during the 1963 D&D activities.

SWMUs 10-003(a to o) represent the majority of the liquid disposal complex and consist of liquid disposal pits, industrial waste manholes and septic tanks, industrial waste lines, and a leach field that served the radiochemistry laboratory.

SWMU 10-004(b) is a reinforced-concrete sanitary septic tank that served the radiochemistry laboratory between 1944 and 1963. SWMU 10-004(b) may have also received liquid waste from radiochemistry laboratory operations.

SWMU 10-007 is the building debris landfill that contains residual materials generated by the TA-10 D&D efforts of 1963 (Blackwell and Babich 1963, 004751). The landfill is located in the excavation footprints of the radiochemistry laboratory solid waste disposal pits [SWMUs 10-002(a) and (b)].

Results obtained from the 1994 Resource Recovery Conservation Act (RCRA) facility investigation (RFI) at TA-10 prompted the initiation of an IA for SWMUs 10-003(a) and 10-007 that included the following activities: sample collection, installation of storm water control measures, and construction of a fenced exclusion zone to minimize the potential for exposure to humans and animals. This fenced zone is currently referred to as the Central Area and is comprised of the SWMUs mentioned above, except SWMUs 10-002(a) and (b) and SWMU 10-003(h).

I-2.1.3 SWMU 10-004(a)

SWMU 10-004(a) is a former 1060-gal. septic tank (structure 10-40) that served the personnel building (TA-10-21) from 1949 through 1963. The septic tank discharged to a pit with associated lines and an outfall located in a stream channel northeast of SWMU 10-002(a). The tank was removed during the 1963 D&D activities; however, no information regarding the removal of the 4-in.-diameter tile drain or of the soil surrounding the outfall is available.

I-2.1.4 AOCs 10-009 and C-10-001

AOC 10-009 is a suspected landfill area thought to contain discarded materials such as asbestos siding, heavy-gauge and coaxial cable, glass laboratory equipment, and other debris. The site was fenced off until further investigation could be conducted. The 2007 investigation is the first investigation to be conducted for AOC 10-009.

AOC C-10-001 is located within the fenced area that encompasses AOC 10-009 and consists of two radioactive (strontium-90) soil contamination areas. These areas were bulldozed during the 1963 D&D activities, but were rediscovered during shrapnel-removal operations in 1994. A voluntary correction action (VCA), conducted in 1995, attempted to remove all radioactive soil by excavating the areas and backfilling them with clean fill material (LANL 1995, 049710).

I-2.2 Investigation Sampling and Determination of Chemicals of Potential Concern

The final data set used to identify chemicals of potential concern (COPCs) and evaluate potential risks to human health and the environment for the Bayo Canyon Aggregate Area consists of all qualified analytical results compiled from both historical sampling activities and the 2007 investigation. Only those data determined to be of decision-level quality following the data-quality assessment (Appendix F) are included in the final data set evaluated in Appendix H and in this appendix.

Decision-level analytical data used to determine COPCs for the Bayo Canyon Aggregate Area include results obtained from samples collected during the following investigations/activities:

- 1994 Phase I RFI for SWMUs 10-001(a,b,c,d), 10-002(a) and (b), 10-003(a to o), 10-004(a) and (b), 10-005, and 10-007 (LANL 1995, 049974; LANL 1996, 054617): surface soil, sediment, and subsurface samples were collected.
- 1995 VCA (LANL 1995, 049710): soil contaminated with radionuclides was removed by excavating and replaced with clean fill.
- 1997 IA for Consolidated Unit 10-002(a)-99 (LANL 1997, 056358): surface soil, subsurface, and vegetation samples were collected.
- 2007 investigation: surface and subsurface samples were collected to assess further the impact former site operations had on the surrounding soil and tuff and to support characterization of the lateral and vertical extent of contamination within the aggregate area.

Tables I-2.2-1 to I-2.2-10 summarize the COPCs evaluated for risk for each of the four main areas in the Bayo Canyon Aggregate Area [Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001]. Appendix H summarizes the COPC selection process and provides a data summary. Only COPCs identified in Appendix H detected above background (inorganic chemicals and radionuclides), had detection limits greater than background values (BVs) (inorganic chemicals), or were detected (organic chemicals) were retained. The recreational scenario and the ecological evaluation typically utilize data for samples collected from 0–1 ft below ground surface (bgs) and 0–5 ft bgs, respectively. The construction worker and the residential scenarios typically utilize data for samples collected from 0–10 ft bgs. However, sampling depths often overlapped due to multiple investigations; therefore, all samples with a starting depth less than the lower bound of the interval for each scenario were included in the risk assessments (Tables I-2.2-1 to I-2.2-10). In addition, some of the COPCs identified in Appendix H may not be evaluated for potential risk under one or more scenarios because they were only reported below the depth interval associated with a given scenario.

I-3.0 CONCEPTUAL SITE MODEL

The primary mechanisms of release are related to historical contaminant sources described in detail in the historical investigation report (HIR) (LANL 2005, 089658) and summarized in section 2.1 of this investigation report. In the source areas, both surface and subsurface potential sources of contamination exist and include

- surface—widely dispersed contamination associated with explosives testing at the firing sites and detonation pile, the septic system outfall, and the exposed portions of the debris landfills; and
- subsurface—residual contamination remaining after D&D of multiple site structures, the debris landfills, releases from the radiological laboratory's acid waste handling system (including planned discharges from infiltration pits and leaks from lines and tanks), and releases from site septic systems (including planned releases from leach fields and leaks from lines and tanks).

The lack of saturated conditions in the source area restricts the vertical migration of contaminants. Although surface water has been observed historically in the Bayo Canyon Aggregate Area (i.e., the lower reaches of the Bayo Canyon drainage channel), standing or running surface water is very rare, occurring only briefly and intermittently as a result of either intense seasonal thunderstorms that produce significant rainfall in short time periods or snowmelt runoff. No zones of perched groundwater have been identified beneath the canyon, and no evidence has been found of the migration of contaminants to deeper groundwater, including the regional aquifer, which is located approximately 600 ft bgs.

The conceptual site model for contaminant exposure for human receptors is shown in Figure I-3.0-1. Primary exposure media for human receptors include surface soil and subsurface soil/tuff. Human receptors may be exposed through direct contact with soil or suspended particulates by incidental ingestion, inhalation, and dermal contact. Incidental ingestion and dermal exposures to surface water are highly unlikely.

The conceptual site model for contaminant exposure for ecological receptors is shown in Figure I-3.0-1 and the ecological scoping checklist (Attachment I-1). Exposure pathways to surface and subsurface soil and tuff that apply for ecological receptors include root uptake by plants, dermal contact, inhalation of vapors or dust, incidental ingestion of soil, and food web transport. Dietary exposures include soil ingestion and food-web transport, and are the primary pathways for wildlife. Surface water is an unlikely exposure pathway for ecological receptors due to its ephemeral and transient occurrence. No exposure pathways are present for ecological receptors to groundwater because no shallow groundwater exists and no springs or seeps have been found within Bayo Canyon.

I-3.1 Environmental Fate and Transport

The evaluation of environmental fate addresses the chemical processes affecting the persistence of chemicals in the environment, and the evaluation of transport addresses the physical processes affecting mobility along a migration pathway. Migration into soil and tuff depends on precipitation or snowmelt, soil moisture content, depth of soil, soil and tuff hydraulic properties, and properties of the COPCs.

The most important factor with respect to the potential for COPCs to migrate to groundwater is the presence of saturated conditions. Downward migration in the vadose zone is also limited by a lack of hydrostatic pressure as well as the lack of a source for the continued release of contamination. Without sufficient moisture and a source, little or no potential migration of materials through the vadose zone to groundwater occurs.

Contamination at depth is addressed in the discussion of nature and extent. Results from the deepest samples collected showed either no detected concentrations of COPCs or low/trace-level concentrations of only a few inorganic, radionuclide, and/or organic COPCs in tuff. The limited extent of contamination is related to the absence of the key factors that facilitate migration, as discussed above. Given how long the contamination has been present in the subsurface, physical and chemicals properties of the COPCs, and the lack of saturated conditions, the potential for contaminant migration to groundwater is very low.

The NMED guidance (NMED 2006, 092513) contains screening levels that consider the potential for contaminants in soil to result in groundwater contamination. These screening levels consider equilibrium partitioning of contaminants among solid, aqueous, and vapor phases and account for dilution and attenuation in groundwater through the use of dilution attenuation factors (DAFs). These DAF soil screening levels (SSLs) can be used to identify chemical concentrations in soil that have the potential to contaminate groundwater (EPA 1996, 059902). Screening contaminant concentrations in soil against these DAF SSLs does not, however, provide an indication of the potential for contaminants to migrate to groundwater. The assumptions used to develop these DAF SSLs include an assumption of uniform contaminant concentrations from the contaminant source to the water table (i.e., it is assumed that migration to groundwater has already occurred). Furthermore, this assumption is inappropriate for cases such as the Bayo Canyon Aggregate Area where sampling has shown that contamination is vertically bounded near the surface and the distance from the surface to the water table is large. For these reasons, screening of contaminant concentrations in soil against the DAF SSLs was not performed.

The best indication of the potential for future contaminant migration to groundwater is the current vertical distribution of contaminants in the subsurface. Most releases at the Bayo Canyon Aggregate Area are historical (i.e., they occurred decades ago). The regional aquifer at the aggregate area is approximately 600 ft bgs. Therefore, for migration of contaminants to occur from shallow soil to the regional aquifer in a meaningful time frame (e.g., 100 to 1000 yr), significant vertical migration should already have occurred. Sampling has shown that this migration has not occurred, indicating a very low potential for future contaminant migration to groundwater.

In addition to hydrologic characteristics of the site described above, the potential for contaminant migration also depends on physical and chemical properties of the contaminants. The inorganic COPCs identified for the Bayo Canyon Aggregate Area include aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, cyanide (total), iron, lead, magnesium, manganese, mercury, molybdenum, nickel, perchlorate, selenium, silver, thallium, uranium, vanadium, and zinc. Acetone, benzoic acid, benzo(g,h,i)perylene, bis(2-ethylhexyl)phthalate, butylbenzylphthalate, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, diethylphthalate, di-n-butyl phthalate, ethylbenzene, 4-isopropyltoluene, methylene chloride, pyrene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloro-1,2,2-trifluoroethane, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and xylene were identified as organic COPCs and were generally detected only in a few samples and at low concentrations. The radionuclide COPCs are primarily strontium-90 and uranium-238. The nature and extent of these COPCs at TA-10 are addressed in Appendix H.

The relevant release and transport processes of the COPCs are a function of chemical-specific properties that include the relationship between the physical form of the constituents and the nature of the constituent transport processes in the environment. Specific properties include the degree of saturation and the potential for ion exchange (barium and other inorganic chemicals) or sorption and the potential for natural bioremediation. The transport of volatile organic compounds (VOCs) occurs primarily in the vapor phase by diffusion or advection in subsurface air. The chemical and physical properties of Bayo Canyon Aggregate Area COPCs are presented in Tables I-3.1-1 and I-3.1-2.

The primary release and transport mechanisms that may lead to the exposure of potential receptors in the Bayo Canyon Aggregate Area include

- dissolution and/or particulate transport of surface contaminants from precipitation and runoff,
- airborne transport of contaminated surface soils or particulates,
- continued dissolution and advective/dispersive transport of chemical and radiological contaminants contained in subsurface soil and bedrock,
- biotic perturbation and/or translocation of contaminants in subsurface contaminated media, and
- uptake of contaminants from soil and water by biota.

Contaminant distributions at TA-10 sites indicate that after the initial deposition of contaminants from operational activities and historical remediation efforts, elevated levels of contaminants tend to remain concentrated in the vicinity of the original release points.

The COPCs for the Bayo Canyon Aggregate Area are discussed below.

I-3.1.1 Inorganic Chemicals

In general, and particularly in a semiarid climate, inorganic chemicals are not highly soluble or mobile in the environment, although there are exceptions. The physical and chemical factors that determine the distribution of inorganic COPCs within the soil and tuff are the soil-water partition coefficient (K_d) of the inorganic chemicals, the pH of the soil, soil characteristics (such as sand or clay content), and the oxidation/reduction potential (Eh). The interaction of these factors is complex, but the K_d values provide a general assessment of the potential for migration through the subsurface: chemicals with higher K_d values are less likely to be mobile than those with lower values. Table I-3.1-1 presents the K_d values for the inorganic COPCs identified in the Bayo Canyon Aggregate Area. These values match the K_d values recommended by the EPA for the default pH of 6.8 for evaluation of superfund sites (EPA 1996, 059902) and represent conservative values, applicable to a wide range of sites. Chemicals with K_d values greater than 40 are very unlikely to migrate through soil towards the water table (Kincaid et al. 1998, 093270). Based on this criterion, aluminum, antimony, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, thallium, uranium, vanadium, and zinc have a low potential to mobilize and migrate through soil and the vadose zone. Arsenic, copper, cyanide, iron, magnesium, perchlorate, selenium, and silver have a greater potential to mobilize and migrate through soil and the vadose zone. These COPCs are discussed further below.

It is important to note that other factors besides the K_d values (e.g., speciation in soil, Eh, pH, and soil mineralogy) also play significant roles in the likelihood that inorganic chemicals will migrate. Information about the fate and transport properties of inorganic chemicals can be obtained from individual chemical profiles published by the Agency for Toxic Substances and Disease Registry (ATSDR) (ATSDR 1997, 056531, and http://www.atsdr.cdc.gov/toxpro2).

I-3.1.1.1 Arsenic

In the environment, arsenic may undergo a variety of reactions including oxidation-reduction reactions, ligand exchange, precipitation, and biotransformation. Arsenic forms insoluble complexes with iron, aluminum, and magnesium oxides commonly found in soil, and in this form, arsenic is relatively immobile. However, under low pH and reducing conditions, arsenic can become soluble and may potentially leach into groundwater or result in runoff of arsenic into surface waters. Arsenic is expected to have low mobility under the environmental conditions (average pH = 7.2, oxidizing near-surface conditions) present in the Bayo Canyon Aggregate Area.

I-3.1.1.2 Copper

Copper's movement in soil is determined by physical and chemical interactions with the soil components. Most copper deposited in soil is strongly adsorbed and remains in the upper few centimeters. Copper will adsorb to organic matter, carbonate minerals, clay minerals, hydrous iron, and manganese oxides. In most temperate soil, pH, organic matter, and ionic strength of the soil solutions are the key factors affecting adsorption. Copper binds to soil much more strongly than other divalent cations, and the distribution of copper in the soil solution is less affected by pH than other metals. Copper is expected to be bound to the soil and move in the system by way of transport of soil particles by water as opposed to movement as dissolved species. The average soil pH is 7.2 in the Bayo Canyon Aggregate Area, so leaching of copper is unlikely.

I-3.1.1.4 Cyanide

Cyanide in the environment is derived from anthropogenic sources and from cyanide-containing substances that naturally occur in fruits, seeds, roots, and leaves of numerous plants and are released to the environment by higher plants, bacteria, and fungi. At soil surfaces, volatilization of hydrogen cyanide is a significant mechanism for cyanide loss. Cyanide occurring at low concentrations in subsurface soil is likely to biodegrade under both aerobic and anaerobic conditions. Cyanide may also leach into groundwater, but only if the concentrations of water-soluble cyanides occur at levels toxic to microorganisms (i.e., landfills, spills). Cyanide was not detected in the Bayo Canyon Aggregate Area but had reported detection limits above the BV.

I-3.1.1.5 Iron

Iron is ubiquitous in soil, making up about 5% of the earth's crust. The iron content of a soil may range from 0.5% to over 5% depending on parent material and the degree of weathering. Iron is sensitive to soil pH conditions and occurs in two oxidation states: iron(III), the insoluble oxidized form, and iron(II), the reduced soluble form. Most iron in well drained neutral to alkaline soil is present as precipitates of iron(III) hydroxides and oxides. With time, these precipitates are mineralized and form various iron-bearing minerals, such as lepidcrocite, hematite, and goethite. Iron is not expected to be mobile in the neutral (average pH = 7.2), well-drained soil present in the Bayo Canyon Aggregate Area.

I-3.1.1.6 Magnesium

Magnesium is the eighth most abundant element in the earth's crust, making up about 2%. It is found in a wide variety of minerals such as brucite, magnesite, dolomite, carnalite and many others. Magnesium is an essential nutrient for humans, animals, and plants. Magnesium is abundant in alkaline soil and occurs in Mg^{2+} valence state. The mobility of magnesium is dependant on the clay content of soil because it occurs as a cation and it is incorporated into the crystal lattice of clays. Sandy soil may become deficient in magnesium because of leaching. Magnesium is mobile; however, the occurrence of magnesium-rich parent minerals in neutral to alkaline soil replenishes the soil reservoir of magnesium. In addition, the extent of magnesium is defined.

I-3.1.1.7 Perchlorate

Perchlorate is highly soluble in water and may migrate with water molecules in saturated soil. In Bayo Canyon perchlorate is present in the soil in trace amounts. The subsurface soil of Bayo Canyon has low moisture content, inhibiting perchlorate mobility. There were only two detections of perchlorate at trace concentrations in the aggregate area and the extent is defined.

I-3.1.1.8 Selenium

Selenium is not often found in the environment in its elemental form but is usually combined with sulfide, silver, copper, lead, and/or nickel minerals. In soil, pH and Eh are determining factors in the transport and partitioning of selenium. In soil with a pH greater than 7.5, selenates, which have high solubility and a low tendency to adsorb onto soil particles, are the major selenium species and are very mobile. The average soil pH in the Bayo Canyon Aggregate Area is 7.2, indicating that some selenium migration may occur. However, the extent of selenium is defined within the aggregate area

I-3.1.1.9 Silver

Natural processes, such as the weathering of rock and the erosion of soil, release silver to air and water. Human activities that release silver to the environment include the processing of ores, steel refining, industrial processes, cement manufacture, fossil fuel combustion, and municipal waste incineration. The dominant process controlling silver partitioning in water and movement in soil is sorption. Therefore, silver is not expected to be mobile and the extent is defined within the Bayo Canyon Aggregate Area.

I-3.1.2 Organic Chemicals

Table I-3.1-2 presents the physical and chemical properties (organic carbon–water partition coefficient [K_{oc}], logarithm to the base 10 octanol/water partition coefficient [log K_{ow}], and solubility) of the organic COPCs identified for the Bayo Canyon Aggregate Area. Physical and chemical properties of organic chemicals are important when evaluating their fate and transport. The following physiochemical property information illustrates some aspects of the fate and transport tendencies of the Bayo Canyon Aggregate Area COPCs. The information is summarized from Ney (1995, 058210).

Water solubility may be the most important chemical characteristic used to assess mobility of organic chemicals. The higher the water solubility of a chemical, the more likely it is to be mobile and the less likely it is to accumulate, bioaccumulate, volatilize, or persist in the environment. A highly soluble chemical (water solubility greater than 1000 mg/L) is prone to biodegradation and metabolism that may detoxify the parent chemical. Acetone, benzoic acid, diethylphthalate, methylene chloride, and 1,1,1-trichloroethane have water solubilities greater than 1000 mg/L.

The lower the water solubility of a chemical, especially below 10 mg/L, the more likely it will be immobilized by adsorption. Chemicals with lower water solubilities are more likely to accumulate or bioaccumulate and persist in the environment, to be slightly prone to biodegradation, and to be metabolized in plants and animals. The COPCs identified as having water solubilities less than 10 mg/L are bis(2-ethylhexyl)phthalate, butylbenzylphthalate, benzo(g,h,i)perylene, and pyrene.

Vapor pressure is a chemical characteristic used to evaluate the tendency of organic chemicals to volatize. Chemicals with vapor pressure greater than 0.01 mm Hg are likely to volatilize, and therefore, concentrations at the site are reduced over time; vapors of these chemicals are more likely to travel toward the atmosphere and not migrate toward groundwater. The COPCs acetone, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, ethylbenzene, 4-isopropyltoluene, methylene chloride, toluene, 1,1,2-trichloro-1,2,2-trifluoroethane, 1,1,1-trichlorethane, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and xylene have vapor pressures greater than 0.01 mm Hg.

Chemicals with vapor pressures less than 0.000001 mm Hg are less likely to volatilize and, therefore, tend to remain immobile. The COPCs bis(2-ethylhexyl)phthalate, butylbenzylphthalate, benzo(g,h,i)perylene, and pyrene also have vapor pressures less than 0.000001 mm Hg.

K_{ow} is an indicator of a chemical's potential to bioaccumulate or bioconcentrate in the fatty tissues of living organisms. The unitless K_{ow} value is an indicator of water solubility, mobility, sorption, and bioaccumulation. The higher the K_{ow} is above 1000, the greater the affinity the chemical has for bioaccumulation in the food chain, the greater its potential for sorption in the soil, and the lower its mobility (Ney 1995, 058210). The COPCs with a K_{ow} greater than 1000 include benzo(g,h,i)perylene, bis(2-ethylhexyl)phthalate, butylbenzylphthalate, di-n-butyl phthalate, 4-isopropyltoluene, and pyrene. A K_{ow} of less than 500 indicates high water solubility, high mobility, little to no affinity for bioaccumulation, and degradability by microbes, plants, and animals. Acetone, benzoic acid, diethylphthalate, methylene chloride, 1,1,1-trichloroethane, and xylene have a K_{ow} less than 500.

The K_{oc} measures the tendency of a chemical to adsorb to organic carbon in soil. K_{oc} values above 500 cm^3/g indicate a strong tendency to adsorb to soil, leading to low mobility (NMED 2006, 092513). Benzo(g,h,i)perylene, bis(2-ethylhexyl)phthalate, butylbenzylphthalate, di-n-octyl phthalate, pyrene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene have K_{oc} values above 500 L/kg, indicating a very low potential to migrate toward groundwater. The COPCs with K_{oc} values less than 500 L/kg are acetone, benzoic acid, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, diethylphthalate, ethylbenzene, methylene chloride, toluene, 1,1,2-trichloro-1,2,2-trifluoroethane, 1,1,1-trichloroethane, and xylene.

The COPCs bis(2-ethylhexyl)phthalate, butylbenzylphthalate, benzo(g,h,i)perylene, and pyrene are the least mobile and the most likely to bioaccumulate. The more soluble and volatile COPCs acetone, benzoic acid, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, diethylphthalate, ethylbenzene, methylene chloride, toluene, 1,1,2-trichloro-1,2,2-trifluoroethane, 1,1,1-trichloroethane, and xylene are more mobile but are also more likely to travel toward the atmosphere and not migrate toward groundwater. Because all of the organic COPCs were detected at low concentrations in a few samples and the extent is defined, they are unlikely to migrate to groundwater.

I-3.1.3 Radionuclides

Radionuclides behave in the environment similarly to metals and are not highly soluble or mobile, particularly in a semiarid climate. The physical and chemical factors that determine the distribution of radionuclides within soil and tuff are the K_d, the pH of the soil and other soil characteristics (e.g., sand or clay content), and the Eh. The interaction of these factors is complex, but K_d values provide a general assessment of the potential for migration through the subsurface: chemicals with higher K_d values are less likely to be mobile than those with lower values. Radionuclides with K_d values greater than 40 are very unlikely to migrate through soil towards the water table (Kincaid et al. 1998, 093270).

Table I-3.1-1 provides the physiochemical properties of the two radionuclide COPCs (strontium-90 and uranium-238) identified for the Bayo Canyon Aggregate Area. The K_d for strontium-90 is just below 40 and the K_d for uranium-238 is well above 40. Extent is defined for both radionuclides and neither radionuclide is expected to be mobile in the semiarid Bayo Canyon environment.

I-4.0 HUMAN HEALTH RISK SCREENING ASSESSMENT RESULTS

Human health risk screening evaluations were conducted for Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001 to determine whether COPC concentrations in soil and tuff pose a potential unacceptable risk to human receptors. The decision scenario for Consolidated Unit 10-002(a)-99 is recreational, while the decision scenario for Consolidated Unit 10-001(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001 is residential.

I-4.1 Soil Screening Levels

The SSLs for the construction worker and residential scenarios were obtained from NMED guidance (NMED 2006, 092513). The recreational SSLs are from Laboratory guidance (LANL 2007, 094496). The SSLs are based on a target noncarcinogenic hazard quotient (HQ) of 1.0 and a target cancer risk of 1×10^{-5} (NMED 2006, 092513). If SSLs were not available from NMED guidance, EPA Region 6 (EPA 2007, 095866) or EPA Region 9 screening levels were used (http://www.epa.gov/region09/waste/sfund/prg/), with concentrations adjusted to the 1×10^{-5} target risk level for carcinogens by multiplying the SSL by a factor of 10. Exposure parameters used to calculate the recreational, construction worker, and residential SSLs are presented in Table I-4.1-1.

Several of the COPCs have soil saturation concentration limits (C_{sat}) as SSLs. The C_{sat} value is not a risk-based number, is not indicative of potential health effects, and cannot be used to determine HQs/HIs or cancer risk. A comparison of site soil concentrations with SSLs has not been performed in this screening assessment. Instead, a "forward" risk calculation has been performed to estimate potential health effects using the exposure factors used to derive the SSLs (NMED 2006, 092513; LANL 2007, 094496). The results are presented in Section I-4.3.

Radionuclide screening action levels (SALs) are used for comparison with radionuclide COPC concentrations and were derived using the residual radioactive (RESRAD) model, Version 6.21 (LANL 2005, 088493). The SALs are based on a 15-mrem/yr dose per DOE guidance (DOE 2000, 067489). Exposure parameters used to calculate the recreational, construction worker, and residential SALs are presented in Tables I-4.1-2 to I-4.1-4.

I-4.2 Exposure Point Concentrations

Exposure point concentrations (EPCs) represent upper bound concentrations of COPCs. For each COPC, the 95% upper confidence limit (UCL) of the arithmetic mean was calculated when possible. If a 95% UCL could not be calculated or the 95% UCL was greater than the maximum value, the maximum detected concentration was used as the EPC. If there were no detections, the maximum reported detection limit was used as the EPC. These values are used as the EPC for each COPC for the human health and the ecological risk screening evaluations (Tables I-2.2-1 to I-2.2-10).

The 95% UCLs were calculated using the EPA software ProUCL 4.0 (EPA 2007, 096530), which is based on EPA guidance (EPA 2002, 085640). All available decision-level data within the depth range of interest was used. ProUCL identifies the type of distribution of each COPC and calculates UCLs using several specific methods based on the identified distribution. Environmental data may have a normal, lognormal, or gamma distribution but are often nonparametric (no definable shape to the distribution). The ProUCL program calculates 95%, 97.5%, and 99% UCLs and recommends a distribution and UCL. In this risk assessment the 95% UCL for the identified distribution and recommended calculation method was used as the EPC in all cases for consistency. Input and output data files for ProUCL calculations are provided on CD as Attachment I-2.

I-4.3 Results of Human Health Screening Evaluation

The EPC of each COPC in soil was compared with the SSLs for the recreational, construction worker, and residential scenarios. The EPCs for carcinogenic COPCs were divided by the SSL and multiplied by 1×10^{-5}. The sum of the cancer risks were compared with the NMED target cancer risk level of 1×10^{-5}. An HQ was generated for each noncarcinogenic COPC by dividing the EPC by the SSL. The HQs were summed to generate a hazard index (HI). The HI was compared with the NMED target HI of 1.0. Radionuclide EPCs were divided by the SAL and multiplied by 15 mrem/yr, which is the target dose (DOE 2000, 067489). The results of the human health screening evaluations for the Bayo Canyon Aggregate Area are presented in Tables I-4.3-1 to I-4.3-26.

Details regarding the human health screening evaluation results are presented in the following subsections.

I-4.3.1 Consolidated Unit 10-001(a)-99

The recreational (0–0.5 ft bgs) and construction worker (0–5 ft bgs) scenarios are the current and reasonably foreseeable future land uses for this consolidated unit. The total excess cancer risk for the recreational scenario is 8×10^{-13}, which is less than the NMED target level of 1×10^{-5} (NMED 2006, 092513). The concentrations of noncarcinogenic COPCs were below their respective recreational SSLs. The HI of 0.03 is less than the NMED target HI of 1.0 (NMED 2006, 092513). The results for the recreational scenario are presented in Tables I-4.3-1 and I-4.3-2.

The total excess cancer risk for the construction worker scenario is 1×10^{-6}, which is less than the NMED target level of 1×10^{-5} (NMED 2006, 092513). The HI (approximately 2) is above the NMED target HI of 1.0 (NMED 2006, 092513). The elevated HI is primarily due to manganese (HQ 1.6), which has an EPC above the SSL. The results for the construction worker scenario are presented in Tables I-4.3-3 and I-4.3-4.

The total excess cancer risk for a resident (0–5 ft bgs) is approximately 3×10^{-6}, which is below the NMED target level of 1×10^{-5} (NMED 2006, 092513). The residential HI is 0.8, which is below the NMED target HI of 1.0 (NMED 2006, 092513). The results for the residential scenario are presented in Tables I-4.3-5 and I-4.3-6.

Ten COPCs had risk-based SSLs above the C_{sat} SSLs for at least one exposure scenario. The forward risk calculation results (Table I-4.3-7) show that the excess cancer risk is below 1×10^{-5} and the HQs are below 1.0 for all scenarios and do not substantially increase the cancer risks and HIs.

One radionuclide, uranium-238, was identified as a COPC at Consolidated Unit 10-001(a)-99. The doses for the recreational, construction worker, and residential scenarios are 0.01mrem/yr, 0.2 mrem/yr, and 0.3 mrem/yr, respectively; which are below the target dose of 15 mrem/yr (DOE 2000, 067489). The results of the dose assessment are presented in Table I-4.3-8.

I-4.3.2 Consolidated Unit 10-002(a)-99

The recreational (0–2.8 ft bgs) and construction worker (0–10 ft bgs) scenarios are the current and reasonably foreseeable future land uses for this site. No carcinogenic COPCs were identified at Consolidated Unit 10-002(a)-99 for the recreational scenario. The concentrations of noncarcinogenic COPCs were below their respective recreational SSLs. The HI of 0.04 is less than the NMED target HI of 1.0 (NMED 2006, 092513). The results for the recreational scenario are presented in Table I-4.3-9.

The total excess cancer risk for the construction worker scenario is approximately 2×10^{-6}, which is below the NMED target level of 1×10^{-5} (NMED 2006, 092513). The HI (approximately 2) is above the NMED target HI of 1.0 (NMED 2006, 092513), primarily due to manganese (HQ 1.5) being above the SSL. The results for the construction worker scenario are presented in Tables I-4.3-10 and I-4.3-11.

The residential (0–10 ft bgs) scenario EPCs, for both the carcinogenic and noncarcinogenic COPCs, were below their respective SSLs. The total excess cancer risk for a resident is approximately 4×10^{-6}, which is below the NMED target level of 1×10^{-5} (NMED 2006, 092513). The residential HI of 0.6 is below the NMED target HI of 1.0 (NMED 2006, 092513). The results for the residential scenario are presented in Tables I-4.3-12 and I-4.3-13.

Two COPCs had risk-based SSLs above the C_{sat} SSLs. None of the COPCs were carcinogenic. The HQs are below 1.0 for all scenarios and do not substantially increase the HIs. The results are provided in Table I-4.3-14.

One radionuclide, strontium-90, was identified as a COPC at Consolidated Unit 10-002(a)-99. The doses for the recreational, construction worker, and residential scenarios are 0.2 mrem/yr, 0.6 mrem/yr, and 91 mrem/yr, respectively. The doses for the recreational and construction worker scenarios are below the target dose of 15 mrem/yr (DOE 2000, 067489), while the residential dose is a factor of 6 above the target dose. The results for the dose assessment are presented in Table I-4.3-15.

I-4.3.3 SWMU 10-004(a)

The recreational (0–1 ft bgs) and construction worker (0–11 ft bgs) scenarios are the current and reasonably foreseeable future land uses for this site. No COPCs were identified at SWMU 10-004(a) for the recreational scenario.

The total excess cancer risk for the construction worker scenario is approximately 2×10^{-6}, which is below the NMED target level of 1×10^{-5} (NMED 2006, 092513). The HI (approximately 2) is above the NMED target HI of 1.0 (NMED 2006, 092513), primarily due to manganese (HQ 1.3) being above the SSL. The results for the construction worker scenario are presented in Tables I-4.3-16 and I-4.3-17.

The EPCs for both carcinogenic and noncarcinogenic COPCs were below their respective residential SSLs. The total excess cancer risk for a resident is approximately 2×10^{-6}, which is below the NMED target level of 1×10^{-5} (NMED 2006, 092513). The residential HI of 0.9 is below the NMED target HI of 1.0 (NMED 2006, 092513). The results for the residential scenario are presented in Tables I-4.3-18 and I-4.3-19.

Two COPCs had risk-based SSLs above the C_{sat} SSLs. The results (Table I-4.2-20) show cancer risks were below the NMED target level of 1×10^{-5} and the HQs were below 1.0 for all scenarios and do not substantially increase the total excess cancer risks and the HIs.

One radionuclide, strontium-90, was identified as a COPC at SWMU 10-004(a). The doses for the recreational, construction worker, and residential scenarios are 0.001 mrem/yr, 0.005 mrem/yr, and 0.7 mrem/yr, respectively; which are below the target dose of 15 mrem/yr (DOE 2000, 067489). The results for the dose assessment are presented in Table I-4.3-21.

I-4.3.4 AOCs 10-009 and C-10-001

The recreational and construction worker scenarios are the current and reasonably foreseeable future land uses for these sites. No carcinogenic COPCs were identified for AOCs 10-009 and C-10-001 for the recreational or construction worker scenarios. The EPCs for the noncarcinogenic COPCs were below their respective recreational and construction worker SSLs. The HIs of 0.0002 and 0.0005 for the recreational and construction worker scenarios, respectively, are less than the NMED target HI of 1.0 (NMED 2006, 092513). The results for the recreational and construction worker scenarios are presented in Tables I-4.3-22 and I-4.3-23, respectively.

No carcinogenic COPCs were identified for AOCs 10-009 and C-10-001 for the residential scenario. The EPCs for the noncarcinogenic COPCs were below their respective residential SSLs. The residential HI of 0.002 is below the NMED target HI of 1.0 (NMED 2006, 092513). The results for the residential scenario are presented in Tables I-4.3-24.

One COPC had a risk-based SSL above the C_{sat} SSL. The results (Table I-4.3-25) show the HQs are below 1.0 for each scenario and do not substantially increase the HIs.

One radionuclide, strontium-90, was identified as a COPC. The doses for the recreational, construction worker, and residential scenarios are 0.02 mrem/yr, 0.001 mrem/yr, and 13 mrem/yr, respectively, which are below the target dose of 15 mrem/yr (DOE 2000, 067489). The results for the dose assessment are presented in Table I-4.3-26.

I-4.4 Uncertainty Analysis

The human health risk screening evaluations are subject to varying degrees and types of uncertainty. Aspects of data evaluation and COPC identification, exposure evaluation, toxicity evaluation, and the additive approach all contribute to uncertainties in the risk evaluation process. Each or all of these uncertainties may affect the evaluation results.

I-4.4.1 Data Evaluation and COPC Identification Process

A primary uncertainty associated with the COPC identification process is the possibility that a chemical may be inappropriately identified as a COPC when it is actually not a COPC or that a chemical may not be identified as a COPC when it actually should be identified as a COPC. Inorganic chemicals are appropriately identified as COPCs because only those chemicals that are either detected or have detection limits above background are retained for further analysis. However, established BVs may not accurately represent certain subunits of the Bandelier Tuff (e.g., fractured, clay-rich material) that may be encountered during sampling, because such data not included in the background data set. There are no established BVs for organic chemicals; therefore, all detected organic chemicals are identified as COPCs and are retained for further analysis.

Other uncertainties associated with the inorganic chemicals and organic chemicals may include errors in sampling, laboratory analysis, and data analysis. However, because concentrations used in the risk screening evaluations are less than estimated quantitation limits, data evaluation uncertainties are expected to have little effect on the evaluation results. The J (estimated) qualification of detected concentrations of some organic COPCs does not affect the evaluation.

I-4.4.2 Exposure Evaluation

The current and reasonably foreseeable future land use for the Bayo Canyon Aggregate Area is recreational. To the degree that actual activity patterns may not be effectively represented by the activities assumed in a given scenario, uncertainties are introduced in the assessment and the evaluations presented here overestimate potential exposure and risk. However, if land use more closely fits the scenario, the assessment appropriately addresses potential human health risks.

A number of assumptions are made relative to exposure pathways, including input parameters, whether or not a given pathway is complete, the contaminated media to which an individual may be exposed, and intake rates for different routes of exposure. In the absence of site-specific data, the exposure assumptions used are consistent with default values (NMED 2006, 092513). When several upper-bound values (as are found in NMED 2006, 092513) are combined to estimate exposure for any one pathway, the resulting risk estimate can exceed the 99th percentile, and therefore can exceed the range of risk that may be reasonably expected.

Some uncertainty is introduced in the concentration aggregation of data for estimating the EPCs at the site. Risk from a single location or area with relatively high COPC concentrations may be underestimated by using a representative, sitewide value. The use of the 95% UCL is intended to provide a protective, upper-bound (i.e., conservative) COPC concentration and may lead to an overestimation of the concentration representative of average exposure to a COPC across the entire site. However, it is the intent of the 95% UCL to represent the reasonable maximum exposure for a receptor. The maximum detected concentration for the EPC also overestimates the exposure to contamination because receptors are not consistently exposed to the maximum detected concentration across the site.

Magnesium was identified as a COPC at Consolidated Unit 10-001(a)-99 and Consolidated Unit 10-002(a)-99 in Appendix H. However, concentrations within the depth intervals evaluated for potential risk were either less than the maximum background concentration [Consolidated Unit 10-001(a)-99] or less than twice the maximum background concentration [Consolidated Unit 10-002(a)-99]. Therefore, magnesium is not a COPC because it is detected slightly above the background and is an essential nutrient (EPA 1989, 008021), and it is not evaluated in the risk screening assessments.

The construction worker HIs for Consolidated Units 10-001(a)-99 and 10-002(a)-99 and SWMU 10-004(a) slightly exceed 1.0 [HIs = approximately 2 primarily as a result of manganese]. The manganese EPCs (240 mg/kg, 231 mg/kg, and 194 mg/kg, respectively) are similar to the manganese background concentrations [soil: 1100 mg/kg; tuff [Qbt 3,Qbt 4]: 752 mg/kg; tuff [Qbo]: 210 mg/kg (LANL 1998, 059730)] and exposure across the site is similar to background. The construction worker HIs without manganese are below 1.0 for all sites.

I-4.4.3 Toxicity Evaluation

1. **Extrapolation from animals to humans**. The slope factors (SFs) and reference doses (RfDs) are often determined by extrapolation from animal data to humans, which may result in uncertainties in toxicity values because differences exist in chemical absorption, metabolism, excretion, and toxic responses between animals and humans. Differences in body weight, surface area, and pharmacokinetic relationships between animals and humans are taken into account to address these uncertainties in the dose-response relationship; however, conservatism is usually incorporated in each of these steps, resulting in the overestimation of potential risk.
2. **Extrapolation from one route of exposure to another route of exposure.** The SFs and RfDs often contain extrapolations from one exposure route to another that result in additional conservatism in the risk calculations. The extrapolation from the oral route to the inhalation and/or the dermal route is used in the derivation of some screening values (NMED 2006, 092513). Differences between the two exposure pathways contribute to the uncertainty in the estimation of potential risk at this site.
3. **Individual variability in the human population.** For noncarcinogenic effects, the degree of variability in human physical characteristics is important both in determining the risks that can be expected at low exposures and in defining the no observed adverse effect level (NOAEL). The NOAEL uncertainty factor approach incorporates a 10-fold factor to reflect individual variability within the human population that can contribute to uncertainty in the risk evaluation; this factor of 10 is generally considered to result in a conservative estimate of risk to noncarcinogenic COPCs.
4. **Derivation of RfDs and SFs.** The RfDs and SFs for different chemicals are derived from experiments conducted by different laboratories that may have different accuracy and precision that could lead to an over- or underestimation of the risk. The uncertainty associated with the toxicity factors for noncarcinogens is measured by the uncertainty factor, the modifying factor, and the confidence level. For carcinogens, the weight of evidence classification indicates the likelihood that a contaminant is a human carcinogen. Toxicity values with high uncertainties may change as new information is evaluated.
5. **Chemical form of the COPC.** COPCs may be bound to the environment matrix and not available for absorption into the human body. However, it is assumed that the COPCs are bioavailable. This assumption can lead to an overestimation of the total risk.

The use of surrogates for some chemicals that do not have EPA-approved or provisional toxicity values also contributes to uncertainty in risk assessment. In this assessment, a surrogate was used to establish toxicity values for the following COPCs based on structural similarity (NMED 2003, 081172):

- benzo(g,h,i)perylene
- 4-isopropyltoluene

These COPCs did not contribute substantially to the HIs of the scenarios assessed.

I-4.4.4 Additive Approach

For noncarcinogens, the effects of exposure to multiple chemicals are generally unknown, and possible interactions could be synergistic or antagonistic, resulting in either an overestimation or underestimation of the potential risk. Additionally, RfDs used in the risk calculations typically are not based on the same endpoints with respect to severity, effects, or target organs. Therefore, the potential for noncarcinogenic effects may be overestimated for individual COPCs that act by different mechanisms and on different target organs but are addressed additively.

I-4.5 Interpretation

I-4.5.1 Consolidated Unit 10-001(a)-99

The total excess cancer risk for the recreational scenario of 8×10^{-13} is below the NMED target level of 1×10^{-5} (NMED 2006, 092513), and the HI of approximately 0.03 is less than NMED's target HI of 1.0 (NMED 2006, 092513). The total excess cancer risk for the construction worker scenario of approximately 1×10^{-6} is less than the NMED target level of 1×10^{-5} (NMED 2006, 092513), and the HI (approximately 2) is above the NMED's target HI of 1.0 (NMED 2006, 092513). However, based on the results of the uncertainty analysis (Section I-4.4.2, p. I-13), the construction worker scenario HI is less than NMED's target HI of 1.0 (NMED 2006, 092513). The cancer risk (approximately 3×10^{-6}) for the residential scenario is below the NMED target level of 1×10^{-5} (NMED 2006, 092513), and the HI of 0.8 is below NMED's target HI of 1.0 (NMED 2006, 092513).

The doses for the recreational, construction worker, and residential scenarios of 0.01, 0.2 , and 0.3 mrem/yr, respectively, are below the target dose of 15 mrem/yr (DOE 2000, 067489). The total doses are equivalent to total risks of 9×10^{-7} and 2×10^{-6} for the construction worker and residential scenarios, based on a comparison to EPA's outdoor worker and residential preliminary remediation goals (PRGs) for radionuclides (http://epa.prgs.ornl.gov/radionuclide), respectively. The total dose for the recreational scenario is equivalent to a total risk of 4×10^{-8}, based on conversion from dose using RESRAD 6.21.

The results of the human health screening assessments indicate no potential unacceptable risks/doses to human health for any of the scenarios.

I-4.5.2 Consolidated Unit 10-002(a)-99

There is no excess cancer risk for the recreational scenario, and the HI of approximately 0.04 is less than NMED's target HI of 1.0 (NMED 2006, 092513). The total excess cancer risk of approximately 2×10^{-6} for the construction worker scenario is below the NMED target level of 1×10^{-5} (NMED 2006, 092513), and the HI of approximately 2 is above the NMED's target HI of 1.0 (NMED 2006, 092513). However, based on the uncertainty analysis (Section I-4.4.2, p. I-13), the construction worker HI is less than NMED's target HI of 1.0 (NMED 2006, 092513). The total excess cancer risk of approximately 4×10^{-6} for the residential scenario is less than the NMED target level of 1×10^{-5} (NMED 2006, 092513), and the HI of approximately 0.6 is less than NMED's target HI of 1.0 (NMED 2006, 092513).

The doses for the recreational, construction worker, and residential scenarios of 0.2 and 0.6 mrem/yr, respectively, are below the target dose of 15 mrem/yr (DOE 2000, 067489) for the recreational and construction worker scenarios. The residential dose of 91 mrem/yr is above the target dose of 15 mrem/yr (DOE 2000, 067489). The total doses are equivalent to total risks of 3×10^{-6} and 1×10^{-4} for the construction worker and residential scenarios, based on a comparison to EPA's outdoor worker and residential PRGs for radionuclides (http://epa.prgs.ornl.gov/radionuclide), respectively. The total dose for the recreational scenario is equivalent to a total risk of 6×10^{-7}, based on conversion from dose using RESRAD 6.21.

The results of the human health screening assessments indicate no potential unacceptable risks/doses to human health under the recreational and construction worker scenarios. For the residential scenario there is potential unacceptable dose but no unacceptable risk from noncarcinogenic and carcinogenic COPCs.

I-4.5.3 SWMU 10-004(a)

There were no COPCs identified for the recreational scenario.

The total excess cancer risk for the construction worker scenario is 2×10^{-6}, which is below the NMED target level of 1×10^{-5} (NMED 2006, 092513), and the HI of approximately 2 is above NMED's target HI of 1.0. However, based on the uncertainty analysis (Section I-4.4.2, p. I-13), the construction worker HI is less than NMED's target HI of 1.0 (NMED 2006, 092513). The total excess cancer risk of approximately 2×10^{-6} for the residential scenario is less than the NMED target level of 1×10^{-5} (NMED 2006, 092513), and the HI of approximately 0.9 is less than NMED's target HI of 1.0 (NMED 2006, 092513).

The doses for the recreational, construction worker, and residential scenarios of 0.001, 0.005, and 0.7 mrem/yr, respectively, are below the target dose of 15 mrem/yr (DOE 2000, 067489). The total doses are equivalent to total risks of 2×10^{-8} and 1×10^{-6} for the construction worker and residential scenarios, based on a comparison to EPA's outdoor worker and residential PRGs for radionuclides (http://epa.prgs.ornl.gov/radionuclide), respectively. The total dose for the recreational scenario is equivalent to a total risk of 4×10^{-9}, based on conversion from dose using RESRAD 6.21.

The results of the human health screening assessments indicate no potential unacceptable risks/doses to human health for any of the scenarios.

I-4.5.4 AOCs 10-009 and C-10-001

There are no carcinogenic COPCs for the recreational scenario, and the HI of approximately 0.0002 is less than NMED's target HI of 1.0 (NMED 2006, 092513).

There are no carcinogenic COPCs for the construction worker scenario, and the HI of approximately 0.0005 is below the NMED's target HI of 1.0 (NMED 2006, 092513).

There are no carcinogenic COPCs for the residential scenario, and the HI of approximately 0.002 is less than NMED's target HI of 1.0 (NMED 2006, 092513).

The doses for the recreational, construction worker, and residential scenarios of 0.02, 0.09, and 13 mrem/yr, respectively, are below the target dose of 15 mrem/yr (DOE 2000, 067489). The total doses are equivalent to total risks of 5×10^{-7} and 2×10^{-5} for the construction worker and residential scenarios, based on a comparison to EPA's outdoor worker and residential PRGs for radionuclides (http://epa.prgs.ornl.gov/radionuclide), respectively. The total dose for the recreational scenario is equivalent to a total risk of 9×10^{-8}, based on conversion from dose using RESRAD 6.21.

The results of the human health screening assessments indicate no potential unacceptable risks/doses to human health for any of the scenarios.

I-5.0 ECOLOGICAL RISK SCREENING EVALUATIONS

I-5.1 Introduction

The approach for conducting ecological evaluations is described in the "Screening Level Ecological Risk Evaluation Methods, Revision 2" (LANL 2004, 087630). The evaluation consists of four parts: a scoping evaluation, a screening evaluation, an uncertainty analysis, and an interpretation of the results.

I-5.2 Scoping Evaluation

The scoping evaluation establishes the breadth and focus of the screening evaluation. The ecological scoping checklist (Attachment I-1) is a useful tool for organizing existing ecological information. The information was used to determine whether ecological receptors might be affected, to identify the types of receptors that might be present, and to develop the ecological conceptual site model for the Bayo Canyon Aggregate Area (Figure I-3.0-1 and Attachment I-1).

Ecological receptors for the Bayo Canyon Aggregate Area potentially may be exposed to contaminants in soil, sediment, and tuff. Common exposure routes include root uptake, food-web transport, soil ingestion, and inhalation. Groundwater is not a potential contaminant exposure pathway for ecological receptors because there are no documented springs in or near Bayo Canyon.

Bayo Canyon is situated between Kwage Mesa to the south and Otowi Mesa to the north, approximately 0.5 mi west of the Los Alamos County Sewage Treatment Plant, at an elevation of approximately 6000 to 6740 ft above sea level (Figure I-1.0-1). The canyon slopes to the southeast at an approximate 3% grade and is geographically isolated from the rest of the Laboratory. Dominant trees within Bayo Canyon include ponderosa pine, mainly along the canyon floor, and juniper, piñon, and gamble oak, mainly along canyon slopes, though there is some mixture of all throughout the canyon proper. Shrubs include chamisa, big sagebrush, salt bush, and chokeberry. Dominant forbs and grasses include bluegrass, mountain muhly, blue grama, pine dropseed, wormwood, false tarragon, tall lupine, and cinquefoil. The immediate areas in and around Bayo Canyon did not burn during the 2000 Cerro Grande fire, so the Bayo Canyon habitat is fairly mature and well established. The plant community is fairly mature and well established, and based on field observations there are no indications of adverse impacts on the vegetation (Attachment I-1).

The scoping portion of the evaluation indicated that terrestrial receptors were appropriate for evaluating the concentrations of contaminants for all sites within Bayo Canyon. The only threatened and endangered (T&E) species known to frequent the area is the Mexican spotted owl. The owl's primary habitat is densely forested canyons and it has not been observed to roost in Bayo Canyon; however, the owl may use the canyon and surrounding area as a foraging site (LANL 2001, 071060). The kestrel is used as a surrogate receptor for this assessment. Aquatic receptors were not evaluated because no permanent aquatic communities are present in the canyon. In summary, eight terrestrial receptors were evaluated representing several trophic levels and include

- a plant;
- soil dwelling invertebrates (represented by the earthworm);

- the deer mouse (mammalian omnivore);
- the montane shrew (mammalian insectivore);
- desert cottontail (mammalian herbivore);
- red fox (mammalian carnivore);
- American robin (avian insectivore, avian omnivore, and avian herbivore); and
- American kestrel (avian insectivore and avian carnivore [surrogate for T&E species]);

The rationale for using these receptors is presented in "Screening Level Ecological Risk Evaluation Methods, Revision 2" (LANL 2004, 087630).

I-5.3 Assessment Endpoints

An assessment endpoint is an explicit expression of the environmental value to be protected. The endpoints are ecologically relevant and help sustain the natural structure, function, and biodiversity of an ecosystem or its components (EPA 1998, 062809). In a screening-level ecological evaluation, receptors represent the populations and/or communities, and assessment endpoints are any adverse effects on the chosen ecological receptors. The purpose of the ecological evaluation is to protect populations and communities of biota rather than individual organisms, except for listed or candidate T&E species and treaty-protected species, when individuals must be protected (EPA 1999, 070086) because populations of protected species tend to be small and the loss of an individual adversely affects the species as a whole (EPA 1997, 059370).

In accordance with this guidance, the Laboratory has developed generic assessment endpoints (LANL 1999, 064137) to ensure that values at all levels of ecological organization are considered in the ecological screening process. These general assessment endpoints can be measured using impacts on reproduction, growth, and survival to represent categories of effects that may adversely impact populations. In addition, specific receptor species were chosen to represent each functional group. The receptor species were chosen because of their presence at the site, their sensitivity to the COPCs, and their potential for exposure to those COPCs. These categories of effects and the chosen receptor species were used to select the types of effects seen in toxicity studies considered in the development of the toxicity reference values (TRVs). Toxicity studies used in the development of TRVs included only studies in which the adverse effect evaluated affected reproduction, survival, and/or growth.

The selection of receptors and assessment endpoints is designed to be protective of both the representative species used as screening receptors and the other species within their feeding guilds and the overall food web for the terrestrial and aquatic ecosystems. Focusing the assessment endpoints on the general characteristics of species that affect populations (rather than the biochemical and behavioral changes that may affect only the studied species) also ensures the applicability to the ecosystem of concern.

I-5.4 Screening Evaluation

The ecological screening evaluation identifies chemicals of potential ecological concern (COPECs) and is based on the comparison of EPCs (95% UCLs, maximum detected concentrations, or maximum detection limits) to ecological screening levels (ESLs) in accordance with Laboratory guidance (LANL 2004, 087630). The EPCs used in the assessment are presented in Tables I-2.2-2, I-2.2-4, I-2.2-6 and I-2.2-9, for Consolidated Units 10-001(a)-99 and 10-002(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001, respectively. ESLs obtained from the ECORISK Database, Version 2.2 (LANL 2005, 090032) are presented in Table I-5.4-1. The ESLs are based on similar species and are derived from experimentally determined NOAELs, lowest observed adverse effect levels (LOAELs), or doses determined lethal to 50% of the test population. Information relevant to the calculation of ESLs, including concentration equations, dose equations, bioconcentration factors, transfer factors, and TRVs are presented in the ECORISK Database, Version 2.2 (LANL 2005, 090032).

The HQs calculated for each COPEC and screening receptor are the ratios of the EPC to the ESLs for each ecological receptor. The higher the contaminant levels relative to the ESLs, the higher the potential risk to receptors; conversely, the higher the ESLs relative to the contaminant levels, the lower the potential risk to receptors. The analysis begins with a comparison of the minimum ESL for each COPC to the EPC. HQs greater than 0.3 are used to identify COPECs requiring additional evaluation (LANL 2004, 087630). Individual HQs for a receptor are summed to derive an HI; an HI greater than 1.0 is an indication that further assessment may be needed to be sure that exposure to multiple COPECs at a site will not lead to potential adverse impacts to a given receptor population. COPCs without ESLs are retained as COPECs and evaluated further in the uncertainty section. The HQ and HI analysis is a conservative indication of potential adverse effects and is designed to minimize the potential of overlooking possible COPECs at the site.

I-5.4.1 Consolidated Unit 10-001(a)-99

The EPCs for Consolidated Unit 10-001(a)-99 are determined from samples collected between 0 and 5 ft bgs (Table I-2.2-2). The results of the comparison of the EPCs with the final (minimum) ESL are shown in Table I-5.4-2. Fourteen inorganic chemicals (antimony, barium, cadmium, chromium, copper, cyanide, lead, manganese, mercury, selenium, silver, thallium, vanadium, and zinc) and benzoic acid had HQs greater than 0.3 and were retained as COPECs for further evaluation. Five inorganic chemicals, eight organic chemicals, and one radionuclide were eliminated from further evaluation because the minimum ESL analysis indicated that HQs were less than 0.3.

Potential ecological risks associated with aluminum in soil are based on soil pH. Aluminum is retained as a COPEC only in soil with a pH lower than 5.5, in accordance with EPA guidance (EPA 2003, 085645). Aluminum was eliminated as a COPEC and not evaluated further because the average soil pH in the Bayo Canyon Aggregate Area is 7.2.

Magnesium, molybdenum, perchlorate, 1,2-dichlorobenzene, 1,3-dichlorobenzene, diethylphthalate, ethylbenzene, 4-isopropyltoluene, 1,1,2-trichloro-1,2,2-trifluoroethane, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene do not have ESLs and were retained as COPECs. They are discussed further in the uncertainty analysis.

An HQ for each retained COPEC/receptor combination was calculated and summed to obtain an HI for each receptor. The HI is the sum of HQs for chemicals with common toxicological endpoints for a given receptor. It is assumed for the purposes of ecological screening, that nonradionuclides have common toxicological effects and that HQs may be added. The HI analysis for Consolidated Unit 10-001(a)-99 provides a clearer picture of potential adverse impacts by determining how many receptors may be affected. The kestrel (intermediate carnivore), robin, deer mouse, shrew, earthworm, and plant have HIs greater than 1.0. The kestrel (top carnivore), cottontail, and red fox have HIs less than 1.0. There is no potential ecological risk for the Mexican spotted owl because its surrogate receptor, the kestrel (top carnivore), has an HI less than 1.0. The results of the HQ/HI analysis are presented in Table I-5.4-3.

I-5.4.2 Consolidated Unit 10-002(a)-99

The EPCs for Consolidated Unit 10-002(a)-99 are determined from samples collected between 0 and 6.7 ft bgs (Table I-2.2-4). Results of the comparison of the EPCs with the final (minimum) ESL are shown in Table I-5.4-4. Twelve inorganic chemicals (antimony, barium, cadmium, copper, cyanide, lead, manganese, mercury, selenium, thallium, vanadium, and zinc), bis(2-ethylhexyl)phthalate, and di-n-butyl phthalate had HQs greater than 0.3 and were retained as COPECs for further evaluation. Four inorganic chemicals, two organic chemicals, and one radionuclide were eliminated from further evaluation because the minimum ESL analysis indicated that HQs for all receptors were less than 0.3.

Potential ecological risks associated with aluminum in soil are based on soil pH. Aluminum is retained as a COPEC only in soil with a pH lower than 5.5, in accordance with EPA guidance (EPA 2003, 085645). Aluminum was eliminated as a COPEC and not evaluated further because the average soil pH in the Bayo Canyon Aggregate Area is 7.2.

Iron, magnesium, and diethylphthalate do not have ESLs and were retained as COPECs. They are discussed further in the uncertainty analysis.

The HQ/HI analysis for the retained COPECs for Consolidated Unit 10-002(a)-99 indicates that all receptors, except the cottontail and the fox, have HIs greater than 1.0. The HQ/HI analysis results are presented in Table I-5.4-5.

I-5.4.3 SWMU 10-004(a)

The EPCs for SWMU 10-004(a) are determined from samples collected between 0 and 4 ft bgs (Table I-2.2-6). The results of the comparison of the EPCs with the final (minimum) ESL are shown in Table I-5.4-6. Four inorganic chemicals (antimony, cyanide, silver, and thallium) had HQs greater than 0.3 and were retained as COPECs for further evaluation. One inorganic chemical, two organic chemicals, and one radionuclide were eliminated from further evaluation because the minimum ESL analysis indicated that HQs for all receptors were less than 0.3. Molybdenum does not have an ESL and was retained as a COPEC for further discussion in the uncertainty analysis.

The HQ/HI analysis for the retained COPECs for SWMU 10-004(a) indicates that the deer mouse, cottontail, shrew, robin, and plant have HIs greater than 1.0. The HIs were less than 1.0 for the kestrel, earthworm, and red fox. There is no potential ecological risk for the Mexican spotted owl because its surrogate receptor, the kestrel (top carnivore), has an HI less than 1.0. The HQ/HI analysis results are presented in Table I-5.4-7.

I-5.4.4 AOCs 10-009 and C-10-001

The EPCs for AOC 10-009 are determined from samples collected between 0 and 6 ft bgs (Table I-2.2-9). The results of the comparison of the EPCs with the final (minimum) ESL are shown in Table I-5.4-8. One inorganic chemical (cyanide) had an HQ greater than 0.3 and was retained as a COPEC for further evaluation. One organic chemical and one radionuclide were eliminated from further evaluation because the minimum ESL analysis indicated that HQs for all receptors were less than 0.3. Molybdenum does not have an ESL and was retained as a COPEC for further discussion in the uncertainty analysis.

The HQ/HI analysis for the retained COPECs for AOC 10-009 indicates that the robin has HIs greater than 1.0. The HIs were less than 1.0 for the kestrel, deer mouse, cottontail, earthworm, plant, shrew, and red fox. There is no potential ecological risk for the Mexican spotted owl because its surrogate receptor, the kestrel (top carnivore), has an HI less than 1.0. The HQ/HI analysis results are presented in Table I-5.4-9.

I-5.5 Uncertainty Analysis

The uncertainty analysis describes the key sources of uncertainty related to the screening evaluations. This analysis can result in either adding or removing chemicals from the list of COPECs. The following is a qualitative uncertainty analysis of the issues relevant to evaluating potential ecological risk at each site.

I-5.5.1 Chemical Form

The assumptions used in the ESL derivations are conservative and not necessarily representative of actual conditions. These assumptions include maximum chemical bioavailability, maximum receptor ingestion rates, minimum bodyweight, and additive effects of multiple COPECs. These factors tend to result in conservative ESL estimates, which may lead to an overestimation of the potential risk. The assumption of additive effects for multiple COPECs may result in an over- or underestimation of the potential risk to receptors.

The chemical form of the individual COPCs was not determined as part of the investigation. Toxicological data are typically based on the most toxic and bioavailable chemical species, which are not typically found in the environment. Inorganic, radionuclide, and organic COPECs are generally not 100% bioavailable to receptors in the natural environment due to interference from other natural processes, such as the adsorption of chemical constituents to matrix surfaces (e.g., soil) or rapid oxidation or reduction changes that render harmful chemical forms unavailable to biotic processes. The ESLs were calculated to ensure a conservative indication of potential risk (LANL 2004, 087630), and the values are biased toward overestimating the potential risk to receptors.

I-5.5.2 Exposure Assumptions

The EPCs used in the calculations of HQs are the 95% UCLs, the maximum detected concentration, or the maximum reported detection limit in the soil/fill/tuff to depths of 5 ft bgs for Consolidated Unit 10-001(a)-99, 6.7 ft bgs for Consolidated Unit 10-002(a)-99, 4 ft bgs for SWMU 10-004(a), and 6 ft bgs for AOC 10-009 and are conservative estimates of exposure to each COPC. The sampling efforts focused on areas of known contamination, and receptors were assumed to ingest 100% of their food and spend 100% of their time at the site. These assumptions regarding the exposure for terrestrial receptors in the Bayo Canyon Aggregate Area are likely to result in an overestimation of potential ecological exposure and risk.

I-5.5.3 Toxicity Values

The HQs were calculated using ESLs, which are based on NOAELs as threshold effect levels; actual risk for a given COPEC/receptor combination occurs at a higher level, somewhere between the NOAEL-based threshold and the threshold based on the LOAEL. The use of NOAELs leads to an overestimation of potential risk to ecological receptors. ESLs are based on laboratory studies requiring extrapolation to wildlife receptors. Laboratory studies are typically based on “artificial” and maintained populations with genetically similar individuals and are limited to single chemical exposures in isolated and controlled conditions using a single exposure pathway. Wild species are concomitantly exposed to a variety of chemical and environmental stressors, potentially rendering them more susceptible to chemical stress. On the other hand, wild populations are likely more genetically diverse than laboratory populations, making wild populations, as a whole, less sensitive to chemical exposure than laboratory populations. The uncertainties associated with the ESLs tend to lead to an overestimation of potential risk.

I-5.5-4 Background Concentration Comparisons

I-5.5-4.1 Consolidated Unit 10-001(a)-99

The ecological screening assessment for Consolidated Unit 10-001(a)-99 is based on the exposure of ecological receptors to contamination to a depth of 5 ft bgs. The EPCs for some of the inorganic COPECs are similar to background concentrations for soil and tuff, indicating that exposure to these inorganic chemicals across the site is similar to background (Table I-5.5-1). Antimony, barium, cadmium, chromium, copper, cyanide, lead, magnesium, manganese, mercury, selenium, silver, thallium, vanadium, and zinc are eliminated as COPECs because their EPCs are similar to background. Molybdenum and perchlorate are retained as COPECs because no background data are available.

I-5.5-4.2 Consolidated Unit 10-002(a)-99

The ecological screening assessment for Consolidated Unit 10-002(a)-99 is based on the exposure of ecological receptors to contamination to a depth of 6.7 ft bgs. The EPCs for some of the inorganic COPECs are similar to background concentrations for soil and tuff, indicating that receptor exposure to these inorganic chemicals across the site is similar to background (Table I-5.5-2). Antimony, barium, cadmium, chromium, copper, cyanide, lead, magnesium, manganese, mercury, selenium, thallium, vanadium, and zinc, are eliminated as COPECs because their EPCs are similar to background.

I-5.5-4.3 SWMU 10-004(a)

The ecological screening assessment is based on the exposure of ecological receptors to contamination to a depth of 4 ft bgs. The EPCs for some of the inorganic COPECs are similar to background concentrations for soil (no tuff present in the 0-4 ft depth) indicating that receptor exposure to these inorganic chemicals across the site is similar to background (Table I-5.5-3). Cyanide, silver, and thallium are eliminated as COPECs because their EPCs are similar to background. The EPC for antimony is above the soil background range and is retained. Molybdenum is retained as a COPEC because no background data are available.

I-5.5-4.4 AOCs 10-009 and C-10-001

The ecological screening assessment for AOCs 10-009 and C-10-001 is based on the exposure of ecological receptors to contamination to a depth of 6 ft bgs. Cyanide and molybdenum were the only inorganic COPECs identified. Cyanide is eliminated as a COPEC because its EPC is similar to background (Table I-5.5-4). Molybdenum is retained as a COPEC because no background data are available.

I-5.5-5 Area Use Factors

T&E species must be assessed on an individual, rather than a population, basis (EPA 1999, 070086). Area use factors (AUFs) are used to account for the amount of time that a single receptor is likely to spend within the contaminated areas based on the size of the receptor's home range (HR). The AUFs for Mexican spotted owl were developed by dividing the size of the site by the HR for that receptor. The carnivorous kestrel is used as a surrogate receptor for the Mexican spotted owl. The unadjusted HI (1.8) for the carnivorous kestrel is above 1.0 for Consolidated Unit 10-002(a)-99. The area for the consolidated unit is 0.61 ha and the HR for the Mexican spotted owl is 366 ha. Therefore, the AUF for the Mexican spotted owl for Consolidated Unit 10-002(a)-99 is 0.002. Application of the AUF for the Mexican spotted owl to the HQ for the carnivorous kestrel yields an adjusted HI less than 1.0 (0.004).

I-5.5.6 Population Area Use Factors

EPA guidance is to manage the ecological risk to populations rather than to individuals, with the exception of T&E species (EPA 1999, 070086). One approach to address the potential effects on populations is to estimate the spatial extent of the area inhabited by the local population that overlaps with the contaminated area. The population area for a receptor is based on the individual receptor HR and its dispersal distance. (Bowman et al. 2002, 073475) estimates that the median dispersal distance for mammals is 7 times the linear dimension of the HR, which is equivalent to the square root of the HR area. If only the dispersal distances for the mammals with HRs within the range of the screening receptors are used (Bowman et al. 2002, 073475), the median dispersal distance becomes 3.6 times the square root of the HR (R^2 = 0.91). If it is assumed that the receptors can disperse the same distance in any direction, the population area is circular and the dispersal distance is the radius of the circle. Therefore, the population area can be derived by $\pi(3.6\sqrt{HR})^2$ or approximately 40 HR.

Population area use factors (PAUFs) are estimated by dividing the area investigated by the estimated population area of each receptor population. The HQs are recalculated minus the COPECs eliminated based on similarity to background (Section I-5.5-4) and adjusted by multiplying by the PAUFs. If the PAUF is greater than 1, the HQ is not adjusted. The HQs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs. The adjusted HQs are summed for each receptor to calculate the adjusted HI.

I-5.5.6.1 Consolidated Unit 10-001(a)-99

The area of Consolidated Unit 10-001(a)-99 is approximately 154 ha. The adjusted HIs are less than 1.0 for all receptors. The PAUFs and adjusted HIs for Consolidated Unit 10-001(a)-99 are presented in Tables I-5.5-5 and I-5.5-6, respectively.

I-5.5.6.2 Consolidated Unit 10-002(a)-99

The area of Consolidated Unit 10-002(a)-99 is approximately 0.6 ha. The adjusted HIs for all receptors are less than 1.0. The PAUFs and adjusted HIs for Consolidated Unit 10-002(a)-99 are presented in Tables I-5.5-7 and I-5.5-8, respectively.

I-5.5.6.3 SWMU 10-004(a)

The area of SWMU 10-004(a) is approximately 0.06 ha. The adjusted HIs for all receptors, except the plant, are less than 1.0. The PAUFs and adjusted HIs are presented in Tables I-5.5-9 and I-5.5-10, respectively.

The plant HI is entirely due to antimony. The antimony was detected in only one sample and the EPC is the maximum detected concentration. There is no evidence of adverse impacts of contamination to the plant community based on field observations during site visits (Attachment I-1); the plant community is typical of the surrounding area and appears healthy.

I-5.5.6.4 AOCs 10-009 and C-10-001

All COPECs were eliminated based on similarity to background, except for molybdenum, which has no background data or ESLs (Section I-5.5-4).

I-5.5.7 Chemicals without ESLs

Several COPECs identified at the Bayo Canyon Aggregate Area do not have ESLs. Without ESLs, these chemicals cannot be assessed quantitatively for potential ecological risk. The organic COPECs without ESLs are 1,2-dichlorobenzene, 1,3-dichlorobenzene, diethylphthalate, ethylbenzene, 4-isopropyltoluene, 1,1,2-trichloro-1,2,2 trifluoroethane, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene. These COPECs were infrequently detected across the site; the number of detected concentrations ranged from one to six samples. The inorganic COPECs molybdenum and perchlorate have no background data. Molybdenum was detected in all samples in which it was analyzed, while perchlorate was detected only once.

In the absence of a chemical-specific ESL, COPEC concentrations can be compared to a surrogate chemical or to residential human health SSLs. Comparison to a surrogate ESL provides an estimate of potential effects of a chemically related compound and a line of evidence to indicate the likelihood that ecological receptors are potentially impacted. The comparison of COPEC concentrations to residential human health SSLs is a viable alternative for several reasons. The inference that humans and animals are similar, on average, in intrinsic susceptibility to chemicals and the fact that, in many cases, data from animals is used as surrogates for data from humans, is the basic premise of modern toxicology (EPA 1989, 008021). In addition, toxicity values derived for the calculation of human health SSLs are often based on potential effects that are more sensitive than the ones used to derive ESLs (e.g., cellular effects for humans versus survival or reproductive effects for terrestrial animals). The EPA also applies uncertainty factors or modifying factors to ensure that the toxicity values are protective (i.e., they are adjusted by uncertainty factors to values much lower than the study results). COPEC concentrations compared with these values are an order of magnitude or more below the SSLs, which corresponds to uncertainty factors of 10 or more. Therefore, it is assumed that the differences in toxicity would not be more than an order of magnitude for any given chemical. The relative difference between values provides a weight of evidence that the potential toxicity of the COPC is likely to be low or very low to the receptor(s).

I-5.5.7.1 Consolidated Unit 10-001(a)-99

No ESLs are available for molybdenum, perchlorate, 1,2-dichlorobenzene, 1,3-dichlorobenzene, diethylphthalate, ethylbenzene, 4-isopropyltoluene, 1,1,2-trichloro-1,2,2-trifluoroethane, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene.

Molybdenum was detected in 6 of 6 samples with a maximum detected concentration of 0.93 mg/kg. No background data are available for molybdenum. Molybdenum is naturally occurring and detected concentrations are likely natural and not from a release. Comparison of the maximum detected concentration with the NMED residential SSL of 392 mg/kg indicates that potential toxicity of molybdenum is very low. Therefore, molybdenum is not retained as a COPEC.

Perchlorate was detected in 1 of 49 samples collected at Consolidated Unit 10-001(a)-99 with a maximum detected concentration of 0.0023 mg/kg. There is no background data for perchlorate. Comparison of the maximum detected concentration to the EPA Region 6 residential SSL of 55 mg/kg indicates that potential toxicity of perchlorate is low. Because of the potential low toxicity and the infrequent detection, perchlorate is not retained as a COPEC.

Dichlorobenzene[1,2-] (1 sample) and 1,3-dichlorobenzene (2 samples) were reported with maximum detected concentrations of 0.00053 mg/kg and 0.0005 mg/kg, respectively. The minimum ESL for a structurally similar compound, 1,4-dichlorobenzene, is 0.88 mg/kg for the montane shrew, resulting in maximum HQs of less than 0.3. The residential SSL for 1,2-dichlorobenzene is a C_{sat} value and the noncarcinogenic residential SSL for 1,3-dichlorobenzene is 32.6 mg/kg, indicating low toxicity Because of the low HQs relative to a surrogate ESL and the infrequent detection, 1,2-dichlorobenzene and 1,3-dichlorobenzene are eliminated as COPECs.

Diethylphthalate was detected in 4 samples at a maximum detected concentration of 0.042 mg/kg. The minimum ESL for a structurally similar compound, bis(2-ethylhexyl)phthalate, is 0.033 mg/kg for the kestral (top carnivore), yielding a maximum HQ of approximately 1. The PAUF-adjusted HQ is less than 1.0 for the kestrel. The NMED residential SSL is 48,900 mg/kg, indicating that potential toxicity to diethylphthalate is very low. Because of the potential very low toxicity and the infrequent detection, diethylphthalate is eliminated as a COPEC.

Ethylbenzene was detected in 4 samples at a maximum detected concentration of 0.0005 mg/kg. The minimum ESL for a structurally similar compound, benzene, is 24 mg/kg for the deer mouse, yielding a maximum HQ of less than 0.3. The NMED residential SSL is 128 mg/kg, indicating that potential toxicity to ethylbenzene is very low. Because of the low potential toxicity and the infrequent detection, ethylbenzene is eliminated as a COPEC.

Isopropyltoluene[4-] was detected in 4 samples at a maximum detected concentration of 0.018 mg/kg. The minimum ESL for a structurally similar compound, toluene, is 23 mg/kg for the montane shrew, yielding a maximum HQ of less than 0.3, indicating that potential toxicity is low. The NMED residential SSL for another structurally related compound, isopropylbenzene, is 271 mg/kg, indicating that potential toxicity to 4-isopropyltoluene is low. Because of the potential low toxicity and the infrequent detection, 4-isopropyltoluene is eliminated as a COPEC.

The COPEC 1,1,2-trichloro-1,2,2-trifluoroethane was detected in 2 samples at a maximum detected concentration of 0.00085 mg/kg. The NMED residential SSL for 1,1,2-trichloro-1,2,2-trifluoroethane is a C_{sat} value (3280 mg/kg), indicating that potential toxicity is very low. Because of the potential low toxicity and the infrequent detection, 1,1,2-trichloro-1,2,2-trifluoroethane is eliminated as a COPEC.

Trimethylbenzene[1,2,4-] (2 samples) and 1,3,5-trimethylbenzene (1 sample) were reported with maximum detected concentrations of 0.00046 mg/kg and 0.00033 mg/kg, respectively. The minimum ESL for a structurally similar compound, benzene, is 24 mg/kg for the deer mouse, yielding maximum HQs of less than 0.3. The NMED residential SSL for 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene are 58 mg/kg and 24.8 mg/kg, respectively, indicating that the potential toxicities are low. Because of the potential low toxicity and the infrequent detection, 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene are eliminated as COPECs.

I-5.5.7.2 Consolidated Unit 10-002(a)-99

No ESLs are available for diethylphthalate.

Diethylphthalate was detected in 2 of 49 samples (4%) from 0 to 6.7 ft bgs at concentrations of 15 mg/kg and 26 mg/kg. The minimum ESL for a structurally similar compound, bis(2-ethylhexyl)phthalate, is 0.033 mg/kg for the kestral (top carnivore), yielding a maximum HQ of 477. The PAUF at Consolidated Unit 10-002(a)-99 for the kestrel is 0.0001 (Section I-5.5.6), which yields a maximum adjusted HQ of less than 1.0. The kestrel is also a surrogate for the Mexican spotted owl. The AUF for the Mexican spotted owl is 0.002 (Section I-5.5.5), which yields an adjusted HQ less than 1.0. The NMED residential SSL is

48,900 mg/kg, indicating that potential toxicity to diethylphthalate is very low. Because of the low adjusted HQs using surrogate ESLs, and the infrequent detection, diethylphthalate is eliminated as a COPEC.

I-5.5.7.3 SWMU 10-004(a)

No ESLs are available for molybdenum.

Molybdenum was detected in 1 sample with a maximum concentration of 0.39 mg/kg. No background data are available for molybdenum. Molybdenum is naturally occurring, and a comparison of the maximum detected concentration with the NMED residential SSL of 392 mg/kg indicates that potential toxicity to molybdenum is very low. Therefore, molybdenum is not retained as COPEC.

I-5.5.7.4 AOCs 10-009 and C-10-001

No ESLs are available for molybdenum.

Molybdenum was detected in 3 samples with a maximum concentration of 0.55 mg/kg. No BV is available for molybdenum. Molybdenum is naturally occurring, and a comparison of the maximum detected concentration with the NMED residential SSL of 392 mg/kg indicates that potential toxicity to molybdenum is very low. Therefore, molybdenum is not retained as COPEC.

I-5.6 Interpretation

I-5.6.1 Receptor Lines of Evidence

Based on the ecological screening assessments, several COPECs (including COPECs without ESLs) were identified at the Bayo Canyon Aggregate Area sites (Tables I-5.4.2, I-5.4-4, I-5.4-6, and I-5.4.8). Receptors were evaluated using the several lines of evidence: minimum ESL comparisons, HI analyses, comparison to background, potential effects to populations (individuals for T&E species), the relative toxicity of related compounds, and the infrequency of detection.

I-5.6.1.1 Kestrel (top carnivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the kestrel (top carnivore), were less than 0.3.
- The HI analyses indicated that HIs for the kestrel (top carnivore) were less than 1.0 for three of the four sites.
- Several COPECs were eliminated because they were similar to background.
- Consolidated Unit 10-002(a)-99 had an HI greater than 1.0 for the kestrel (top carnivore). The HI was adjusted by the PAUF, which is the ratio of the site area to the kestrel's population area. The adjusted HI is less than 1.0 for the kestrel (top carnivore).
- The kestrel (top carnivore) is a surrogate for the Mexican spotted owl. The HI was adjusted by the AUF for individuals, which is the ratio of the site area to the owl's home range. The adjusted HI is less than 1.0.

These lines of evidence support the conclusion that there is no potential ecological risk to the kestrel (top carnivore) or the Mexican spotted owl at the Bayo Canyon Aggregate Area.

I-5.6.1.2 Kestrel (intermediate carnivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the kestrel, were less than 0.3.
- The HI analyses indicated that HIs for the kestrel (intermediate carnivore) were less than 1.0 for three of the four sites.
- Several COPECs were eliminated because they were similar to background.
- Consolidated Unit 10-002(a)-99 had an HI greater than 1.0 for the kestrel (intermediate carnivore). The HI was adjusted by the PAUF, which is the ratio of the site area to the kestrel's population area. The adjusted HI was less than 1.0 for the kestrel (intermediate carnivore).

These lines of evidence support the conclusion that there is no potential ecological risk to the kestrel (intermediate carnivore) at the Bayo Canyon Aggregate Area.

I-5.6.1.3 Robin (herbivore; insectivore; omnivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the robin, were less than 0.3.
- The HI analyses indicated that HIs for the robin (all feeding guilds) were less than 1.0 for one of the four sites.
- Several COPECs were eliminated because they were similar to background reducing the HI to below 1.0 for all but one site.
- Consolidated Unit 10-002(a)-99 had HIs greater than 1.0 for the robin (all feeding guilds). The HIs were adjusted by the PAUF, which is the ratio of the site area to the robin's population area. The adjusted HIs were less than 1.0 for the robin (all feeding guilds).

These lines of evidence support the conclusion that no potential ecological risk to the robin (all feeding guilds) exists at the Bayo Canyon Aggregate Area.

I-5.6.1.4 Deer Mouse (omnivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the deer mouse, were less than 0.3.
- The HI analyses indicated that HIs for the deer mouse were less than 1.0 for one of the four sites.
- Several COPECs were eliminated because they were similar to background.
- Three sites [Consolidated Units 10-001(a)-99) and 10-002(a)-99), and SWMU 10-004(a)] had HIs greater than 1.0 for the deer mouse. The HIs were adjusted by the PAUF, which is the ratio of the site area to the deer mouse's population area. The adjusted HIs were less than 1.0 for the deer mouse at all sites.

These lines of evidence support the conclusion that no potential ecological risk to the deer mouse exists at the Bayo Canyon Aggregate Area.

I-5.6.1.5 Desert Cottontail (herbivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the cottontail, were less than 0.3.
- The HI analyses indicated that HIs for the cottontail were less than 1.0 for one of the four sites.
- Several COPECs were eliminated because they were similar to background.
- Three sites [Consolidated Units 10-001(a)-99) and 10-002(a)-99), and SWMU 10-004(a)] had HIs greater than 1.0 for the cottontail. The HIs were adjusted by the PAUF, which is the ratio of the site area to the cottontail's population area. The adjusted HIs were less than 1.0 for the cottontail at all sites.

These lines of evidence support the conclusion no potential ecological risk to the cottontail exists at the Bayo Canyon Aggregate Area.

I-5.6.1.6 Montane Shrew (insectivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the shrew, were less than 0.3.
- The HI analyses indicated that HIs for the shrew were less than 1.0 for one of the four sites.
- Several COPECs were eliminated because they were similar to background. This reduced the HI to below 1.0 for all but one site.
- Three sites [Consolidated Units 10-001(a)-99) and 10-002(a)-99), and SWMU 10-004(a)] had HIs greater than 1.0 for the shrew. The HIs were adjusted by the PAUF, which is the ratio of the site area to the shrew's population area. The adjusted HIs were less than 1.0 for the shrew at all sites.

These lines of evidence support the conclusion no potential ecological risk to the shrew exists at the Bayo Canyon Aggregate Area.

I-5.6.1.7 Red Fox (carnivore)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the fox, were less than 0.3.
- The HI analyses indicated that HIs for the fox were less than 1.0 for all sites.

These lines of evidence support the conclusion that no potential ecological risk to the fox exists at the Bayo Canyon Aggregate Area.

I-5.6.1.8 Earthworm (invertebrate)

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the earthworm, were less than 0.3.
- The HI analyses indicated that HIs for the earthworm were less than 1.0 for two of the four sites.
- Several COPECs were eliminated because they were similar to background. This reduced the HI to below 1.0 for all sites.

These lines of evidence support the conclusion that no potential ecological risk to the fox exists at the Bayo Canyon Aggregate Area.

I-5.6.1.9 Plant

- Initial screening using the minimum ESLs eliminated a number of COPECs because the HQs for all of the receptors, including the plant, were less than 0.3.
- The HI analyses indicated that HIs for the plant were less than 1.0 for one of the four sites.
- Several COPECs were eliminated because they were similar to background reducing the HI to below 1.0 for all but one of the sites.
- The plant HI at SWMU 10-004(a) is entirely from antimony. The antimony EPC is the maximum detected concentration and antimony was not detected in any other samples at the site. There is no evidence of adverse impacts of contamination to the plant community based on field observations during site visits (Attachment I-1); the plant community is typical of the surrounding area and appears healthy.

These lines of evidence support the conclusion that no potential ecological risk to the plant exists at the Bayo Canyon Aggregate Area.

I-5.6.1.10 COPECs with No ESLs

COPECs with no ESLs were not evaluated for each receptor. If a surrogate chemical could be identified, the minimum ESL was used to screen the COPEC. If a residential SSL was available, it was used to estimate potential toxicity. All but one COPEC were eliminated based on these comparisons and infrequency of detection. Diethylphthalate concentrations in Consolidated Units 10-001(a)-99 and 10-002(a)-99 were compared to the minimum ESL for a structurally similar compound, bis(2-ethylhexyl)phthalate, which is 0.033 mg/kg for the kestral (top carnivore), yielding HQs greater than 1. The PAUF-adjusted HQs are less than 1.0 for the kestrel.

The analysis of COPECs with no ESLs supports the conclusion that there is no potential ecological risk to any receptor at the Bayo Canyon Aggregate Area.

I-5.6.2 Summary

No potential ecological risk was found for any receptor following evaluations based on minimum ESL, HI analyses, comparisons to background, potential effects to populations (individuals for T&E species), the relative toxicity of related compounds, and the infrequency of detection. These lines of evidence, discussed above for each receptor, and the analysis of COPECs with no ESLs support the conclusion that there is no potential ecological risk within the Bayo Canyon Aggregate Area.

I-6.0 Conclusions

I-6.1 Human Health

The estimated total excess cancer risks from chemical exposures were below the NMED target level of 1×10^{-5} (NMED 2006, 092513) for the recreational, construction worker, and residential scenarios at all sites within the Bayo Canyon Aggregate Area.

The HIs for the recreational and residential scenarios were less than the NMED target HI of 1.0 (NMED 2006, 092513) for all sites. Consolidated Units 10-001(a)-99 and 10-002-(a)-99 and SWMU 10-004(a) had HIs greater than the NMED target HI of 1.0 (NMED 2006, 092513) for the construction worker scenario. The HIs for the construction worker at these sites are approximately 2 primarily because of manganese. The EPCs for manganese are similar to background, indicating that exposures are similar to background. The HIs without manganese are below 1.0, indicating no potential for unacceptable risk to the construction worker at any of the Bayo Canyon Aggregate Area sites.

The doses for the recreational and construction worker scenarios are below DOE's target dose of 15 mrem/yr at all four sites. The doses for a resident are below 15 mrem/yr at three of the sites, but the dose is 91 mrem/yr at Consolidated Unit 10-002(a)-99.

The radionuclide EPCs were also used to estimate the total risk, using EPA outdoor worker and residential radionuclide PRGs (http://epa-orgs.ornl.gov/cgi-bin/radionuclides/rprg_search) for the construction worker and residential scenarios, respectively. The total risks from radionuclides under the construction worker scenario are 9×10^{-7}, 3×10^{-6}, 2×10^{-8}, and 5×10^{-7} for Consolidated Units 10-001(a)-99 and 10-002-(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001, respectively. The total risks from radionuclides for the residential scenario are 2×10^{-6}, 1×10^{-4}, 1×10^{-6}, and 2×10^{-5}, for Consolidated Units 10-001(a)-99 and 10-002-(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001, respectively. The total risks for the recreational scenario was based on a conversion using RESRAD 6.21. The total risks from radionuclides under the recreational scenario are 4×10^{-8}, 6×10^{-7}, 4×10^{-9}, and 9×10^{-8} for Consolidated Units 10-001(a)-99 and 10-002-(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001, respectively.

The assessment of radionuclides indicates that there is no potential for unacceptable doses for the recreational and construction worker scenarios at all sites and for the residential scenario at Consolidated Unit 10-001(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001 . The dose for the residential scenario is above 15 mrem/yr at Consolidated Unit 10-002(a)-99.

I-6.2 Ecology

No potential ecological risk was found for any receptor based on minimum ESL comparisons, HI analyses, comparisons to background, potential effects to populations (individuals for T&E species), the relative toxicity of related compounds, and the infrequency of detection. These lines of evidence, discussed above for each receptor guild, and the analysis of COPECs with no ESLs support the conclusion that no potential ecological risk exists at the Bayo Canyon Aggregate Area.

I-6.0 REFERENCES

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

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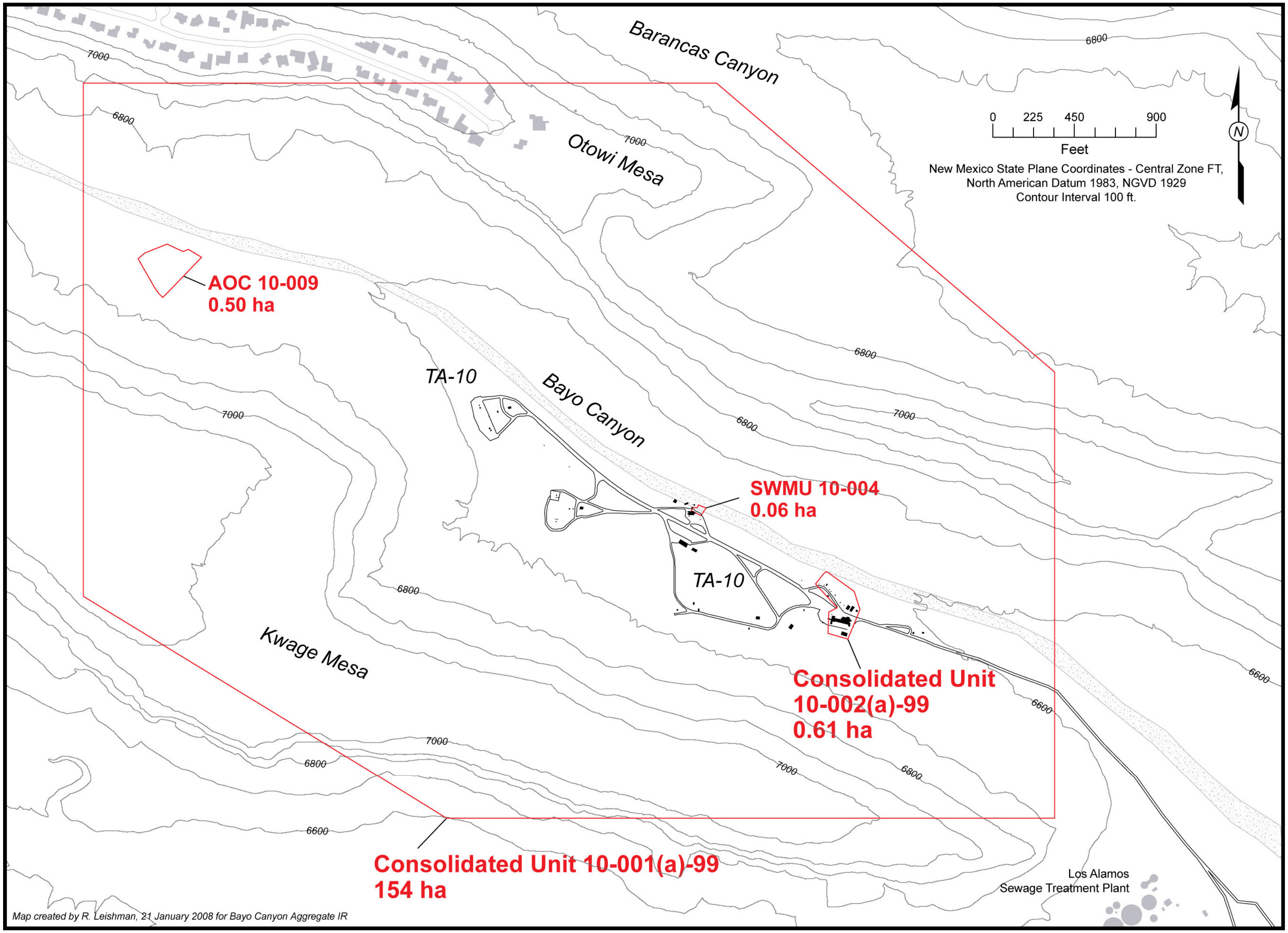


Figure I-1.0-1 Sites within the Bayo Canyon Aggregate Area

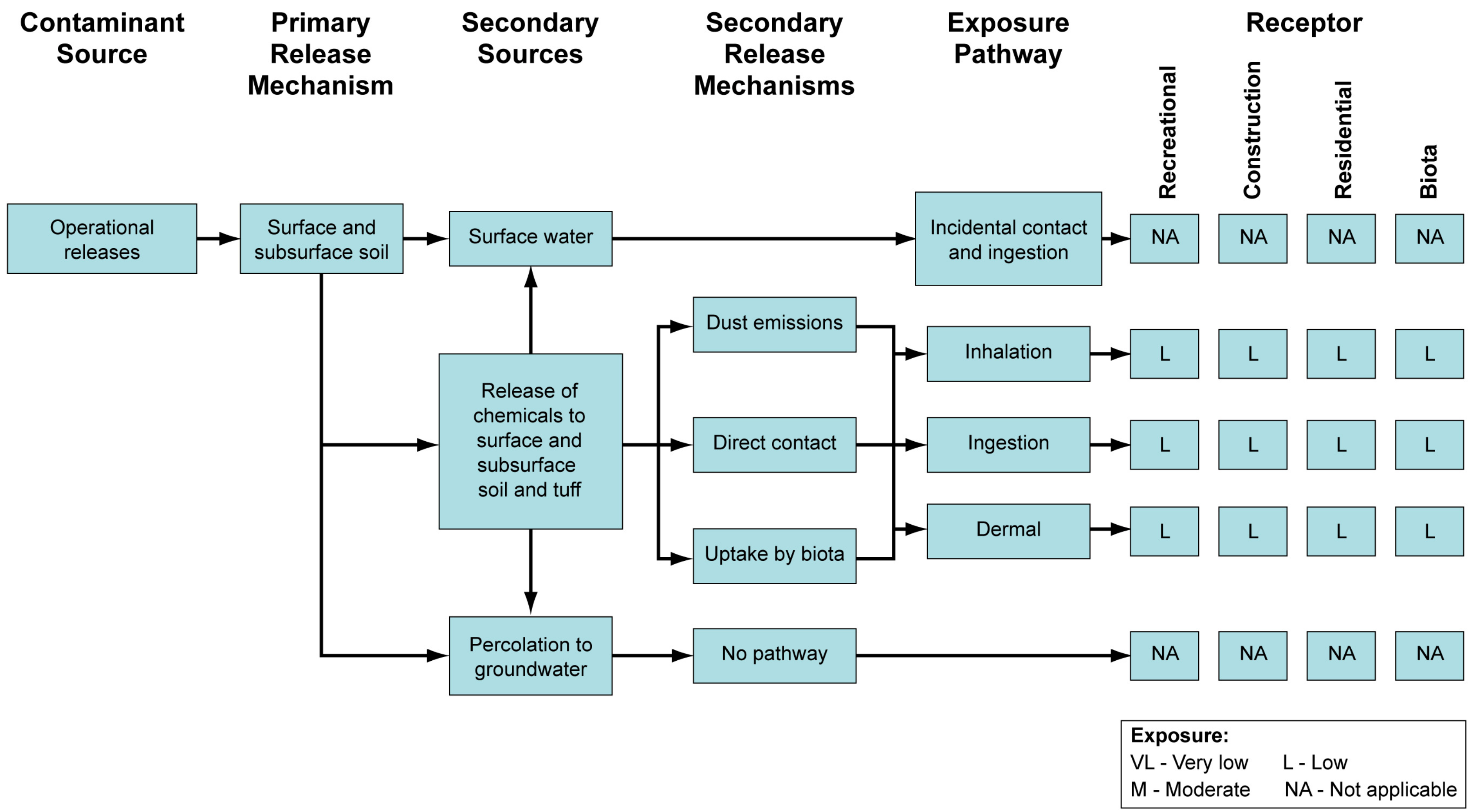


Figure I-3.0-1 Conceptual site model for Bayo Canyon Aggregate Area

Table I-2.2-1
Exposure Point Concentrations for Consolidated Unit 10-001(a)-99 for the Recreational Scenario (0–0.5 ft bgs depth)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC[a]	EPC Method
Inorganic Chemicals (mg/kg)							
Antimony	93	20	0.054	0.150	Normal	0.111	KM (t)
Cadmium	93	66	0.025	0.92	Nonparametric	0.423	KM (Chebyshev)
Copper	93	80	0.73	17.7	Approximate Gamma	3.959	KM (BCA)
Cyanide (total)	24	2	0.11	0.214	Nonparametric	0.214	Maximum detected concentration
Lead	93	69	1.4	28.3	Gamma	10.92	Approximate Gamma
Molybdenum	6	6	0.29	0.93	Normal	0.818	Students-t
Selenium	93	17	0.17	7.4	Nonparametric	0.484	KM (t)
Thallium	93	16	0.0479	1.4	Approximate Gamma	0.196	KM (t)
Uranium	85	74	1.09	8.1	Gamma	3.449	KM (BCA)
Zinc	93	88	8.2	79.3	Gamma	30.27	KM (BCA)
Organic Chemicals (mg/kg)							
Acetone	24	2	0.0046	0.012	Nonparametric	0.00856	KM (t)
Benzo(g,h,i)perylene	30	1	0.11	0.11	n/a[b]	0.11	Maximum detected concentration
Benzoic acid	30	1	0.733	0.733	n/a	0.733	Maximum detected concentration
Dichlorobenzene[1,3-]	54	1	0.00014	0.00014	n/a	0.00014	Maximum detected concentration
Dichlorobenzene[1,4-]	54	1	0.0002	0.0002	n/a	0.0002	Maximum detected concentration
Diethylphthalate	30	4	0.017	0.042	Normal	0.0374	KM (t)
Ethylbenzene	24	4	0.00027	0.0005	Normal	0.00047	KM (t)
Isopropyltoluene[4-]	24	3	0.00086	0.018	Normal	0.0036	KM (t)
Methylene chloride	24	1	0.0026	0.0026	n/a	0.0026	Maximum detected concentration
Pyrene	30	1	0.020	0.020	n/a	0.020	Maximum detected concentration
Toluene	24	15	0.00042	0.007	Lognormal	0.0021	KM (BCA)
Trichloroethane[1,1,1-]	24	2	0.00023	0.00082	Nonparametric	0.001	KM (t)
Xylene (total)	23	3	0.00093	0.0012	Normal	0.0012	Maximum detected concentration

Table I-2.2-1 (continued)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC[a]	EPC Method
Radionuclides (pCi/g)							
Urianium-238	10	10	0.897	2.34	Normal	1.78	Student's-t

[a] 95% UCLs from ProUCL 4.0 (EPA 2007, 096530).

[b] n/a = Not applicable.

Table I-2.2-2
Exposure Point Concentrations for Consolidated Unit 10-001(a)-99
for the Ecological Assessment (0–5 ft bgs depth) and the Residential/Construction Scenarios (0–5 ft bgs depth)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC[a]	EPC Method
Inorganic Chemicals (mg/kg)							
Aluminum	122	122	235	12600	Nonparametric	4773	Chebyshev (Mean, Sd)
Antimony	122	40	0.054	0.17	Gamma	0.103	KM (t)
Arsenic	122	101	0.36	3.7	Lognormal	1.217	KM (BCA)
Barium	120	120	3.7	276	Gamma	46.4	Approximate Gamma
Beryllium	122	101	0.15	2.3	Gamma	0.628	KM (BCA)
Cadmium	122	93	0.022	1.70	Nonparametric	0.397	KM (Chebyshev)
Chromium	122	96	0.38	11.5	Nonparametric	3.222	KM (BCA)
Cobalt	122	106	0.21	6.5	Gamma	1.831	KM (BCA)
Copper	122	100	0.407	17.7	Gamma	3.66	KM (BCA)
Cyanide (total)	49	4	0.082	0.214	Normal	0.176	KM (t)
Lead	120	120	1.4	28.3	Lognormal	10.32	H
Magnesium	122	122	85.9	2760	Approximate Gamma	844	Approximate Gamma
Manganese	121	121	71.7	520	Lognormal	240	Student's-t
Mercury	52	23	0.0081	0.0904	Approximate Gamma	0.0218	KM (t)
Molybdenum	13	13	0.19	0.97	Normal	0.688	Student's-t
Nickel	122	92	0.47	10.3	Gamma	3.11	KM (Percentile Bootstrap)
Perchlorate	49	1	0.0023	0.0023	n/a[b]	0.0023	Maximum detected concentration
Selenium	122	34	0.17	7.4	Nonparametric	0.514	KM (t)
Silver	121	48	0.022	0.13	Gamma	0.053	KM (t)
Thallium	122	30	0.0479	1.4	Lognormal	0.179	KM (t)
Uranium	90	78	1.09	8.1	Gamma	3.47	KM (BCA)

Table I-2.2-2 (continued)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC	EPC Method
Vanadium	122	117	1.1	19.7	Gamma	6.805	KM (BCA)
Zinc	122	112	8.2	79.3	Lognormal	29.29	KM (BCA)
Organic Chemicals (mg/kg)							
Acetone	51	4	0.0046	0.012	Normal	0.00636	KM (t)
Benzo(g,h,i)perylene	56	1	0.11	0.11	n/a	0.11	Maximum detected concentration
Benzoic acid	56	1	0.733	0.733	n/a	0.733	Maximum detected concentration
Dichlorobenzene[1,2-]	107	1	0.00053	0.00053	n/a	0.00053	Maximum detected concentration
Dichlorobenzene[1,3-]	107	2	0.00014	0.0005	Nonparameteric	0.0005	Maximum detected concentration
Dichlorobenzene[1,4-]	107	2	0.0002	0.00062	Nonparameteric	0.00062	Maximum detected concentration
Diethylphthalate	56	4	0.017	0.042	Normal	0.0372	KM (t)
Ethylbenzene	51	6	0.00027	0.0005	Normal	0.0004435	KM (t)
Isopropyltoluene[4-]	51	6	0.00031	0.018	Approximate Gamma	0.00185	KM (t)
Methylene chloride	24	1	0.0026	0.0026	n/a	0.0026	Maximum detected concentration
Pyrene	56	1	0.02	0.02	n/a	0.02	Maximum detected concentration
Toluene	51	26	0.00026	0.007	Nonparametric	0.00129	KM (t)
Trichloro-1,2,2-trifluoroethane[1,1,2-]	51	2	0.00062	0.00085	Nonparametric	0.00085	Maximum detected concentration
Trichloroethane[1,1,1-]	51	2	0.00023	0.00082	Nonparametric	0.00082	Maximum detected concentration
Trimethylbenzene[1,2,4-]	51	2	0.00038	0.00046	Nonparametric	0.0004002	KM (t)
Trimethylbenzene[1,3,5-]	51	1	0.00033	0.00033	n/a	0.00033	Maximum detected concentration
Xylene (total)	49	3	0.00093	0.0012	Normal	0.0012	Maximum detected concentration
Radionuclides (pCi/g)							
Uranium-238	20	20	0.897	2.34	Normal	1.626	Student's-t

Note: The residential and construction worker scenarios are evaluated for the 0–5 ft bgs interval because no samples were collected from 5–10 ft bgs.

[a] 95% UCLs from ProUCL 4.0 (EPA 2007, 096530).

[b] n/a = Not applicable.

Table I-2.2-3
Exposure Point Concentrations for Consolidated Unit 10-002(a)-99 for the Recreational Scenario (0–2.8 ft bgs depth)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC[a]	EPC Method
Inorganic Chemicals (mg/kg)							
Antimony	6	0	Not detected	Not detected	n/a[b]	3.4	Maximum detection limit
Cadmium	6	4	0.07	0.83	Normal	0.665	KM (t)
Cyanide (total)	3	1	0.223	0.52	n/a	0.2	Maximum detected concentration
Lead	6	5	5.8	23.9	Normal	16.08	KM (t)
Uranium	3	3	3.39	4.3	Normal	4.74	Student's t
Organic Chemicals (mg/kg)							
Di-n-butyl phthalate	5	1	0.0346	0.0346	n/a	0.0346	Maximum detected concentration
Xylene[1,3-]+xylene[1,4-]	1	1	0.00279	0.00279	n/a	0.00279	Maximum detected concentration
Radionuclides (pCi/g)							
Strontium-90	13	13	0.7	193	Lognormal	61.7	Chebyshev (MVUE)

[a] 95% UCLs from ProUCL 4.0 (EPA 2007, 096530).

[b] n/a = Not applicable.

Table I-2.2-4
Exposure Point Concentrations for Consolidated Unit 10-002(a)-99 for the Ecological Assessment (0–6.7 ft bgs depth)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC[a]	EPC Method
Inorganic Chemicals (mg/kg)							
Aluminum	55	55	743	7760	Normal	4184	Student's-t
Antimony	55	4	0.082	12.3	Gamma	1.126	KM (t)
Arsenic	55	41	0.39	11.5	Nonparametric	1.794	KM (BCA)
Barium	55	53	11.1	152	Gamma	51.54	KM (BCA)
Beryllium	55	49	0.21	1.6	Gamma	0.674	KM (BCA)
Cadmium	55	21	0.043	12.7	Nonparametric	0.929	KM (BCA)
Chromium	55	51	1.3	5.7	Normal	3.13	KM (t)
Copper	55	44	1	263	Nonparametric	19.4	KM (BCA)
Cyanide (total)	5	2	0.12	0.223	Nonparametric	0.223	Maximum detected concentration
Lead	55	54	2.7	23.9	Gamma	8.593	KM (BCA)
Magnesium	55	52	212	1480	Normal	840.6	KM (t)
Manganese	48	48	97	352	Normal	240.9	Student's-t
Mercury	20	3	0.104	0.56	Normal	0.0978	KM (t)
Nickel	55	42	1.5	7.7	Gamma	3.59	KM (Percentile Bootstrap)
Selenium	55	4	0.52	0.77	Normal	0.548	KM (t)
Thallium	55	3	0.13	0.185	Normal	0.17	KM (t)
Uranium	51	49	0.116	7.46	Gamma	3.324	KM (Chebyshev)
Vanadium	55	44	2	11.5	Normal	6.681	KM (t)
Zinc	55	54	8.8	51.1	Gamma	26.65	KM (BCA)

Table I-2.2-4 (continued)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC	EPC Method
Organic Chemicals (mg/kg)							
Bis(2-ethylhexyl)phthalate	49	2	0.025	0.028	Nonparametric	0.0273	KM (t)
Butylbenzylphthalate	49	1	0.09	0.09	n/a[b]	0.090	Maximum detected concentration
Diethylphthalate	49	2	15	26	Nonparametric	15.75	KM (t)
Di-n-butyl phthalate	49	3	0.0346	0.73	Normal	0.092	KM (t)
Xylene[1,3-]+xylene[1,4-]	1	1	0.000279	0.000279	n/a	0.000279	Maximum detected concentration
Radionuclides (pCi/g)							
Strontium-90	62	62	-0.706	340	Nonparametric	41.16	Chebyshev (Mean, Sd)

[a] 95% UCLs from ProUCL 4.0 (EPA 2007, 096530)

[b] n/a = Not applicable.

Table I-2.2-5
Exposure Point Concentrations for Consolidated Unit 10-002(a)-99
for the Residential/Construction Scenarios (0–10 ft bgs depth)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC[a]	EPC Method
Inorganic Chemicals (mg/kg)							
Aluminum	68	68	743	7760	Nonparametric	4558	Chebyshev (Mean, Sd)
Antimony	68	6	0.076	12.3	Nonparametric	1.634	KM (Chebyshev)
Arsenic	68	50	0.34	11.5	Nonparametric	1.598	KM (BCA)
Barium	68	66	11.1	152	Gamma	50.72	KM (BCA)
Beryllium	68	61	0.21	1.6	Nonparametric	0.728	KM (Chebyshev)
Cadmium	68	25	0.042	12.7	Nonparametric	1.288	KM (Chebyshev)
Chromium	68	61	1.3	20.6	Lognormal	4.311	KM (Chebyshev)
Copper	68	55	1	263	Nonparametric	25.21	KM (Chebyshev)
Cyanide (total)	9	2	0.12	0.223	Nonparametric	0.267	KM (t)
Lead	68	66	2.7	52.6	Nonparametric	11.53	KM (Chebyshev)
Magnesium	68	65	212	1480	Normal	815	KM (t)
Manganese	60	60	58.9	352	Normal	231	Student’s t
Mercury	27	4	0.0081	0.56	Gamma	0.0714	KM (t)
Molybdenum	3	3	0.46	0.7	Normal	0.7	Maximum detected concentration
Nickel	68	53	1	7.7	Gamma	3.361	KM (percentile bootstrap)
Perchlorate	9	1	0.0022	0.0022	n/a[b]	0.0022	Maximum detected concentration
Selenium	68	4	0.52	0.77	Normal	0.542	KM (t)
Thallium	68	5	0.078	0.74	Gamma	0.178	KM (t)
Uranium	60	58	0.116	11.7	Gamma	3.607	KM (Chebyshev)
Vanadium	68	53	2	11.5	Normal	6.41	KM (t)
Zinc	68	67	8.8	51.1	Gamma	25.99	KM (BCA)

Table I-2.2-5 (continued)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC	EPC Method
Organic Chemicals (mg/kg)							
Bis(2-ethylhexyl)phthalate	62	2	0.025	0.028	Nonparametric	0.0275	KM (t)
Butylbenzylphthalate	62	1	0.09	0.09	n/a	0.09	Maximum detected concentration
Diethylphthalate	62	2	15	26	Nonparametric	15.59	KM (t)
Di-n-butyl phthalate	62	3	0.0346	0.073	Normal	0.0797	KM (t)
Xylene[1,3-]+xylene[1,4-]	1	1	0.000279	0.000279	n/a	0.000279	Maximum detected concentration
Radionuclides (pCi/g)							
Strontium 90	75	75	-0.706	340	Nonparametric	34.5	Chebyshev (Mean, Sd)

[a] 95% UCLs from ProUCL 4.0 (EPA 2007, 096530).

[b] n/a = Not applicable.

Table I-2.2-6
Exposure Point Concentrations for SWMU 10-004(a) for the Ecological Assessment (0–4 ft bgs depth)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC[a]	EPC Method
Inorganic Chemicals (mg/kg)							
Antimony	6	1	13.7	13.7	n/a[b]	13.7	Maximum detected concentration
Cadmium	5	1	0.02	0.02	n/a	0.02	Maximum detected concentration
Cyanide (total)	1	0	Not detected	Not detected	n/a	0.52	Maximum detection limit
Molybdenum	1	1	0.39	0.39	n/a	0.39	Maximum detected concentration
Silver	6	3	0.021	1.1	Normal	0.669	KM (t)
Thallium	6	0	Not detected	Not detected	n/a	0.84	Maximum detection limit
Uranium	5	1	2.22	2.22	n/a	2.22	Maximum detected concentration
Organic Chemicals (mg/kg)							
Acetone	6	2	0.008	0.04	Nonparametric	0.04	KM (t)
Methylene chloride	6	2	0.003	0.004	Nonparametric	0.004	Maximum detected concentration
Radionuclides (pCi/g)							
Strontium 90	6	6	-0.42	0.78	Normal	0.371	Student's t

[a] 95% UCLs from ProUCL 4.0 (EPA 2007, 096530) .

[b] n/a = Not applicable.

Table I-2.2-7
Exposure Point Concentrations for SWMU 10-004(a) for the Residential/Construction Scenarios (0–11 ft bgs depth)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC[a]	EPC Method
Inorganic Chemicals (mg/kg)							
Antimony	7	1	13.7	13.7	n/a[b]	13.7	Maximum detected concentration
Arsenic	8	6	0.46	1	Normal	0.771	KM (t)
Cadmium	7	2	0.019	0.02	Nonparametric	0.02	Maximum detected concentration
Chromium	8	5	2	6.1	Normal	4.198	KM (t)
Cyanide (total)	2	0	Not detected	Not detected	n/a	0.52	Maximum detection limit
Iron	8	8	3310	6620	Normal	5326	Student's t
Manganese	8	8	107	242	Normal	194.1	Student's t
Molybdenum	2	2	0.39	0.55	n/a	0.550	Maximum detected concentration
Silver	8	4	0.021	1.1	Gamma	0.485	KM (t)
Thallium	8	0	Not detected	Not detected	n/a	0.84	Maximum detection limit
Uranium	6	1	2.22	2.22	n/a	2.22	Maximum detected concentration
Organic Chemicals (mg/kg)							
Acetone	8	4	0.003	0.04	Normal	0.196	KM (t)
Methylene chloride	8	3	0.003	0.0054	Normal	0.0047	KM (t)
Radionuclides (pCi/g)							
Strontium 90	8	8	-0.42	0.78	Normal	0.264	Student's t

[a] 95% UCLs from ProUCL 4.0 (EPA 2007, 096530).

[b] n/a = Not applicable.

Table I-2.2-8
Exposure Point Concentrations for AOCs 10-009 and C-10-001 for the Recreational Scenario (0–3 ft bgs depth)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC[a]	EPC Method
Inorganic Chemicals (mg/kg)							
Cyanide (total)	7	0	Not detected	Not detected	n/a[b]	0.53	Maximum detection limit
Molybdenum	2	2	0.4	0.55	n/a	0.55	Maximum detected concentration
Organic Chemicals (mg/kg)							
Toluene	7	2	0.0041	0.00052	Nonparametric	0.00057	KM (t)
Radionuclides (pCi/g)							
Strontium-90	9	9	-0.005	12.8	Nonparametric	8.575	Chebyshev (Mean, Sd)

[a] 95% UCLs from ProUCL 4.0 (EPA 2007, 096530).

[b] n/a = Not applicable.

Table I-2.2-9
Exposure Point Concentrations for AOCs 10-009 and C-10-001 for the Ecological Assessment (0–6 ft bgs depth)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC[a]	EPC Method
Inorganic Chemicals (mg/kg)							
Cyanide (total)	13	0	Not detected	Not detected	n/a[b]	0.53	Maximum detection limit
Molybdenum	3	3	0.4	0.55	Normal	0.55	Maximum detected concentration
Organic Chemicals (mg/kg)							
Toluene	13	4	0.0041	0.00079	Normal	0.00071	KM (t)
Radionuclides (pCi/g)							
Strontium-90	15	15	-0.11	12.8	Nonparametric	5.285	Chebyshev (Mean, Sd)

[a] 95% UCLs from ProUCL 4.0 (EPA 2007, 096530).

[b] n/a = Not applicable.

Table I-2.2-10
Exposure Point Concentrations for AOCs 10-009 and C-10-001 for the Residential/Construction Scenarios (0–10.2 ft bgs depth)

COPC	Number of Analyses	Number of Detects	Minimum Detected Concentration	Maximum Detected Concentration	Distribution	EPC[a]	EPC Method
Inorganic Chemicals (mg/kg)							
Cyanide (total)	14	0	Not detected	Not detected	n/a[b]	0.53	Maximum detection limit
Molybdenum	4	4	0.4	0.56	Normal	0.56	Maximum detected concentration
Organic Chemicals (mg/kg)							
Toluene	13	4	0.0041	0.00079	Normal	0.00071	KM (t)
Radionuclides (pCi/g)							
Strontium-90	16	16	-0.11	12.8	Nonparametric	4.964	Chebyshev (Mean, Sd)

[a] 95% UCLs from ProUCL 4.0 (EPA 2007, 096530) .

[b] n/a = Not applicable.

Table I-3.1-1
K_d Values for Inorganic and Radionuclide COPCs

COPC	K_d[a] (cm^3/g)
Aluminum	1500
Antimony	45
Arsenic	29
Barium	41
Beryllium	790
Cadmium	75
Chromium[b]	1800000
Cobalt	45
Copper	35
Cyanide (total)	9.9
Iron	25
Lead	900
Magnesium	4.5
Manganese	65
Mercury	52
Molybdenum	20d
Nickel	65
Perchlorate	2.80E-07[c]
Selenium	5
Silver	8.3
Thallium	71
Uranium	450[c]
Vanadium	1000
Zinc	62
Strontium-90	35[c]
Uranium-238	450[c]

[a] K_d values from NMED 2006, 092513, unless noted otherwise.
[b] K_d value for chromium(III) used because it is the predominant chromium species in soil.
[c] K_d value from http://rais.ornl.gov/, Chemical-specific factors, 2008.

Table I-3.1-2
Chemical Properties of Organic COPCs

COPC	Solubility[a] (mg/L)	K_{oc} (L/g)	Log K_{ow}[a] (unitless)	Vapor Pressure[a] (mm Hg)
Acetone	1.00E+06	1.98E-00	-2.40E-01	2.31E+02
Benzo(g,h,i)perylene	2.60E-04	2.68E+06	6.63E+00	1.00E-10
Benzoic acid	3.40E+03	1.45E+01	1.87E+00[b]	7.00E-04
Bis(2-ethylhexyl)phthalate	2.70E-01	1.65E+05	7.60E+00	1.42E-07
Butylbenzylphthalate	2.69E+00	9.63E+03	4.73E+00	8.25E-06
Dichlorobenzene [1,2-]	8.00E+01	4.43E+02	3.43E+00	1.47E+00
Dichlorobenzene [1,3-]	1.25E+02	4.34E+02	3.53E+00	2.15E+00
Dichlorobenzene [1,4-]	8.13E+01	4.34e+02	3.44E+00	1.74E+00
Diethylphthalate	1.08E+03	1.26E+02	2.42E+00	2.10E-03
Di-n-butylphthalate	1.12E+01	1.46E+03	4.50E+00	0.00E+00
Ethylbenzene	1.69E+02	5.18E+02	3.15E+00	9.60E+00
Isopropyltoluene[4-}	2.34E+01[b]	na[c]	4.10E+00[b]	1.46E+00[b]
Methylene chloride	1.30E+04	2.37E+01	1.25E+00	4.35E+02
Pyrene	1.35E-01	6.94E+04	4.88E+00	4.50E-06
Toluene	5.26E+02	2.68E+02	2.73E+00	2.84E+01
Trichloro-1,2,2-trifluoroethane[1,1,2-]	1.70E+02	2.25E+02	3.16E+00	3.63E+02
Trichloroethane[1,1,1-]	1.29E+03	4.86E+01	2.49E+00	1.24E+02
Trimethylbenzene [1,2,4-]	5.70E+01	7.18E+02	3.63E+00	2.10E+00
Trimethylbenzene [1,3,5-]	4.82E+01	7.03E+02	3.42E+00	2.10E+00
Xylene (total)	1.1E+02	4.43E+02	2.60E+00	7.99E+00
Xylene[1,3-]+ Xylene[1,4-]	1.1E+02	4.43E+02	2.60E+00	7.99E+00

[a] Value from http://rais.ornl.gov/, Chemical-specific factors, 2008, unless otherwise noted.
[b] Value from Chemfinder (http://www.chemfinder.cambridgesoft.com).
[c] na = not available.

Table I-4.1-1
Exposure Parameter Values Used to Calculate Chemical SSLs

Parameters	Units	Recreational	Residential	Construction Worker
Target HQ	unitless	1	1	1
Target cancer risk	unitless	10^{-5}	10^{-5}	10^{-5}
Averaging time (carcinogen)	days	25550	25550	25550
Averaging time (noncarcinogen)	days	2190	10950	365
Skin absorption factor - SVOCs	unitless	0.1	0.1	0.1
Skin absorption factor - other	unitless	Chemical-specific	Chemical-specific	Chemical-specific
Adherence factor–child	mg/cm	0.2	0.2	n/a[a]
Body weight–child	kg	31	15	n/a
Cancer slope factor–oral (chemical-specific)	$(mg/kg\text{-}day)^{-1}$	Chemical-specific	Chemical-specific	Chemical-specific
Cancer slope factor–inhalation (chemical-specific)	$(mg/kg\text{-}day)^{-1}$	Chemical-specific	Chemical-specific	Chemical-specific
Exposure frequency	day/yr	200	350	250
Exposure duration–child	years	6	6	n/a
Age-adjusted ingestion factor	mg/kg-day	22.6	114	n/a
Age-adjusted inhalation factor	m^3-yr/kg-day	0.8	11	n/a
Inhalation rate–child	m^3/day	1.2	10	n/a
Soil ingestion rate–child	mg/day	71.4	200	n/a
Particulate emission factor	m^3/kg	6.61×10^9	6.61×10^9	2.1×10^6
Reference dose–oral (chemical-specific)	(mg/kg-day)	Chemical-specific	Chemical-specific	Chemical-specific
Reference dose–inhalation (chemical-specific)	(mg/kg-day)	Chemical-specific	Chemical-specific	Chemical-specific
Exposed surface area–child	cm^2/day	3523	2800	n/a
Age-adjusted skin contact factor for carcinogens	mg-yr/kg-day	273.3	361	n/a
Volatilization factor for soil (chemical-specific)	(m^3/kg)	Chemical-specific	Chemical-specific	Chemical-specific
Body weight–adult	kg	70	70	70
Exposure duration[b]	yr	30	30	1
Adherence factor–adult	mg/cm^2	0.07	0.07 mg/cm^2	0.3
Soil ingestion rate–adult	mg/day	25.6	100	330
Exposed surface area–adult	cm^2/day	5700	5700	3300
Inhalation rate–adult	m^3/day	1.6	20	20

Note: Parameter values from NMED 2006, 092513.

[a] n/a = Not applicable.

[b] Exposure duration for lifetime resident is 30 yr. For carcinogens, the exposures are combined for child (6 yr) and adult (24 yr).

Table I-4.1-2
Parameters Used in the SAL Calculations for Radionuclides, Recreational

Parameters	Recreational, Child	Recreational, Adult
Inhalation rate (m^3/yr)	10,526[a]	14,035[b]
Mass loading (g/m^3)	1.5×10^{-7} [c]	1.5×10^{-7} [c]
Outdoor time fraction	0.0228[d]	0.0228[d]
Indoor time fraction	0	0
Soil ingestion (g/yr)	626[e]	225[f]

[a] Calculated as [1.2 m^3/hr x 200 hr/yr] / [indoor + outdoor time fractions], where 1.2 m^3/hr is the child inhalation rate for moderate activity (EPA 1997, 066596,Table 5-23).

[b] Calculated as [1.60 m^3/hr x 200 hr/yr] / [indoor + outdoor time fractions], where 1.6 m^3/day is the adult inhalation rate for moderate activity (EPA 1997, 066596,Table 5-23).

[c] Calculated as [1/ 6.6 x 10^{+9} m^3/kg) x 1000 g/kg, where 6.6 x 10^{+9} m^3/kg is the particulate emission factor (NMED 2006, 092513).

[d] Calculated as [1 hr/day x 200 day/yr] / 8766 hr/yr, where 1 hr/day is an estimate of the exposure time for a recreational adult or child (LANL 2005, 087800).

[e] Calculated as [(0.4 g/day x 5.6 hr/day) x 200 hr/yr] / [indoor + outdoor time fractions], where 5.6hr/day is the time spent out doors for a child (EPA 1997, 066598, Section 15.4.1), and where 0.4 g/day is the upper bound child soil-ingestion rate (EPA 1997, 066598, Table 4-23).

[f] Calculated as [(0.1 g/day x 3.9 hr/day) x 200 hr/yr] / [indoor + outdoor time fractions], where 3.9 hr/day is the time-weighted average for ages 12-44 (EPA 1997, 066598, Table 15-10), and where 0.1 g/day is the adult soil-ingestion rate (NMED 2006, 092513).

Table I-4.1-3
Parameters Used in the SAL Calculations for Radionuclides, Construction Worker

Parameters	Construction Worker, Adult
Inhalation rate (m^3/yr)	19,478[a]
Mass loading (g/m^3)	0.0004[b]
Outdoor time fraction	0.2567[c]
Indoor time fraction	0
Soil ingestion (g/yr)	321[d]

[a] Calculated as [20 m^3/day x 250 day/yr] / [indoor + outdoor time fractions], where 20 m^3/day is the daily inhalation rate of an adult and 250 days/yr is the exposure frequency (NMED 2006, 092513).

[b] Calculated as [1/ 2.1 x 10^{+6} m^3/kg] x 1000 g/kg, where 2.1 x 10^{+6} m^3/kg is the particulate emission factor (NMED 2006, 092513).

[c] Calculated as [9 hr/day x 250 day/yr] / 8766 hr/yr, where 9 hr/day is an estimate of the average length of the work day.

[d] Calculated as [0.33 g/day x 250 day/yr] / [indoor + outdoor time fractions], where 0.33 g/day is the adult soil ingestion rate (NMED 2006, 092513).

Table I-4.1-4
Parameters Used in the SAL Calculations for Radionuclides, Residential

Parameters	Residential, Child	Residential, Adult
Inhalation rate (m^3/yr)	3652.5[a]	7305[b]
Mass loading (g/m^3)	1.5×10^{-7} [c]	1.5×10^{-7} [c]
Outdoor time fraction	0.2236 [d]	0.0599 [e]
Indoor time fraction	0.7347 [f]	0.8984 [g]
Soil ingestion (g/yr)	73 [h]	36.5 [i]

[a] Calculated as [10 m^3/day x 350 day/yr] / [indoor + outdoor time fractions], where 10 m^3/day is the daily inhalation rate of a child (NMED 2006, 092513).

[b] Calculated as [20 m^3/day x 350 day/yr] / [indoor + outdoor time fractions], where 20 m^3/day is the daily inhalation rate of an adult (NMED 2006, 092513).

[c] Calculated as [1/ 6.6 x 10^{+9} m^3/kg) x 1000 g/kg, where 6.6 x 10^{+9} m^3/kg is the particulate emission factor (NMED 2006, 092513).

[d] Calculated as [5.6 hr/day x 350 day/yr] / 8766 hr/yr, where 5.6 hr/day is an estimate of time spent outdoors for a 3- to 11-yr-old child (EPA 1997, 066598, section 15.4-1).

[e] Calculated as [1.5 hr/day x 350 day/yr] / 8766 hr/yr, where 1.5 hr/day is an estimate of time spent outdoors for an adult 12 yr and older (EPA 1997, 066598, section 15.4-1).

[f] Calculated as [(24–5.6 hr/day x 350 day/yr] / 8766 hr/yr.

[g] Calculated as [(24–1.5 hr/day x 350 day/yr] / 8766 hr/yr.

[h] Calculated as [0.2 g/day x 350 day/yr] / [indoor + outdoor time fractions], where 0.2 g/day is the child soil-ingestion rate (NMED 2006, 092513).

[i] Calculated as [0.1 g/day x 350 day/yr] / [indoor + outdoor time fractions], where 0.1 g/day is the adult soil-ingestion rate (NMED 2006, 092513).

Table I-4.3-1
Comparison of Carcinogenic COPCs to SSLs
for the Recreational Scenario at Consolidated Unit 10-001(a)-99

COPC	EPC (mg/kg)	Recreational SSL* (mg/kg)	Carcinogenic Risk
Dichlorobenzene[1,4-]	0.0002	2.36E+03	8.49E-13
		Total Excess Cancer Risk	**8E-13**

* SSL from LANL 2007, 094496.

Table I-4.3-2
Comparison of Noncarcinogenic COPCs to SSLs
for the Recreational Scenario at Consolidated Unit 10-001(a)-99

COPC	EPC (mg/kg)	Recreational SSL[a] (mg/kg)	Hazard Quotient
Antimony	0.111	3.17E+02	3.50E-04
Cadmium	0.423	3.92E+02	1.08E-03
Copper	3.96	3.17E+04	1.25E-04
Cyanide (total)	0.214	7.97E+03	2.68E-05
Lead	10.92	5.60E+02	1.95E-02
Molybdenum	0.818	3.96E+03	2.07E-04
Selenium	0.484	3.96E+03	1.22E-04
Thallium	0.196	5.23E+01	3.75E-03
Uranium	3.449	2.38E+03	1.45E-03
Zinc	30.27	1.00E+05	3.03E-04
Acetone	0.0086	1.00E+05	8.56E-08
Benzo(g,h,i)perylene	0.11	2.38E+04	4.62E-06
Benzoic acid	0.733	1.00E+05	7.33E-06
Dichlorobenzene[1,3-]	0.00014	3.74E+01[b]	n/a[c]
Diethylphthalate	0.0374	1.00E+05	3.74E-07
Ethylbenzene	0.00047	1.28E+02[b]	n/a
Isopropyltoluene[4-]	0.0036	3.89E+02[b,d]	n/a
Methylene chloride	0.0026	2.63E+03[b]	n/a
Pyrene	0.02	2.38E+04	8.40E-07
Toluene	0.0021	2.52E+02[b]	n/a
Trichloroethane[1,1,1-]	0.00082	5.51E+02[b]	n/a
Xylene (total)	0.0012	8.20E+01[b]	n/a
		Hazard Index	**0.03**

[a] SSLs from LANL 2007, 094496.

[b] The SSL is a C_{sat} value.

[c] n/a = Not applicable. Refer to the forward risk calculations presented in Table I-4.3-7.

[d] SSL for Cumene (isopropylbenzene) used as surrogate, based on structural similarity.

Table I-4.3-3
Comparison of Carcinogenic COPCs to SSLs
for the Construction Worker Scenario at Consolidated Unit 10-001(a)-99

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	Carcinogenic Risk
Chromium	3.223	2.61E+01[b]	1.23E-06
Dichlorobenzene[1,4-]	0.0006	1.96E+03	3.06E-12
		Total Excess Cancer Risk	**1E-06**

[a] SSLs from NMED 2006, 092513.

[b] SSL for hexavalent chromium used.

Table I-4.3-4
Comparison of Noncarcinogenic COPCs to SSLs
for the Construction Worker Scenario at Consolidated Unit 10-001(a)-99

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	Hazard Quotient
Aluminum	4773	1.44E+04	3.31E-01
Antimony	0.103	1.24E+02	8.31E-04
Arsenic	1.217	8.52E+01	1.43E-02
Barium	46.39	6.02E+04	7.71E-04
Beryllium	0.628	5.62E+01	1.12E-02
Cadmium	0.397	1.54E+02	2.58E-03
Cobalt	1.822	6.10E+01	2.99E-02
Copper	3.66	1.24E+04	2.95E-04
Cyanide (total)	0.176	4.76E+03	3.70E-05
Lead	10.32	8.00E+02	1.29E-02
Manganese	240.3	1.50E+02	1.60E+00
Mercury	0.0218	9.27E+02	2.35E-05
Molybdenum	0.688	1.55E+03	4.44E-04
Nickel	3.122	6.19E+03	5.04E-04
Perchlorate	0.0023	7.9E+02[b]	2.89E-06
Selenium	0.514	1.55E+03	3.32E-04
Silver	0.053	1.55E+03	3.42E-05
Thallium	0.179	2.04E+01	8.77E-03
Uranium	3.452	2.00E+02[c]	1.73E-02
Vanadium	6.763	3.10E+02	2.18E-02
Zinc	29.36	9.29E+04	3.16E-04
Acetone	0.00636	9.85E+04	6.46E-08
Benzo(g,h,i)perylene	0.11	9.01E+03[d]	1.22E-05
Benzoic acid	0.733	1.0E+05[b]	7.33E-06
Dichlorobenzene[1,2-]	0.0005	3.74E+01	1.34E-05
Dichlorobenzene[1,3-]	0.0005	3.74E+01	1.34E-05
Diethylphthalate	0.0372	1.00E+05	3.72E-07
Ethylbenzene	0.000444	1.28E+02[e]	n/a[f]
Isopropyltoluene[4-]	0.00185	3.89E+02[e,g]	n/a
Methylene chloride	0.0026	2.63E+03[e]	n/a
Pyrene	0.02	9.01E+03	2.22E-06
Toluene	0.00129	2.52E+02[e]	n/a
Trichloro-1,2,2-trifluoroethane[1,1,2-]	0.00085	3.28E+03[e]	n/a
Trichloroethane[1,1,1-]	0.00082	5.63E+02[e]	n/a
Trimethylbenzene[1,2,4-]	0.0004	1.90E+02	2.11E-06

Table I-4.3-4 (continued)

COPCs	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	Hazard Quotient
Trimethylbenzene[1,3,5-]	0.0003	6.92E+01[e]	n/a
Xylene (total)	0.0012	8.20E+01[e]	n/a
		Hazard Index	**2.1**

[a] SSL from NMED 2006, 092513, unless noted otherwise.
[b] SSL from EPA Region 6, outdoor worker (EPA 2007, 095866).
[c] SSL from EPA Region 9, industrial (http://www.epa.gov/region09/waste/sfund/prg/)
[d] Pyrene used as surrogate, based on structural similarity (NMED 2006, 092513).
[e] The SSL is a C_{sat} value.
[f] n/a = Not applicable. Refer to the forward risk calculations presented in Table I-4.3-7.
[g] SSL for cumene (isopropylbenzene) used as a surrogate, based on structural similarity.

Table I-4.3-5
Comparison of Carcinogenic COPCs to SSLs
for the Residential Scenario at Consolidated Unit 10-001(a)-99

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	Carcinogenic Risk
Arsenic	1.217	3.9E+00	3.12E-06
Chromium	3.223	2.10E+03[b]	1.53E-08
Dichlorobenzene[1,4-]	0.0006	3.95E+01	1.52E-10
Methylene chloride	0.0026	1.82E+02	1.43E-10
		Total Excess Cancer Risk	**3E-06**

[a] SSL from NMED 2006, 092513, unless noted otherwise.
[b] SSL from EPA Region 6 (EPA 2007, 095866).

Table I-4.3-6
Comparison of Noncarcinogenic COPCs to SSLs
for the Residential Scenario at Consolidated Unit 10-001(a)-99

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	Hazard Quotient
Aluminum	4773	7.78E+04	6.13E-02
Antimony	0.103	3.13E+01	3.29E-03
Barium	46.39	1.56E+04	2.97E-03
Beryllium	0.628	1.56E+02	4.03E-03
Cadmium	0.397	3.90E+01	1.02E-02
Cobalt	1.822	1.52E+03	1.20E-03
Copper	3.66	3.13E+03	1.17E-03
Cyanide (total)	0.176	1.22E+03	1.44E-04
Lead	10.32	4.00E+02	2.58E-02
Manganese	240.3	3.59E+03	6.69E-02
Mercury	0.0218	2.3E+01[b]	9.48E-04
Molybdenum	0.688	3.91E+02	1.76E-03
Nickel	3.122	1.56E+03	2.00E-03
Perchlorate	0.0023	5.5E+01[b]	4.20E-05
Selenium	0.514	3.91E+02	1.31E-03
Silver	0.053	3.91E+02	1.36E-04
Thallium	0.179	5.16E+00	3.47E-02
Uranium	3.452	1.6E+01[c]	2.16E-01
Vanadium	6.763	7.82E+01	8.65E-02
Zinc	29.36	2.35E+04	1.25E-03
Acetone	0.00636	2.81E+04	2.26E-07
Benzo(g,h,i)perylene	0.11	2.29E+03[d]	4.80E-05
Benzoic acid	0.733	1.0E+05[b]	7.33E-06
Dichlorobenzene[1,2-]	0.0005	3.74E+01[e]	n/a[f]
Dichlorobenzene[1,3-]	0.0005	3.26E+01	1.53E-05
Diethylphthalate	0.0372	4.89E+04	2.26E-07
Ethylbenzene	0.000444	1.28E+02[e]	n/a
Isopropyltoluene[4-]	0.00185	2.71E+02[g]	6.83E-06
Pyrene	0.02	2.29E+03	8.73E-06
Toluene	0.00129	2.52E+02[e]	n/a
Trichloro-1,2,2-trifluoroethane[1,1,2-]	0.00085	3.28E+03[e]	n/a
Trichloroethane[1,1,1-]	0.00082	5.63E+02[e]	n/a
Trimethylbenzene[1,2,4-]	0.0004	5.80E+01	6.90E-06
Trimethylbenzene[1,3,5-]	0.0003	2.48E+01	1.21E-05

Table I-4.3-6 (continued)

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	Hazard Quotient
Xylene (total)	0.0012	8.20E+01[e]	n/a
		Hazard Index	**0.8**

[a] SSL from NMED 2006, 092513, unless noted otherwise.

[b] SSL from EPA Region 6, residential (EPA 2007, 095866).

[c] SSL from EPA Region 9, residential (http://www.epa.gov/region09/waste/sfund/prg/).

[d] Pyrene used as surrogate, based on structural similarity (NMED 2006, 092513).

[e] The SSL is a C_{sat} value.

[f] n/a = Not applicable. Refer to the forward risk calculations presented in Table I-4.3-7.

[g] SSL for cumene (isopropylbenzene) used as a surrogate based on structural similarity.

Table I-4.3-7
Consolidated Unit 10-001(a)-99 C_{sat} COPC Forward Risk Evaluation

Chemical	EPC (mg/kg)	RfD-Oral[a] (mg/kg-day)	RfD-Inhalation[a] (mg/kg-day)	SF-Oral[a] $(mg/kg\text{-}day)^{-1}$	SF-Inhalation[a] $(mg/kg\text{-}day)^{-1}$	HQ	Carcinogenic Risk
Recreational							
Dichlorobenzene[1,3-]	0.00014	3.00E-03	3.00E-03	n/a[b]	n/a	1.78E-07	n/a
Ethylbenzene	0.00047	1.00E-01	3.80E-05	n/a	n/a	3.72E-05	n/a
Isopropyltoluene[4-][c]	0.0036	1.00E-01	1.14E-01	n/a	n/a	4.59E-07	n/a
Methylene chloride	0.0026	6.00E-02	8.60E-01	7.50E-03	1.65E-03	6.0E-08	5.69E-12
Toluene	0.0021	8.00E-02	1.40E+00	n/a	n/a	3.92E-08	n/a
Trichloroethane[1,1,1-]	0.00082	2.80E-01	6.30E-01	n/a	n/a	4.50E-08	n/a
Xylene (total)	0.0012	2.00E-01	2.86E-02	n/a	n/a	1.52E-07	n/a
Construction Worker							
Ethylbenzene	0.00044	1.00E-01	3.80E-5	n/a	n/a	3.27E-04	n/a
Isopropyltoluene[4-][c]	0.0019	1.00E-01	1.14E-01	n/a	n/a	2.04E-06	n/a
Methylene chloride	0.0026	6.00E-02	8.60E-01	7.50E-03	1.65E-03	2.46E-07	2.99E-12
Toluene	0.0013	8.00E-02	1.40E+00	n/a	n/a	1.04E-07	n/a
Trichloro-1,2,2-trifluoroethane[1,1,2-]	0.00085	3.00E-01	2.00E-01	n/a	n/a	4.00E-07	n/a
Trichloroethane[1,1,1-]	0.00082	2.80E-01	6.30E-01	n/a	n/a	8.33E-08	n/a
Trimethylbenzene[1,3,5-]	0.0003	5.00E-02	1.70E-03	n/a	n/a	3.58E-06	n/a
Xylene (total)	0.0012	2.00E-01	2.86E-02	n/a	n/a	1.36E-06	n/a
Residential							
Dichlorobenzene[1,2-]	0.0005	9.00E-02	6.90E-03	n/a	n/a	5.63E-06	n/a
Ethylbenzene	0.00044	1.00E-01	3.80E-05	n/a	n/a	1.07E-03	n/a
Toluene	0.0013	8.00E-02	1.40E+00	n/a	n/a	3.11E-07	n/a
Trichloro-1,2,2-trifluoroethane[1,1,2-]	0.00085	3.00E-01	2.00E-01	n/a	n/a	2.72E-09	n/a
Trichloroethane[1,1,1-]	0.00082	2.80E-01	6.30E-01	n/a	n/a	2.79E-07	n/a
Xylene (total)	0.0012	2.00E-01	2.86E-02	n/a	n/a	4.46E-06	n/a

[a] Values from NMED 2006, 092513.

[b] n/a = Not applicable.

[c] Cumene (isopropylbenzene) used as a surrogate based on structural similarity.

Table I-4.3-8
Consolidated Unit 10-001(a)-99 Radionuclide Dose

Receptor	Radionuclides	EPC (pCi/g)	SAL* (pCi/g)	Dose (mrem/yr)
Recreational	Uranium-238	1.779	2.10E+03	0.01
Construction worker	Uranium-238	1.626	1.60E+02	0.21
Residential	Uranium-238	1.626	8.6E+01	0.3

* SALs from LANL 2005, 088493.

Table I-4.3-9
Comparison of Noncarcinogenic COPCs to SSLs
for the Recreational Scenario at Consolidated Unit 10-002(a)-99

COPC	EPC (mg/kg)	Recreational SSL[a] (mg/kg)	Hazard Quotient
Antimony	3.4	3.17E+02	1.07E-02
Cadmium	0.665	3.92E+02	1.70E-03
Cyanide (total)	0.223	7.97E+03	2.80E-05
Lead	16.08	5.60E+02	2.87E-02
Uranium	4.74	2.38E+03	1.99E-03
Di-n-butyl phthalate	0.0346	3.99E+04	8.67E-07
Xylene[1,3-]+Xylene[1,4-]	0.00279	8.20E+01[b]	n/a[c]
		Hazard Index	**0.04**

[a] SSLs from LANL 2007, 094496.

[b] The SSL is a C_{sat} value.

[c] n/a = Not applicable. Refer to the forward risk calculations presented in Table I-4.3-14.

Table I-4.3-10
Comparison of Carcinogenic COPCs to SSLs
for the Construction Worker Scenario at Consolidated Unit 10-002(a)-99

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	Carcinogenic Risk
Chromium	4.311	2.61E+01[b]	1.65E-06
		Total Excess Cancer Risk	**2E-06**

[a] SSLs from NMED 2006, 092513.

[b] SSL for hexavalent chromium used.

Table I-4.3-11
Comparison of Noncarcinogenic COPCs to SSLs for the Construction Worker Scenario at Consolidated Unit 10-002(a)-99

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	Hazard Quotient
Aluminum	4558	1.44E+04	3.17E-01
Antimony	1.634	1.24E+02	1.32E-02
Arsenic	1.598	8.52E+01	1.88E-02
Barium	50.72	6.02E+04	8.43E-04
Beryllium	0.728	5.62E+01	1.30E-02
Cadmium	1.288	1.54E+02	8.36E-03
Copper	25.21	1.24E+04	2.03E-03
Cyanide (total)	0.267	4.76E+03	5.61E-05
Lead	11.53	8.00E+02	1.44E-02
Manganese	231	1.50E+02	1.54E+00
Mercury	0.0714	9.27E+02	7.70E-05
Molybdenum	0.7	1.55E+03	4.52E-04
Nickel	3.361	6.19E+03	5.43E-04
Perchlorate	0.0022	7.9E+02[b]	2.77E-06
Selenium	0.542	1.55E+03	3.50E-04
Thallium	0.178	2.04E+01	8.73E-03
Uranium	3.607	2.00E+02[c]	1.80E-02
Vanadium	6.41	3.10E+02	2.07E-02
Zinc	25.99	9.29E+04	2.80E-04
Bis(2-ethylhexyl)phthalate	0.0005	4.66E+03	1.07E-07
Butylbenzylphthalate	0.0006	2.40E+02[d]	n/a[e]
Diethylphthalate	0.0372	1.00E+05	3.72E-07
Di-n-butyl phthalate	0.000444	2.33E+04	1.91E-08
Xylene (total)	0.0012	8.20E+01[d]	n/a
		Hazard Index	**2**

[a] SSL from NMED 2006, 092513, unless noted otherwise.
[b] SSL from EPA Region 6, outdoor worker (EPA 2007, 095866).
[c] SSL from EPA Region 9, industrial (http://www.epa.gov/region09/waste/sfund/prg/)
[d] The SSL is a C_{sat} value.
[e] n/a = Not applicable. Refer to the forward risk calculations presented in Table I-4.3-14.

Table I-4.3-12
Comparison of Carcinogenic COPCs to SSLs
for the Residential Scenario at Consolidated Unit 10-002(a)-99

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	Carcinogenic Risk
Arsenic	1.598	3.90E+00	4.1E-06
Chromium	4.311	2.10E+03[b]	2.05E-08
Bis(2-ethylhexyl)phthalate	0.0005	3.47E+02	1.4E-11
		Total Excess Cancer Risk	**4E-06**

[a] SSL from NMED 2006, 092513, unless noted otherwise.

[b] SSL from EPA Region 6 (EPA 2007, 095866).

Table I-4.3-13
Comparison of Noncarcinogenic COPCs to SSLs
for the Residential Scenario at Consolidated Unit 10-002(a)-99

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	Hazard Quotient
Aluminum	4558	7.78E+04	5.86E-02
Antimony	1.634	3.13E+01	5.22E-02
Barium	50.72	1.56E+04	3.25E-03
Beryllium	0.728	1.56E+02	4.67E-03
Cadmium	1.288	3.90E+01	3.30E-02
Copper	25.21	3.13E+03	8.05E-03
Cyanide (total)	0.267	1.22E+03	2.19E-04
Lead	11.53	4.00E+02	2.88E-02
Manganese	231	3.59E+03	6.43E-02
Mercury	0.0714	2.30E+01[b]	3.10E-03
Molybdenum	0.7	3.91E+02	1.79E-03
Nickel	3.361	1.56E+03	2.15E-03
Perchlorate	0.0022	5.5E+01[b]	4.02E-05
Selenium	0.542	3.91E+02	1.39E-03
Thallium	0.178	5.16E+00	3.45E-02
Uranium	3.607	1.60E+01[c]	2.25E-01
Vanadium	6.41	7.82E+01	8.20E-02
Zinc	25.99	2.35E+04	1.11E-03
Bis(2-ethylhexyl)phthalate	0.0005	3.47E+02	1.44E-06
Butylbenzylphthalate	0.0006	2.40E+02[b,d]	n/a[e]
Diethylphthalate	0.0372	4.89E+04	7.61E-07
Di-n-butyl phthalate	0.000444	6.11E+03	7.27E-08
Xylene (total)	0.0012	8.20E+01[d]	n/a
		Hazard Index	**0.6**

[a] SSL from NMED 2006, 092513, unless noted otherwise.

[b] SSL from EPA Region 6, residential (EPA 2007, 095866).

[c] SSL from EPA Region 9, residential (http://www.epa.gov/region09/waste/sfund/prg/).

[d] The SSL is a C_{sat} value.

[e] n/a = Not applicable. Refer to the forward risk calculations presented in Table I-4.3-14.

Table I-4.3-14
Consolidated Unit 10-002(a)-99 C_{sat} COPC Forward Risk Evaluation

Chemical	EPC (mg/kg)	RfD-Oral[a] (mg/kg-day)	RfD-Inhalation[a] (mg/kg-day)	SF-Oral[a] $(mg/kg\text{-}day)^{-1}$	SF-Inhalation[a] $(mg/kg\text{-}day)^{-1}$	HQ	Carcinogenic Risk
Recreational							
Xylene (total)	0.0028	2.00E-01	2.86E-02	n/a[b]	n/a	3.73E-07	n/a
Construction Worker							
Butylbenzylphthalate	0.0006	2.00E-01 [c]	2.00E-01 [c]	n/a	n/a	3.84E-08	n/a
Xylene (total)	0.0028	2.00E-01	2.86E-02	n/a	n/a	1.36E-06	n/a
Residential							
Butylbenzylphthalate	0.0006	2.00E-01 [c]	2.00E-01 [c]	n/a	n/a	3.84E-08	n/a
Xylene (total)	0.0028	2.00E-01	2.86E-02	n/a	n/a	4.46E-06	n/a

[a] Values from NMED 2006, 092513, unless noted otherwise.
[b] n/a = Not applicable.
[c] Values from EPA region 6 (EPA 2007, 095866).

Table I-4.3-15
Consolidated Unit 10-002(a)-99 Radionuclide Dose

Receptor	Radionuclides	EPC (pCi/g)	SAL* (pCi/g)	Dose (mrem/yr)
Recreational	Strontium-90	61.7	5.60E+03	0.2
Construction worker	Strontium-90	34.5	8.00E+02	0.6
Residential	Strontium-90	34.5	5.7E+00	91

*SALs from LANL 2005, 088493.

Table I-4.3-16
Comparison of Carcinogenic COPCs to SSLs
for the Construction Worker Scenario at SWMU 10-004(a)

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	Carcinogenic Risk
Chromium	4.198	2.61E+01[b]	1.61E-06
		Total Excess Cancer Risk	**2E-06**

[a] SSLs from NMED 2006, 092513.

[b] SSL for hexavalent chromium used.

Table I-4.3-17
Comparison of Noncarcinogenic COPCs to SSLs for the Construction Worker Scenario at SWMU 10-004(a)

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	Hazard Quotient
Antimony	13.7	1.24E+02	1.10E-01
Arsenic	0.771	8.52E+01	9.05E-03
Cadmium	0.02	1.54E+02	1.30E-04
Cyanide (total)	0.52	4.76E+03	1.09E-04
Iron	5326	9.29E+04	5.73E-02
Manganese	194	1.50E+03	1.29E+00
Molybdenum	0.55	1.55E+03	3.55E-04
Silver	0.485	1.55E+03	3.13E-04
Thallium	0.84	2.04E+01	4.12E-02
Uranium	2.22	2.00E+01[b]	1.11E-02
Acetone	0.196	9.85E+04	1.99E-06
Methylene chloride	0.0047	2.63E+03[c]	n/a[d]
		Hazard Index	**2**

[a] SSL from NMED 2006, 092513, unless noted otherwise.

[b] SSL from EPA Region 9, industrial (http://www.epa.gov/region09/waste/sfund/prg/).

[c] SSL is C_{sat} value.

[d] n/a = Not applicable. Refer to the forward risk calculations presented in Table I-4.3-20.

Table I-4.3-18
Comparison of Carcinogenic COPCs to SSLs for the Residential Scenario at SWMU 10-004(a)

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	Carcinogenic Risk
Arsenic	0.771	3.90E+00	2E-06
Chromium	4.198	2.10E+03[b]	2E-08
Methylene chloride	0.0047	1.82E+02	2.6E-10
		Total Excess Cancer Risk	**2E-06**

[a] SSL from NMED 2006, 092513, unless noted otherwise.

[b] SSL from EPA Region 6 (EPA 2007, 095866).

Table I-4.3-19
Comparison of Noncarcinogenic COPCs to SSLs for the Residential Scenario at SWMU 10-004(a)

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	Hazard Quotient
Antimony	13.7	3.13E+01	4.38E-01
Cadmium	0.02	3.90E+01	5.13E-04
Cyanide (total)	0.52	1.22E+03	4.26E-04
Iron	5326	2.35E+04	2.27E-01
Manganese	194	3.59E+03	5.40E-02
Molybdenum	0.55	3.91E+02	1.41E-03
Silver	0.485	3.91E+02	1.24E-03
Thallium	0.42	5.16E+00	8.14E-02
Uranium	2.22	1.60E+01[b]	1.39E-01
Acetone	0.196	2.81E+04	6.98E-06
		Hazard Index	**1.0**

[a] SSL from NMED 2006, 092513, unless noted otherwise.

[b] SSL from EPA Region 9, residential (http://www.epa.gov/region09/waste/sfund/prg/).

Table I-4.3-20
SWMU 10-004(a) C_{sat} COPC Forward Risk Evaluation

Chemical	EPC (mg/kg)	RfD-Oral* (mg/kg-day)	RfD-Inhalation* (mg/kg-day)	SF-Oral* (mg/kg-day)$^{-1}$	SF-Inhalation[a]*(mg/kg-day)$^{-1}$	HQ	Carcinogenic Risk
Construction Worker							
Methylene chloride	0.0026	6.00E-02	8.60E-01	7.50E-03	1.65E-03	2.40E-07	2.93E-12

* Values from NMED 2006, 092513.

Table I-4.3-21
SWMU 10-004(a) Radionuclide Dose

Receptor	Radionuclides	EPC (pCi/g)	SAL* (pCi/yr)	Dose (mrem/yr)
Recreational	Strontium-90	0.371	5.60E+03	0.001
Construction worker	Strontium-90	0.264	8.00E+02	0.005
Residential	Strontium-90	0.264	5.7E+00	0.7

* SALs from LANL 2005, 088493.

Table I-4.3-22
Comparison of Noncarcinogenic COPCs to SSLs
for the Recreational Scenario at AOCs 10-009 and C-10-001

COPC	EPC (mg/kg)	Recreational SSL[a] (mg/kg)	Hazard Quotient
Cyanide (total)	0.53	7.97E+03	6.65E-05
Molybdenum	0.55	3.96E+03	0.0001
Toluene	0.00057	2.52E+02[b]	n/a[c]
		Hazard Index	**0.0002**

[a] SSLs from LANL 2007, 094496.

[b] SSL is C_{sat} value.

[c] n/a = Not applicable. Refer to the forward risk calculations presented in Table I-4.3-25.

Table I-4.3-23
Comparison of Noncarcinogenic COPCs to SSLs
for the Construction Worker Scenario at AOCs 10-009 and C-10-001

COPC	EPC (mg/kg)	Construction Worker SSL[a] (mg/kg)	Hazard Quotient
Cyanide (total)	0.53	4.76E+03	1.1E-04
Molybdenum	0.56	1.55E+03	3.6E-04
Toluene	0.00071	2.52E+02[b]	n/a[c]
		Hazard Index	**0.0005**

[a] SSL from NMED 2006, 092513, unless noted otherwise.

[b] SSL is the C_{sat} value.

[c] n/a = Not applicable. Refer to the forward risk calculations presented in Table I-4.3-25.

Table I-4.3-24
Comparison of Noncarcinogenic COPCs to SSLs
for the Residential Scenario at AOCs 10-009 and C-10-001

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	Hazard Quotient
Cyanide (total)	0.53	1.22E+03	4.34E-04
Molybdenum	0.56	3.91E+02	1.43E-03
Toluene	0.00071	2.52E+02[b]	n/a[c]
		Hazard Index	**0.002**

[a] SSL from NMED 2006, 092513, unless noted otherwise.

[b] SSL is the C_{sat} value.

[c] n/a = Not applicable. Refer to the forward risk calculations presented in Table I-4.3-25.

Table I-4.3-25
AOCs 10-009 and C-10-001 C_{sat} COPC Forward Risk Evaluation

Chemical	EPC (mg/kg)	RfD-Oral[a] (mg/kg-day)	RfD-Inhalation[a] (mg/kg-day)	SF-Oral[a] $(mg/kg\text{-}day)^{-1}$	SF-Inhalation[a] $(mg/kg\text{-}day)^{-1}$	HQ	Carcinogenic Risk
Recreational							
Toluene	0.00212	8.00E-02	1.40E+00	n/a[b]	n/a	3.92E-08	n/a
Residential							
Toluene	0.00129	8.00E-02	1.40E+00	n/a	n/a	3.11E-07	n/a
Construction Worker							
Toluene	0.00129	8.00E-02	1.40E+00	n/a	n/a	8.43E-08	n/a

[a] Values from NMED 2006, 092513.

[b] n/a = Not applicable.

Table I-4.3-26
AOCs 10-009 and C-10-001 Radionuclide Dose

Receptor	Radionuclides	EPC (pCi/g)	SAL* (pCi/g)	Dose (mrem/yr)
Recreational	Strontium-90	8.575	5.60E+03	0.02
Construction worker	Strontium-90	4.964	8.00E+02	0.09
Residential	Strontium-90	4.964	5.7E+00	13

* SALs from LANL 2005, 088493.

Table I-5.4-1
Ecological Screening Levels for Terrestrial Receptors for Consolidated Units 10-001(a)-99, 10-002(a)-99, SWMU 10-004(a), and AOCs 10-009 and C-10-001

COPC	American Kestrel (intermediate Carnivore)	American Kestrel (top carnivore)	American Robin (herbivore)	American Robin (insectivore)	American Robin (omnivore)	Deer Mouse (omnivore)	Desert Cottontail (herbivore)	Earthworm (invertebrate)	Plant	Montane Shrew (insectivore)	Red Fox (top carnivore)
Inorganic Chemicals											
Aluminum	pH<5.5	pH<5.5	pH<5.5	pH<5.5	pH<5.5	pH<5.5	pH<5.5	pH<5.5	pH<5.5	pH<5.5	pH<5.5
Antimony	na[a]	na	na	na	na	0.48	2.9	78	0.05	0.26	45
Arsenic	160	1100	42	18	26	32	160	6.8	18	15	810
Barium	11000	37000	820	1000	930	1800	3300	330	110	1300	41000
Beryllium	na	na	na	na	na	56	170	40	2.5	18	420
Cadmium	2	580	4.4	0.29	0.54	0.51	9.9	140	32	0.27	510
Chromium[b]	2200	5400	280	190	220	530	1900	0.34	0.35	170	4400
Cobalt	930	3500	170	96	120	400	1800		13	160	5400
Copper	88	1200	28	11	16	59	250	13	10	34	3500
Cyanide (total)	0.61	1.4	0.1	0.1	0.1	340	740	na	na	310	5200
Iron	na	na	na	na	na	na	na	na	na	na	na
Lead	120	810	21	14	16	120	370	1700	120	72	3700
Magnesium	na	na	na	na	na	na	na	na	na	na	na
Manganese	110000	290000	4600	10000	6400	1200	1700	na	50	1300	35000
Mercury	0.082	0.28	0.07	0.013	0.022	3	22	0.05	34	1.7	46
Molybdenum	na	na	na	na	na	na	na	na	na	na	na
Nickel	530	9500	530	70	120	530	12000	100	20	250	31000
Perchlorate	na	na	na	na	na	na	na	na	na	na	na
Selenium	8.5	140	1.5	1.1	1.3	1.1	3	7.7	0.1	0.92	110
Silver	52	2200	30	7.2	11	77	490	na	0.05	44	13000
Thallium	6.6	75	9.2	0.9	1.6	0.068	2.8	na	0.1	0.032	2.8

Table I-5.4-1 (continued)

COPC	American kestrel (intermediate Carnivore)	American kestrel (top carnivore)	American robin (herbivore)	American robin (insectivore)	American robin (omnivore)	Deer mouse (omnivore)	Desert cottontail (herbivore)	Earthworm (invertebrate)	Plant	Montane shrew (insectivore)	Red fox (top carnivore)
Uranium	21000	39000	1900	1600	1700	750	2000	na	25	220	4800
Vanadium	84	170	8.9	6.7	7.6	480	1500	na	0.025	140	3300
Zinc	180	1400	200	27	48	290	3000	190	10	160	10000
Organic Chemicals											
Acetone	1200	30000	7.5	170	14	1.2	1.4	na	na	15	2900
Benzo(g,h,i)perylene	na	na	na	na	na	47	540	na	na	24	94
Benzoic acid	na	na	na	na	na	1.3	4.2	na	na	1	350
Bis(2-ethylhexyl)phthalate	0.045	0.033	20	0.02	0.04	1.1	2700	na	na	0.59	1.2
Butylbenzylphthalate	na	na	na	na	na	160	2300	na	na	90	1900
Dichlorobenzene[1,2-]	na	na	na	na	na	na	na	na	na	na	na
Dichlorobenzene[1,3-]	na	na	na	na	na	na	na	na	na	na	na
Dichlorobenzene[1,4-]	na	na	na	na	na	1.5	11	1.2	na	0.88	72
Diethylphthalate	na	na	na	na	na	na	na	na	na	na	na
Di-n-butylphthalate	0.068	0.24	0.39	0.011	0.021	370	16000	na	160	180	5000
Ethylbenzene	na	na	na	na	na	na	na	na	na	na	na
Isopropyltoluene[4-]	na	na	na	na	na	na	na	na	na	na	na
Methylene chloride	na	na	na	na	na	2.6	3.4	na	na	9	1700
Pyrene	na	na	na	na	na	32	110	18	na	22	360
Toluene	na	na	na	na	na	25	61	na	200	23	3100
Trichloro-1,2,2-trifluoroethane[1,1,2-]	na	na	na	na	na	na	na	na	na	na	na
Trichloroethane[1,1,1-]	na	na	na	na	na	400	1800	na	na	260	50000
Trimethylbenzene[1,2,4-]	na	na	na	na	na	na	na	na	na	na	na
Trimethylbenzene[1,3,5-]	na	na	na	na	na	na	na	na	na	na	na

Table I-5.4-1 (continued)

COPC	American Kestrel (intermediate Carnivore)	American Kestrel (top carnivore)	American Robin (herbivore)	American Robin (insectivore)	American Robin (omnivore)	Deer Mouse (omnivore)	Desert Cottontail (herbivore)	Earthworm (invertebrate)	Plant	Montane Shrew (insectivore)	Red Fox (top carnivore)
Xylene (total)	280	3200	90	41	56	2	7	na	100	1.4	130
Xylene[1,3]+Xylene[1,4-]	na	na	na	na	na	na	na	na	na	na	na
Radionuclides											
Strontium-90	2400	1900	600	1500	930	1700	1300	1200	1300	1700	560
Uranium-238	4100	4200	3900	3400	3400	2100	2100	55	1800	2100	2100

Notes: Units are mg/kg. ESLs from ECORISK Database Version 2.2 (LANL 2005, 090032).

[a] na = Not available.

[b] Hexavalent chromium ESLs used.

Table I-5.4.2
Final ESL Comparison for Consolidated Unit 10-001(a)-99

COPC	EPC (mg/kg)	Final ESL (mg/kg)	Hazard Quotient	Final ESL Receptor
Inorganic Chemicals				
Antimony	0.103	0.05	**2.1**	Plant
Arsenic	1.217	6.8	0.2	Earthworm
Barium	46.4	110	**0.4**	Plant
Beryllium	0.628	2.5	0.25	Plant
Cadmium	0.397	0.27	**1.5**	Earthworm
Chromium	3.222	0.34[a]	**9.5**	Earthworm
Cobalt	1.831	13	0.1	Plant
Copper	3.66	10	**0.4**	Plant
Cyanide (total)	0.176	0.1	**1.8**	Plant
Lead	10.32	14	**0.7**	American robin
Magnesium	844	na[b]	na	na
Manganese	240	50	**4.8**	Plant
Mercury	0.0218	0.05	**0.4**	Earthworm
Molybdenum	0.688	na	na	na
Nickel	3.11	20	0.2	Plant
Perchlorate	0.0023	na	na	na
Selenium	0.514	0.1	**5.1**	Plant
Silver	0.053	0.05	**1.1**	Plant
Thallium	0.179	0.1	**1.8**	Plant
Uranium	3.47	25	0.1	Plant
Vanadium	6.805	0.025	**272**	Plant
Zinc	29.29	10	**2.9**	Plant
Organic Chemicals				
Acetone	0.00636	1.2	0.005	Deer mouse
Benzo(g,h,i)perylene	0.11	24	0.005	Montane shrew
Benzoic acid	0.733	1	**0.7**	Montane shrew
Dichlorobenzene[1,2-]	0.00053	na	na	na
Dichlorobenzene[1,3-]	0.0005	na	na	na
Dichlorobenzene[1,4-]	0.00062	0.88	0.001	Montane shrew
Diethylphthalate	0.0372	na	na	na
Ethylbenzene	0.000444	na	na	na
Isopropyltoluene[4-]	0.00185	na	na	na
Methylene chloride	0.0026	2.6	0.001	Deer mouse
Pyrene	0.02	18	0.001	Earthworm
Toluene	0.00129	23	0.0001	Montane shrew

Table I-5.4.2 (continued)

COPC	EPC (mg/kg)	Final ESL (mg/kg)	Hazard Quotient	Final ESL Receptor
Trichloroethane[1,1,1-]	0.00085	260	0.09	Montane shrew
Trichloro-1,2,2-trifluoroethane[1,1,2-]	0.00082	na	na	na
Trimethylbenzene[1,2,4-]	0.0004	na	na	na
Trimethylbenzene[1,3,5-]	0.00033	na	na	na
Xylene (total)	0.0012	1.4	0.001	Montane shrew
Radiological (pCi/g)				
Uranium-238	1.626	27	0.06	Deer mouse

Note: Bolded values indicate HQ greater than 0.3.

[a] ESL for hexavalent chromium is used.

[b] na = Not available.

Table I-5.4-3
HI Analysis for Consolidated Unit 10-001(a)-99

COPEC	EPCs (mg/kg)	Hazard Quotient										
		American Kestrel (intermediate Carnivore)	American Kestrel (top carnivore)	American Robin (herbivore)	American Robin (insectivore)	American Robin (omnivore)	Deer Mouse (omnivore)	Desert Cottontail (herbivore)	Earthworm (invertebrate)	Plant	Montane Shrew (insectivore)	Red Fox (carnivore)
Inorganic Chemicals												
Antimony	0.103	na[a]	na	na	na	na	0.21	0.04	0.001	**2.1**	0.40	0.002
Barium	46.4	0.004	0.001	0.06	0.05	0.05	0.03	0.01	0.14	0.4	0.04	0.001
Cadmium	0.397	0.20	0.001	0.09	**1.41**	**0.74**	**0.78**	0.04	0.003	0.01	**1.5**	0.001
Chromium[b]	3.222	0.001	0.001	0.01	0.02	0.01	0.01	0.002	**9.5**	**9.2**	0.02	0.001
Copper	3.66	0.04	0.003	0.13	0.33	0.23	0.06	0.01	0.28	0.4	0.1	0.001
Cyanide (total)	0.176	0.29	0.13	**1.8**	**1.8**	**1.8**	0.001	0.0002	na	na	0.001	0.00003
Lead	10.32	0.09	0.01	**0.49**	**0.74**	**0.65**	0.09	0.03	0.01	0.1	0.1	0.003
Magnesium	844	na	na	na	na	na	na	na	na	na	na	na
Manganese	240	0.002	0.001	0.05	0.02	0.04	0.20	0.1	na	**4.8**	0.2	0.01
Mercury	0.0218	0.27	0.08	**0.31**	**1.7**	**0.99**	0.01	0.001	**0.44**	0.001	0.01	0.0005
Molybdenum	0.688	na	na	na	na	na	na	na	na	na	na	na
Perchlorate	0.0023	na	na	na	na	na	na	na	na	na	na	na
Selenium	0.514	0.060	0.004	**0.34**	**0.47**	**0.40**	**0.47**	0.2	0.07	**5.1**	**0.6**	0.005
Silver	0.053	0.001	0.00002	0.002	0.007	0.005	0.001	0.0001	na	**1.1**	0.001	0.000004
Thallium	0.179	0.03	0.002	0.02	0.20	0.11	**2.6**	0.1	na	**1.8**	**5.6**	0.06
Vanadium	6.805	0.08	0.04	**0.76**	**1.0**	**0.90**	0.01	0.005	na	**272**	0.05	0.002
Zinc	29.29	0.16	0.02	0.15	**1.1**	**0.61**	0.10	0.01	0.15	**2.9**	0.2	0.003
Organic Chemicals												
Benzoic acid	0.733	na	na	na	na	na	**0.56**	0.2	na	na	**0.7**	0.002
Dichlorobenzene[1,2-]	0.00053	na	na	na	na	na	na	na	na	na	na	na

Table I-5.4-3 (continued)

COPEC	EPC (mg/kg)	Hazard Quotient										
		American Kestrel (intermediate Carnivore)	American Kestrel (top carnivore)	American Robin (herbivore)	American Robin (insectivore)	American Robin (omnivore)	Deer Mouse (omnivore)	Desert Cottontail (herbivore)	Earthworm (invertebrate)	Plant	Montane Shrew (insectivore)	Red Fox (carnivore)
Organic Chemicals												
Dichlorobenzene[1,3-]	0.0005	na	na	na	na	na	na	na	na	na	na	na
Diethylphthalate	0.0372	na	na	na	na	na	na	na	na	na	na	na
Ethylbenzene	0.00044	na	na	na	na	na	na	na	na	na	na	na
Isopropyltoluene[4-]	0.00185	na	na	na	na	na	na	na	na	na	na	na
Trichloro-1,2,2-trifluoroethane[1,1,2-]	0.00082	na	na	na	na	na	na	na	na	na	na	na
Trimethylbenzene[1,2,4-	0.0004	na	na	na	na	na	na	na	na	na	na	na
Trimethylbenzene[1,3,5-	0.00033	na	na	na	na	na	na	na	na	na	na	na
Hazard Index		1	0.3	**4**	**9**	**7**	**5**	0.7	**11**	**301**	**10**	0.1

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.0.

[a] na = Not available.

[b] ESL for hexavalent chromium is used.

Table I-5.4-4
Final ESL Comparison for Consolidated Unit 10-002(a)-99

COPC	EPC (mg/kg)	Final ESL (mg/kg)	Hazard Quotient	Final ESL Receptor
Inorganic Chemicals				
Antimony	1.126	0.05	**22.5**	Plant
Arsenic	1.794	6.8	0.26	Earthworm
Barium	51.54	110	**0.47**	Plant
Beryllium	0.674	2.5	0.27	Plant
Cadmium	0.929	0.27	**3.4**	Montane shrew
Chromium	3.13	0.34[a]	**9.2**	Earthworm
Copper	19.4	10	**1.9**	Plant
Cyanide (total)	0.223	0.1	**2.2**	American robin
Lead	8.593	14	**0.61**	American robin
Magnesium	840.6	na[b]	na	na
Manganese	240.9	50	**4.8**	Plant
Mercury	0.0978	0.05	**2.0**	Earthworm
Nickel	3.59	20	0.2	Plant
Selenium	0.548	0.1	**5.5**	Plant
Thallium	0.17	0.1	**1.7**	Plant
Uranium	3.324	25	0.1	Plant
Vanadium	6.681	0.025	**267**	Plant
Zinc	26.65	10	**2.7**	Plant
Organic Chemicals				
Bis(2-ethylhexyl)phthalate	0.0273	0.02	**1.4**	American robin
Butylbenzylphthalate	0.09	90	0.001	Montane shrew
Diethylphthalate	15.75	na	na	na
Di-n-butylphthalate	0.092	0.011	**8.4**	American robin
Xylene (total)	0.000279	1.4	0.0002	Montane shrew
Radiological (pCi/g)				
Strontium-90	41.16	560	0.07	Red Fox

Note: Bolded values indicate HQ greater than 0.3.

[a] ESL for hexavalent chromium is used.

[b] na = Not available.

Table I-5.4-5
HI Analysis for Consolidated Unit 10-002(a)-99

COPECs	EPCs (mg/kg)	Hazard Quotient										
		American Kestrel (intermediate Carnivore)	American Kestrel (top carnivore)	American Robin (herbivore)	American Robin (insectivore)	American Robin (omnivore)	Deer Mouse (omnivore)	Desert Cottontail (herbivore)	Earthworm (invertebrate)	Plant	Montane Shrew (insectivore)	Red Fox (carnivore)
Inorganic Chemicals												
Antimony	1.126	na[a]	na	na	na	na	**2.35**	**0.39**	0.01	**22.5**	**4.3**	0.03
Barium	51.54	0.005	0.001	0.06	0.05	0.06	0.03	0.02	0.16	**0.47**	0.04	0.001
Cadmium	0.929	**0.46**	0.002	0.21	**3.2**	**1.7**	**1.8**	0.1	0.01	0.03	**3.4**	0.002
Chromium[b]	3.13	0.001	0.001	0.01	0.02	0.01	0.01	0.002	**9.2**	**8.9**	0.02	0.001
Copper	19.4	0.22	0.02	0.69	**1.8**	**1.2**	**0.33**	0.1	**1.5**	**1.9**	**0.57**	0.01
Cyanide (total)	0.223	0.37	0.16	**2.2**	**2.2**	**2.2**	0.001	0.0003	na	na	0.001	0.00004
Lead	8.593	0.07	0.01	**0.41**	**0.61**	**0.54**	0.07	0.02	0.01	0.1	0.1	0.002
Magnesium	840.6	na	na	na	na	na	na	na	na	na	na	na
Manganese	240.9	0.002	0.001	0.05	0.02	0.04	0.20	0.1	na	**4.8**	0.2	0.01
Mercury	0.0978	**1.2**	**0.35**	**1.4**	**7.5**	**4.4**	0.03	0.004	**2.0**	0.003	0.1	0.002
Selenium	0.548	0.06	0.004	**0.37**	**0.50**	**0.42**	**0.50**	0.2	0.07	**5.5**	**0.60**	0.005
Thallium	0.17	0.03	0.002	0.02	0.19	0.11	**2.5**	0.1	na	**1.7**	**5.3**	0.06
Vanadium	6.681	0.08	0.04	**0.75**	**1**	**0.88**	0.01	0.004	na	**267**	0.05	0.002
Zinc	26.65	0.15	0.02	0.13	**0.99**	**0.56**	0.09	0.01	0.14	**2.7**	0.2	0.003
Organic Chemicals												
Bis(2-ethylhexyl)phthalate	0.0273	**0.61**	**0.83**	0.001	**1.4**	0.7	0.02	0.00001	na	na	0.05	0.02
Diethylphthalate	15.75	na	na	na	na	na	na	na	na	na	na	na
Di-n-butyl phthalate	0.092	**1.4**	**0.38**	0.24	**8.4**	**4.4**	0.0002	0.00001	na	0.001	0.001	0.00002
Hazard Index		**5**	**2**	**7**	**28**	**17**	**8**	1	**13**	**317**	**15**	0.1

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.0.

[a] na = Not available.

[b] ESL for hexavalent chromium is used.

Table I-5.4.6
Final ESL Comparison for SWMU 10-004(a)

COPC	EPC (mg/kg)	Final ESL (mg/kg)	Hazard Quotient	Final ESL Receptor
Inorganic Chemicals				
Antimony	13.7	0.05	**274**	Plant
Cadmium	0.02	0.27	0.1	Earthworm
Cyanide (total)	0.52	0.1	**5.2**	American robin
Molybdenum	0.39	na*	na	na
Silver	0.669	0.05	**13.4**	Plant
Thallium	0.84	0.1	**8.4**	Plant
Uranium	2.22	25	0.1	Plant
Organic Chemicals				
Acetone	0.04	1.2	0.03	Deer mouse
Methylene chloride	0.004	2.6	0.002	Deer mouse
Radiological (pCi/g)				
Strontium-90	0.371	560	0.0007	Red Fox

Note: Bolded values indicate HQ greater than 0.3.
* na = Not available.

Table I-5.4-7
HI Analysis for SWMU 10-004(a)

COPECs	EPCs (mg/kg)	Hazard Quotient										
		American Kestrel (intermediate Carnivore)	American Kestrel (top carnivore)	American Robin (herbivore)	American Robin (insectivore)	American Robin (omnivore)	Deer Mouse (omnivore)	Desert Cottontail (herbivore)	Earthworm (invertebrate)	Plant	Montane Shrew (insectivore)	Red Fox (carnivore)
Inorganic Chemicals												
Antimony	13.7	na*	na	na	na	na	**28.5**	**4.7**	0.18	**274**	**53**	**0.30**
Cyanide (total)	0.52	0.9	0.4	5.2	5.2	5.2	0.002	0.0007	na	na	0.002	0.0001
Molybdenum	0.39	na	na	na	na	na	na	na	na	na	na	na
Silver	0.669	0.01	0.0003	0.02	0.09	0.06	0.01	0.001	na	**13.4**	0.02	0.0001
Thallium	0.84	0.06	0.01	0.05	**0.47**	0.26	**6.2**	0.2	na	**4.2**	**13.1**	0.15
Hazard Index		1.0	0.4	5	6	6	**35**	**5**	0.2	**292**	**66**	0.2

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.0.
*na = Not available.

Table I-5.4-8
Final ESL Comparison for AOCs 10-009 and C-10-001

COPC	EPC (mg/kg)	Final ESL (mg/kg)	Hazard Quotient	Final ESL Receptor
Inorganic Chemicals				
Cyanide (total)	0.53	0.1	**5.3**	American robin
Molybdenum	0.55	na*	na	na
Organic Chemicals				
Toluene	0.00071	23	0.00003	Montane shrew
Radiological (pCi/g)				
Strontium-90	5.285	560	0.009	Red Fox

Note: Bolded values indicate HQ greater than 0.3.

* na = Not available.

Table I-5.4-9
HI Analysis for AOCs 10-009 and C-10-001

COPECs	EPCs (mg/kg)	Hazard Quotient										
		American Kestrel (intermediate Carnivore)	American Kestrel (top carnivore)	American Robin (herbivore)	American Robin (insectivore)	American Robin (omnivore)	Deer Mouse (omnivore)	Desert Cottontail (herbivore)	Earthworm (invertebrate)	Plant	Montane Shrew (insectivore)	Red Fox (carnivore)
Inorganic Chemicals												
Cyanide (total)	0.53	**0.87**	0.38	**5.3**	**5.3**	**5.3**	0.002	0.0007	na*	na	0.002	0.0001
Molybdenum	0.55	na	na	na	na	na	na	na	na	na	na	na
Hazard Index		0.44	0.19	**5**	**5**	**5**	0.004	0.004	0.004	0.004	0.004	0.01

Note: Bolded values indicate HQ greater than 0.3 or HI greater than 1.0.

* na = Not available.

Table I-5.5-1
Comparison of EPCs to Background Concentrations for Consolidated Unit 10-001(a)-99

Inorganic Chemical	EPCs[a]	Soil Background Concentrations[a]	Tuff Background Concentrations[a,b]
Antimony	0.103	0.1–1	0.05–0.4
Barium	46.4	21–410	1.4–51.6
Cadmium	0.397	0.2–2.6	0.1–1.5
Chromium	3.222	1.9–36.5	0.25–13
Copper	3.66	0.25–16	0.25–6.2
Cyanide (total)	0.176	0.5[c]	0.5[c]
Lead	10.32	2–28	1.6–15.5
Magnesium	844	420–10,000	39–2,820
Manganese	240	76–1,100	22–752
Mercury	0.0218	0.05–0.1	0.1
Molybdenum	0.688	n/a[d]	n/a
Perchlorate	0.0023	n/a	n/a
Selenium	0.514	0.1–1.7	0.1–0.105
Silver	0.053	1.0[c]	0.2–1.9
Thallium	0.179	0.063–1	0.05–1.7
Vanadium	6.805	4–56.5	0.25–21
Zinc	29.29	14–75.5	5.5–65.6

Note: From LANL 1998, 059730.

[a] Units are mg/kg.

[b] Qbt 3 summary statistics were used to represent the tuff at Consolidated Unit 10-001(a)-99.

[c] No summary statistics available; the BV was used.

[d] n/a = Not available.

Table I-5.5-2
Comparison of EPCs to Background Concentrations for Consolidated Unit 10-002(a)-99

Inorganic Chemical	EPCs[a]	Soil Background Concentrations[a]	Tuff Background Concentrations[a,b]
Antimony	1.126	0.1–1	0.1–0.2
Barium	51.54	21–410	3.6–23
Cadmium	0.929	0.2–2.6	0.4[c]
Chromium	3.13	1.9–36.5	0.25–2.3
Copper	19.4	0.25–16	0.25–2.6
Cyanide (total)	0.223	0.5[c]	0.5[c]
Lead	8.593	2–28	2–20
Magnesium	841	420–10,000	69–690
Manganese	241	76–1,100	38–210
Mercury	0.0978	0.05–0.1	0.1[c]
Selenium	0.548	0.1–1.7	0.3[c]
Thallium	0.17	0.063–1	0.1–0.9
Vanadium	6.681	4–56.5	0.2–3.8
Zinc	26.65	14–75.5	5.3–46

Note: From LANL 1998, 059730.
[a] Units are mg/kg.
[b] Qbo summary statistics were used to represent tuff at Consolidated Unit 10-002(a)-99.
[c] No summary statistics available; the BV was used.

Table I-5.5-3
Comparison of EPCs to Background Concentrations for SWMU 10-004(a)

Inorganic and Radiological Chemical	EPCs[a]	Soil Background Concentrations[a]	Tuff Background Concentrations[a]
Antimony	13.7	0.1–1	All samples are soil
Cyanide (total)	0.52	0.5[b]	All samples are soil
Molybdenum	0.39	n/a[c]	All samples are soil
Silver	0.669	1.0[b]	All samples are soil
Thallium	0.84	0.063–1	All samples are soil

Note: From LANL 1998, 059730.
[a] Units are mg/kg.
[b] No summary statistics available; the BV was used.
[c] n/a = Not available.

Table I-5.5-4
Comparison of EPCs to Background Concentrations for AOCs 10-009 and C-10-001

Inorganic and Radiological Chemical	EPCs[a]	Soil Background Concentrations[a]	Tuff Background Concentrations[a]
Cyanide (total)	0.53	0.5[b]	All samples are soil
Molybdenum	0.55	n/a[c]	All samples are soil

Note: From LANL 1998, 059730.

[a] Units are mg/kg.

[b] No summary statistics available; the BV was used.

[c] n/a = Not available.

Table I-5.5-5
PAUFs for Consolidated Unit 10-001(a)-99 Ecological Receptors

Receptor	Home Range[a] (ha)	Population Area[a] (ha)	PAUF[b]
American robin	0.42	16.8	1
American kestrel	106	4240	0.04
Deer mouse	0.077	3	1
Desert cottontail	3.1	124	1
Montane shrew	0.39	15.6	1
Red fox	1038	41,520	0.004

[a] Values from EPA 1993, 059384.

[b] PAUF is calculated as the area of the consolidated unit (154 ha) divided by the population area. If a PAUF greater than 1, it is set to 1 and no adjustment is made.

Table I-5.5-6
Adjusted HI Analysis for Consolidated Unit 10-001(a)-99

COPECs	EPCs (mg/kg)	American Kestrel (intermediate Carnivore)	American Kestrel (top carnivore)	American Robin[a] (herbivore)	American Robin[a] (insectivore)	American Robin[a] (omnivore)	Deer Mouse[a] (omnivore)	Desert Cottontail[a] (herbivore)	Earthworm (invertebrate)	Plant	Montane Shrew[a] (insectivore)	Red Fox (top carnivore)
Molybdenum	0.688	na[b]	na	na	na	na	na	na	na	na	na	na
Perchlorate	0.0023	na	na	na	na	na	na	na	na	na	na	na
Benzoic acid	0.733	na	na	na	na	na	0.56	0.17	na	na	0.73	<0.001
Dichlorobenzene[1,2-]	0.00053	na	na	na	na	na	na	na	na	na	na	na
Dichlorobenzene[1,3-]	0.0005	na	na	na	na	na	na	na	na	na	na	na
Diethylphthalate	0.0372	na	na	na	na	na	na	na	na	na	na	na
Ethylbenzene	0.00044	na	na	na	na	na	na	na	na	na	na	na
Isopropyltoluene[4-]	0.00185	na	na	na	na	na	na	na	na	na	na	na
Trichloro-1,2,2-trifluoroethane[1,1,2-]	0.00082	na	na	na	na	na	na	na	na	na	na	na
Trimethylbenzene[1,2,4-]	0.0004	na	na	na	na	na	na	na	na	na	na	na
Trimethylbenzene[1,3,5-]	0.00033	na	na	na	na	na	na	na	na	na	na	na
Adjusted HIs		na	na	na	na	na	0.6	0.2	na	na	na	<0.001

Note: Bolded values indicate adjusted HI greater than 1.0.

[a] PAUF greater than one. HI not adjusted.

[b] na = Not available.

Table I-5.5-7
PAUFs for Consolidated Unit 10-002(a)-99 Ecological Receptors

Receptor	Home Range[a] (ha)	Population Area[a] (ha)	PAUF[b]
American robin	0.42	16.8	0.04
American kestrel	106	4240	0.0001
Deer mouse	0.077	3	0.2
Desert cottontail	3.1	124	0.005
Montane shrew	0.39	15.6	0.04
Red fox	1038	41,520	0.00001

[a] Values from EPA 1993, 059384.

[b] PAUF is calculated as the area of the consolidated unit (0.61 ha) divided by the population area.

Table I-5.5-8
Adjusted HI Analysis for Consolidated Unit 10-002(a)-99

COPECs	EPCs (mg/kg)	American Kestrel (intermediate Carnivore)	American Kestrel (top carnivore)	American Robin (herbivore)	American Robin (insectivore)	American Robin (omnivore)	Deer Mouse (omnivore)	Desert Cottontail (herbivore)	Earthworm (invertebrate)	Plant	Montane Shrew (insectivore)	Red Fox (top carnivore)
Bis(2-ethylhexyl)phthalate	0.0273	<0.001	<0.001	<0.001	0.05	0.025	0.005	<0.001	na*	na	0.002	<0.001
Diethylphthalate	15.75	na	na	na	na	na	na	na	na	na	na	na
Di-n-butyl phthalate	0.092	<0.001	<0.001	0.009	0.30	0.16	<0.001	<0.001	na	0.001	<0.001	<0.001
Adjusted HIs		<0.001	<0.001	0.009	0.4	0.2	0.005	<0.001	na	0.001	0.02	<0.001

Note: Bolded values indicate adjusted HI greater than 1.0.

* na = Not available.

Table I-5.5-9
PAUFs for SWMU 10-004(a) Ecological Receptors

Receptor	Home Range[a] (ha)	Population Area[a] (ha)	PAUF[b]
American robin	0.42	16.8	0.004
American kestrel	106	4240	0.00001
Deer mouse	0.077	3	0.02
Desert cottontail	3.1	124	0.0005
Montane shrew	0.39	15.6	0.004
Red fox	1038	41,520	0.000001

[a] Values from EPA 1993, 059384.

[b] PAUF is calculated as the area of the consolidated unit (0.06 ha) divided by the population area.

Table I-5.5-10
Adjusted HI Analysis for SWMU 10-004(a)

COPECs	EPCs (mg/kg)	American Kestrel (intermediate Carnivore)	American Kestrel (top carnivore)	American Robin (herbivore)	American Robin (insectivore)	American Robin (omnivore)	Deer Mouse (omnivore)	Desert Cottontail (herbivore)	Earthworm (invertebrate)	Plant	Montane Shrew (insectivore)	Red Fox (top carnivore)
Antimony	13.7	na*	na	na	na	na	0.57	0.002	0.18	**274**	0.20	<0.001
Molybdenum	0.39	na	na	na	na	na	na	na	na	na	na	na
Adjusted HIs		na	na	na	na	na	0.6	0.002	0.2	**274**	0.2	<0.001

Note: Bolded values indicate adjusted HI greater than 1.0.

* na = Not available.

Attachment I-1

Ecological Scoping Checklist for Bayo Canyon Aggregate Area

PART A—SCOPING MEETING DOCUMENTATION

Site ID	**TA-10 Bayo Canyon Aggregate Area**
Form of site releases (solid, liquid, vapor). Describe all relevant known or suspected <u>mechanisms</u> of release (spills, dumping, material disposal, outfall, explosive testing, etc.) and describe potential <u>areas</u> of release. Reference locations on a map as appropriate.	The Bayo Canyon Aggregate Area (Technical Area [TA] 10) is located in the lower reaches of Bayo Canyon, upgradient from the Los Alamos County sewage treatment plant. From 1943 through 1961, TA-10 was used as a firing test site; therefore, the area and all related structures were constructed to test assemblies that contained conventional high explosives (HE), including components made from depleted or natural uranium. The principal structures associated with TA-10 are a former radiochemistry laboratory (TA-01-1), two assembly buildings (TA-10-10 and TA-10-12), an inspection building (TA-10-8), a personnel building (TA-10-21), structures at two detonation control complexes (TA-10-12 and TA-10-15), and adjacent firing pads. Formerly, TA-10 also included various ancillary facilities associated with waste disposal, particularly for the radiochemistry laboratory. Associated facilities included sanitary and radioactive liquid waste sewage lines, manholes, septic tanks, seepage pits, solid radioactive waste disposal pits, and former landfills. TA-10 now consists of Consolidated Units 10-001(a)-99 and 10-002(a)-99, Solid Waste Management Units (SWMUs) 10-004(a) and 10-006, and Areas of Concern (AOCs) C-10-001 and 10-009. The rationale for the consolidation of separate SWMUs into Consolidated Units 10-001(a)-99 and 10-002(a)-99 was based on the operational history, waste streams, geographical proximity, transport mechanisms, and on the investigation required to assess contamination. The following sections describe each consolidated unit, SWMU, and AOC along with known or suspected mechanisms of release. *Consolidated Unit 10-001(a)-99* consists of the former shot pads that made up two firing sites located in the western third of TA-10. Metallic shrapnel and residual HE was dispersed during firing site operations (explosive testing) as well as radionuclide material. The majority of this material was removed during several Decontamination & Decommissioning and cleanup operations performed between the 1960's and 1997; however, smaller shrapnel fragments and some radionuclide material are still present, most notably, depleted uranium dispersed in soil. During the 1994 Interim Action, shrapnel was found embedded in the northwestern sides of trees in this area (opposite the known primary firing sites). *Consolidated Unit 10-002(a)-99* consists of the former radiochemistry laboratory and an associated liquid disposal complex (material disposal). Waste, containing radioactive, inorganic, and organic chemicals, was discharged to the liquid disposal complex that consisted of liquid disposal pits, industrial waste manholes and septic tanks, industrial waste lines, and a leach field that served the radiochemistry laboratory. Within the consolidated unit is a fenced zone in the footprint created by the excavation of solid waste disposal pits (containing radioactive, inorganic, and organic chemicals) used by the radiochemistry laboratory from 1945 to 1950. The wastes were removed, and the pits were backfilled with shot pad building debris and site soil during the 1963 D&D activities. This fenced zone is currently referred to as the "Central Area" and is comprised of the SWMUs of Consolidated Unit 10-002(a)-99, except SWMUs 10-002(a and b) and SWMU 10-003(h). Strontium-90 is known to be at the surface, in the subsurface, and bioaccumulation of strontium-90 has occurred in some chamisa plants within this zone.

	SWMU 10-004(a) is a former 1060-gal. septic tank (structure TA-10-40) that discharged to a pit with associated lines and to an outfall located in a stream channel northeast of SWMU 10-002(a). The tank served the personnel building (TA-10-21) from 1949 through 1963 and was removed during the 1963 D&D activities. There is no information regarding the removal of the 4" diameter tile drain nor of the soil surrounding the outfall. Potential contaminants associated with the septic system and outfall are limited to organic constituents only. *SWMU 10-006* may consist of various locations where burning operations at TA-10 were conducted, primarily in the 1950s and early 1960s; however, the exact location of this SMWU is unknown. Potential contaminants associated with open burning include uranium, strontium-90, and HE. During current field activities, the location of this site was sought; however, nothing has been found to date. *AOC C-10-001* is located within the fenced area that encompasses AOC 10-009 and consisted of two radioactive (strontium-90) soil contamination areas. These areas were bulldozed during 1963 D&D activities but were rediscovered during shrapnel-removal operations in 1994. A Voluntary Correction Action was conducted in 1995 to excavate the radioactive soil and restore the site with clean fill material. *AOC 10-009* is a suspect former landfill area that is thought to contain discarded materials such as asbestos siding, heavy-gauge and coaxial cable, glass laboratory equipment, and other debris. The EPA was notified of a new SWMU in June 1995 and the site was fenced off until further investigation could be conducted. The 2007 investigation is the first investigation to be conducted for AOC 10-009.
List of Primary Impacted Media **(Indicate all that apply.)**	**Surface soil** – Surface soil may contain dispersed depleted uranium (Consolidated Unit 10-001[a]-99, AOCs 10-009 and C-10-001) and strontium-90 (Consolidated Unit 10-002[a]-99) or more localized elevated areas due to previous operations. At Consolidated Unit 10-001(a)-99 metal shrapnel is also present at the surface. **Subsurface** – At Consolidated Unit 10-001(a)-99, metal shrapnel is present within the shallow subsurface (1to 6 inches) and depleted uranium may also be present. At Consolidated Unit 10-002(a)-99, AOCs 10-009 and C-10-001, and SWMU 10-004(a), subsurface soil and tuff are potentially contaminated with organic and inorganic chemicals and/or radionuclides from previous operations. Strontium-90 contamination is documented in the surface, subsurface and in some vegetation in the "Central Area" within Consolidated Unit 10-002(a)-99.
	Groundwater – Alluvial or perched groundwater is not present within Bayo Canyon and the regional groundwater table is approximately 600 ft bgs; and sampling of regional monitoring well R-24 located down gradient of Bayo Canyon Aggregate Area has reported no detections of strontium-90. **Surface water** – Permanent (year round) surface water is not present in Bayo Canyon: the canyon bottom stream is ephemeral. In upper canyon reaches, intermittent seasonal flow occurs only during and shortly after heavy rain events during the summer monsoon season. In the lower canyon reaches (TA-10), the presence of seasonal surface water is extremely rare, even during heavy rain events, and is often not present for multiple seasons. Throughout the duration of the 2007 investigation, no surface water was observed in the lower canyon reaches.

FIMAD vegetation class based on Arcview vegetation coverage **(Indicate all that apply.)**	Dominant trees within Bayo Canyon include: ponderosa pine (primarily along the canyon floor); juniper; and piñon and gamble oak (primarily along canyon slopes, though there is some mixture throughout Bayo Canyon proper). Dominant Shrubs include: chamisa, big sagebrush, salt bush and chokeberry. Dominant forbs and grasses include: bluegrass, mountain muhly, blue grama, pine dropseed, wormwood, false tarragon, tall lupine, and cinquefoil.
Is T&E Habitat Present? **If applicable, list species known or suspected to use the site for breeding or foraging.**	The only threatened or endangered (T&E) species known to frequent the LANL area is the Mexican spotted owl. The owl's primary habitat is densely forested canyons and it has not been observed to roost in Bayo Canyon; however, the owl may use the canyon and surrounding area as a foraging site (LANL 2001, 071060).
Provide list of Neighboring/ Contiguous/ Up-gradient sites, include a brief summary of COPCs and form of releases for relevant sites and reference map as appropriate. **(Use information to evaluate need to aggregate sites for screening.)**	Bayo Canyon is geographically isolated from the Laboratory. No other consolidated units or SWMUs are located near the TA-10 portion of Bayo Canyon.
Surface Water Erosion Potential Information **Summarize information from SOP 2.01, including the run-off subscore (maximum of 46); terminal point of surface water transport; slope; and surface water run-on sources.**	Consolidated Unit 10-002(a)-99 was evaluated in 1997 and again in 2002. Sources are all subsurface with no direct link to the Bayo Canyon ephemeral stream channel. A total of 18 SWMUs were evaluated with all run-off scores ranging from 26 to 27.8.

PART B—SITE VISIT DOCUMENTATION

Site ID	Bayo Canyon Aggregate Area
Date of Site Visit	01/12/07
Site Visit Conducted by	Gary Stoopes

Receptor Information:

Estimate cover	Relative vegetative cover (high, medium, low, none) = medium Relative wetland cover (high, medium, low, none) = none Relative structures, asphalt, etc., cover (high, medium, low, none) = low, residual, broken up asphalt from former roads/parking areas.
Field notes on the FIMAD vegetation class to assist in ground-truthing the Arcview information	Vegetation is as noted above.
Field notes on T&E Habitat, if applicable. Consider the need for a site visit by a T&E subject matter expert to support the use of the site by T&E receptors.	The only threatened or endangered (T&E) species known to frequent the LANL area is the Mexican spotted owl. The owl's primary habitat is densely forested canyons and it has not been observed to roost in Bayo Canyon; however, the owl may use the canyon and surrounding area as a foraging site (LANL 2001, 071060)
Are ecological receptors present at the site? **(yes/no/uncertain)** **Describe the general types of receptors present at the site (terrestrial and aquatic), and make notes on the quality of habitat present at the site.**	Yes. The vegetation at the site is healthy and varied, no adverse affects on plants were noted during field activities, and the habitat is sufficient for supporting foraging of terrestrial receptors. Vegetative community is typical of the canyon bottom. The following wildlife has been observed or known to be present while conducting field work at the site: elk, mule deer, coyotes, rabbits, mice, birds, and although gophers have not been observed, their burrows are quite abundant throughout the canyon floor.

Contaminant Transport Information:

Surface water transport **Field notes on the erosion potential, including a discussion of the terminal point of surface water transport (if applicable).**	Surface water transport and erosion potential is low overall, but during heavy or unusual rain events alteration of the stream channel can occur. Since the D&D of TA-10 in the 1960's, no upkeep on the previous erosion controls (culverts, road grading etc) has been done. Surface runoff and drainage patterns from the canyon slope have returned to a "natural state" though still influenced by some remaining man-made alterations.
Are there any off-site transport pathways (surface water, air, or groundwater)? **(yes/no/uncertain)** **Provide explanation**	Surface Water: No Groundwater: No Air: Yes. Surface contamination may be dispersed by wind though vegetation and forest litter inhibits this process substantially.
Interim action needed to limit off-site transport? **(yes/no/uncertain)** **Provide explanation/ recommendation to project lead for IA SMDP.**	No. Releases are predominately subsurface and unlikely to move.

Ecological Effects Information:

Physical Disturbance **(Provide list of major types of disturbances, including erosion and construction activities, review historical aerial photos where appropriate.)**	No. The site has not been physically disturbed since D&D operations. There is little evidence of disturbances or erosion on mesa tops. Some erosion/deposition is observed on steeper slopes and the canyon floor.
Are there obvious ecological effects? **(yes/no/uncertain)** **Provide explanation and apparent cause (e.g., contamination, physical disturbance, other).**	No. The habitat is healthy and wildlife is abundant**.**
Interim action needed to limit apparent ecological effects? **(yes/no/uncertain)** **Provide explanation and recommendations to mitigate apparent exposure pathways to project lead for IA SMDP.**	No. Releases are predominately subsurface.

No Exposure/Transport Pathways:

If there are no complete exposure pathways to ecological receptors onsite and no transport pathways to offsite receptors, the remainder of the checklist should not be completed. Stop here and provide additional explanation/justification for proposing an ecological No Further Action recommendation (if needed). At a minimum, the potential for future transport should include likelihood that future construction activities could make contamination more available for exposure or transport. Not applicable.

Adequacy of Site Characterization:

Do existing or proposed data provide information on the nature, rate and extent of contamination? **(yes/no/uncertain)** **Provide explanation** **(Consider if the maximum value was captured by existing sample data.)**	Yes. The 2007Investigation was designed address data issues from previous investigations to define nature and extent of contamination.
Do existing or proposed data for the site address potential transport pathways of site contamination? **(yes/no/uncertain)** **Provide explanation** **(Consider if other sites should aggregated to characterize potential ecological risk.)**	Yes. The 2007 investigation was designed to address potential transport pathways.

PART C—ECOLOGICAL PATHWAYS CONCEPTUAL EXPOSURE MODEL

Question A:

Could soil contaminants reach receptors via vapors?

- **Volatility of the hazardous substance (volatile chemicals generally have Henry's Law constant >10^{-5} atm-me/mol and molecular weight <200 g/mol).**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: There are no volatile chemicals detected at high concentrations.

Question B:

Could the soil contaminants reach receptors through fugitive dust carried in air?

- **Soil contamination would have to be on the actual surface of the soil to become available for dust.**
- **In the case of dust exposures to burrowing animals, the contamination would have to occur in the depth interval where these burrows occur.**

Answer (likely/unlikely/uncertain): Likely

Provide explanation: No high levels of surface contamination; however, contaminated near-surface soil could reach burrowing gophers.

Question C:

Can contaminated soil be transported to aquatic ecological communities (use SOP 2.01 run-off score and terminal point of surface water runoff to help answer this question)?

- **If the SOP 2.01 run-off score* for each PRS included in the site is equal to zero, this suggests that erosion at the site is not a transport pathway. (* Note that the runoff score is not the entire erosion potential score, rather it is a subtotal of this score with a maximum value of 46 points).**
- **If erosion is a transport pathway, evaluate the terminal point to see if aquatic receptors could be affected by contamination from this site.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: There are no nearby aquatic communities that could be impacted; runoff is minimal.

<u>**Question D:**</u>

Is contaminated groundwater potentially available to biological receptors through seeps or springs or shallow groundwater?

- **Known or suspected presence of contaminants in groundwater.**
- **The potential for contaminants to migrate via groundwater and discharge into habitats and/or surface waters.**
- **Contaminants may be taken up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone (~1 m depth).**
- **Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: There is no alluvial or perched water beneath site and there are no springs or seeps.

<u>**Question E:**</u>

Is infiltration/percolation from contaminated subsurface material a viable transport and exposure pathway?

- **Suspected ability of contaminants to migrate to groundwater.**
- **The potential for contaminants to migrate via groundwater and discharge into habitats and/or surface waters.**
- **Contaminants may be taken up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone (~1 m depth).**
- **Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: There is no alluvial or perched water beneath site and there are no springs or seeps.

<u>**Question F:**</u>

Might erosion or mass wasting events be a potential release mechanism for contaminants from subsurface materials or perched aquifers to the surface?

- **This question is only applicable to release sites located on or near the mesa edge.**
- **Consider the erodability of surficial material and the geologic processes of canyon/mesa edges.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Mass wasting is not a release mechanism because area is not near the mesa edge. Erosion is minimal at the site.

<u>Question G:</u>

Could airborne contaminants interact with receptors through respiration of vapors?

- **Contaminants must be present as volatiles in the air.**
- **Consider the importance of inhalation of vapors for burrowing animals.**
- **Foliar uptake of organic vapors is typically not a significant exposure pathway.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 1

Terrestrial Animals: 1

Provide explanation: Volatile organics compounds, if present, are detected at very low concentrations.

<u>Question H:</u>

Could airborne contaminants interact with plants through deposition of particulates or with animals through inhalation of fugitive dust?

- **Contaminants must be present as particulates in the air or as dust for this exposure pathway to be complete.**
- **Exposure via inhalation of fugitive dust is particularly applicable to ground-dwelling species that would be exposed to dust disturbed by their foraging or burrowing activities or by wind movement.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 2

Terrestrial Animals: 2

Provide explanation: Deposition of particulates on plants may be an exposure pathway. Inhalation of re-suspended dust is also a pathway for surface contaminants; however, most contamination occurs in the subsurface.

<u>Question I:</u>

Could contaminants interact with plants through root uptake or rain splash from surficial soils?

- **Contaminants in bulk soil may partition into soil solution, making them available to roots.**
- **Exposure of terrestrial plants to contaminants present in particulates deposited on leaf and stem surfaces by rain striking contaminated soils (i.e., rain splash).**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 2

Provide explanation: Site contamination mostly occurs in the subsurface, at depths that could be impacted by plant roots. Strontium-90 uptake by chamisa plants has been documented at the Central Area within Consolidated Unit 10-002(a)-99.

Question J:

Could contaminants interact with receptors through food web transport from surficial soils?

- **The chemicals may bioaccumulate in animals.**
- **Animals may ingest contaminated food items.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2

Provide explanation: Some contaminants are known to be bioaccumulators; however, most contamination is present in the subsurface.

Question K:

Could contaminants interact with receptors via incidental ingestion of surficial soils?

- **Incidental ingestion of contaminated soil could occur while animals grub for food resident in the soil, feed on plant matter covered with contaminated soil or while grooming themselves clean of soil.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2

Provide explanation: Foraging and grooming activities may result in exposure. However, most contamination is present in the subsurface.

Question L:

Could contaminants interact with receptors through dermal contact with surficial soils?

- **Significant exposure via dermal contact would generally be limited to organic contaminants that are lipophilic and can cross epidermal barriers.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 1

Provide explanation: Exposure via dermal contact is possible for terrestrial receptors; however, there is no organic chemical contamination at the surface and the organic COPCs are not lipophilic.

Question M:

Could contaminants interact with plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma emitting radionuclides.**
- **Burial of contamination attenuates radiological exposure.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: There are no gamma-emitting radionuclides detected at the site.

Question N:

Could contaminants interact with plants through direct uptake from water and sediment or sediment rain splash?

- **Contaminants may be taken-up by terrestrial plants whose roots are in contact with surface waters.**
- **Terrestrial plants may be exposed to particulates deposited on leaf and stem surfaces by rain striking contaminated sediments (i.e., rain splash) in an area that is only periodically inundated with water.**
- **Contaminants in sediment may partition into soil solution, making them available to roots.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 2

Provide explanation: There is subsurface contamination at the site.

Question O:

Could contaminants interact with receptors through food web transport from water and sediment?

- **The chemicals may bioconcentrate in food items.**
- **Animals may ingest contaminated food items.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 1

Provide explanation: There is no persistent water on the site; however, sediment is intermittently present based on rain/flow events.

<u>Question P:</u>

Could contaminants interact with receptors via ingestion of water and suspended sediments?

- **If sediments are present in an area that is only periodically inundated with water, terrestrial receptors may incidentally ingest sediments.**
- **Terrestrial receptors may ingest water-borne contaminants if contaminated surface waters are used as a drinking water source.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: There is no persistent water on the site.

<u>Question Q:</u>

Could contaminants interact with receptors through dermal contact with water and sediment?

- **If sediments are present in an area that is only periodically inundated with water, terrestrial species may be dermally exposed during dry periods.**
- **Terrestrial organisms may be dermally exposed to water-borne contaminants as a result of wading or swimming in contaminated waters.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: There is no persistent water on the site.

<u>Question R:</u>

Could contaminants interact with plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma emitting radionuclides.**
- **Burial of contamination attenuates radiological exposure.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: Strontium-90 and uranium-238 are not gamma-emitting radionuclides and are present mainly in the subsurface which attenuates radiological exposure.

Question S:

Could contaminants bioconcentrate in free floating aquatic, attached aquatic plants, or emergent vegetation?

- **Aquatic plants are in direct contact with water.**
- **Contaminants in sediment may partition into pore water, making them available to submerged roots.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Plants/Emergent Vegetation: 0

Provide explanation: There is no persistent water on the site.

Question T:

Could contaminants bioconcentrate in sedimentary or water column organisms?

- **Aquatic receptors may actively or incidentally ingest sediment while foraging.**
- **Aquatic receptors may be directly exposed to contaminated sediments or may be exposed to contaminants through osmotic exchange, respiration, or ventilation of sediment pore waters.**
- **Aquatic receptors may be exposed through osmotic exchange, respiration, or ventilation of surface waters.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Animals: 0

Provide explanation: There is no persistent water on the site.

Question U:

Could contaminants bioaccumulate in sedimentary or water column organisms?

- **Lipophilic organic contaminants and some metals may concentrate in an organism's tissues**
- **Ingestion of contaminated food items may result in contaminant bioaccumulation through the food web.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Animals: 0

Provide explanation: There is no persistent water on the site.

Question V:

Could contaminants interact with aquatic plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma emitting radionuclides.**
- **The water column acts to absorb radiation, thus external irradiation is typically more important for sediment dwelling organisms.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Plants: 0

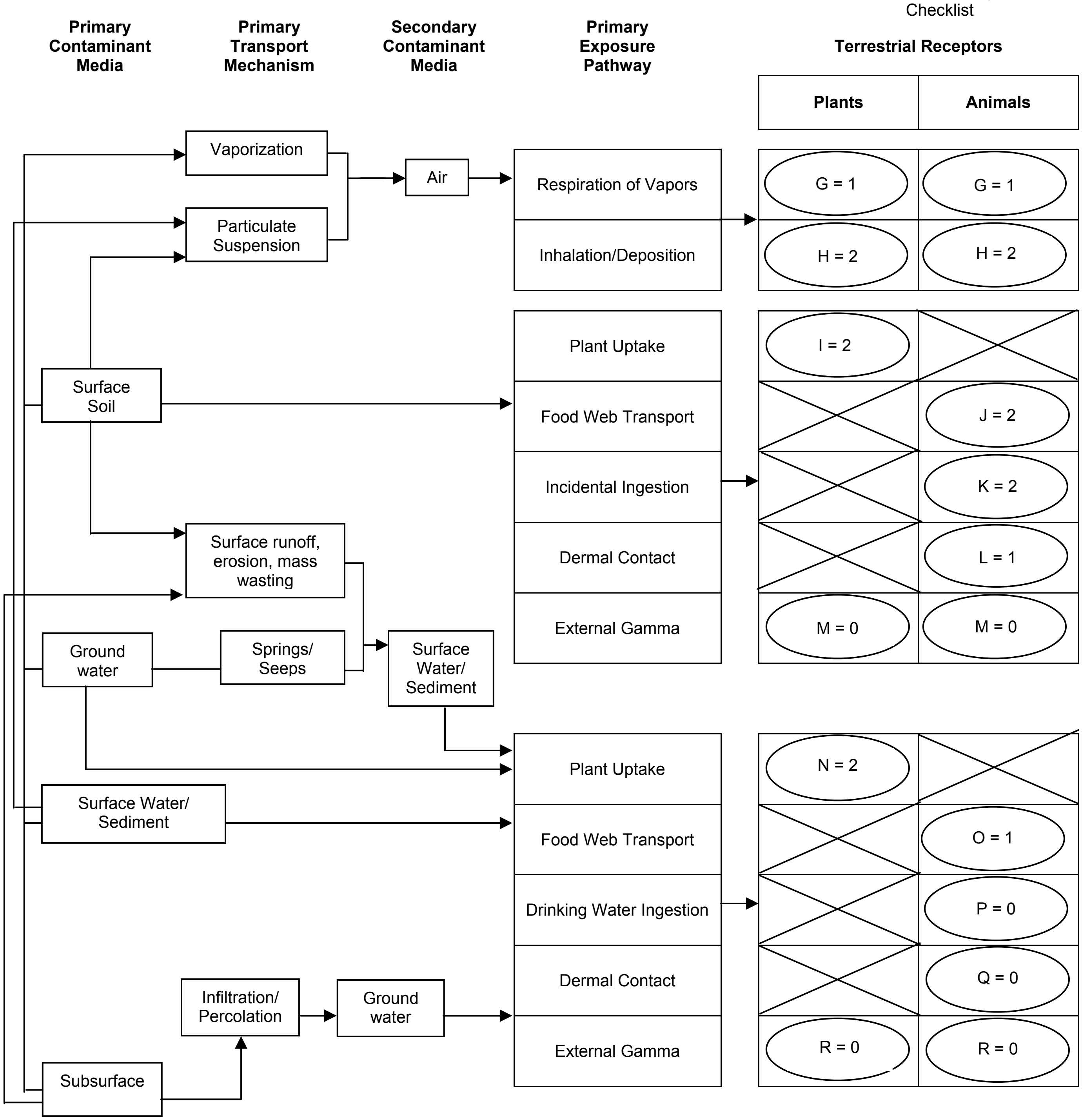
Aquatic Animals: 0

Provide explanation: There is no persistent water on the site.

NOTE:

Letters in circles refer to questions on the Scoping Checklist

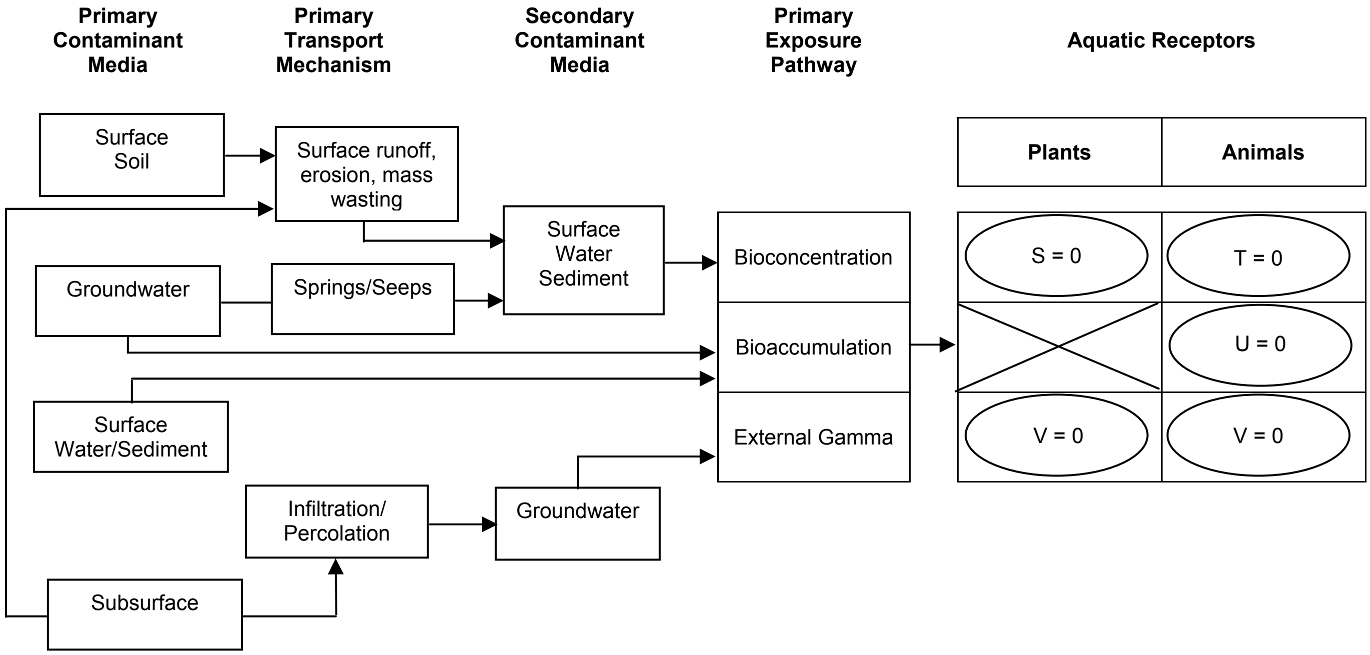
Ecological Scoping Checklist
Terrestrial Receptors
Ecological Pathways Conceptual Exposure Model



NOTE:

Letters in circles refer to questions on the Scoping Checklist

Ecological Scoping Checklist
Aquatic Receptors
Ecological Pathways Conceptual Exposure Model



Signatures and certifications:

Checklist completed by (provide name, organization and phone number):

Name (printed):	Gary Stoopes
Name (signature):	Gary Stoopes
Organization:	TPMC
Phone number:	662-1368
Date Completed:	01/12/2007

Verification by a member of ER Project Ecological Risk Task Team (provide name, organization and phone number):

Name (printed):	Richard Mirenda
Name (signature):	Richard Mirenda
Organization:	WES-GS
Phone number:	665-6953

Attachment I-2

ProUCL Calculation Files
(on CD included with this document)

Appendix J

Preliminary Corrective Action Alternatives for Former Technical Area 10

J-1.0 INTRODUCTION

Section IV.C.5.c.iv of the March 1, 2005, Compliance Order on Consent (the Consent Order) requires an evaluation of the removal of the landfill material at Solid Waste Management Unit (SWMU) 10-007 at Los Alamos National Laboratory (the Laboratory). A value analysis of a range of alternatives, including complete removal, was developed in Appendix C of the investigation work plan, submitted to the New Mexico Environment Department (NMED) in July 2005 (LANL 2005, 089659). The purpose of the value analysis was to identify, evaluate, and recommend a preferred preliminary alternative for SWMU 10-007. In addition, section 4.3 of the revised work plan (LANL 2005, 092083) approved by NMED (NMED 2005, 092426) discussed three potential issues:

- At SWMU 10-007, strontium-90 contamination remains on-site beneath construction debris and backfill material and is being taken up by chamisa.
- Area of Concern (AOC) 10-009 was identified as the site of an alleged landfill that had not previously been investigated.
- At Consolidated Unit 10-001(a)-99, radiological shrapnel potentially remained at the site.

For SWMU 10-007, the proposed corrective actions included different combinations of institutional controls, removal actions, barriers, and capping. Final determination of the appropriate corrective action(s) required the collection of additional data. The lateral extent of elevated strontium-90 activity and confirmation of the type of debris buried at SWMU 10-007 were needed.

For AOC 10-009, the work plan presumed that the landfill would be removed because of the limited volume of debris anticipated.

For Consolidated Unit 10-001(a)-99, further investigation was required to confirm the results of earlier investigations (LANL 1996, 054491, p. 36) assess the potential for radiological shrapnel, and assess the need for the removal of radioactive shrapnel.

As a result of the 2007 field investigation, additional data have been collected to better define the significant issues remaining at former Technical Area (TA) 10. Based on the geophysical surveys, drilling, sampling, and trenching conducted at AOC 10-009, it was determined that no landfill existed at the location.

Geophysical and radiological surveys were conducted over the area surrounding the shot pads at Consolidated Unit 10-001(a)-99. Evaluation of the collocated geophysical and radiological data showed no correlation between the abundance of shrapnel pieces and radiological contamination (Appendix M of this investigation report). The radiological survey did identify a number of small areas of uranium-238 soil contamination, but examination of the elevated areas found no radiologically contaminated shrapnel pieces that a recreational user might pick up and handle.

Only SWMU 10-007 requires further evaluation for the most appropriate final remedy. Trenching, drilling, sampling, and geophysical surveying at SWMU 10-007 confirmed the presence of predominantly concrete and metal (rebar) construction debris as well as the lateral extent of the strontium-90 contamination in the subsurface. During 2007 trenching activities, no construction debris shallower than 3 ft belowgrade was identified (historically, no surface debris has ever been reported at SWMU 10-007), and the potential for a surface debris hazard is not present. Additionally, samples of the construction debris confirm that residual strontium-90 contamination is associated with soil remaining within the Central Area of Consolidated Unit 10-002(a)-99 following removal of the liquid waste disposal complex rather than with the construction debris itself (i.e., soil contamination associated with historical discharges of radioactive wastewater rather than releases from buried debris). Radiological surveys (discussed in Appendix M) confirmed the presence of strontium-90 soil contamination at the surface and the presence of chamisa and cactus plants that have bioaccumulated strontium-90.

Human health and ecological risk assessments are presented in Appendix I of this investigation report. The assessments show that only risk from residual radioactivity, not from chemicals, remains at SWMU 10-007. The alternatives below are being evaluated by the U.S. Department of Energy (DOE) to determine what final actions are required to ensure radiological protection of the public.

J-2.0 SITE OBSERVATIONS SIGNIFICANT TO SELECTING A FINAL ALTERNATIVE

The alternatives evaluation presented in the approved work plan ranked a range of technologies on the relative performance of each to a set of criteria (LANL 2005, 089659, Appendix C). The evaluation effectively ranked the options relative to one another. Following trenching activities, geophysical and radiological data collection, drilling, and environmental sampling, the nature and extent of contamination within and below SWMU 10-007 are defined. Following is a summary of key observations based on the available data that bear on the final selection of a remedial alternative for SWMU 10-007.

J-2.1 Radiological Conditions

Radiological walkover surveys were performed across Consolidated Unit 10-002(a)-99, including the Central Area where the liquid waste disposal complex was formerly located. Results of the survey are presented in Figure M-2.2-3 of Appendix M. Red data points are any count rate greater than 110% of background levels (>661 counts per minute [cpm]). The maximum count rate measured in the surveyed areas at former TA-10 was 3126 cpm. Historical sampling of vegetation shows that chamisa plants remobilize subsurface strontium-90 through bioaccumulation and result in a 1997 interim action (LANL 1997, 056358) Overall, the level of contamination is low and in well-defined areas with no indication that surface migration towards the ephemeral stream channel is taking place.

Dose assessments for Consolidated Unit 10-002(a)-99 were made by comparing the strontium-90 endpoint concentration to the screening action levels (SALs) for recreational and construction worker scenarios. For both scenarios, the annual dose was calculated to be less than 1 millirem per year (mrem/yr). Current site conditions do not pose a radiological dose threat to recreational users or construction workers.

J-2.2 Strontium-90 Distribution and Mobility

Fixed laboratory analyses for strontium-90 as well as field screening of recovered cores document substantial decreases in activity with depth. For example, samples collected at location 10-601164 contained as much as 1310 picocuries per gram (pCi/g) strontium-90 activity at a depth interval of 14 to 16 ft. In the sample collected from the 19- to 21-ft interval, the strontium-90 activity is 86.2 pCi/g. In the 39- to 40.5-ft sampling interval the strontium-90 activity was less than the minimum detectable activity. Decreasing activities to less than detectable levels indicate that the strontium-90 contamination in the area of SWMU 10-007 is not highly mobile in the subsurface.

Numerous boreholes have been drilled in the area of the former liquid waste disposal complex. Shallow perched water has never been encountered during any drilling and sampling activities (LANL 2005, 085658, pp.12–20; LANL 2006, 092489, p. 9). Neither shallow perched water nor significant amounts of moisture were encountered during 2007 drilling activities in former TA-10 as a whole. Regional well R-24 was drilled in 2006 approximately 2300 ft downcanyon (Kleinfelder 2006, 092489) from SWMU 10-007. Three rounds of regional groundwater samples have been collected since July 2006, with no detections of strontium-90. No indication was found that strontium-90 migrated to any depth or laterally during operation of the former TA-10 liquid waste disposal complex or in the 45 yr since TA-10 was decommissioned.

J-3.0 ALTERNATIVES

The following seven preliminary (corrective action) alternatives were formulated to represent a range of effectiveness to meet the requirements and objectives described in section 4.3 of the approved work plan (LANL 2005, 089659):

- Preliminary alternative 1: Institutional controls consisting of land-use restricted to recreational users, installation of a permanent fence around the SWMU 10-007 debris landfill and contaminated chamisa, installation of run-on and erosion controls, removal of old “Do Not Dig” monuments, and installation of new monuments adjacent to the fenced area;
- Preliminary alternative 2: Control of deep-rooted plants through herbicide application and/or physical removal along with the institutional controls listed in alternative 1;
- Preliminary alternative 3: Subsurface, low-permeability grout barrier along with the institutional controls listed in alternative 1;
- Preliminary alternative 4: Excavation and disposal to remove elevated strontium-90 at the surface locations, and restricting land use to recreational along with the institutional controls listed in alternative 1;
- Preliminary alternative 5: Excavation and disposal of debris and soil with elevated strontium-90 and no restriction on land use;
- Preliminary alternative 6: Engineered cap over the debris area along with the institutional controls listed in alternative 1; and
- Preliminary alternative 7: No action.

Alternatives 2 and 4 are modified from those originally discussed in the approved work plan. Where the approved work plan proposed an injected herbicide barrier to control plant remobilization of strontium-90, alternative 2 now scopes a broader range of vegetation controls. Alternative 4 was originally proposed as a partial remediation of strontium-90 with intermediate institutional controls. Since the required excavation activities would be similar in scope and environmental impact to alternative 5, surface remediation was proposed as an intermediate option.

J-3.1 Evaluation Criteria

The following comparison criteria represent the remediation goals for the comparison of preliminary alternatives and are based on the Consent Order (Section VII.D.4) and DOE Order 5400.5:

- protect human health and the environment,
- meet standards (including as low as reasonably achievable [ALARA] and site-worker exposure),
- control source term (reduce or eliminate future releases) and reduce toxicity and mobility,
- ensure reliability and effectiveness,

- ensure implementability, and
- minimize cost (capital and maintenance).

The seven alternatives presented above are similar to those originally proposed in the approved work plan with minor modifications based on the additional information gathered in 2007. The relative performance of each of the preliminary alternatives when compared with each other remains unchanged from the findings in the approved work plan. Based on the findings of the current investigation, each option was reevaluated in terms of benefit realized beyond the institutional controls listed in alternative 1. The evaluation assumes that given the presence of significant subsurface strontium-90 contamination that could be excavated, the physical SWMU 10-007 area must be controlled. It further assumes that for the institutional controls of alternative 1 to not be in place, full removal must be conducted as presented in alternative 5.

J-3.2 Evaluation of Alternatives

Table J-3.2-1 presents the evaluation of the performance of each alternative for the various criteria. Alternative 1 is taken as the minimum acceptable action if removal of debris and strontium-90 contamination is not conducted.

J-3.2.1 Alternative 1: Institutional Controls

Institutional controls consist of a combination of land-use restrictions, physical controls and postings to restrict access to the site, and site improvements to control surface water and erosion in a more permanent fashion. Deed restrictions must be negotiated with the current property owner, Los Alamos County, to limit future land use to recreation and to clearly identify the location of subsurface strontium-90 contamination. Current “Do not dig” monuments would be removed and more appropriate monuments relocated to the perimeter of the SWMU 10-007 landfill and the area of subsurface strontium-90 contamination. Physical access to the area would be controlled through the construction of a permanent fence. Run-on controls, such as berms, would be installed to prevent surface water from flowing across the controlled area. Erosion controls would be installed to prevent encroachment of the intermittent stream channel over time.

Advantages:

- Installation of permanent fencing and monuments at the perimeter of the controlled area will isolate the area and discourage human intrusion into the contaminated media.
- Relocated monuments will better alert the public to the subsurface hazard than the present monuments, which are not adjacent to the landfill boundaries or the area of elevated subsurface strontium-90 contamination.
- Run-on and erosion controls will improve long-term site stability and will help reduce long-term surface transportation related to plant remobilization of strontium-90.

Disadvantages:

- Institutional controls will require the area to be fenced off from an otherwise scenic recreational area.
- Uptake of strontium-90 and potential remobilization by vegetation is not directly addressed by these institutional controls.

- The effectiveness of the controls requires periodic inspection and maintenance, which would include fence and monument repairs, inspection of erosion and run-on controls, and periodic surface radiological surveys to monitor remobilized strontium-90 by deep-rooted plants.

J-3.2.2 Alternative 2: Institutional Controls with Vegetation Control

This alternative builds on the controls in alternative 1 by addressing the vegetation remobilization of strontium-90 directly. Deep-rooted plants (principally chamisa) would be removed periodically, cut back, or killed using chemical herbicides or physical removal to prevent strontium-90 remobilization from the subsurface.

Advantages:

- This alternative directly addresses potential remobilization of strontium-90 to the land surface by plants.
- The potential for migration of surface contamination off-site beyond surface water controls is reduced.

Disadvantages:

- Repeated vegetation removal and/or herbicide application is required to remain effective.
- Cleared plant debris will need to be disposed of as waste.
- Removal activities or excessive application of herbicide may result in an increase in erosion at the site.
- Long-term repeated applications of chemical herbicides may result in unknown adverse impacts to flora and fauna that do not remobilize strontium-90.
- Site dose to a recreational user is currently very low. Vegetation controls result in little improvement to protectiveness of human health and the environment.

J-3.2.3 Alternative 3: Institutional Controls with Injected Grout Barrier

This alternative is an uncommon application of an established technology. Typical applications are to create impermeable vertical grout curtains. For SWMU 10-007, grout would be injected at numerous locations to create a continuous low-permeability barrier over the subsurface debris and strontium-90 contamination.

Advantages:

- Excavation into the subsurface contamination will be slightly more difficult because the grout will be harder than soil and alluvium.
- Plant uptake and remobilization of strontium-90 will be reduced.

Disadvantages:

- Site dose to a recreational user is currently very low. An injected grout barrier provides little improvement to protectiveness of human health and the environment beyond alternative 1.
- Deep-rooted plants must be killed before the grout barrier can be injected.

- The value of reduced infiltration is questionable, because site data and observations do not indicate that strontium-90 is highly mobile in the subsurface.
- Dose reduction to a recreational user would be the same as vegetation removal but would cost much more.
- Documenting proper placement of a continuous grout barrier would be very difficult.
- Grout may be subject to degradation (e.g., cracking and heaving) over the long-term because of temperature cycling and differential settling of soils.
- The long-term effectiveness of this application is not known.
- Killing existing deep-rooted vegetation will result in waste requiring disposal.
- The cost is high relative to the potential benefits.

J-3.2.4 Alternative 4: Institutional Controls Following Removal of Surface Contamination

This alternative involves excavating radiological surface contamination at SWMU 10-007 from areas identified in the radiological surveys and analytical data, followed by implementation of the institutional controls listed in alternative 1.

Advantages:

- A minor, immediate, short-term reduction in future human exposure from plant-remobilized strontium-90 would be realized.

Disadvantages:

- Site dose to a recreational user currently is very low. Surface removal provides little improvement to protectiveness of human health and the environment beyond alternative 1.
- The approach provides only short-term improvement unless vegetation control options are implemented.
- Waste disposal costs are significant with no long-term benefit.
- Risk to the public is increased from transport of waste to the disposal facility.
- Sampling and analyses are required to confirm adequate removal.

J-3.2.5 Alternative 5: Remediation of Debris and Strontium-90 Contamination with Uncontrolled Release of Property

This alternative proposes to excavate debris and strontium-90 contamination with the goal of uncontrolled release of the property.

Advantages:

- Strontium-90 and debris would no longer be issues at the site.
- A minor reduction in future dose to humans would be achieved.
- A minor improvement in source-term control would be seen.

Disadvantages:

- Removal would be prohibitively expensive if trace organic detections in environmental samples resulted in generation of mixed waste.
- The cost is very high compared to the benefit.
- Required excavation would be a minimum of 20 ft below existing grade. Depending on the cleanup levels, the excavation could exceed 40 ft in depth.
- Safety requirements could require slopes on the excavation sides that would cross the stream channel.
- Material staging, waste storage areas, and support areas would disturb extremely large areas compared to the area being remediated.
- Significant local environmental impacts would occur to an area much larger than the one being remediated.
- The risk to the public would be increased due to high volume of truck traffic shipping excavated materials off site and importing restoration backfill materials.

J-3.2.6 Alternative 6: Institutional Controls Following Installation of Engineered Cover

This alternative involves installing an engineered cover that includes a biobarrier to prevent the incursion of deep-rooted plants and burrowing mammals. The final surface would be vegetated with native grasses and shallow-rooting native plants. Land use would be restricted to the recreational scenario with the controls listed in alternative 1 above.

Advantages:

- The biobarrier addresses the remobilization of strontium-90 by deep-rooted plants and burrowing animals.
- A minor reduction in current and future dose to humans would be realized.
- The isolation of debris would be increased.

Disadvantages:

- Engineering design and construction costs are very high compared to the reduced dose to humans because the current dose to a recreational user is much less than 1 mrem/yr.
- The benefits of reduced infiltration are questionable because no indication has been found that strontium-90 is migrating off-site in the subsurface.
- The risk to public would be increased as a result of truck traffic hauling construction materials to the site.
- The cover will be larger than the area of SWMU 10-007, resulting in a large area of environmental impact relative to that being remediated.

J-3.2.7 Alternative 7: No Action

This alternative allows the site fence and “Do Not Dig” monuments to deteriorate over time. No run-on or erosion control maintenance or periodic inspections of the site would be performed.

Advantages:

- The short-term cost is low.

Disadvantages:

- The alternative does not implement ALARA measures.
- Future exposure to humans and ecological receptors from remobilized strontium-90 in deep-rooted plants is unknown.
- The alternative relies on the current deed notation of subsurface contamination and monuments to prevent human intrusion into the strontium-90 contamination.
- The costs associated with exposures from an uncontrolled area of surface and subsurface contamination are potentially unknown.

J-4.0 RECOMMENDATIONS

Evaluation of the existing data show that the current dose to a recreational user or a construction worker is less than 1 mrem/yr. Environmental sample data, radiological survey results, and regional groundwater sampling document that the strontium-90 contamination in the subsurface at SWMU 10-007 is not migrating off-site. Deep-rooted plants have remobilized strontium-90 and caused areas of limited surface contamination. The potential exists for the surface contamination to build up over the long-term and be transported by runoff from the site.

Based on the half-life of strountium-90 (~29 yr) and current analytical data, calculations were done using maximum activity to estimate the length of radioactive decay in years to reduce the dose to an acceptable level using the construction worker SAL. The result is 84 yr or approximately 3 half-lives. Thus, maintenance is required at SWMU 10-007 until the year 2092 if the site is not removed. The construction worker SAL was chosen because it is the appropriate scenario if someone actually digs into SWMU 10-007.

The least costly alternative is to take no action, as listed in alternative 7. This alternative is deemed inappropriate because it relies on maintaining the current land use and temporary fencing to prevent surface exposures or excavation into the strontium-90 contamination in the subsurface. No monitoring would be in place to assess buildup of strontium-90 taken up by plants or to control surface water run-on and erosion, which could result in off-site migration of the remobilized strontium-90. Alternative 7 is therefore rejected.

Alternative 5, full removal of subsurface debris and remediation of strontium-90 contamination, was evaluated as an alternative that would allow uncontrolled release of the property. Because of the excavation requirements and large areas required for material storage and equipment staging, the environmental impacts are unacceptable when dose reduction is less than 1 mrem/yr to remove a source term that data indicate is not highly mobile. In addition, health and safety impacts from excavation and off-site transporting activities add risk to workers and the general public. The cost of remediation compared to potential benefits is unreasonable. Alternative 5 is thus rejected.

Alternative 1 consists of long-term institutional controls including installation of a permanent fence and “Do Not Dig” monuments to restrict public access, alert the public to the presence of strontium-90 in the subsurface, and control accidental intrusion. In addition, run-on and erosion controls will increase the surface stability of the SWMU, reduce the likelihood of water ponding and infiltrating, and reduce the potential for off-site migration of strontium-90. Although periodic inspection and maintenance of these controls is required, alternative 1 is relatively cost-effective and protective of human health and the environment, based on the low current dose from the site.

Alternatives 2, 3, 4, and 6 all require long-term institutional controls, as presented in alternative 1, along with additional measures. Because of the low initial dose and lack of off-site migration, these additional measures offer little overall improvement in protectiveness to human health and the environment. All of them result in increased costs and environmental impacts relative to alternative 1.

In summary, alternatives 1, 2, 3, 4, and 6 remain as viable alternatives. The final appropriate alternative for SWMU 10-007, based on radioactivity as the only issue, will be negotiated between the DOE and the current property owner, Los Alamos County.

J-5.0 REFERENCES

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

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy–Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

Kleinfelder, January 2006. "Final Completion Report, Characterization Well R-24," report prepared for Los Alamos National Laboratory, Project No. 49436, Albuquerque, New Mexico. (Kleinfelder 2006, 092489)

LANL (Los Alamos National Laboratory), April 1996. "Interim Action Report for TA-10, Bayo Canyon Shrapnel," Los Alamos National Laboratory document LA-UR-96-1088, Los Alamos, New Mexico. (LANL 1996, 054491)

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LANL (Los Alamos National Laboratory), July 2005. "Investigation Work Plan for Bayo Canyon Aggregate Area," Los Alamos National Laboratory document LA-UR-05-4761, Los Alamos, New Mexico. (LANL 2005, 089659)

LANL (Los Alamos National Laboratory), November 23, 2005. "Response to the Notice of Disapproval for the Investigation Work Plan for the Bayo Canyon Aggregate Area and Revision to Same," Los Alamos National Laboratory letter (ER2005-0885) to J.P. Bearzi (NMED-HWB) from D. McInroy (ENV-ERS Deputy Program Director) and D. Gregory (DOE Federal Project Director), Los Alamos, New Mexico. (LANL 2005, 092083)

NMED (New Mexico Environment Department), December 19, 2005. "Approval of the Investigation Work Plan for the Bayo Canyon Aggregate Area," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2005, 092426)

Table J-3.2-1
Comparative Analysis of Alternative Response Actions for Radionuclides

No.	Response	Criteria: Protectiveness of Human Health and the Environment	Compliance with Standards	Control Source Term (Reduce Or Eliminate Future Releases)	Reliability and Effectiveness	Implementability	Cost
1	Institutional controls: 1. Land use restricted to recreational scenario 2. Installation of a permanent fence 3. Installation of run-on and erosion controls 4. Relocation of "Do Not Dig" monuments just outside of fence.	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**
		Adequate for human health because dose to a recreational user is low. Fencing, deed restrictions, and relocated monuments discourage human intrusion into contaminated media. Run-on and erosion controls minimize the potential for transport of remobilized strontium-90 from bioaccumulation in plants. The approach limits impacts to the environment resulting from more intrusive site alternatives.	Current dose to a recreational user is low. Fencing isolates recreational users from plants that bioaccumulate strontium-90 and the resulting surface accumulation of remobilized strontium-90 in plant litter. Run-on and erosion controls limit the potential for migration of remobilized strontium-90 in plant materials at the surface.	Run-on and erosion controls limit the potential for migration of remobilized strontium-90 in plant materials at the surface. No evidence of movement of strontium-90 in subsurface.	Effective for prevention of intrusion and redistribution of strontium-90 if properly maintained.	Good implementability.	Low short-term costs associated with construction of the fence, monuments, and run-on and erosion controls. Administrative costs are limited to periodic inspections and maintenance.
		Cons	**Cons**	**Cons**	**Cons**	**Cons**	**Cons**
		Minor or unknown impacts to flora and fauna from subsurface strontium-90. However, current site observations do not indicate an adverse impact to the flora and fauna. Human intrusion is possible.	Potential remobilization of strontium-90 to surface and redistribution.	Relies on institutional controls and monitoring to prevent releases due to human intrusion. Does not prevent the potential remobilization of strontium-90 to surface. Does not control potential movement of strontium-90 in the subsurface.	Depends on inspection and maintenance of the fence, monuments, and run-on and erosion controls to prevent long-term unauthorized use, potential additional human exposure, and redistribution of strontium-90.	Requires long-term inspection of site and maintenance of fence, monuments, and run-on and erosion controls. Requires negotiating deed restrictions with Los Alamos County for recreational use, excavation restrictions, installation of new "Do Not Dig" monuments, and installation of permanent fence and run-on/erosion controls.	Requires long-term inspection and maintenance costs.
2	Control of deep-rooted plants through cutting, removal, and/or systemic application of herbicide. Includes all alternative 1 controls.	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**
		Cutting and clearing deep-rooted plants will provide a reduction in strontium-90 remobilization and surface redistribution.	Site dose to recreational users is currently low. Dose reduction will be limited.	Access to source by roots and remobilization is reduced if reapplication is done when required.	Depends on annual maintenance and/or herbicide applications.	Good implementability.	Low initial costs.
		Cons	**Cons**	**Cons**	**Cons**	**Cons**	**Cons**
		Clearing and disposal of plant material may result in increased human exposures to strontium-90. Herbicide application may result in unknown adverse impacts to other flora and fauna that do not remobilize strontium-90. Erosion control benefits of chamisa will be lost.	Clearing and disposal of plant material may result in increased human exposures to strontium-90.	Does not control potential movement of strontium-90 in subsurface. Loss of erosion control benefits of chamisa.	Requires annual inspection and clearing of area and possibly repeated herbicide applications. May have unintended effects on other flora and fauna. Loss of erosion control benefits of chamisa.	Requires removal, screening and disposal of existing deep-rooted plants in addition to the requirements in alternative 1. Produces plant wastes that must annually be screened and disposed of properly. Requires annual inspection and maintenance.	Incurs annual maintenance costs. High cost relative to potential benefits. Potentially unreasonable cost and effort of numerous maintenance operations, including reapplications of herbicide over the strontium-90 decay time (half-life 28 yrs).

Table J-3.2-1 (continued)

No.	Response	Criteria: Protectiveness of Human Health and the Environment	Compliance with Standards	Control Source Term (Reduce Or Eliminate Future Releases)	Reliability and Effectiveness	Implementability	Cost
3	Injected grout barrier to impede human intrusion, reduce potential infiltration and inhibit plant and animal intrusion. Land use restricted to recreational scenario with controls listed in alternative 1 above.	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**
		Minor reduction in future human exposure because construction debris is already a physical impediment to intrusion or excavation. May reduce remobilization of strontium-90 due to plant uptake and may result in reduction in future surface contamination. Will reduce infiltration to the subsurface contaminated zone.	Limited ALARA value: construction debris is already a physical impediment to intrusion or excavation Minor reduction in exposure to remobilized strontium-90 from plant uptake.	Access to source by humans is marginally reduced. Remobilization of strontium-90 from plant uptake may be reduced and result in reduction in future surface contamination.	Excavation of grout barrier still possible but is more difficult. Provides physical impediment to deep-rooted plants.	Common technology.	Moderate cost
		Cons	**Cons**	**Cons**	**Cons**	**Cons**	**Cons**
		Reduced potential infiltration will be of limited value because there is no evidence of strontium-90 movement, perched water has not been identified in Bayo Canyon, and regional well R-24 (2300 ft downcanyon) (Kleinfelder 2006, 092489) shows that regional groundwater has not been impacted by strontium-90.	The barrier has limited ALARA value over land-use restrictions. Grout barrier adds little value because concrete construction debris is already a physical impediment to intrusion or excavation.	Construction debris is already a physical impediment to intrusion or excavation. The alternative will provide little additional source-term control beyond what is provided by the run-on controls. Steep concentration gradients, the lack of perched water, and lack of impacts to regional groundwater at well R-24 (Kleinfelder 2006, 092489) indicate that strontium-90 is not mobile at the site.	Construction debris is already a physical impediment to intrusion or excavation. Reliability as a root barrier and infiltration barrier requires placement of a continuous grout layer, and documenting proper grout placement is difficult. The grout will be subject to degradation from temperature variations and setting of soils, lowering or destroying its value as a barrier.	Uncommon application. Verification of proper placement difficult.	High cost relative to potential benefits.
4	Excavation and disposal to remove surface contamination. Land use restricted to recreational scenario with controls listed in alternative 1 above.	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**
		Immediate reduction in strontium-90 activity at the soil surface.	Immediate reduction in potential surface exposures.	Provides limited short-term benefit by removal of strontium-90 in surface soil.	Provides short-term improvement beyond land use restrictions and site controls in alternative 1.	Good implementability. The level of effort is directly tied to the negotiated cleanup level.	Moderate one-time cost incurred.
		Cons	**Cons**	**Cons**	**Cons**	**Cons**	**Cons**
		Does not prevent future plant uptake and redistribution.	Site dose to recreational users is currently low. Not likely to reduce dose beyond that of alternative 1. Remobilization of strontium-90 by plants is not addressed. Increased risk to the workers and public from excavation and transport of radioactive waste.	No net long-term benefit regarding remobilized strontium-90 will be realized. The approach has no impact to control of the subsurface strontium-90 source term.	No long-term improvement beyond land-use restrictions and site controls in alternative 1.	Disturbance of vegetation and plants. Waste storage/disposal necessary.	High cost relative to potential benefits because of waste disposal costs and short-term effects. No net value over the long-term from remobilization.

Table J-3.2-1 (continued)

No.	Response	Criteria: Protectiveness of Human Health and the Environment	Compliance with Standards	Control Source Term (Reduce Or Eliminate Future Releases)	Reliability and Effectiveness	Implementability	Cost
5	Excavation and disposal of construction debris and strontium-90–contaminated media in the subsurface to meet criteria for release without restrictions. No institutional controls would be required.	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**
		No institutional controls necessary. Source removal is protective of groundwater.	Eliminates all potential exposure to surface strontium-90 at the site.	Source term removed.	Effective. Source term removed.	Relatively easy to implement, known technology.	High cost, but source removed permanently.
		Cons	**Cons**	**Cons**	**Cons**	**Cons**	**Cons**
		Little actual reduction in exposure will be achieved relative to alternative 1. The area physically impacted during source removal activities will be much greater than the area being remediated. The environmental harm from site work is excessive relative to benefits from reduction in human exposure. Because strontium-90 contamination does not appear mobile at the site, the value is questionable.	Questionable reasonableness because the current dose to a recreational user is low. Limited long-term dose reduction for reasonable future use of the property. Increased risk to the public from large volumes of radioactive waste being transported to a disposal facility.	Because there is no evidence that strontium-90 contamination is mobile at the site, the value is questionable. The environmental harm from site work is excessive relative to the benefits from reduction in human exposure	Little actual reduction in exposure relative to alternative 1.	The required excavation would be in excess of 20 ft deep. The required side slopes in unconsolidated media could impact a very large area. Additional areas will be impacted by waste storage areas, equipment staging areas, and stockpiles of clean excavated material. Large volumes of waste require packaging and transport to a disposal facility. Significant transportation hazards exist. Waste minimization would be poor, and waste disposal costs would be very high (prohibitively high if mixed waste is encountered).	High cost relative to potential benefits. Prohibitively expensive if contaminated media profiled as mixed waste.
6	Installation of an engineered cover that includes a biobarrier to prevent incursion of deep-rooted plants and burrowing mammals. Final surface to be vegetated with native grasses and shallow-rooting native plants. Land use restricted to recreational scenario with controls listed in alternative 1 above.	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**
		Minor reduction in dose to humans relative to alternative 1 can be achieved through covering current surface contamination. Biobarrier will reduce the potential for remobilization of strontium-90 by flora and fauna.	Immediate reduction in surface exposures.	Eliminates remobilization of strontium-90 by deep-rooted plants. Reduces infiltration.	Has greater effectiveness in limiting remobilization of strontium-90 by deep-rooted plants. Effectively reduces infiltration.	Known and proven technology.	High cost but effectively reduces potential dose.
		Cons	**Cons**	**Cons**	**Cons**	**Cons**	**Cons**
		No evidence of current transport to groundwater. Institutional controls still required to prevent excavation in the area of strontium-90 contamination. Required disturbance of a large area of the canyon.	Dose to the recreational user is initially low. The cost to design and install a cover may be unreasonable compared to the dose reduction.	Little actual reduction in exposure is achieved relative to alternative 1. No evidence strontium-90 contamination is mobile at the site; characterization data and downgradient sampling of the regional aquifer at well R-24 (Kleinfelder 2006, 092489) indicate that the strontium-90 contamination is not highly mobile.	Effectiveness is expected to be similar to alternative 1. Cap must be inspected and maintained to ensure long-term effectiveness. There is no evidence that infiltrating water is moving strontium-90.	Approach is moderately complex because of the necessary engineering design of the cover and adherence to design specifications during construction. On-site materials study should be performed to identify local sources of cover construction materials to potentially reduce construction costs. Will disturb large area of canyon.	Short-term costs are high compared to dose reduction. Long-term costs are similar to alternative 1 because of inspections required to ensure the integrity of the fence, monuments, and cover.

Table J-3.2-1 (continued)

No.	Response	Criteria					
		Protectiveness of Human Health and the Environment	**Compliance with Standards**	**Control Source Term (Reduce Or Eliminate Future Releases)**	**Reliability and Effectiveness**	**Implementability**	**Cost**
7	No action.	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**	**Pros**
		Current dose to a recreational user is low.	No reduction in exposures.	No additional controls relative to existing conditions.	Surface contamination may be redistributed.	No action necessary.	No cost.
		Cons	**Cons**	**Cons**	**Cons**	**Cons**	**Cons**
		Minor human exposure to some strontium-90 from chamisa and possible exposure to radionuclides if land is used for residences. Minor or unknown impacts to flora and fauna.	Does not address ALARA compliance. No controls on potential exposures.	Potential remobilization of strontium-90 to surface and redistribution.	No controls on use.	Public acceptance may be low.	Potential unknown future costs from potential future exposures.

Appendix K

Geophysical Survey Report: Shrapnel Survey

K-1.0 INTRODUCTION AND SCOPE

ARM Geophysics (a division of ARM Group, Inc.) performed a nonintrusive geophysical investigation using the TM-5emu instrument at former Technical Area (TA) 10 of Los Alamos National Laboratory (the Laboratory), located in Bayo Canyon, from July 19 to August 14, 2007. The primary objective of the investigation was to collect, process, and interpret TM-5emu digital geophysics data collocated with a global positioning system (GPS) to delineate the lateral extent anomalies may be attributed to the subsurface metallic content and the inferred shrapnel distribution from Consolidated Unit 10-001(a)-99, a former firing site within TA-10. In field applications, the TM-5emu has been shown to be superior to standard electromagnetic methods in detecting smaller metallic items, such as shrapnel remaining at the former TA-10. Attachment K-1 provides the original ARM report, including daily quality control summaries, on CD.

K-2.0 METHODOLOGY

K-2.1 Geodetic Positioning

All geophysical instruments were integrated with a centimeter-grade differential global positioning system (DGPS) to (1) allow real-time navigation along planned survey routes; (2) provide an accurate location of geophysical measurements; (3) provide the means of establishing a local reference grid system (as needed); and (4) allow direct data integration with the Laboratory's Geographic Information System (GIS). The DGPS of preference for the current survey was the Ashtech Z-extreme (base and rover) units. The geographic positions were acquired at 1-s intervals to allow for adequate spatial sampling relative to walking speed. All geographic data are presented in New Mexico State Plane Coordinate System, Central Zone, North American Datum 1983, U.S. survey feet.

K-2.2 Electromagnetic Unit Metal Detector (GAP TM-5emu)

The TM-5emu System consists of a Norand 602 computer, a Minelab F1B2 electromagnetic sensor module, two 18-in. sensor coils, an EMUDAS program, and various ancillary devices. The TM-5emu system is a combination of both analogue and digital electronics to process the information into a form that allows simplified operations, including an automatic procedure for "ground-balancing" out the effects of adverse geologic conditions. The basic function of the Norand system is to acquire digital data from the sensor module and present it in a form that allows the operator to achieve certain objectives through a combination of graphic display, audio tone mapped to target response, and digital-signal processing. The Norand system has a built-in procedure that provides automatic discrimination between buried metal objects and natural geologic material with a high magnetic susceptibility, such as basalt and ironstone. The TM-5emu response is measured in electromagnetic units (EMUs), and all data were digitally recorded in the field for subsequent processing on computer.

K-3.0 RESULTS AND DISCUSSION

K-3.1 Geodetic (GPS and DGPS) Survey

GPS and DGPS data were integrated with each of the sensor system results to allow real-time navigation along planned survey routes; provide accurate location of geophysical measurements; provide the means of establishing a local reference grid system (as needed); and allow direct data integration with the Laboratory's GIS. As part of the geophysical survey, a geodetic grid system was established and large-scale features (such as an ephemeral stream channel and mowed area) were also surveyed as reference. Figure K-3.1-1 is a site map showing the established grid system with large-scale features outlined.

K-3.2 Electromagnetic (GAP TM-5emu Detector) Survey

EMU data were collected and processed to determine two main points of interest: (1) the sitewide distribution of shrapnel and (2) delineation of any trends or anomalies in the shrapnel detected on-site. The main focus of the TM-5emu survey was completed through combining the data onto one composite map, shown in Figure K-3.2-1.

To meet the main objective, the TM-5emu response data were interpreted both qualitatively and quantitatively for anomalous responses in the data. Qualitatively, the TM-5emu metal detection data show anomaly distribution (see Figure K-3.2-1) ranging from high-anomaly densities in the central to southwest-central portion of the site, radiating to lower anomaly densities outwards in all directions. Anomalous densities are particularly pronounced in the northwest, southeast, and eastern portions of the site. Quantitatively, the TM-5emu data interpretation resulted in 39,199 peak anomaly selections, which equates to an average anomaly density of approximately 1000 per acre. Individual daily quality control summary and grid-based map images are provided in Attachment K-1.

In addition, areas with low counts (shown in green) that are interspersed with areas of higher counts (shown in red) are probably former roads or tracks or small ephemeral channels and gullies where shrapnel is not present because of a lack of deposit, surface movement during heavy precipitation events, removal by human intervention, or a combination of the above. Of note is the wide green area that cuts diagonally from south to north though the survey area. This former channel or low area has begun to fill in from altered surface flow patterns. Aerial photographs and ground observations confirm this observation. Thus, any remaining shrapnel that has not previously washed out has subsequently been covered with recent sediments.

The density distribution around the former shot pads suggests that they were cleaned periodically. The density distribution around the eastern shot pad shows a central area with lower shrapnel density surrounded by a ring of higher density. This trend is less obvious in the western shot pad but can still be inferred. The sitewide density color-coded map shown in Figure K-3.2-2 further demonstrates these trends.

The geophysical data indicate (1) the shrapnel distribution is adequately defined by the current survey boundary, as indicated by the site map, and (2) the shrapnel is primarily within the first few inches of the surface, as indicated by the lack of distribution near roads or other areas of potential erosion.

K-4.0 CONCLUSIONS

The main objective of the geophysical shrapnel survey was to determine the distribution for all shrapnel to ensure the extent was defined. This objective was achieved by mapping the area using the TM-5emu instrument until the potential shrapnel anomaly distribution dropped off significantly from the central location of the former firing site pads. No ordnance-related hazards were identified.

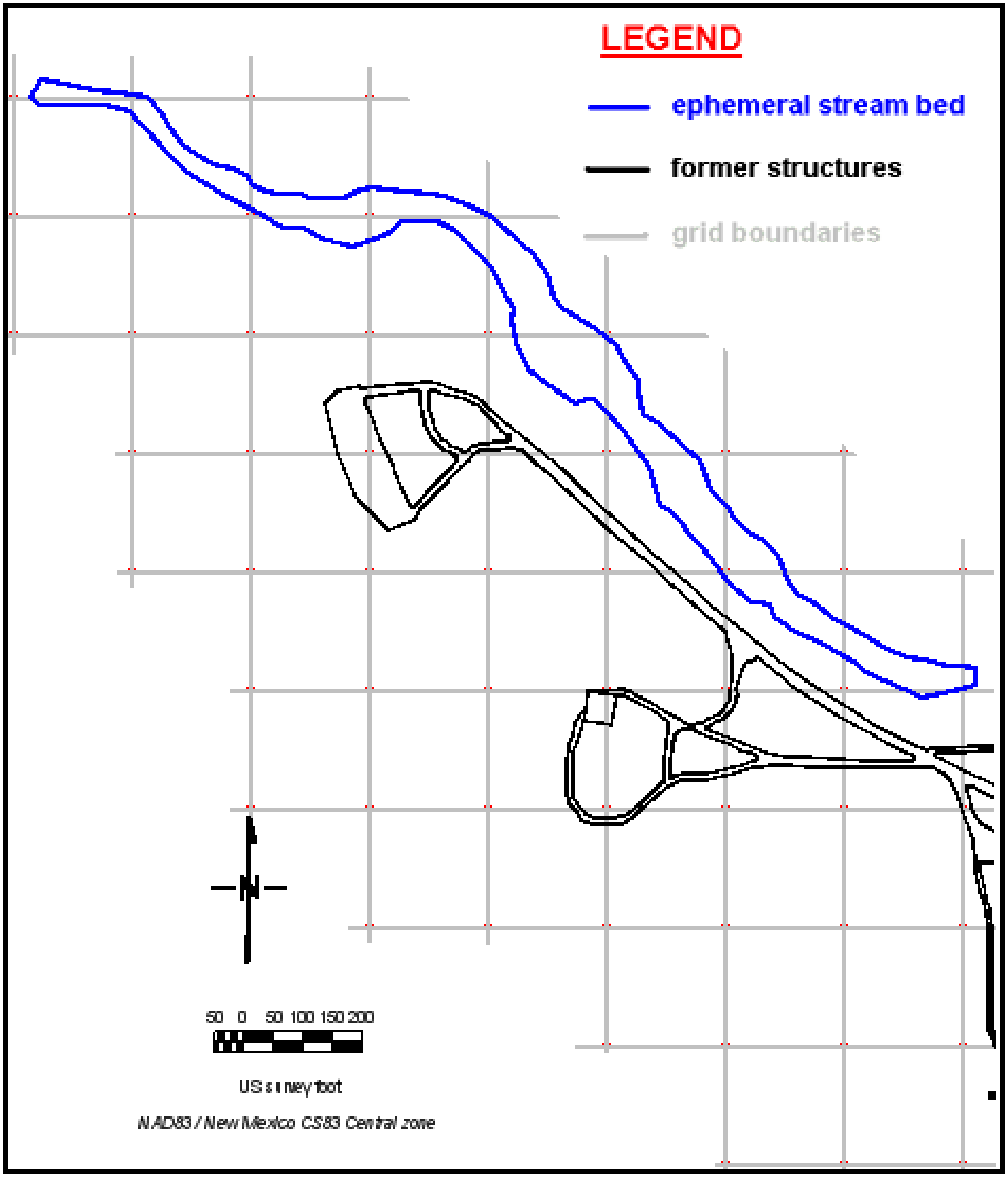
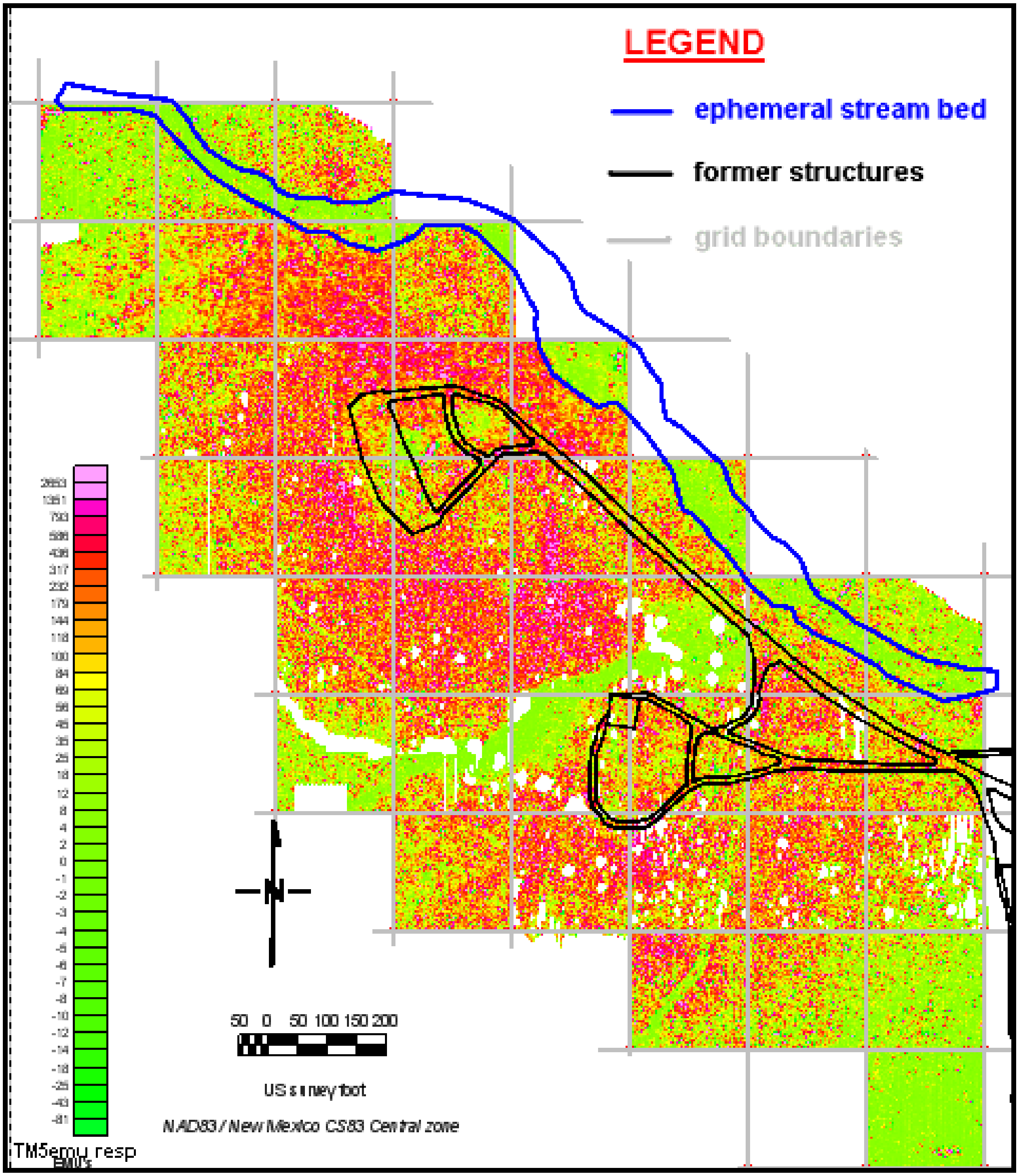
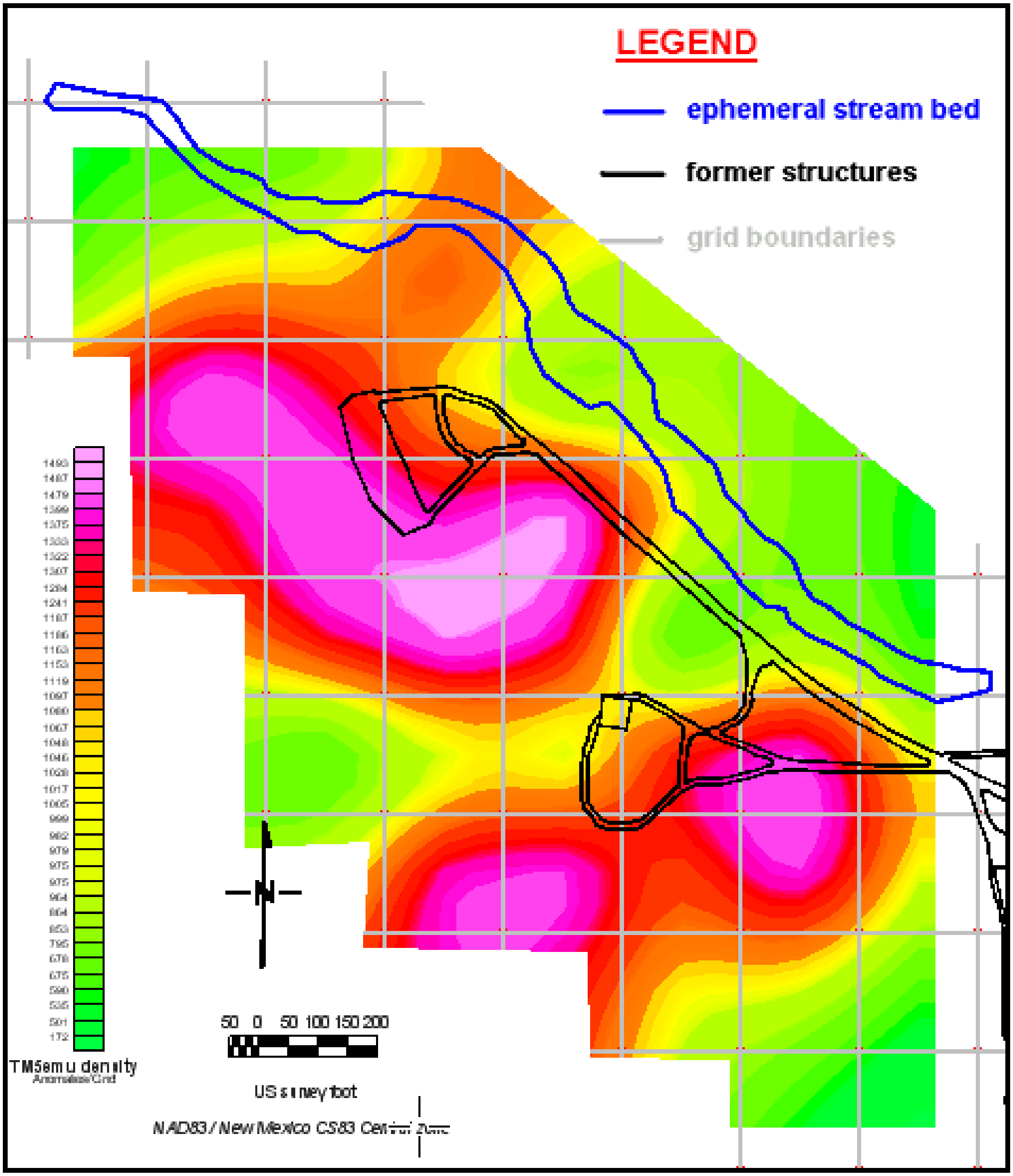


Figure K-3.1-1 Site map showing the established grid system, the former building structures and roads, and the ephemeral stream channel



Note: Red shades indicate high response values (shrapnel), and green shades indicate low response values ("background" or lack of shrapnel).

Figure K-3.2-1 Results of the TM-5emu survey



Note: Red shades indicate higher densities of anomalies (shrapnel cluttering), and green shades indicate lower densities of anomalies (lower level or lack of shrapnel cluttering).

Figure K-3.2-2 Sitewide density map of composite TM-5emu survey results

Attachment K-1

Geophysical Investigation of Bayo Canyon
Los Alamos National Laboratory, Los Alamos, New Mexico
prepared by ARM Geophysics
(on CD included with this document)

Appendix L

Geophysical Survey Report:
Landfill and Buried Structures Identification Survey

L-1.0 INTRODUCTION AND SCOPE

From August 14 to 22, 2007, ARM Geophysics, Inc., performed a nonintrusive geophysical investigation at Bayo Canyon, Los Alamos, New Mexico. These surveys were performed to identify buried material and former structures in Technical Area 10, located 0.5 mi west of the Los Alamos County sewage treatment plant. To achieve this objective, surveys were performed using electromagnetic (EM) terrain conductivity (EM31), high-sensitivity metal detector (EM61), and digital ground-penetrating radar (GPR) surveys. Attachment L-1 provides the original ARM report on CD.

Survey areas were selected based on the approved work plan for Bayo Canyon Aggregate Area and in-field decisions as each survey progressed.

Survey areas included the following areas within Consolidated Unit 10-002(a)-99, which consists of multiple sites, many of which are only indirectly related by historical process. The consolidated unit consists of now-removed liquid disposal pits and lines and the existing Solid Waste Management Unit (SWMU) 10-007 debris landfill. The following are the primary geophysical targets in this consolidated unit:

- building debris landfill (SWMU 10-007)
- suspected septic leach field
- buried pipes and structures associated with former radiochemistry building
- SWMU 10-004(a), the former septic tank and related structures
- suspect landfill Area of Concern (AOC) 10-009

L-2.0 METHODOLOGY

All operational methods used were in accordance to proper procedures as outlined in the operation manuals or operating instructions for each instrument. Methodology for the geophysical instruments used and any ancillary equipment is described below.

L-2.1 Geodetic Positioning

All geophysical instruments were integrated with a differential global positioning system (DGPS) to allow real-time navigation along planned survey routes to provide accurate location of geophysical measurements, eliminate the need to establish a local reference grid, and allow direct data integration with Los Alamos National Laboratory's (the Laboratory's) Geographic Information System (GIS). The geographic positions of all measurement points were acquired at 1-s intervals as the geophysical data were collected. The data were acquired using a differential system to allow accurate positioning in real-time, with accuracy of less than 1 m. All geographic data are presented in New Mexico State Plane Coordinate System, North American Datum 1983, Central Zone, U.S. survey feet.

L-2.2 Terrain Conductivity (EM31)

The EM31 instrument uses the principle of EM induction to measure the electrical conductivity of the ground. Lateral changes in terrain conductivity can indicate the presence of disturbed ground, disposal areas, buried metallic and nonmetallic waste, and impacted groundwater. In addition, the method is useful in detecting linear metal objects such as utilities.

A Geonics EM31-MK2 was used to conduct the survey. The EM31 operates in accordance with the theory of operation at low induction numbers. An alternating current is passed through a transmitter coil to induce eddy currents into the ground below the instrument. These eddy currents generate a secondary magnetic field. The quadrature-phase component of the induced secondary magnetic field is detected by a receiver coil and measured by the instrument. The measured response is linearly related to the terrain conductivity. The instrument converts the measured signal and displays it as terrain conductivity in millisiemens per meter (mS/m).

For this investigation, EM31 data were recorded at approximately 2-ft intervals along lines spaced approximately 10-ft apart. Higher resolution coverage was completed in selected target areas using a 5-ft line spacing. Line and station separation sometimes varied depending upon surface obstructions, such as the presence of cultural interference, buildings, and dense vegetation. Geodetic coordinates were recorded at 1-s intervals using an integrated DGPS. A base station free from cultural interference, such as aboveground metal objects and overhead power lines, was occupied at the beginning and end of each survey day to calibrate the instrument and perform system functional tests. During these system tests, battery, phasing, and sensitivity checks were performed.

L-2.3 High-Sensitivity Metal Detector (EM61)

Buried metal objects can be effectively located using a Geonics EM61-MK2 high-sensitivity metal detector. The EM61 is a time-domain EM system that can discriminate between conductive soils and metal objects. It has numerous advantages over other commonly used metal-detection devices. For example, it is significantly less sensitive to cultural interference.

The EM61 generates rapid electromagnetic pulses and measures the subsurface response between pulses. Secondary EM fields are generated in the ground after each pulse. These fields dissipate rapidly in earth materials but remain for a longer time in buried metal objects. The EM61 measures the prolonged metal response only after the earth response has dissipated. This response is measured and displayed in millivolts.

For this investigation, data were collected at less than 2-ft intervals along lines spaced approximately 10 ft apart. Higher resolution coverage was completed in selected areas using a 5-ft line spacing. Line and station separation sometimes varied, depending upon surface obstructions. Geodetic coordinates were recorded at 1-s intervals using an integrated DGPS so each measurement point could be accurately located.

L-2.4 GPR

The GPR technique uses the transmission and reflection of radio waves to image objects beneath the ground surface. The technique responds to changes in the electrical properties of the earth or buried materials. A GPR target must possess electrical characteristics that are different from the surrounding media to be detected. When the transmitted wave encounters an anomalous object or layer, the wave is reflected back to the surface where it is recorded and analyzed. The waves are transmitted rapidly such that a continuous subsurface image is generated as the transmitter is pulled along the ground surface.

The GPR survey was performed using a digital SIR-3000 Subsurface Interface Radar system. Following initial field tests to determine maximum penetration and sufficient resolution, a 200-MHz transducer was selected to perform the detailed survey. The data were digitally recorded, displayed, and analyzed as they were collected to allow real-time interpretation. Line locations were selected based on historical locations of target features such as pits and shafts or suspected buried features, such as a leach field.

In-field signal velocity calculations and depth calibrations were performed by recording two-way signal travel times over objects with known depths. In addition, hyperbolic fitting was performed by computer to calculate signal travel time and more accurately estimate target depths.

L-3.0 RESULTS AND DISCUSSION

L-3.1 Building Debris Landfill (SWMU 10-007)

The purpose of investigating the building debris landfill was to delineate the lateral extent of the disposal area. To achieve this objective, terrain conductivity EM31, high sensitivity metal detector EM61, and GPR techniques were used.

Figure L-3.1-1 presents a plan map of the EM61 data. These data show high amplitude anomalies and abrupt lateral variations that indicate the presence of buried metal objects. Because the EM61 responds only to metal objects, values above background indicate the presence of metal. The results presented in Figure L-3.1-1 show a kidney-shaped anomaly in the western portion of the survey area that is consistent with the suspected location of the debris landfill. Additional anomalies (reddish to pink in color) located near the eastern border of this survey area are attributed to interference from fence posts and other metal objects that were being temporarily stored there. Figure L-3.1-2 presents a plan map of the EM31 data, which generally confirms the EM61 data.

The interpreted boundary of the debris landfill was refined using the GPR data. Nine GPR lines were run in a radial pattern over the suspected landfill boundaries. The GPR data are presented in Attachment L-1 (on compact disk included with this document). The results generally corroborate the EM data, with one exception. The GPR results indicate an anomaly exists outside the interpreted EM anomaly area near GPR line 65. It is likely that the source of the GPR anomaly is nonmetallic (probably concrete) and therefore did not produce a significant EM response. The debris landfill boundary shown in Figure L-3.1-1 is a combined interpretation of all geophysical data sets (EM31, EM61, and GPR). The inferred area of the debris landfill is 6010 ft^2.

L-3.2 Suspected Septic Leach Field [SWMU 10-004(b)]

Historical documents indicate a former septic leach field exists northeast of the Central Area. The suspected leach field was apparently associated with structures that were removed from the area that is now considered the Central Area (within the fenced boundary). These types of structures at the Laboratory often contain no metal and cannot be detected using EM techniques. For this reason, only GPR was used. Numerous GPR lines were collected in an attempt to identify any existing buried pipelines extending into the suspected area. In addition, lines were run to analyze for lateral variations that may be associated with disturbed subsurface conditions. The locations of the GPR lines are shown in Figure L-3.2-1.

Detailed computer analysis of the GPR data showed no anomalies that could be attributed with certainty to the alleged leach field.

L-3.3 Buried Pipes Associated with Radiochemistry Building and SWMU 10-002(b)

Historical documents show the presence of buried pipes extending from the former radiochemistry building to a septic tank(s) located north of the building and within the present Central Area. EM data were obtained from these areas as shown in the terrain conductivity (EM-31) map (Figure L-3.3-1). These results do not show any linear anomalies that would indicate the presence of pipelines. GPR data were obtained over these areas as well, but no anomalies were observed that could be attributed with certainty to pipelines.

SWMU 10-002(b) was a solid and liquid waste pit located on the south side of the radiochemistry laboratory building. At the time of this investigation, a large (~4-in.) metal pipe with elbow joint was visible at the surface on at east side of the suspected pit location (this pipe has since been removed). EM61 data were obtained from the area in an attempt to map any buried metal objects such as tanks or pipes. The EM61 data are shown in Figure L-3.3-2. The only anomalies observed in this area were associated with surface interference from the pipe observed at the ground surface.

GPR data were also acquired over the area shown in Figure L-3.3-2, but no evidence of a buried structure was observed and delineating a disturbed area was not possible. Finally, radiofrequency pipe locator methods were used in an attempt to trace the possible subsurface route of the exposed pipe, but no consistent signal was detected.

L-3.4 SWMU 10-004(a)

EM and GPR techniques were used at SWMU 10-004(a) to detect any subsurface anomaly that may be attributed to buried structures. The terrain conductivity data are shown in Figure L-3.4-1. The high amplitude anomaly near the center of the survey area is attributed to surface metal interference caused by equipment temporarily stored at the surface in this area. Similarly, the EM61 data shown in Figure L-3.4-2 also show this interference. No other EM anomalies were observed that could be attributed to buried structures or pipes. GPR data (lines 53, 54, and 55 in Figure L-3.4-2) were acquired over a subtle linear EM anomaly, but the results showed no evidence of buried objects.

L-3.5 AOC 10-009

The suspect landfill area was surveyed with EM and GPR techniques in an attempt to delineate the lateral extent of the alleged disposal area. The terrain conductivity data (EM31) are shown in Figure L-3.5-1. These data exhibit a halo of high conductivities associated with interference from the surrounding chainlink fence. No other anomaly inside the chainlink fence interference indicates the presence of buried debris. The EM61 data shown in Figure L-3.5-2 exhibit a similar response: no significant target anomalies were observed. A previous radiological survey identified areas of contamination within the survey area. ARM relocated in this area using DGPS during the geophysical investigations. Further visual observations of this area revealed the presence of disseminated quantities of mm-size yellow material exposed at the surface. GPR data were obtained from this area to identify possible buried materials. The GPR results showed no evidence that would indicate the presence of a significant quantity of buried debris.

L-4.0 CONCLUSIONS

The targets of this geophysical investigation for SWMUs 10-004(b), 10-004(a), and 10-002(b) are assumed to have been removed during the decontamination and decommissioning operations of surface and buried structures in the 1960s. However, more data are needed to confirm this assumption. The results of the current investigation confirm prior removal of the target structures (or that they never existed) because no geophysical anomalies were observed that would indicate their presence.

The geophysical investigation of the suspected landfill at AOC 10-009 revealed no anomaly or anomalous data that could be attributed to buried material or debris.

Finally, geophysical techniques were used at SWMU 10-007 to delineate the extent of the buried construction debris known to exist in the area. The EM results identified a kidney-shaped anomaly that was attributed to buried material and disturbed subsurface conditions. The GPR data obtained from this same area identified various anomaly shapes including tubular bodies that are interpreted as demolition debris. The inferred area of the debris landfill is 6010 ft^2.

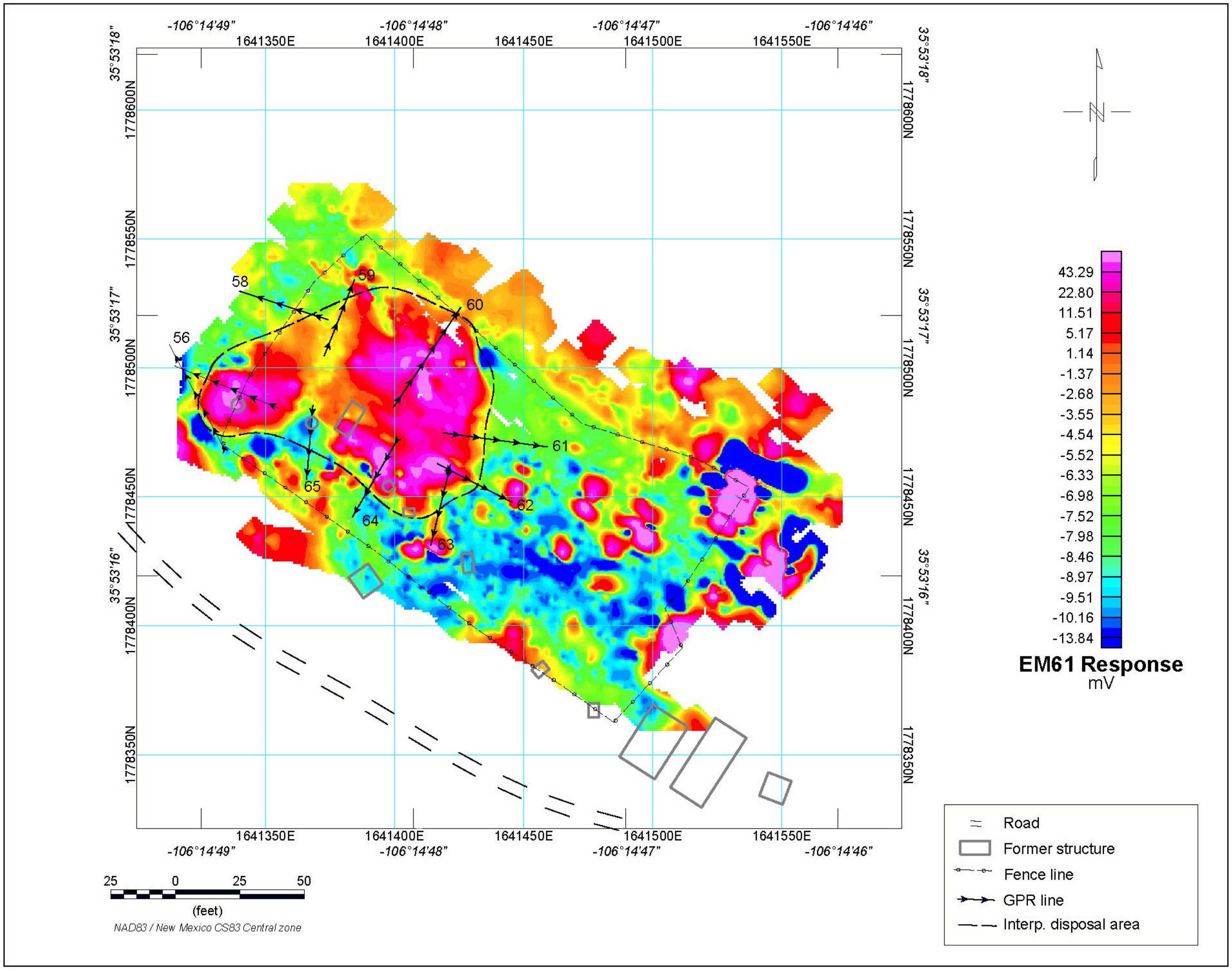


Figure L-3.1-1 Buried metal anomaly (EM61) map of SWMU 10-007

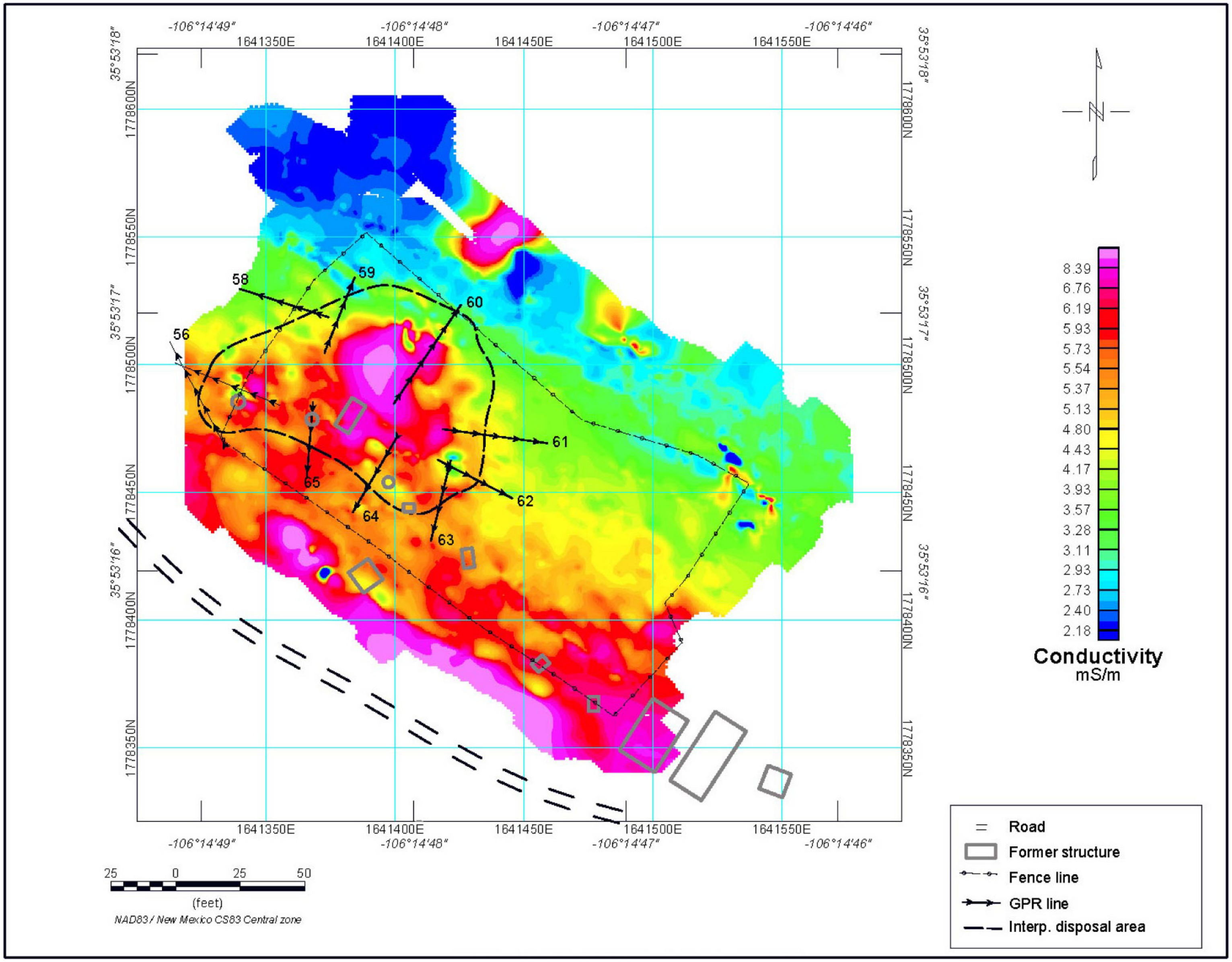


Figure L-3.1-2 Terrain conductivity (EM31) map of SWMU 10-007

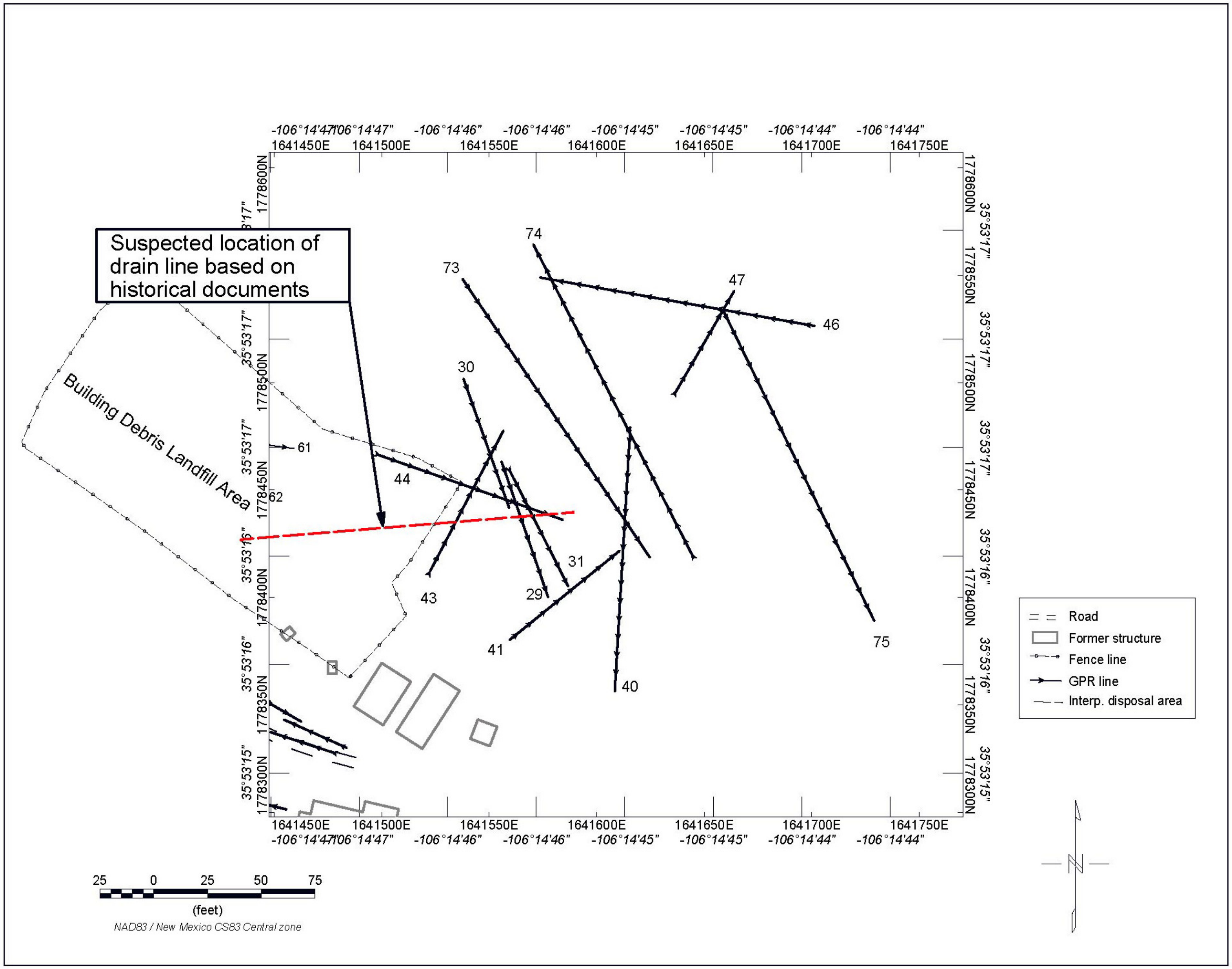


Figure L-3.2-1 GPR line locations used to investigate the suspected septic leach field at Consolidated Unit 10-002(a)-99

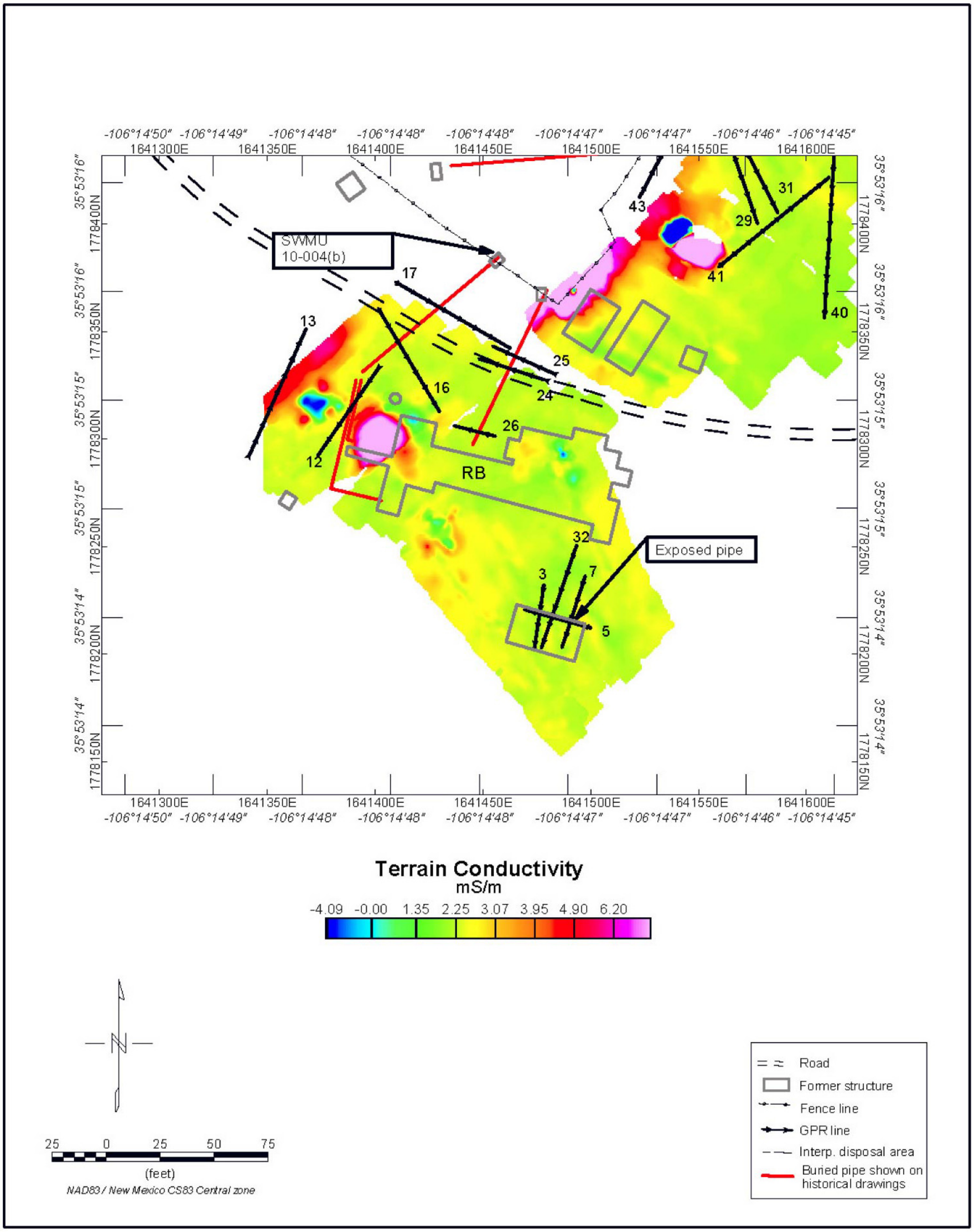


Figure L-3.3-1 Terrain conductivity map of former radiochemistry building area and SWMU 10-004(b)

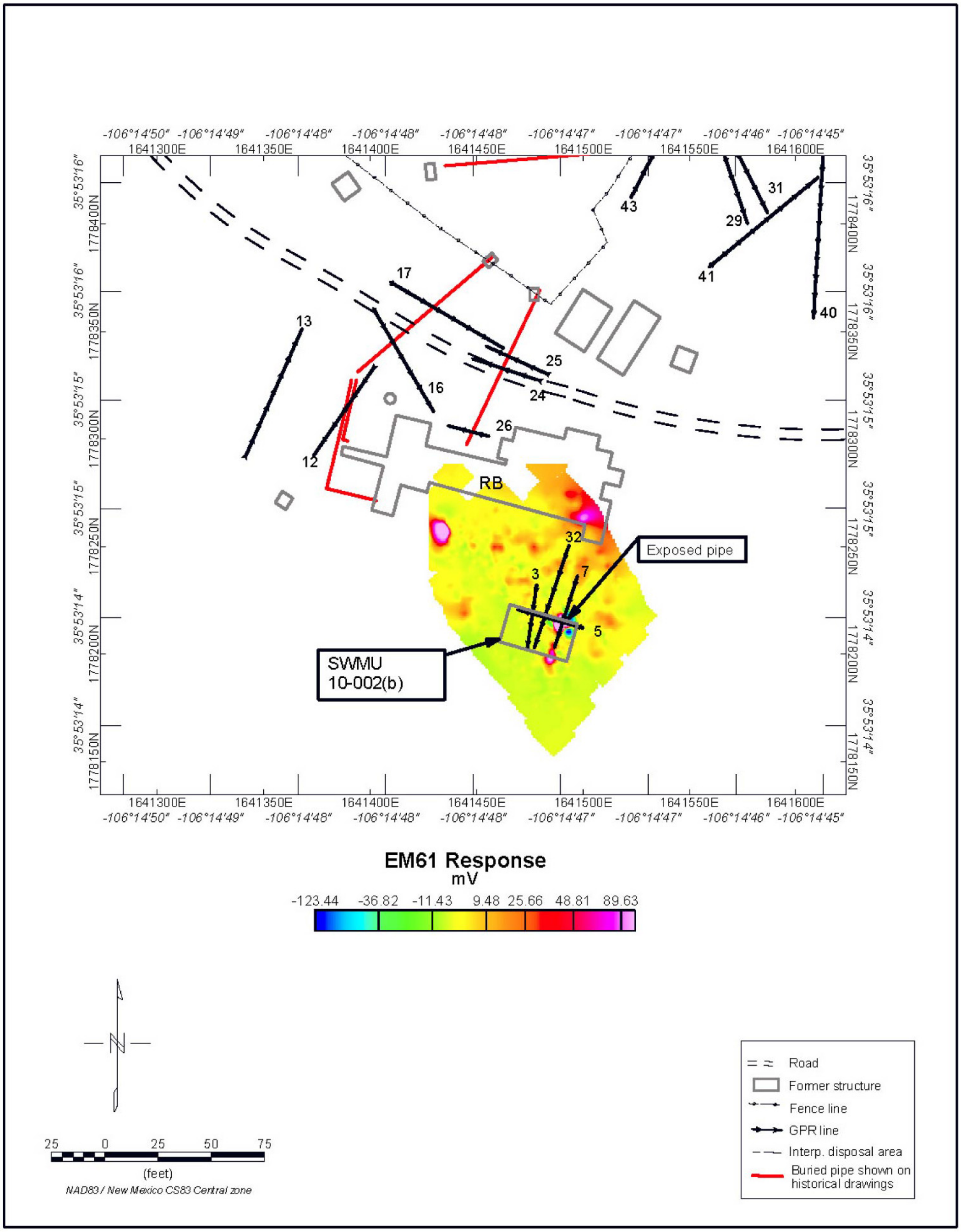


Figure L-3.3-2 Buried metal anomaly map (EM61) of former radiochemistry building area and SWMU 10-002(b)

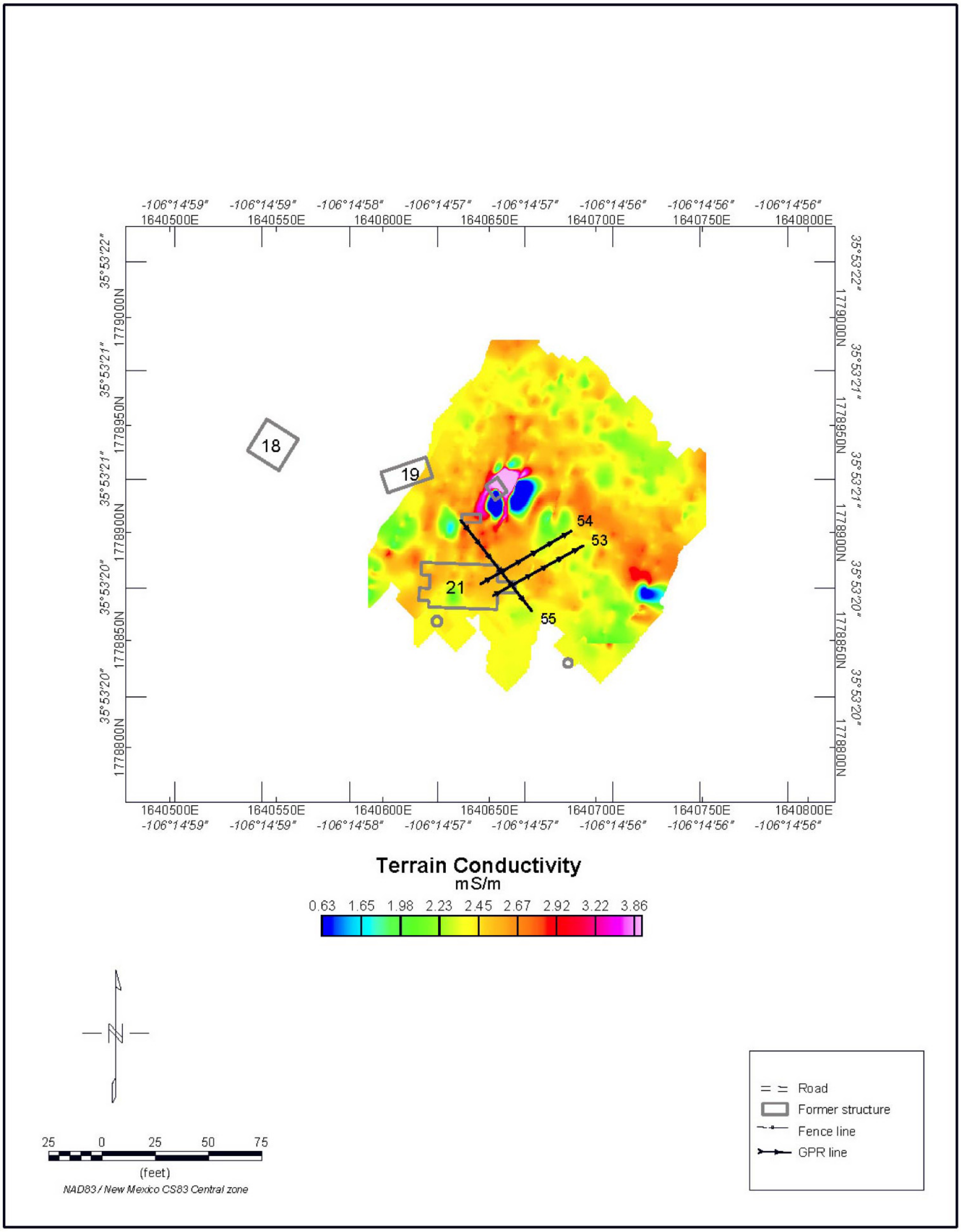


Figure L-3.4-1 Terrain conductivity map (EM31) of SWMU 10-004(a)

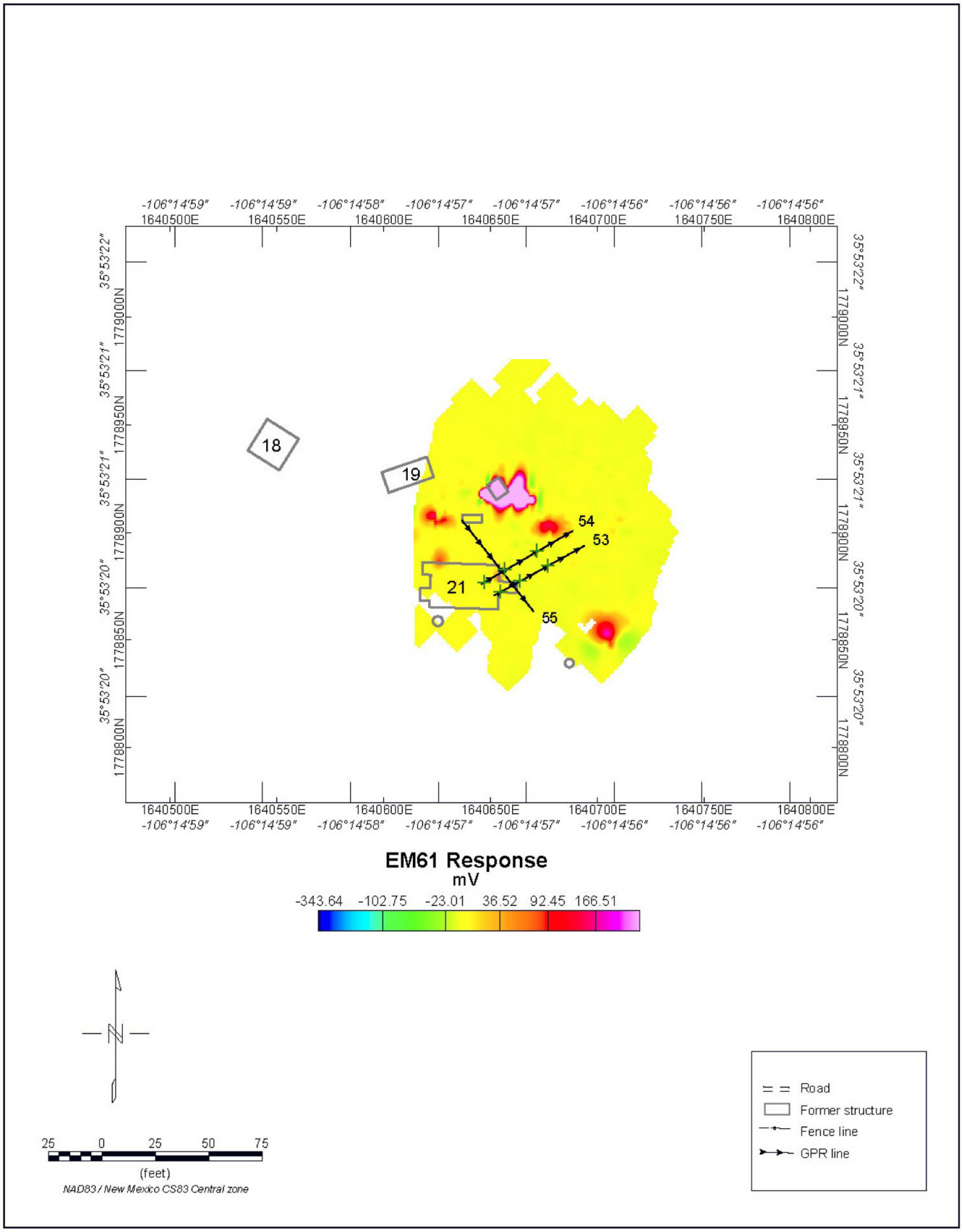


Figure L-3.4-2 Buried metal anomaly map (EM61) of SWMU 10-004(a)

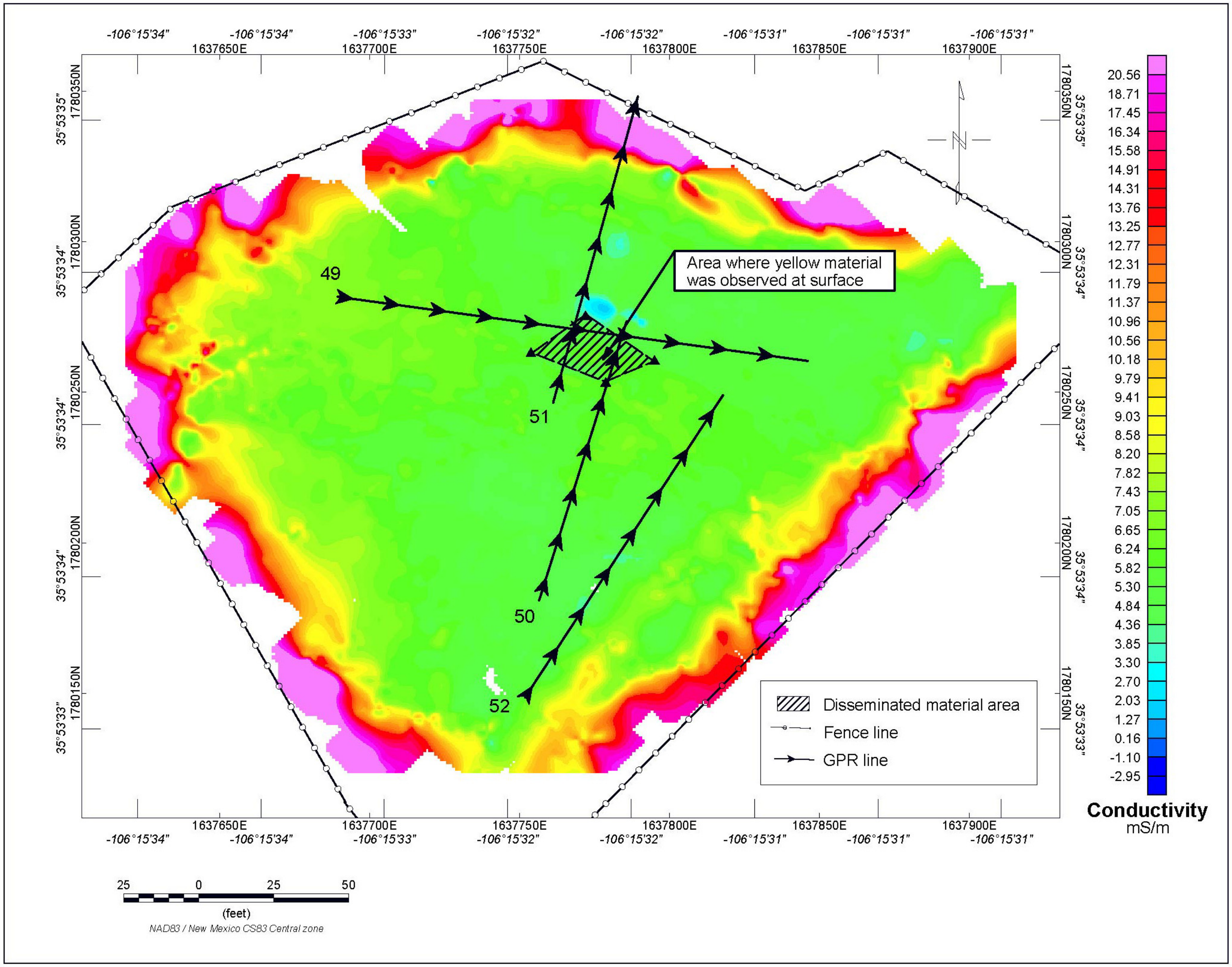


Figure L-3.5-1 Terrain conductivity map (EM31) of AOC 10-009

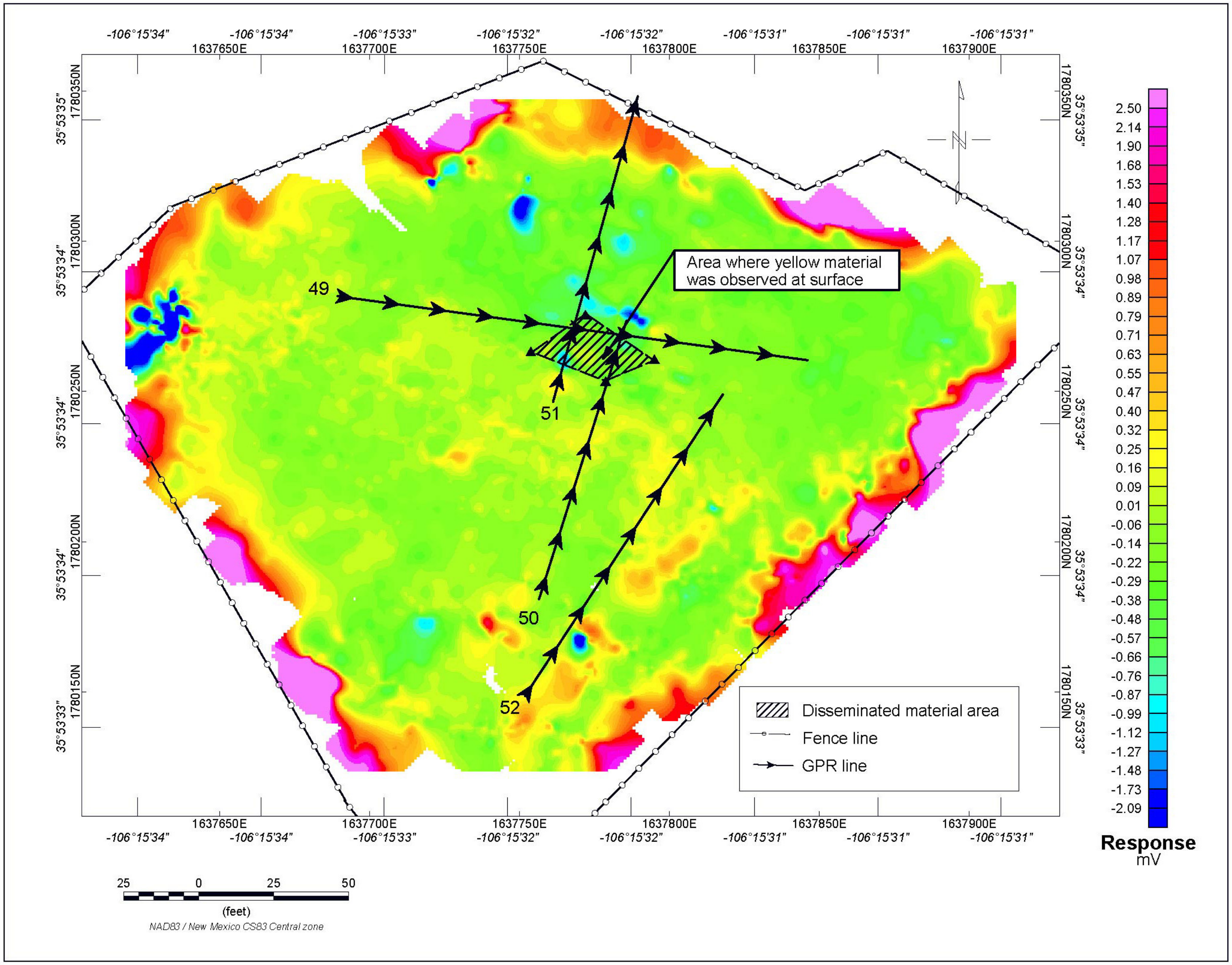


Figure L-3.5-2 Buried metal anomaly map (EM61) AOC 10-009

Attachment L-1

Geophysical Investigation of Bayo Canyon Aggregate Area
Los Alamos, New Mexico
prepared by ARM Geophysics
(on CD included with this document)

Appendix M

Radiological Survey Report

M-1.0 INTRODUCTION

Environmental Restoration Group, Inc. (ERG) conducted a walk-over radiological survey of portions of the former Technical Area 10 in Bayo Canyon, referred to as Bayo Canyon Aggregate Area. The survey data were collected to assist Los Alamos National Laboratory (the Laboratory) in its efforts to meet the requirements under the March 1, 2005, Compliance Order on Consent (the Consent Order) to determine whether further cleanup of the site is required. The survey was performed over 8 d between July 22 and October 10, 2007. Attachment M-1 provides the original ERG report, including function check forms and calibration sheets, on CD.

The survey was performed using a global positioning system (GPS) coupled with radiological instrumentation. A diamond-shaped pancake Geiger-Müeller (G-M) detector array was used for the survey. The G-M detector is capable of detecting alpha, beta, and gamma radiation. Because the radionuclides of concern at the site consist of strontium-90, a high-energy beta emitter, and depleted uranium, an alpha, beta, and gamma emitter, the G-M detector was selected for this project.

M-2.0 GPS-RADIOLOGICAL SURVEYS

M-2.1 GPS Survey Method

The specific detector selected for the survey was the Ludlum Model 44-94, a four G-M tube array arranged in a diamond shape. G-M tube detectors have a thin mica window and a high efficiency for alpha and beta particles with a much lower efficiency for gamma rays.

The walk-over survey was designed to detect only the beta and gamma component of the radiation because alpha particles will not be detected unless the detector is within an inch or two of the surface. Each GPS-radiological survey system consisted of a Ludlum Model 2221 ratemeter/scaler with a Ludlum Model 44-94 G-M detector coupled to a Trimble ProXRS mapping grade GPS. The Ludlum Model 2221s were operated in fast response rate meter mode, allowing for count rates tagged with corresponding coordinates to be collected at 1-s intervals. For the walk-over surveys the systems were carried in backpacks with the detectors held approximately 6 in. above the ground surface. Each detector line-spacing was approximately 5 ft and the walking survey speed was approximately 2.5 ft/s. At the end of each work day, the field data were downloaded into a laptop computer and processed on-site using a combination of Trimble Pathfinder Office and ESRI ArcView GIS computer applications.

M-2.2 GPS Survey Results

The data from the survey are presented in Figures M-2.2-1, M-2.2-2, and M-2.2-3, where the colors correspond to the detector count-rate range in which each datum fell. More than 120,000 data points were recorded throughout 23 acres of Bayo Canyon from four separate areas including Consolidated Units 10-001(a)-99 and 10-002(a)-99 as well as Solid Waste Management Units (SWMUs) 10-009 and 10-004(a). The calculated mean value for detector count rates was 451 counts per minute (cpm) with a standard deviation of 66 cpm, as shown in Table M-2.2-1. Color ranges for data presentation in each figure were chosen based upon the survey mean plus 2 or 3 standard deviations. Thus, in each figure, data values less than mean plus 2 standard deviations are colored gray, data values from the mean plus 2 standard deviations to mean plus 3 standard deviations are colored green, and data values more than the mean plus 3 standard deviations are colored red. The statistics of the data set are presented in Table M-2.2-1.

Figure M-2.2-1 shows the survey results for Consolidated Unit 10-001(a)-99. There were six locations with elevated readings identified for further investigation. Locations 1 through 5 were investigated on October 10, 2007, and small (mm-size) yellow fragments were observed disseminated in the surface soil and were suspected to be oxidized depleted uranium. Location 6 had previously been identified and investigated on August 24, 2007. There was no visible material as observed at locations 1 through 5, and the elevated readings could not be reproduced.

Figure M-2.2-1 also shows the survey results for SWMU 10-004(a). No elevated readings were detected for this area.

Figure M-2.2-2 shows the survey results for SWMU 10-009. An area of elevated readings, noted in the figure as location 7, was identified and further investigated. Again, small yellow fragments (mm-size) suspected to be oxidized depleted uranium were found disseminated in the surface soil.

Figure M-2.2-3 shows the survey results for Consolidated Unit 10-002(a)-99. At locations 8 and 9, elevated readings were determined to be strontium-90 in soil. Locations 10 and 11 are areas within and near the fenced area (the Central Area, which roughly corresponds to SWMU 10-007) where elevated readings were detected.

Many of the elevated readings appear as lines or stringers of elevated values because of the response characteristics of the Ludlum Model 2221. The Ludlum 2221 manual states, "Fast response = 4 +/- 1 second, Slow response = 22 seconds +/- 2 seconds, all response times are measured from 10–90% of final reading." From discussions with Ludlum representatives, it was determined that the response time is also a factor of the count-rate level. At very low count rates, as observed in Bayo Canyon, the response time is much slower than at a high count rates. The net effect is the occurrence of a linear array of elevated count rates along the walked path (Figure M-2.2-3), even though the anomaly.

M-2.3 GPS Survey Data Quality Control

All radiological instrumentation was calibrated within a 6-mo period before National Institute of Standards and Technology traceable sources and pulser were used. The instrumentation was also function checked before and after use each day. Function check forms and calibration sheets are included in Attachment M-1.

M-3.0 COMPARISON BETWEEN RADIOLOGICAL AND GEOPHYSICAL DATA

A grid system, consisting of 257 10-m by 10-m grids, was created to overlay an area where both EM geophysics and radiological data had been collected at Consolidated Unit 10-001(a)-99, the former firing sites where the majority of shrapnel is concentrated. Comparison of the EM geophysics and radiological survey data was made by calculating the averages of all readings that fell within each 10-m by 10-m grid block. A comparison of the radiological survey data versus the geophysics survey data is shown in Figure M-3.0-1. With the exception of one grid block, no correlation can be found between the two data sets. In other words, there is no indication the presence of metallic objects proves the presence of radioactive materials or vice versa. The one grid block with a very high radiological count rate, 3126 cpm, and a high EM geophysics survey value, 1125 ERM, does not indicate a correlation and is likely to be coincidental, based on the rest of the data.

M-4.0 CONCLUSION

The radiological survey data indicate elevated radiation is present within the soil surface in Bayo Canyon at select and isolated areas. Because of the transect spacing and the speed of the walk-over survey, it is possible other areas where sources are present on the surface were not observed in this survey. The survey is not capable of detecting smaller source values buried beneath the surface (approximately more than 3 in.). No correlation was found between the radiological data (cpm) and the EM geophysical data (ERM).

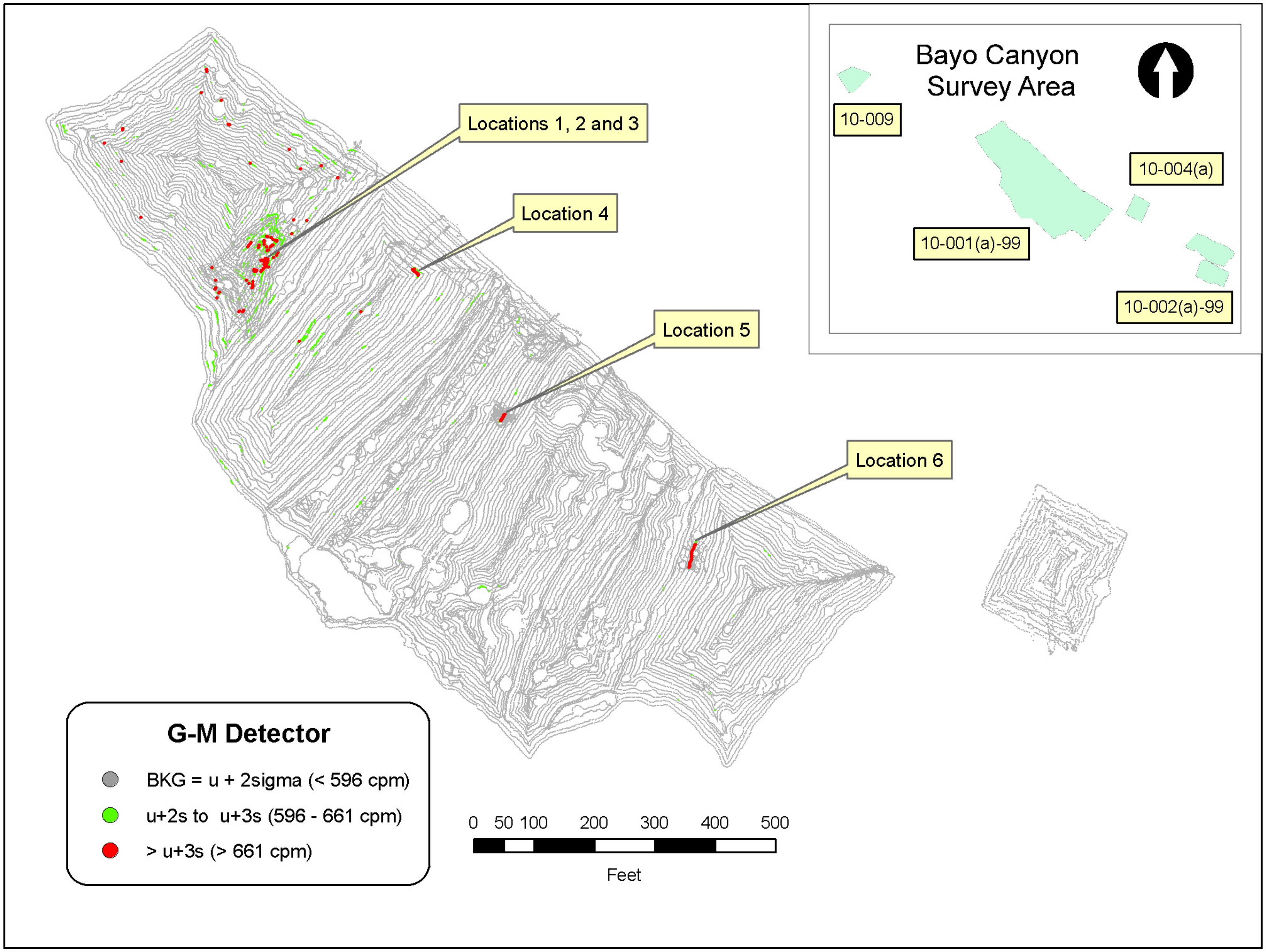


Figure M-2.2-1 Survey data of Consolidated Unit 10-001(a)-99 and SWMU 10-004(a) in Bayo Canyon Aggregate Area

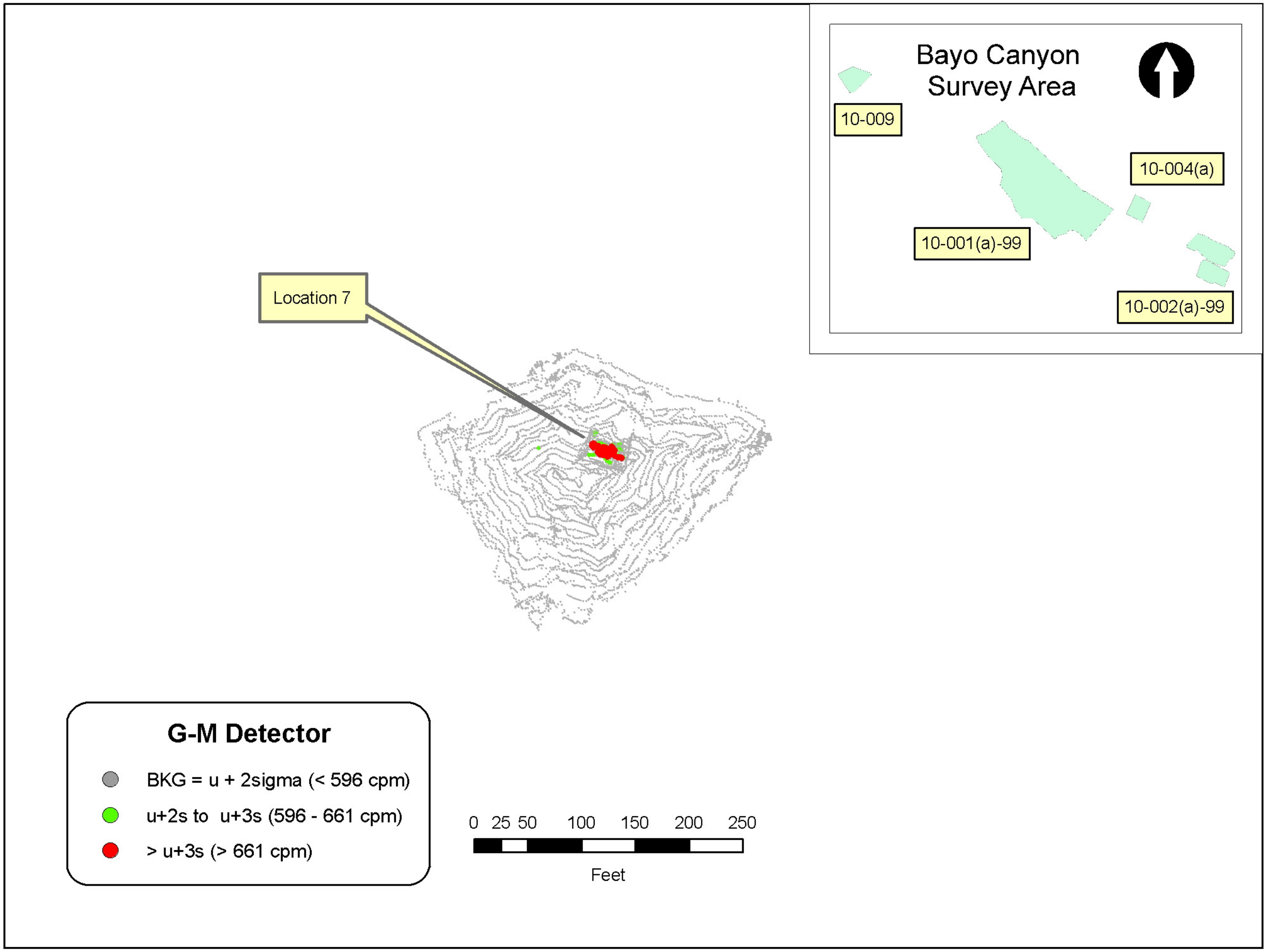


Figure M-2.2-2 Survey data of SWMU 10-009 in Bayo Canyon Aggregate Area

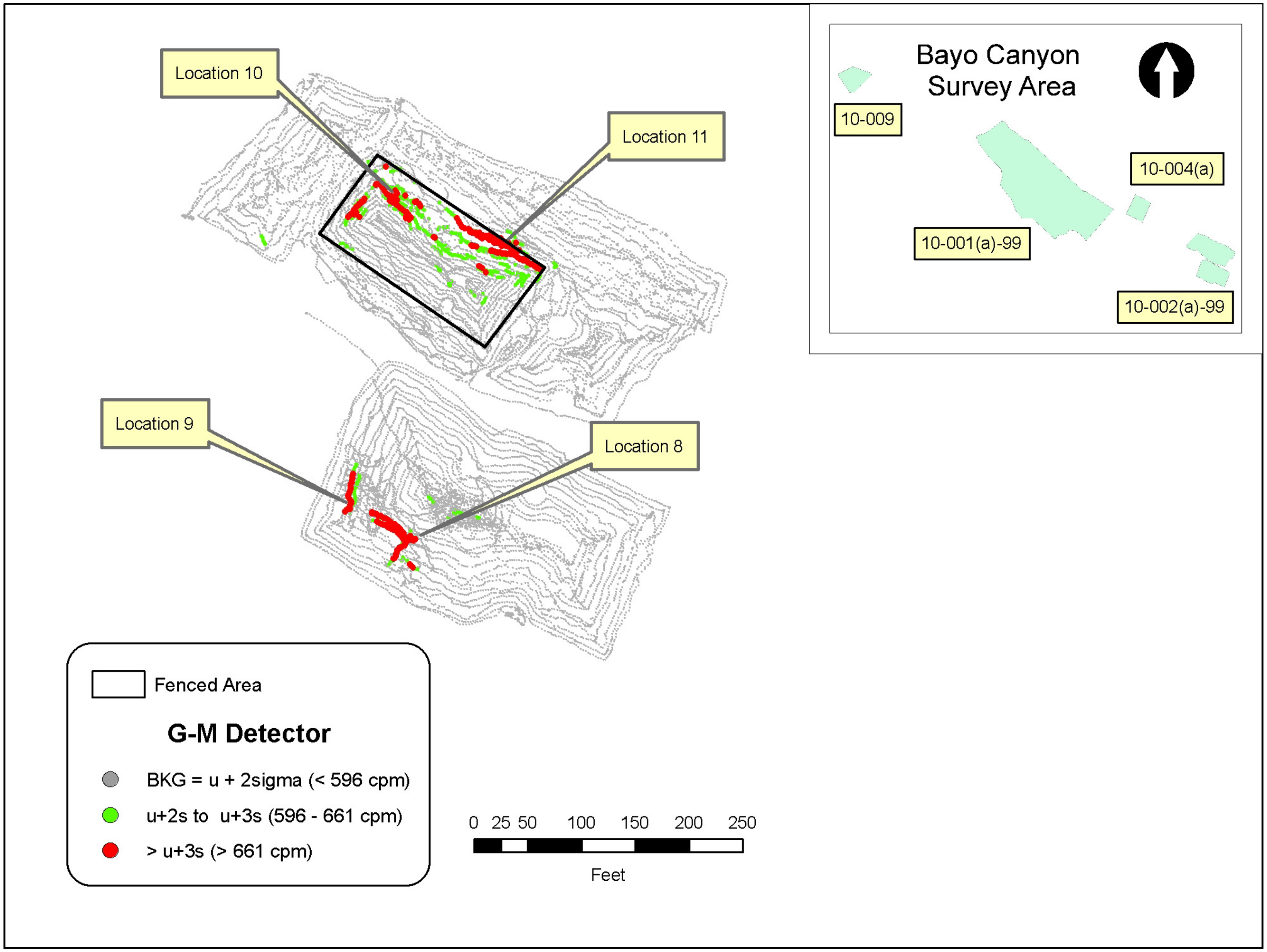


Figure M-2.2-3 Survey data of Consolidated Unit 10-002(a)-99 in Bayo Canyon Aggregate Area

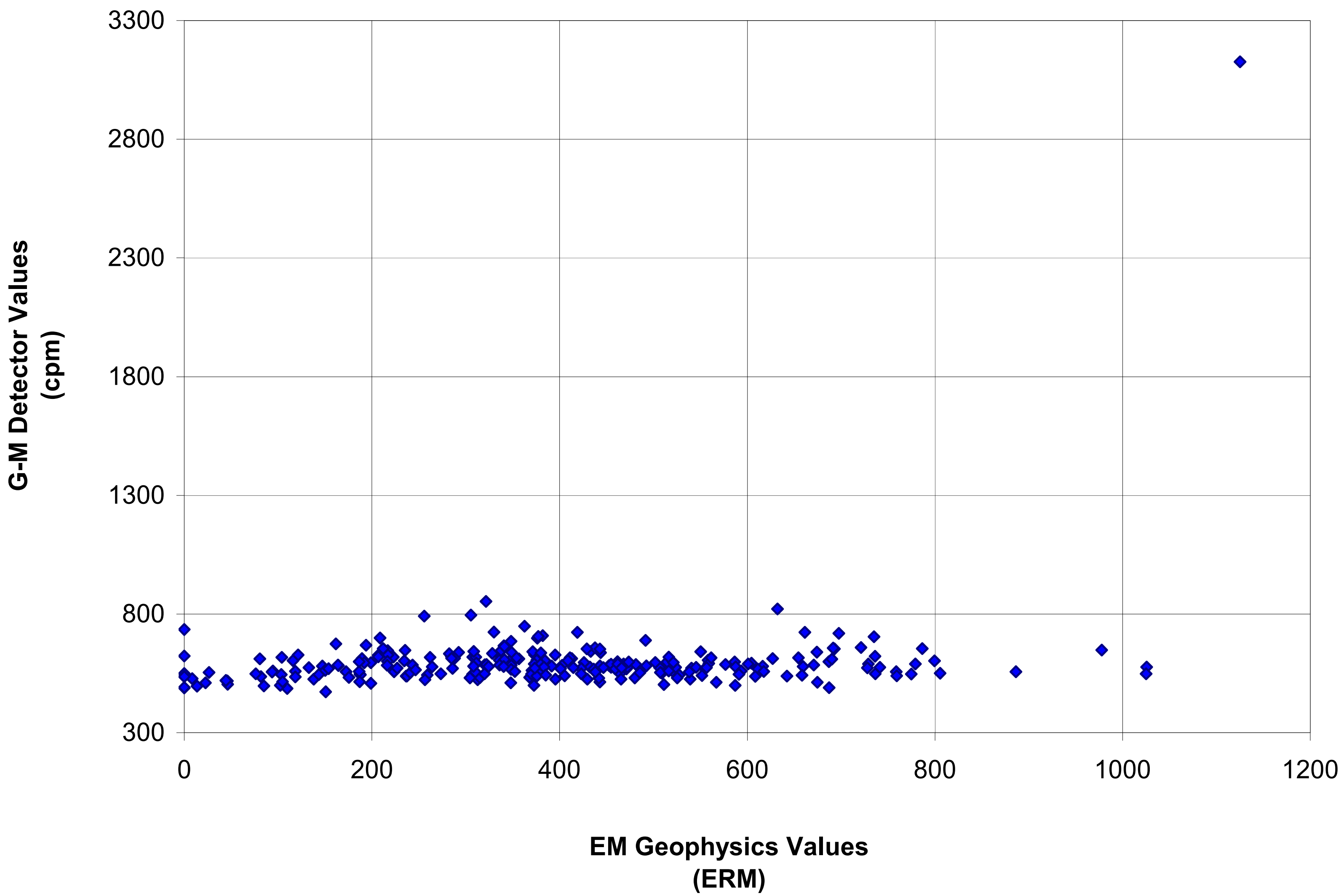


Figure M-3.0-1 Comparison of radiological survey data and geophysical survey data

Table M-2.2-1
Survey Count Rate Data

Detector	Readings	Mean (cpm)	Standard Deviation	Maximum Reading (cpm)	Minimum Reading (cpm)
Ludlum Model 44-94	121,702	451	66	3126	175

Attachment M-1

Radiological Survey
Los Alamos National Laboratory
Former Technical Area 10, Bayo Canyon Aggregate Area
prepared by ERG
(on CD included with this document)