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Date: OCT 21 2010
Refer To: EP2010-0398

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Subject: Submittal of the Phase II Investigation Work Plan for Upper Los Alamos Canyon Aggregate Area

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of the Phase II Investigation Work Plan for Upper Los Alamos Canyon Aggregate Area.

If you have any questions, please contact Becky Coel-Roback at (505) 665-5011 (becky_cr@lanl.gov) or Cheryl Rodriguez at (505) 665-5330 (crodriguez2@doeal.gov).

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MG/GR/DM/BCR:sm

Enclosures: Two hard copies with electronic files – Phase II Investigation Work Plan for Upper Los Alamos Canyon Aggregate Area (LA-UR-10-6327)

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LA-UR-10-6327
October 2010
EP2010-0398

Phase II Investigation Work Plan for Upper Los Alamos Canyon Aggregate Area

Los Alamos
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Prepared by the Environmental Programs Directorate

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LA-UR-10-6327
EP2010-0398

Phase II Investigation Work Plan for Upper Los Alamos Canyon Aggregate Area

October 2010

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EXECUTIVE SUMMARY

The Upper Los Alamos Canyon Aggregate Area, located in Technical Area 00 (TA-00), former TA-01, TA-03, former TA-32, TA-41, TA-43, and TA-61 at Los Alamos National Laboratory (the Laboratory), includes a total of 115 solid waste management units and areas of concern (AOCs). Forty-seven of the sites were investigated in 2008–2009 and the results reported in the investigation report. Of those 47 sites, 27 required additional sampling to define the extent of contamination, and 9 of the 47 sites required removal of soil or tuff to reduce the potential risk to human health. At former TA-01, one site not originally proposed for remedial action has been added to the scope proposed in this work plan, and another is being remediated under an interim measure. Four sites at former TA-32 have undergone soil removal or sampling for extent of contamination as part of a separate accelerated corrective action. Another site, AOC C-00-044, has not been investigated previously and is included in this Phase II work plan. A total of 28 sites are addressed in this work plan.

The primary activities associated with the investigation are (1) surface and subsurface soil and tuff sampling and (2) excavation of soil and/or tuff in limited areas with elevated contaminant concentrations. Activities on Los Alamos County or private property are contingent upon the approval of the respective property owners and the conditions specified in access agreements among the U.S. Department of Energy; Los Alamos National Security, LLC; and the property owners.

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1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or 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. The Laboratory site covers 40 mi^2 of the Pajarito Plateau, which consists of a series of fingerlike mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 to 7800 ft above mean sea level (amsl). The location of Upper Los Alamos Canyon Aggregate Area with respect to the Laboratory technical areas (TAs) and surrounding land holdings is shown in Figure 1.1-1. Sites within the aggregate area are shown in Plate 1.

The solid waste management units (SWMUs) and areas of concern (AOCs) addressed in this Phase II investigation work plan are potentially contaminated with both hazardous and radioactive components. The New Mexico Environment Department (NMED), pursuant to the New Mexico Hazardous Waste Act, regulates cleanup of hazardous wastes and hazardous constituents. DOE regulates cleanup of radioactive contamination, pursuant to DOE Order 5400.5, “Radiation Protection of the Public and the Environment,” and DOE Order 435.1, “Radioactive Waste Management.” Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

Corrective actions at the Laboratory are subject to the Compliance Order on Consent (the Consent Order). This work plan describes work activities that will be executed and completed in accordance with the Consent Order.

1.1 General Site Information

Figure 1.1-1 shows the location of Upper Los Alamos Canyon Aggregate Area and surrounding TAs. The Upper Los Alamos Canyon Aggregate Area consists of 115 sites, 54 of which were previously investigated and/or remediated and were approved for no further action (LANL 2006, 091915). Those 54 sites were not proposed for further investigation or other activities in the April 2006 investigation work plan (LANL 2006, 091916) and are not discussed further in this investigation work plan.

The remaining 61 sites were evaluated in the 2006 investigation work plan (LANL 2006, 091916). Of these 61 sites, 47 sites (2 in TA-00, 32 in TA-01, 4 in TA-03, 5 in TA-32, 1 in TA-41, 2 in TA-43, and 1 in TA-61) underwent sampling in 2008–2009. Delayed action was proposed by the Laboratory and approved by NMED for eight sites (LANL 2006, 091916; NMED 2006, 095460). For six other sites, the Laboratory proposed (LANL 2006, 091916), and NMED approved (NMED 2006, 095460), no sampling. Table 1.1-1 lists the 61 sites, with a brief description for each site and the results of the investigation conducted in 2008–2009.

As a result of the findings presented in the 2010 investigation report (LANL 2010, 108528), 25 of the Upper Los Alamos Canyon Aggregate Area sites were proposed for certificates of completion. Of these, 21 sites were granted certificates of completion, and 4 were denied but do not require further sampling (NMED 2010, 110667). None of these 25 sites are included in this Phase II work plan, but the status of the latter 4 sites will be addressed using existing data and current site conditions in the Phase II investigation report. The eight sites for which delayed action was proposed (LANL 2006, 091916) are still appropriate for delayed action and are not included in this work plan. The remaining 27 of the 61 sites are included in this Phase II investigation work plan, along with one newly identified site, for a total of 28 sites.

Of the 28 sites addressed in this work plan 7 are proposed for some excavation of contaminated media prior to sample collection. An interim measure involving removal of contaminated media and construction of retention basins was conducted at one site, SWMU 01-001(f) (LANL 2010, 110763; LANL 2010, 109422), but additional extent sampling is proposed in this work plan. Four sites in former TA-32 have been sampled and/or remediated during a recent accelerated corrective action (ACA). Those activities were directed by an approved ACA work plan (LANL 2009, 108332; NMED 2010, 108455).The results of the ACA will be reported in a remedy completion report, to be submitted to NMED in November 2010, and in the Phase II investigation report for the Upper Los Alamos Canyon Aggregate Area. Although no additional cleanup is warranted at TA-32, the vertical extent of some inorganic chemicals is not defined at one of the sites [SWMU 32-002(a)], and therefore, additional extent sampling is proposed in this work plan.

Phase II investigations will be conducted at sites located within TA-00, former TA-01, TA-03, former TA-32, TA-43, and TA-61.

TA-00 includes all Laboratory-related operations and sites outside former or current Laboratory boundaries. These sites are geographically separated and scattered across the Pajarito Plateau in the northern part of Los Alamos County and in adjacent Santa Fe County. The TA-00 sites included in Upper Los Alamos Canyon Aggregate Area are located in Los Alamos Canyon and the Los Alamos townsite.

Former TA-01 was the Laboratory's first technical area. Beginning in 1943, it housed the Laboratory administration, theoretical division, plutonium chemistry, and physics research. Between 1943 and 1945, much of the theoretical, experimental, and production work in developing the atomic bomb took place at former TA-01. From 1946 to 1965, these activities were moved elsewhere in the Laboratory and the site underwent decontamination and decommissioning (D&D) in 1966. The site of former TA-01 lies within the current townsite of Los Alamos, on the north and south sides of Trinity Drive surrounding Ashley Pond. The properties are owned privately, by Los Alamos County, and by DOE.

TA-03 is located on South Mesa between Los Alamos Canyon to the north and Twomile Canyon to the south and is the Laboratory's main technical area. It contains most of the Laboratory's administrative buildings and public and corporate access facilities. In addition, TA-03 houses several Laboratory activities such as experimental sciences, special nuclear materials, theoretical/computations, and physical support operations.

Former TA-32 was a small medical research facility consisting of three laboratories, an office building, a warehouse, and a valve house. Work at the site included biological research involving radionuclides. The site of former TA-32 is located within the current townsite of Los Alamos, approximately 400 ft east of Knecht Street and 400 ft south of Trinity Drive. Various Los Alamos County buildings and operations now occupy the area on the mesa-top, and DOE owns the land below the mesa top.

TA-43 is located on East Mesa next to the Los Alamos Medical Center. In the past, TA-43 was used for industrial hygiene research; currently, it is used for biomedical research.

TA-61 is located on Sigma Mesa, which is bounded by Los Alamos Canyon on the north and Sandia Canyon on the south. It includes physical support and infrastructure facilities, such as a municipal sanitary landfill, Los Alamos County's Eco Station trash and recycling facility, sewer pump stations, general storage sheds, and general warehouse storage for maintenance activities performed throughout the Laboratory.

1.2 Investigation Objectives

The objective of the Phase II activities proposed in this work plan is to complete the activities recommended in the 2010 investigation report (LANL 2010, 108528). The specific objectives for the sites are to

- collect surface and subsurface samples to define the extent of contamination at 24 SWMUs and 3 AOCs;
- collect characterization samples at AOC C-00-044, which was not included in the previous investigation; and
- remove soil and/or tuff containing elevated concentrations of contaminants at seven of these SWMUs.

The 2010 investigation report (LANL 2010, 108528) recommended removal actions at nine sites. Two SWMUs [01-001(f) and 32-002(a)] and one AOC [32-003] that were recommended for remediation are being addressed under interim measures or ACAs. In addition, SWMU 01-001(g), which was not recommended for remediation in the 2010 investigation report, is being proposed for remediation in this Phase II work plan.

The sites to be investigated and the proposed activities are summarized in Table 1.1-1. This investigation work plan presents

- summaries of site background and current site conditions;
- the scope of activities proposed for each site, based on recommendations in the approved 2010 investigation report (LANL 2010, 108528; NMED 2010, 109195);
- the methods proposed for achieving the investigation objectives and managing investigation-derived waste; and
- a proposed schedule for conducting the investigation activities and reporting the investigation results.

Activities proposed for sites on county or private property will be completed contingent upon approval of the activities by the property owner(s) before sampling or remediation is conducted. Completion of some sampling or remediation activities may require the use of mechanized equipment and access for such equipment that may not be approved by the property owner. In such cases reasonable attempts will be made to complete the proposed activities using hand equipment or other means as approved by the property owner.

Some sites have limited accessibility because of steep slopes or other factors that make using a drill rig impossible. Reasonable attempts will be made to complete the proposed activities at those sites using hand equipment or portable power equipment if worker safety factors permit the use of such equipment.

1.3 Cleanup Levels

As specified in section VII.B.1 of the Consent Order, NMED soil screening levels (SSLs) or screening action levels (SALs) will be used as soil cleanup levels unless they are determined to be impractical or unless values do not exist for the current and reasonably foreseeable future land use scenarios. In some cases where NMED SSLs do not exist, U.S. Environmental Protection Agency (EPA) regional screening values are used.

1.4 Site Conditions

Surface and subsurface features and geologic characteristics of the Upper Los Alamos Canyon Aggregate Area are described in detail in the original investigation work plan (LANL 2006, 091916). Conditions at the sites included in this Phase II investigation work plan are predominantly influenced by

- a semiarid climate with low precipitation and a high evapotranspiration rate that limits the extent of subsurface moisture percolation and, therefore, the amount of moisture available to transport radionuclides or hazardous waste constituents in the subsurface, and
- a thick, relatively dry, unsaturated (vadose) zone that greatly restricts or prevents downward migration of contaminants to the regional aquifer.

These and other elements of the environmental setting in the Upper Los Alamos Canyon Aggregate Area are considered when the investigation data are evaluated with respect to the fate and transport of contaminants.

2.0 SITE DESCRIPTIONS AND PROPOSED INVESTIGATION ACTIVITIES

This section presents a brief description and operational history, summary of the nature and extent of contamination, and proposed investigation activities for each site within the Upper Los Alamos Canyon Aggregate Area requiring additional investigation. More complete descriptions of the sites and previous investigations are presented in the original investigation work plan for the Upper Los Alamos Canyon Aggregate Area (LANL 2006, 091916) and the investigation report (LANL 2010, 108528).

2.1 SWMU 00-017, Industrial Waste Lines

2.1.1 Site Description and Operational History

SWMU 00-017 (Figure 2.1-1) includes former line 167, former manhole (unassigned land release [ULR]) 33, and lines 170 and 171. Former line 167 and former manhole ULR-33 were removed before 1985, except for the anchors and sections of pipe encased in anchors. Lines 170 and 171 are the only sections of industrial waste line known to remain in Los Alamos townsite. The site of former line 167 and former manhole ULR 33 under the Omega Bridge remains undeveloped. Nine concrete anchors and 3-ft-long sections of pipe encased in each of the anchors remain at the site.

The industrial waste lines were installed to serve the entire Laboratory from its beginning in 1943. With an estimated total length of 39,000 ft, the underground industrial waste lines and associated sumps and pumps were used to transport waste generated by various operations to treatment facilities. The estimated operation period for the majority of these waste lines is from the 1950s to the 1970s. Phased decommissioning and removal of the waste lines began in 1964, and various removal projects were completed through 1986.

2.1.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the lateral and vertical extent of lead are not defined at SWMU 00-017. The vertical extent of lead is not defined at previous sampling locations 00-604250 and 00-604247, where the concentration of lead increased with depth. The extent of all other inorganic chemicals, organic chemicals, and radionuclides is defined.

2.1.3 Proposed Extent Sampling at SWMU 00-017

Additional sampling is proposed at SWMU 00-017 as recommended in the approved investigation report (LANL 2010, 108528; NMED 2010, 109195). Four existing locations (00-10143, 00-10144, 00-10182, and 00-604250) will each be extended to greater depths to define the vertical extent of contamination. One new sampling location (17-1 in Figure 2.1-1) will be placed among the four existing sampling locations on the south slope of Los Alamos Canyon (locations 00-10145, 00-10146, 00-10180, and 00-604247) for which the vertical extent is not defined. The new sampling location will be extended to a greater depth and will serve to define the vertical extent of contamination for all four locations. Sampling to define the extent of lead contamination at SWMU 00-017 will be performed in conjunction with sampling at AOC C-00-044 (section 2.2). Samples from AOC C-00-044 will be used to define the lateral extent of lead for both SWMU 00-017 and AOC C-00-044. Samples at SWMU 00-017 will be analyzed for lead only. The proposed samples to be collected at SWMU 00-017 and the analyses to be performed are presented in Table 2.1-1; the proposed sampling locations are shown in Figure 2.1-1. SWMU 00-017 is located on DOE property.

2.2 AOC C-00-044, Soil Contamination

2.2.1 Site Description and Operational History

AOC C-00-044 consists of surface contamination resulting from the historical use of lead-based paint on the Los Alamos Canyon Bridge (also known as Omega Bridge). The bridge was constructed in 1951 and is located in both TA-00 and TA-03. This AOC was identified in 1999 during Resource Conservation and Recovery Act facility investigation (RFI) activities (LANL 1999, 063395). Surface samples collected from locations on the north and south end of the bridge during investigation of SWMU 00-017 contained elevated lead concentrations. The lead could not reasonably be attributed to SWMU 00-017, an inactive underground industrial waste line. During further research and interviews of Los Alamos County and Laboratory maintenance staff, it was discovered that lead paint chips were deposited beneath the bridge on the north and south slopes of Los Alamos Canyon as a result of periodic bridge maintenance activities, including scraping and chipping old paint before new paint was applied.

2.2.2 Nature and Extent of Contamination

AOC C-00-044 has not been investigated previously. Samples collected at SWMU 00-017 contained elevated concentrations of lead, likely as a result of contamination from AOC C-00-044. The lateral and vertical extent of lead at SWMU 00-017 are not defined. Other areas within AOC C-00-044 have not been sampled.

2.2.3 Proposed Sampling at AOC C-00-044

Forty-four surface and subsurface samples will be collected at 22 sampling locations within the footprint of Omega Bridge and to the east and west of the footprint, both on the upper slope of Los Alamos Canyon and in the canyon bottom. Samples will be analyzed for target analyte list (TAL) metals and semivolatile organic compounds (SVOCs) only. Sampling for AOC C-00-004 will be performed in conjunction with sampling at SWMU 00-017 (section 2.1), and the results from each site will be used as appropriate to determine the extent of contamination for both sites. The proposed samples to be collected at AOC C-00-044 and the analyses to be performed are presented in Table 2.2-1; the proposed sampling locations are shown in Figure 2.2-1. AOC C-00-044 is located on DOE property.

2.3 SWMU 01-001(a), Septic Tank 134

2.3.1 Site Description and Operational History

Septic tank 134 (structure 01-134), 5 ft × 9 ft × 5.67 ft deep, made of reinforced concrete and installed in 1945 (LANL 2001, 069946, p. 35), was located south of the sheet metal shop (building 01-104). It served Warehouse 19 (building 01-103) and the sheet metal shop from 1949 to 1964. Two separate sanitary waste lines from the two buildings fed into the septic tank, and the effluent discharged through an outfall to Bailey Bridge Canyon. Warehouse 19 was used to store unknown nonradioactive materials. The concrete floor of the sheet metal shop was radioactively contaminated and was removed to Bailey Bridge Canyon and covered with dirt (Montoya 1965, 003711). Part of the floor drain of the sheet metal shop was dug out and found to have no radiological contamination. The rest of the floor drain was left in place (Montoya 1965, 003711).

2.3.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the lateral and vertical extent of contamination are not defined for the following:

- the lateral extent of barium, cadmium, cobalt, and vanadium;
- the vertical extent of chromium and nickel;
- the lateral and vertical extent of copper and silver; and
- the lateral and vertical extent of bis(2-ethylhexyl)phthalate.

2.3.3 Proposed Extent Sampling at SWMU 01-001(a)

Subsurface samples will be collected at five previously sampled locations (00-603748, 00-603749, 00-603750, 00-603751, and 00-603761), extending the depth at each location to define the vertical extent of contamination. Samples will also be collected at eight new locations (1a-1 through 1a-8) to define the lateral extent of contamination: two sampling locations will be placed to the east and west of the farthest downgradient previous locations, and three sampling locations will be placed approximately 50 ft south (downgradient) of the previous locations. Another set of three sampling locations will be sited approximately 80 ft downgradient of the previous locations. A geomorphic evaluation will be performed to determine the locations most likely to have received effluent from septic tank 134. All samples will be analyzed for barium, cadmium, cobalt, chromium, copper, nickel, silver, vanadium, and bis(2-ethylhexyl)phthalate. The proposed samples to be collected at SWMU 01-001(a) and the analyses to be performed are presented in Table 2.3-1; the proposed sampling locations are shown in Figure 2.3-1. SWMU 01-001(a) is located on Los Alamos County property, and all proposed activities will require approval of the property owner before sampling or remediation is performed.

2.4 SWMU 01-001(d), Septic Tank 138

2.4.1 Site Description and Operational History

Septic tank 138 (structure 01-138), 3 ft × 6 ft × 5 ft deep and made of reinforced concrete, was installed in 1943. It was located southeast of building Y (01-81) and served buildings K (01-40), V (01-70), and Y. Building K was a chemical stock room that contained a mercury still. Building V housed the original TA-01 uranium and beryllium machine shop. Dry-grinding of boron was also conducted in building V. Building Y housed a physics laboratory that handled tritium, uranium-238, and polonium-210. The buildings were

connected to septic tank 138 by a sanitary waste line. The outfall was located east of building Y and discharged over the rim of Los Alamos Canyon. This outfall area is known as Hillside 138. The septic tank was abandoned in place in 1956, and was removed in 1975 or 1976 (Ahlquist et al. 1977, 005710, pp. 77–80).

Currently, the location of the former pipelines and former septic tank is privately owned and commercially developed with buildings and asphalt parking lot. The outfall is located on undeveloped land owned by DOE. SWMU 01-001(d) overlaps the footprint of SWMU 01-006(h), and the two sites share the same hillside area. Therefore, the proposed activities for SWMU 01-001(d) (section 2.4.3) apply also to SWMU 01-006(h) (section 2.16.3).

2.4.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the vertical extent of aluminum, arsenic, barium, beryllium, chromium, copper, iron, manganese, mercury, nickel, selenium, silver, and zinc;
- the lateral extent of chromium and nickel; and
- the lateral and vertical extent of cesium-137 and plutonium-239/240.

Concentrations of plutonium-239/240 exceeded the residential SAL at three locations (00-603801, 00-603804, and 00-603820). Mercury concentrations also exceed the residential SSL at locations 00-603801 and 00-603804. Soil will be removed at those locations to reduce concentrations to below the residential levels.

2.4.3 Proposed Extent Sampling and Soil Removal at SWMUs 01-001(d) and 01-006(h)

Subsurface samples will be collected at 15 previously sampled locations (00-603821, 00-603802, 00-603800, 00-603801, 00-603803, 00-603807, 00-603806, 00-603811, 00-603812, 00-603814, 00-603815, 00-603816, 00-603817, 00-603818, and 00-603819), extending the depth at each location to define the vertical extent of contamination. Three new sampling locations will be placed to define the lateral extent of contamination; one location (6h-1 in Figure 2.4-1) will be approximately 20–30 ft west of existing location 00-603803 to define lateral extent to the west, one location (6h-3) will be in the middle of the slope section downgradient of location 00-603820, and one location (6h-2) will be downgradient of existing location 00-603819 to define the downgradient extent of contamination to the toe of the slope in Los Alamos Canyon. Samples collected to define extent will be analyzed for TAL metals, gamma-emitting radionuclides, and isotopic plutonium. Soil will be removed at three hillslope locations (00-603801, 00-603804, and 00-603820) where plutonium-239/240 and mercury concentrations exceed the residential SAL or SSL. Soil removal will continue until the concentrations of plutonium-239/240 and mercury meet residential levels for the site. Additional sampling locations will be added as necessary to define the cleanup area, stepping out to the east and west from locations 00-603801, 00-603804, and 00-603820, and downgradient from location 00-603820. Confirmation samples will be collected upon completion of the soil removal. Confirmation samples will be analyzed for isotopic plutonium. The proposed samples to be collected at SWMUs 01-001(d) and 01-006(h) and the analyses to be performed are presented in Table 2.4-1; the proposed extent sampling locations are shown in Figure 2.4-1. Although all proposed activities are on DOE property, portions of SWMUs 01-001(d) and 01-006(h) are located on private property and access through private property is necessary to conduct the Phase II work.

2.5 SWMU 01-001(f), Septic Tank 140

2.5.1 Site Description and Operational History

Septic tank 140 (structure 01-140) was 3 ft × 6 ft × 5 ft deep, made of reinforced concrete, and installed in 1945 (LANL 2001, 069946, p. 36). It was located west of building K-1 (01-98) and served buildings HT (01-29) and FP (01-20). Building HT was used to heat-treat and machine natural and enriched uranium. The heat treatment operations could have contributed radioactive waste to the tank. Building FP was a foundry for nonradioactive and nonferrous metals and was not radiologically contaminated (Buckland 1964, 004810; Ahlquist et al. 1977, 005710, p. 39). The septic system outfall discharged into Los Alamos Canyon to an area known as Hillside 140. The septic tank and its inlet and outlet lines were removed in 1975 or 1976 (Ahlquist et al. 1977, 005710, p. 111).

Currently, the entire mesa-top area of SWMU 01-001(f) is developed, and the locations of the former pipelines are under the pavement and buildings of Ridge Park Village. The location of the former septic tank is partially covered by a building. The outfall location and the drainage into which it discharged are on undeveloped land owned by DOE.

2.5.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the vertical extent of cadmium and copper;
- the lateral and vertical extent of chromium and nickel;
- the lateral and vertical extent of Aroclor-1254;
- the lateral extent of polycyclic aromatic hydrocarbons (PAHs) and methylene chloride; and
- the lateral and vertical extent of plutonium-239/240, uranium-234, uranium-235/236, and uranium-238 are not defined.

Since the 2008–2009 investigation activities, SWMU 00-001(f) has been extensively remediated to remove elevated concentrations of Aroclor-1254 and Aroclor-1260. The remediation activities were directed by the Los Alamos Site Monitoring Area 2 Interim Measure and Monitoring Plan (LANL 2008, 104020). During the initial interim measure, 304 yd^3 of sediment and 192 yd^3 of rock contaminated with polychlorinated biphenyls (PCBs) were removed from the drainage below SWMU 01-001(f), and 2290 yd^3 of PCB-contaminated sediment has been removed from the base of the drainage. A total of 94 confirmation samples were collected following removal activities (LANL 2010, 109422, p. v). It was determined that additional removal was necessary to complete the cleanup of PCB contamination (LANL 2010, 109422, p. 14). The results of those activities were reported in a supplemental report submitted to NMED in October 2010 (LANL 2010, 110763). The results of the confirmation sampling and risk-screening assessments for the site will be included in the Phase II investigation report for the Upper Los Alamos Canyon Aggregate Area. Because material contaminated with Aroclor-1254 has been removed and confirmation samples collected, no additional sampling is proposed to define the extent of Aroclor-1254. However, additional sampling is needed to define the vertical extent of cadmium, copper, chromium, nickel, isotopic plutonium, and isotopic uranium. The lateral extent of TAL metals, radionuclides, and SVOCs has been defined by the preexcavation sampling associated with the remedial activities conducted at the base of the drainage. These data will be presented in the Phase II investigation report for the Upper Los Alamos Canyon Aggergate Area. The lateral extent of methylene chloride was not defined because preexcavation samples were not analyzed for VOCs.

2.5.3 Proposed Extent Sampling at SWMU 01-001(f)

Subsurface samples will be collected at seven previously sampled locations (00-603824, 00-603825, 00-603835, 00-603836, 00-603837, 00-603838, 00-603839, and 00-603843), extending the depth at each location to define the vertical extent of cadmium, copper, chromium, nickel, methylene chloride, isotopic plutonium, and isotopic uranium. Samples collected to define vertical extent will be analyzed for cadmium, copper, chromium, nickel, methylene chloride, and isotopic uranium, as indicated in Table 2.5-1. Samples at locations 00-603843 and 00-603825 will also be analyzed for isotopic plutonium. One new sampling location (1f-1) will be placed downgradient of existing location 00-603843 to define the lateral extent of methylene chloride. Samples collected to define lateral extent will be analyzed for methylene chloride only. The proposed samples to be collected at SWMU 01-001(f) and the analyses to be performed are presented in Table 2.5-1; the proposed sampling locations are shown in Figure 2.5-1. The portion of SWMU 01-001(f) where sampling is proposed is on DOE property.

2.6 SWMU 01-001(g), Septic Tank 141

2.6.1 Site Description and Operational History

Septic tank 141 (structure 01-141), 3 ft × 6 ft × 5 ft deep and installed in 1943 (LANL 2001, 069946, p. 37), was located south of building X (01-79) near the edge of Los Alamos Canyon and served building X, where radioactive targets were tested. The tank received sanitary waste from building X through one sanitary waste line. The outfall discharged over the rim of the canyon. The septic tank was removed in September 1975 (Ahlquist et al. 1977, 005710, p. 119).

Currently, the location of the former inlet pipeline is under a building of the Los Arboles condominiums, and the outfall location is on undeveloped land owned by DOE.

2.6.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the vertical extent of chromium and nickel and
- the lateral extent of plutonium-239/240.

Concentrations of plutonium-239/240 exceeded the residential SAL (33 pCi/g) at two locations. The elevated concentrations are at locations on DOE property. Soil removal is proposed for SWMU 01-001(g) to reduce concentrations of plutonium-239/240 to below the residential SAL.

2.6.3 Proposed Extent Sampling and Soil Removal at SWMU 01-001(g)

Subsurface samples will be collected at four previously sampled locations (00-603845, 00-603847, 00-603848, and 00-603849), extending the depth at each location to define the vertical extent of chromium and nickel. Samples collected to define vertical extent will be analyzed for chromium and nickel. One new sampling location (1g-1) will be placed to the west of existing location 00-603847 to define the lateral extent of plutonium-239/240 to the west, and one new sampling location (1g-2) will be placed downgradient of locations 00-603846 and 00-603848 to define the lateral extent of plutonium-239/240 downgradient. Samples collected to define lateral extent will be analyzed for isotopic plutonium. The proposed samples to be collected at SWMU 01-001(g) and the analyses to be performed are presented in Table 2.6-1; the proposed sampling locations are shown in Figure 2.6-1. A portion of

SWMU 01-001(g) is located on private property, including one proposed sampling location. Completion of the proposed activities at location 00-603845 will be contingent upon an access agreement approved by the property owner.

Soil will be removed at two hillslope locations (00-603846 and 00-603849) where plutonium-239/240 concentrations exceed the residential SAL (33 pCi/g). Soil removal will continue until plutonium-239/240 concentrations are below the residential SAL. Additional sampling locations will be added as necessary to define the cleanup area, stepping out to the east and west from locations 00-603846 and 00-603849, and downgradient from location 00-603846. Confirmation samples will be collected upon completion of the soil removal. Confirmation samples will be analyzed for isotopic plutonium.

2.7 SWMU 01-001(o), Sanitary Waste Line

2.7.1 Site Description and Operational History

SWMU 01-001(o) is the former sanitary waste line located east of Bailey Bridge and served buildings J (01-34) and ML (01-42). Building J housed a laboratory, and ML was a medical laboratory. The line discharged directly into Bailey Bridge Canyon. Currently, the locations of the former pipelines run across Loma Vista Drive and under a building of the Los Arboles condominiums.

2.7.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the vertical extent of chromium, copper, lead, mercury, nickel, silver, and zinc at locations 00-603850, 00-603852, 00-603853, 00-603854, 00-603856, 00-603857, and 00-603858;
- the lateral and vertical extent of Aroclor-1254 and di-n-butylphthalate;
- the lateral and vertical extent of americium-241 and plutonium-239/240; and
- the lateral extent of cesium-137 and strontium-90.

The concentration of Aroclor-1254 exceeded the residential SSL (1.12 mg/kg) at location 00-603852. Soil removal is proposed at location 00-603852 to reduce concentrations of Aroclor-1254 to below the residential SSL.

2.7.3 Proposed Extent Sampling and Soil Removal at SWMU 01-001(o)

Subsurface samples will be collected at seven previously sampled locations (00-603850, 00-603852, 00-603853, 00-603854, 00-603856, 00-603857, and 00-603858), extending the depth at each location to define the vertical extent of chromium, copper, lead, mercury, nickel, silver, and zinc. Four new locations (1o-1, 1o-2, 1o-3, and 1o-4) will be placed downgradient of existing locations to define the lateral extent of contamination in the downgradient direction. Samples collected to define extent will be analyzed for chromium, copper lead, mercury, nickel, silver, zinc, Aroclor-1254, di-n-butylphthalate, americium-241, cesium-137, plutonium-239/240, and strontium-90.

Soil and/or tuff will be excavated to remove elevated concentrations (above the residential SSL of 1.12 mg/kg) of Aroclor-1254 at location 00-603852. The site will be remediated until concentrations of Aroclor-1254 are below the residential SSL. Four step-out sampling locations (1o-5 through 1o-8) will be used to define the cleanup area, and additional sampling locations may be added as necessary to define

the cleanup area. Confirmation samples will be collected when soil removal is completed. Step-out and confirmation samples will be analyzed for Aroclor-1254. The proposed samples to be collected at SWMU 01-001(o) and the analyses to be performed are presented in Table 2.7-1; the proposed sampling locations are shown in Figure 2.7-1. SWMU 01-001(o) is located on private property, and completion of the proposed activities at locations on private property will be contingent upon an access agreement approved by the property owner.

2.8 SWMU 01-001(s), Western Sanitary Waste Line

2.8.1 Site Description and Operational History

SWMU 01-001(s) constitutes the remaining portion of the western sanitary waste line (WSWL). The buildings served by SWMU 01-001(s) housed most of the processing and production operations in the early days of the Laboratory. SWMU 01-001(s) served buildings A, B, C, D, G, M, V, Boiler House 2, and Sigma.

- Building A (01-1) housed administrative offices.
- Building B (01-2) had administrative offices and electronic and metallurgical laboratories. Small amounts of radionuclide foils were stored in a concrete vault in the building (Ahlquist et al. 1977, 005710, p. 128).
- Building C (01-5) had a uranium machine shop and other machining (e.g., graphite machining) operations. Before its removal in 1964, building C was found free of radioactive contamination, except for the concrete building pad. The contaminated concrete pad was removed to an unspecified material disposal area (MDA).
- Building D (01-6) was used to process plutonium.
- Building G (01-21) housed the Sigma Pile, constructed of graphite and uranium. Leak-testing of radium sources was also performed in building G. In 1959, the building structure was found to be uncontaminated and was removed. The concrete floor was found to be slightly contaminated with radioactivity and, along with drainlines, was taken to an unspecified MDA (Ahlquist et al. 1977, 005710, p. 125).
- Building M (01-43) was used to process and recover enriched uranium.
- Building V (01-70) contained offices and a toolmaker's shop. It was the original machine shop for machining uranium and beryllium and for dry-grinding boron.
- Boiler House 2 (01-4) supplied steam to TA-01 buildings.
- The Sigma Building (01-56) was used for machining radionuclides for casting and powder metallurgy.

SWMU 01-001(s) exited from building D, ran parallel to most of the main industrial waste line [SWMU 01-002], and passed near the southwest corner of building C. It then proceeded west along the former Finch Street and turned north between former buildings T-221 and T-225. This sanitary waste line connected to septic tank 6 [SWMU 00-030(g)], which is in the Pueblo Canyon Aggregate Area.

Currently, the entire SWMU area has been developed. Most of the western section of SWMU 01-001(s) is under the Trinity Village apartments, and the eastern section of SWMU 01-001(s) is under a number of streets and various buildings.

2.8.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the lateral and vertical extent of barium, copper, lead, and nickel and
- the vertical extent of plutonium-239/240 and tritium.

2.8.3 Proposed Extent Sampling at SWMU 01-001(s)

Subsurface samples will be collected at three previously sampled locations (03-603859, 03-603860, and 03-603865), extending the depth at each location to define the vertical extent of contamination. At locations 03-603859 and 03-603860, new sampling locations (1s-1 through 1s-4) will be placed approximately 10 ft north and south of the existing locations to define the lateral extent of contamination. All samples will be analyzed for barium, copper, lead, nickel, plutonium-239/240 (except at location 03-603865), and tritium. The proposed samples to be collected at SWMU 01-001(s) and the analyses to be performed are presented in Table 2.8-1; the proposed sampling locations are shown on Plate 2. The locations of proposed activities at SWMU 01-001(s) are on private property, and completion of the proposed activities will be contingent upon an access agreement approved by the property owner.

2.9 SWMU 01-003(a), Bailey Bridge Landfill

2.9.1 Site Description and Operational History

Bailey Bridge landfill was used between 1959 and 1978 for the disposal of demolition debris. A September 1964 Zia Company memorandum regarding disposal of TA-01 debris from demolition activities specified that concrete walls and flooring from the former Sigma Building (01-56) with activity less than 2500 counts per minute (cpm) of surface alpha contamination were broken up and disposed of in Bailey Bridge Canyon, and the disposed concrete was covered with 4 ft of earthen fill (Hill 1964, 004821). Additional fill was deposited when the area was developed for housing. Demolition debris with less than 2500 cpm of surface alpha contamination from several other buildings (the D-5 vault [01-11], HT [01-29], Warehouse 19 [01-103], and the sheet metal shop [01-104]) located in the western portion of TA-01 was also disposed of in Bailey Bridge Canyon and covered with soil (Ahlquist et al. 1977, 005710; DOE 1987, 008663).

The Bailey Bridge no longer exists, and the head of Bailey Bridge Canyon (the location of the landfill) has received fill material and has been regraded. The mesa-top portion of the SWMU is under pavement and one building of the Los Arboles townhouses. The area downslope of the landfill is undeveloped DOE land.

2.9.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the vertical extent of arsenic, barium, chromium, copper, iron, lead, manganese, mercury, nickel, and zinc;
- the lateral extent of arsenic, chromium, lead, manganese, and mercury; and
- the lateral and vertical extent of plutonium-239/240.

Concentrations of Aroclor-1254 exceeded the residential SSL (1.12 mg/kg) at locations 00-603902, 00-603904, and 00-603919. Those locations will be excavated to remove the elevated concentrations. Lead was detected above the residential SSL (400 mg/kg) at location 00-603905. Soil will be removed at that location to reduce the concentration of lead to below the residential SSL.

2.9.3 Proposed Extent Sampling and Soil Removal at SWMU 01-003(a)

Subsurface samples will be collected at 11 previously sampled locations (00-603903, 00-603904, 00-603906, 00-603908, 00-603910, 00-603911, 00-603912, 00-603913, 00-603917, 00-603918, and 00-603919), extending the depth at each location to define the vertical extent of arsenic, barium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, isotopic plutonium, and tritium. Samples collected to define vertical extent will be analyzed for arsenic, barium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, isotopic plutonium, and tritium. Four new sampling locations (3a-1 through 3a-4) will extend to the toe of the slope in Los Alamos Canyon to define the lateral extent of arsenic, barium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, isotopic plutonium, and tritium in that area.

Soil, sediment, and/or tuff will be excavated as necessary to remove elevated concentrations of lead and Aroclor-1254. Lead was detected at a concentration of 10,400 mg/kg in surface sediment at location 00-603905, indicating the presence of at least one discrete piece of lead debris. This location will be inspected for visible signs of discrete pieces of lead or other metal. If lead debris is found, it will be selectively removed and disposed of. If no visible lead is found, sediment will be removed from the location and geomorphic evaluations will determine the extent of removal (i.e., removing a complete localized sediment pocket if appropriate). Sediment will be removed until concentrations of lead are below the residential SSL. The vertical extent of lead contamination is defined at that location by a deeper sample in tuff.

Soil and/or tuff will be excavated to remove concentrations of Aroclor-1254 above the residential SSL at locations 00-603902, 00-603904, and 00-603919. Soil and/or tuff will be removed until concentrations of Aroclor-1254 in confirmation or screening samples are below the residential SSL of 1.12 mg/kg. Step-out sampling locations will be used as necessary to define the cleanup area. Confirmation samples will be collected when soil removal is completed. Step-out and confirmation samples will be analyzed for Aroclor-1254.

The proposed samples to be collected at SWMU 01-003(a) and the analyses to be performed are presented in Table 2.9-1; the proposed sampling locations are shown on Plate 3. A portion of SWMU 01-003(a) is located on private property, including one proposed sampling location. Completion of the proposed activities at locations 00-603902 and 00-603918, which are on private property, will be contingent upon an access agreement approved by the property owner.

2.10 SWMU 01-003(b), Surface Disposal Area

2.10.1 Site Description and Operational History

SWMU 01-003(b) is the former surface disposal site for construction debris reported to be below the north rim of Los Alamos Canyon, approximately 450 ft east of Bailey Bridge Canyon (LANL 1990, 007511, p. 1-003). Although the exact location of the surface disposal area is not obvious, sampling was conducted in the most likely location.

2.10.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the vertical extent of aluminum, arsenic, barium, beryllium, chromium, copper, lead, nickel, perchlorate, selenium, and thallium.

2.10.3 Proposed Extent Sampling at SWMU 01-003(b)

Subsurface samples will be collected at two previously sampled locations (00-604023 and 00-604024), extending the depth at each location to define the vertical extent of contamination. Samples collected to define vertical extent will be analyzed for aluminum, arsenic, barium, beryllium, chromium, copper, lead, nickel, perchlorate, selenium, and thallium. The proposed samples to be collected at SWMU 01-003(b) and the analyses to be performed are presented in Table 2.10-1; the proposed sampling locations are shown in Figure 2.10-1. A portion of SWMU 01-003(b) is located on private property, but all proposed sampling locations are on DOE property.

2.11 SWMU 01-003(d), Surface Disposal Site

2.11.1 Site Description and Operational History

SWMU 01-003(d), also known as Can Dump Site, was used for surface disposal of empty solvent and paint cans during the operations of Zia Company (paint, carpentry, furniture repair, and sign shops). No radioactive materials were handled in these warehouses because they were outside the TA-01 security fence. The SWMU is located on an undeveloped hillside of Los Alamos Canyon just south of the current Qwest building.

Currently, the site is located on undeveloped DOE land.

2.11.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the lateral extent of antimony, barium, lead, and zinc and
- the lateral and vertical extent of selenium.

2.11.3 Proposed Extent Sampling at SWMU 01-003(d)

Surface and subsurface samples will be collected at four new sampling locations, three of which (3d-1, 3d-2, and 3d-3) will be placed downgradient of previous sampling locations 00-604030, 00-604031, and 00-604032 to define the lateral extent of antimony, barium, lead, selenium, and zinc downgradient of the previous sampling locations. A fourth new sampling location will be placed to the east of previous location 00-604032 to define the lateral extent to the east. A deeper sample will be collected at previous sampling location 00-604032, extending the depth to 7 ft below ground surface (bgs) with two sampling intervals to define the vertical extent of selenium. Samples will be analyzed for antimony, barium, lead, selenium, and zinc. The proposed samples to be collected at SWMU 01-003(d) and the analyses to be performed are presented in Table 2.11-1; the proposed sampling locations are shown in Figure 2.11-1.

SWMU 01-003(d) is located entirely on DOE property, although access to the site is through private property.

2.12 SWMU 01-006(a), Cooling Tower Drainline and Outfall

2.12.1 Site Description and Operational History

SWMU 01-006(a) served Cooling Tower 80 (structure 01-80). The drainline and outfall were located on the east side of the cooling tower and south of building X (01-79) near the north rim of Los Alamos Canyon.

Currently, the location of the former pipeline is under a building of the Los Arboles condominiums. Although no record can be found on the removal of the pipeline, it was probably removed during the construction of the residential building. The drainline was not found to be in place during the 2008–2009 investigation activities.

2.12.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the vertical extent of plutonium-239/240 and
- the vertical extent of uranium-235/236.

The 2010 investigation report (LANL 2010, 108528) erroneously states that the lateral extent of uranium-235/236 is not defined at SWMU 01-006(a). However, uranium-235/236 was not detected above BV in the farthest downgradient sample collected at the site (00-604046). Therefore, no additional sampling for lateral extent is proposed for uranium-235/236.

2.12.3 Proposed Extent Sampling at SWMU 01-006(a)

Subsurface samples will be collected at two previously sampled locations (00-604041 and 00-604044), extending the depth at each location to define the vertical extent of plutonium-239/240 and uranium-235/236. Samples will be analyzed for isotopic plutonium and isotopic uranium. Because of their proximity and common downgradient drainage area, sampling results for SWMU 01-006(a) will be used in conjunction with results from SWMU 01-001(g) to ensure that the extent of contamination is defined for both sites. The proposed samples to be collected at SWMU 01-006(a) and the analyses to be performed are presented in Table 2.12-1; the proposed sampling locations are shown in Figure 2.12-1. SWMU 01-006(a) is located partially on private property, but the proposed sampling locations are all on DOE property.

2.13 SWMU 01-006(b), Drainline and Outfall

2.13.1 Site Description and Operational History

SWMU 01-006(b) served building D (01-6), which was primarily used to process plutonium. The drainline exited the southwest side of the building and extended southwest and then south before discharging into Los Alamos Canyon. The types and quantities of fluids handled by this drainline are unknown. During the excavation of buildings D (01-6) and D-2 (01-8) and the surrounding areas, all drainlines were removed along with areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64). Currently, the area is

undeveloped and privately owned, although the area downgradient of the outfall is on undeveloped DOE property.

2.13.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the lateral and vertical extent of americium-241 and plutonium-239/240.

Concentrations of plutonium-239/240 exceeded the residential SAL at locations 00-604224, 00-604225, and 00-604237, with a maximum concentration of 1030 pCi/g in the 2–3 ft bgs sample at location 00-604237. Soil removal is recommended to reduce plutonium-239/240 concentrations to below the residential SAL.

2.13.3 Proposed Extent Sampling and Soil Removal at SWMU 01-006(b)

Subsurface samples will be collected at five previously sampled locations (00-604223, 00-604224, 00-604225, 00-604226, and 00-604237), extending the depth at each location to define the vertical extent of plutonium-239/240 and americium-241 (locations 00-604225 and 00-604237 only). One new sampling location (6b-1) will be placed to the west of existing location 00-604225 to define the lateral extent of americium-241 and plutonium-239/240 to the west. Two new sampling locations (6b-2 and 6b-3) will be placed downgradient of existing location 00-604225 and to the southeast of location 00604226 to define the lateral extent of americium-241 and plutonium-239/240. The proposed samples to be collected at SWMU 01-006(b) and the analyses to be performed are presented in Table 2.13-1; the proposed sampling locations are shown in Figure 2.13-1.

Soil and tuff containing elevated concentrations of plutonium-239/240 will be excavated until concentrations are below the residential SAL (33 pCi/g). Step-out sampling locations will be used as necessary to define the cleanup area. Confirmation samples will be collected when soil removal is completed. Step-out and confirmation samples will be analyzed for isotopic plutonium (Table 2.13-1). SWMU 01-006(b) is located partially on private property, and all proposed activities at locations on private property will be contingent upon an access agreement approved by the property owner.

2.14 SWMU 01-006(c), Drainlines and Outfalls

2.14.1 Site Description and Operational History

SWMU 01-006(c) consists of up to four drainlines and outfalls that served building D-2 (01-8). Building D-2 served as the facility for laundering radioactively contaminated clothing and recyclable equipment for the entire TA from 1943 to 1945. The laundry facility was moved to TA-21 in 1945. During the Ahlquist radiological survey, contaminated soil was excavated in the areas of former buildings D and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70). The soil was monitored with gross-alpha instruments until the excavated soil gross-alpha activity was below the detection limit of 25 pCi/g. Clean fill material was used as backfill (Ahlquist et al. 1977, 005710, p. 36). The SWMU 01-006(c) drainlines exited the southwest side of the building and discharged directly onto Hillside 137. Two drainlines at the southeast end of the building were shown on engineering drawings but were not located when trenching was conducted in the area of building D-2 (Ahlquist et al. 1977, 005710, p. 49). Two drainlines at the southwest end of the building were encountered during trenching and were removed (Ahlquist et al. 1977, 005710, p. 64).

2.14.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the lateral and vertical extent of chromium and nickel;
- the vertical extent of PAHs, dibenzofuran, and methylene chloride; and
- the vertical extent of plutonium-239/240.

2.14.3 Proposed Extent Sampling at SWMU 01-006(c)

Subsurface samples will be collected at previously sampled location 00-603783, extending the depth to define the vertical extent of contamination. Samples will be analyzed for chromium, nickel, plutonium-239/240, PAHs, dibenzofuran, and methylene chloride. The proposed samples to be collected at SWMU 01-006(c) and the analyses to be performed to define vertical extent are presented in Table 2.14-1; the proposed sampling location is shown in Figure 2.14-1. The lateral extent of chromium and nickel will be evaluated using data collected for SWMU 01-007(b) (section 2.19.3). SWMU 01-006(c) is located partially on private property, including the proposed sampling location. Completion of the proposed activities will be contingent upon an access agreement approved by the property owner.

2.15 AOC 01-006(e), Drainlines and Outfalls to Ashley Pond

2.15.1 Site Description and Operational History

AOC 01-006(e) consists of two drainlines and two outfalls that discharged to Ashley Pond. One drainline originated at building P (01-46); the other drainline served the cleaning plant. Building P was used for personnel offices, and no radioactive materials or hazardous chemicals, except toluene, were used in the building. Cleaning solvents were probably used at the cleaning plant. The building P drainline was a 4-in.-diameter pipe that extended northeast from the building for approximately 100 ft underground to the southwest side of the pond. The drainline from the cleaning plant originated at the northwest corner of the building and extended underground to the southeast side of the pond. The cleaning plant was replaced by a parking lot in the 1960s (LANL 1992, 043454, pp. 6-46–6-47), and the location of the former cleaning plant is currently under Trinity Drive.

Currently, the locations of former pipelines are either landscaped or under pavement. The site is currently owned and operated by Los Alamos County.

2.15.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the vertical extent of barium, chromium, and nickel.

2.15.3 Proposed Extent Sampling at AOC 01-006(e)

Subsurface samples will be collected at two previously sampled locations (00-603874 and 00-603876), extending the depth at each location to define the vertical extent of contamination. The samples will be analyzed for barium, chromium, and nickel. The proposed samples to be collected at SWMU 01-006(e) and the analyses to be performed are presented in Table 2.15-1; the proposed sampling locations are

shown in Figure 2.15-1. The proposed sampling locations at AOC 01-006(e) are on Los Alamos County property. Completion of the proposed sampling activities will be contingent upon an access agreement approved by Los Alamos County.

2.16 SWMU 01-006(h), Stormwater-Drainage System

2.16.1 Site Description and Operational History

SWMU 01-006(h) is the stormwater-drainage system that served the northwest side of building R (01-50) and the east side of building Y (01-81). Building R housed model, glass, carpentry, and plumbing shops. Building Y housed a physics laboratory that handled tritium, uranium-238, and polonium-210. An outfall was located 25 ft south of building Y on the north rim of Los Alamos Canyon, immediately west of Hillside 138.

Currently, the entire SWMU area is under commercial buildings. SWMU 01-006(h) overlaps the footprint of SWMU 01-001(d), and the two sites share the same hillside area. Therefore, the proposed activities for SWMU 01-006(h) (section 2.16.3) apply also to SWMU 01-001(d) (section 2.4.3).

2.16.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the vertical extent of aluminum, arsenic, barium, beryllium, chromium, copper, iron, manganese, mercury, nickel, selenium, silver, and zinc;
- the lateral extent of chromium and nickel; and
- the lateral and vertical extent of cesium-137 and plutonium-239/240.

Concentrations of plutonium-239/240 exceeded the residential SAL (33 pCi/g) at locations 00-603801, 00-603804, and 00-603820 on the hillside portion of the site. Mercury concentrations also exceed the residential SSL at locations 00-603801 and 00-603804. Soil will be removed at those locations to reduce concentrations to below the residential levels.

2.16.3 Proposed Extent Sampling and Soil Removal at SWMUs 01-006(h) and 01-001(d)

Proposed extent sampling and soil removal activities at SWMUs 01-006(h) and 01-001(d) are described in section 2.4.3.

2.17 SWMU 01-006(n), Stormwater-Drainage System

2.17.1 Site Description and Operational History

SWMU 01-006(n) is the stormwater-drainage system that served building D (01-6), which was used to process plutonium. It originated near the east corner of the building and extended along the southeast side of the building to an outfall into Los Alamos Canyon. No information on the excavation of this specific drainline can be found, although during the D&D of buildings D and D-2 (01-8) areas, all drainlines were removed along with areas of elevated radioactivity (Ahlquist et al. 1977, 005710, p. 64). The outfall location is within the boundary of SWMU 01-007(a).

Currently, the location of the drainline is under a paved parking lot on private property.

2.17.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the lateral and vertical extent of plutonium-239/240.

2.17.3 Proposed Extent Sampling at SWMU 01-006(n)

Subsurface samples will be collected at three new sampling locations. One location (6n-1) will be placed between previously sampled locations 00-604227 and 00-604228 and will be sampled to depths below 9.25 ft bgs to define the vertical extent of contamination at the two previous sampling locations. Two new locations (6n-2 and 6n-3) will be placed downgradient of locations 00-604227 and 00-604229 to define the lateral extent of contamination in the downgradient location. Samples will be analyzed for isotopic plutonium. The proposed samples to be collected at SWMU 01-006(n) and the analyses to be performed are presented in Table 2.17-1; the proposed sampling locations are shown in Figure 2.17-1.
SWMU 01-006(n) is located on private property. Completion of the proposed sampling activities will be contingent upon an access agreement approved by the property owner.

2.18 SWMU 01-007(a), Suspected Subsurface Soil Radiological Contamination

2.18.1 Site Description and Operational History

SWMU 01-007(a) is an area of suspected subsurface soil radiological contamination near building D (01-6), which was used primarily for processing plutonium (Ahlquist et al. 1977, 005710, p. 11). During the Ahlquist radiological survey, almost 9000 m^3 of soil was removed from the areas of former buildings D and D-2 (01-8) (Ahlquist et al. 1977, 005710, p. 40). The soil was monitored with gross-alpha instruments until the excavated soil gross-alpha activity was below the detection limit of 25 pCi/g. Clean fill material was used as backfill (Ahlquist et al. 1977, 005710, p. 36).

Currently, SWMU 01-007(a) is beneath a paved parking lot on private property.

2.18.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the vertical extent of chromium and nickel and
- the lateral and vertical extent of bis(2-ethylhexyl)phthalate.

2.18.3 Proposed Extent Sampling at SWMU 01-007(a)

Subsurface samples will be collected at five previously sampled locations (00-604233, 00-604234, 00-604235, 00-604236, and 00-604240), extending the depth at each location to define the vertical extent of chromium, nickel, and bis(2-ethylhexyl)phthalate. Samples collected to define vertical extent will be analyzed for chromium, nickel, and bis(2-ethylhexyl)phthalate. One new sampling location (7a-1) will be placed downgradient of previously sampled location 00-604236 to define the lateral extent of bis(2-ethylhexyl)phthalate to the toe of the slope in Los Alamos Canyon. Samples collected to define lateral extent will be analyzed for bis(2-ethylhexyl)phthalate. The proposed samples to be collected at SWMU 01-007(a) and the analyses to be performed are presented in Table 2.18-1; the proposed

sampling locations are shown in Figure 2.18-1. SWMU 01-007(a) is located partially on private property, including one proposed sampling location. Completion of the proposed activities at locations on private property will be contingent upon an access agreement approved by the property owner.

2.19 SWMU 01-007(b), Suspected Subsurface Soil Radiological Contamination

2.19.1 Site Description and Operational History

SWMU 01-007(b) is an area of suspected subsurface soil radiological contamination associated with the drainlines and outfalls from the building D-2 (01-8) laundry facility (Ahlquist et al. 1977, 005710, p. 11). Building D-2 served as the facility for laundering radioactively contaminated clothing and recyclable equipment for the entire technical area from 1943 to 1945. Drainlines from the laundry facility discharged directly onto Hillside 137 southwest of building D-2. The laundry facility was moved to TA-21 in 1945. During the Ahlquist radiological survey, contaminated soil was excavated in the areas of former buildings D (01-6) and D-2 (Ahlquist et al. 1977, 005710, pp. 64–70). The soil was monitored with gross-alpha instruments until the excavated soil gross-alpha activity was below the detection limit of 25 pCi/g. Clean fill material was used as backfill (Ahlquist et al. 1977, 005710, p. 36).

Currently, the mesa-top portion of the site has been covered with fill material by the private owner in anticipation of redevelopment.

2.19.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the lateral and vertical extent of chromium, nickel, and selenium and
- the vertical extent of bis(2-ethylhexyl)phthalate.

2.19.3 Proposed Extent Sampling at SWMU 01-007(b)

Shallow subsurface samples will be collected at five previously sampled locations (00-603782, 00-603792, 00-603796, 00-603797, and 00-603798), extending the depth at each location to define the vertical extent of chromium, nickel, selenium, and bis(2-ethylhexyl)phthalate. Samples collected to define vertical extent will be analyzed for chromium, nickel, selenium, and bis(2-ethylhexyl)phthalate. Two new sampling locations (7b-1 and 7b-2) will be placed downgradient of previously sampled locations 00-603796 and 00-603797 to define the lateral extent of chromium, nickel, and selenium downgradient. These samples will also serve to define lateral extent of chromium and nickel at SWMU 01-006(c) (section 2.14). Samples collected to define lateral extent will be analyzed for chromium, nickel, and selenium. The proposed samples to be collected at SWMU 01-007(b) and the analyses to be performed are presented in Table 2.19-1; the proposed sampling locations are shown in Figure 2.19-1. SWMU 01-007(b) is located partially on private property, including one proposed sampling location. Completion of the proposed activities at locations on private property will be contingent upon an access agreement approved by the property owner.

2.20 SWMU 01-007(c), Suspected Subsurface Soil Radiological Contamination

2.20.1 Site Description and Operational History

SWMU 01-007(c) is an area of spotty, shallow, gross alpha soil contamination north and west of building D (01-6) (Ahlquist et al. 1977, 005710, p. 11). During the Ahlquist radiological survey, plutonium contamination was discovered at SWMU 01-007(c) (Ahlquist et al. 1977, 005710, pp. 70–77). Approximately 1300 m^3 of soil and a clay-tile waste line from building D were removed from this area and taken to an unspecified location (Ahlquist et al. 1977, 005710, p. 40). This clay-tile pipe was a portion of SWMU 01-001(s).

Currently, the entire area of SWMU 01-007(c) is under pavement and residential buildings on private property or Los Alamos County streets.

2.20.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the lateral and vertical extent of chromium and nickel.

2.20.3 Proposed Extent Sampling at SWMU 01-007(c)

Subsurface samples will be collected at four previously sampled locations (00-603895, 00-603897, 00-603898, and 00-603900), extending the depth at each location to define the vertical extent of chromium and nickel. Three new sampling locations (7c-1, 7c-2, and 7c-3) will be placed at the north, south, and northwest portions of the site to define the lateral extent of chromium and nickel. Sampling will be performed, if practicable, with non-stainless-steel sampling equipment to reduce the possibility of chromium and nickel cross-contamination from sampling equipment. Samples will be analyzed for chromium and nickel. The proposed samples to be collected at SWMU 01-007(c) and the analyses to be performed are presented in Table 2.20-1; the proposed sampling locations are shown in Figure 2.20-1. SWMU 01-007(c) is located on private property. Completion of the proposed activities at locations on private property will be contingent upon an access agreement approved by the property owner.

2.21 SWMUs 03-038(a) and 03-038(b), Former Acid-Neutralizing and Pumping Building and Former Acid Waste Holding Tank

2.21.1 Site Description and Operational History

SWMUs 03-038(a) and 03-038(b) make up Consolidated Unit 03-038(a)-00, which is located near the southwest end of Omega Bridge. SWMU 03-038(a) is the site of the former acid-neutralizing and pumping building (former 03-700). The building was constructed in 1952 and consisted of a 16-ft × 22-ft × 11-ft concrete-block pump house and two 14-ft × 22-ft × 14-ft concrete underground tanks. The pumping building was the central collection point for industrial wastes from the Chemical and Metallurgical Research Building (03-29), the Sigma Building (03-66), and other Laboratory buildings. Once collected, wastes were pumped from the tanks into a waste line (line 167 of SWMU 00-017) leading to the TA-50 radioactive liquid waste treatment facility. Building 03-700, with associated portions of waste lines, manholes, the pump station, and the underground concrete tanks, was removed and disposed of at TA-54 in 1981 and 1982 as part of the radioactive liquid waste lines removal project of 1981–1986 (Elder et al. 1986, 006666, p. 41).

SWMU 03-038(b) is the former site of a 28,500-gal. steel waste-holding tank (structure 03-738) located north of former building 03-700. The tank was constructed in 1952 and was 11 ft in diameter, 44 ft long, and partially buried on the upper south wall of Los Alamos Canyon. The tank was removed as a single unit in 1982 as part of the radioactive liquid waste lines removal project of 1981–1986 (Elder et al. 1986, 006666, p. 41). The tank apparently did not leak; soil samples collected beneath the tank were below the cleanup levels used at the time (Elder et al. 1986, 006666, p. 41).

The site is located on DOE property just west of the south end of Omega Bridge.

2.21.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the lateral and vertical extent of contamination are defined for all constituents at SWMUs 03-038(a) and 03-038(b), except for the following:

- the vertical extent of barium, chromium, copper, lead, and nickel and
- the lateral extent of barium.

2.21.3 Proposed Extent Sampling at SWMUs 03-038(a) and 03-038(b)

Subsurface samples will be collected at two previously sampled locations (00-604257 and 00-604259), extending the depth at each location to define the vertical extent of contamination. Four new sampling locations (38ab-1, 38ab-2, 38ab-3, and 38ab-4) will be placed at step-out positions from previous sampling locations 00-604254, 00-604255, 00-604256, and 00-604258 to define the lateral extent of barium. Samples will be analyzed for barium, chromium, copper, lead, and nickel. Proposed samples collected at AOC C-00-044 will be used as appropriate to define the lateral extent of contamination to the north of SWMU 03-038(b). The proposed samples to be collected at SWMUs 03-038(a) and 03-038(b) and the analyses to be performed are presented in Table 2.21-1; the proposed sampling locations are shown in Figure 2.21-1. SWMUs 03-038(a) and 03-038(b) are located on DOE property.

2.22 SWMU 03-055(c), Outfall

2.22.1 Site Description and Operational History

SWMU 03-055(c) is identified as an outfall located northeast of the fire station (building 03-41). This system channels stormwater toward Los Alamos Canyon through a galvanized corrugated metal pipe. Previously, the storm drain was connected to building floor drains but currently it collects and channels only stormwater runoff from parking lots located in the northern portion of TA-03.

Currently, the site is in an undeveloped wooded area on DOE property.

2.22.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the vertical extent of zinc.

2.22.3 Proposed Extent Sampling at SWMU 03-055(c)

Shallow subsurface samples will be collected at four previously sampled locations (03-603243, 03-603245, 03-603248, and 03-603250), extending the depth at each location to define the vertical extent of zinc. Samples will be analyzed only for zinc. The proposed samples to be collected at SWMU 03-055(c) and the analyses to be performed are presented in Table 2.22-1; the proposed sampling locations are shown in Figure 2.22-1. SWMU 03-055(c) is located on DOE property.

2.23 SWMU 32-002(a), Septic Tank

2.23.1 Site Description and Operational History

SWMU 32-002(a) is a former septic tank and its associated drainline. The septic system received waste from building 32-1 and discharged to Los Alamos Canyon. Research activities at the site involved plutonium-238, plutonium-239, americium-241, and carbon-14. Inorganic and organic chemicals also may have been used at the facility. The laboratory (building 32-01) operated from 1944 to 1953 and was decommissioned in 1954. The septic tank was removed before 1996, but no archival records are available on removal date or disposition of the tank. The drainline was removed in 1996 and disposed of at MDA G, TA-54 (LANL 1996, 059178, pp. 12, 71).

Extent sampling and soil removal were conducted at SWMU 32-002(a) in 2010 as part of an ACA. Activities were directed by the approved ACA work plan for Upper Los Alamos Canyon Aggregate Area, former TA-32 (LANL 2009, 108332; NMED 2010, 108455). The results of the ACA activities will be reported in the remedy completion report, to be submitted to NMED in November 2010. The results of the ACA and risk-screening assessments for SWMU 32-002(a) will also be included in the Phase II investigation report for Upper Los Alamos Canyon Aggregate Area.

2.23.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528) and data to be presented in the remedy completion report, the extent of contamination is not defined for the following:

- the vertical extent of aluminum, barium, beryllium, chromium, copper, lead, and nickel.

2.23.3 Proposed Extent Sampling at SWMU 32-002(a)

Subsurface samples will be collected at three previously sampled locations (00-603582, 00-603585, and 32-06372), extending the depth at each location to define the vertical extent of aluminum, barium, beryllium, chromium, copper, lead, and nickel. The samples will be analyzed for aluminum, barium, beryllium, copper, lead, and nickel at location 00-603582; aluminum, barium, and copper at location 00-603585; and chromium and nickel at location 32-06372. Sampling results from location 00-603585 will also be used to define the vertical extent of nickel and chromium at nearby locations 00-603586, 00-603588, and 00-603596, which are within approximately 10 ft of location 00-603585. The proposed samples to be collected at SWMU 32-002(a) and the analyses to be performed are presented in Table 2.23-1; the proposed sampling locations are shown on Plate 4. Two of the proposed sampling locations are on Los Alamos County property (00-603582 and 32-06372), and the other location is on DOE property (00-603585).

2.24 SWMU 32-002(b), Septic System

SWMU 32-002(b) is former septic tank and its associated drainline and outfall. The septic system was installed when SWMU 32-002(a) septic system could no longer meet the usage requirement of the laboratory (building 32-1). The influent line of SWMU 32-002(a) was diverted to the septic tank of SWMU 32-002(b), which also received effluent from building 32-2. The outfall of SWMU 32-002(b) was at the edge of Los Alamos Canyon. The septic tank was removed in 1988 (LANL 1990, 007513), and the drainline was removed in 1996 and disposed of at TA-54, MDA G (LANL 1996, 059178, pp. 12, 71).

Extent sampling was conducted at SWMU 32-002(b) in 2010 as part of an ACA. The sampling activities were directed by the approved ACA work plan (LANL 2009, 108332; NMED 2010, 108455). The results of those activities will be reported in the remedy completion report, to be submitted in November 2010. The results of the ACA and risk-screening assessments for SWMU 32-002(b) will also be included in the Phase II investigation report for Upper Los Alamos Canyon Aggregate Area, which will be submitted after the work proposed in this Phase II work plan is completed. No additional activities are proposed for SWMU 32-002(b).

2.25 AOC 32-003, Transformer Site

AOC 32-003 is the location of a former transformer station, discovered during the 1993 Phase I RFI. At the site, three transformers sat on a wooden platform on poles approximately 20 ft aboveground (LASL 1948, 091749).

Extent sampling and soil removal were conducted at AOC 32-003 in 2010 as part of an ACA. Soil was excavated to remove elevated concentrations of Aroclor-1260. Activities were directed by the approved ACA work plan (LANL 2009, 108332; NMED 2010, 108455). The results of those activities will be reported in the remedy completion report, to be submitted in November 2010. The results of the ACA and risk-screening assessments for AOC 32-003 will also be included in the Phase II investigation report for Upper Los Alamos Canyon Aggregate Area. No additional activities are proposed for AOC 32-003.

2.26 AOC 32-004, Drainline and Outfall

AOC 32-004 is a former drainline and outfall that served building 32-3 and discharged directly to Los Alamos Canyon without passing through a septic tank. Building 32-03 included a vault room where a radioactive source was stored. Part of the drainline was removed in 1996, and because no contamination was found inside the pipe, the rest of the drainline was left in place and each end was grouted (LANL 1996, 059178, p. 58).

Extent sampling was conducted at AOC 32-004 in 2010 as part of an ACA to verify the concentrations of PAHs detected in samples collected in 1996. The sampling activities were directed by the approved ACA work plan (LANL 2009, 108332; NMED 2010, 108455). The results of those activities will be reported in the remedy completion report, to be submitted in November 2010. The results of the ACA and risk-screening assessments for AOC 32-004 will also be included in the Phase II investigation report for Upper Los Alamos Canyon Aggregate Area, which will be submitted after the work proposed in this Phase II work plan is completed. No additional activities are proposed for AOC 32-004.

2.27 AOC C-43-001, Storm Drain Outfall

2.27.1 Site Description and Operational History

AOC C-43-001 is a storm-drain outfall that flows into Los Alamos Canyon. It collects runoff from the Health Research Laboratory (HRL) (building 43-1) loading dock and also functions as the overflow from the lift station (structure 43-10). The overflow line is an 8-in.-diameter vitrified clay pipe that extends from structure 43-10 130 ft south to a manhole. A 12-in.-diameter corrugated metal pipe, which receives discharge from two storm drains and any effluent from the overflow, flows southwest for 160 ft and drains into the canyon south of the HRL. The sanitary waste lines for the HRL [SWMU 43-001(a1) and AOC 43-001(a2)] may have become clogged at some time, causing an overflow. Any sanitary waste carried through the sewer lines could have discharged into the storm drains. Although no documentation was found to confirm any routine releases into the storm drains, the outfall may have received radioactive, nonsanitary cooling water.

Currently, the outfall is located on the undeveloped north slope of Los Alamos Canyon on DOE property.

2.27.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the lateral and vertical extent of contamination are defined for all constituents at AOC C-43-001, except for the following:

- the lateral extent of chromium, copper, lead, and zinc.

2.27.3 Proposed Extent Sampling at AOC C-43-001

Shallow subsurface samples will be collected at three new sampling locations downgradient of existing sampling locations 00-604846, 00-604847, and 00-604848 (locations 1-1 through 1-3) to define the lateral extent of chromium, copper, lead, and zinc. Samples will be analyzed for chromium, copper, lead, and zinc. The proposed samples to be collected at AOC C-43-001 and the analyses to be performed are presented in Table 2.27-1; the proposed sampling locations are shown in Figure 2.27-1. AOC C-43-001 is located entirely on DOE property.

2.28 SWMU 61-007, Transformer Site

2.28.1 Site Description and Operational History

SWMU 61-007 is the location of a transformer-staging site of an electrical contracting firm that once operated in the vicinity. The firm is no longer in existence, and its years of operation are not known. While excavating a trench for a new sewer line along the south side of East Jemez Road, approximately 0.75 mi east of the intersection of East Jemez Road and Diamond Drive in 1989, workers detected an organic odor. A chemical analysis of the soil determined that the soil was contaminated with PCBs and 1,2,4-trichlorobenzene (Nylander 1989, 062843).

Currently, the site is under a dirt road/parking area and is not occupied by any industrial area or residence. The municipal landfill for Los Alamos County is located south of SWMU 61-007.

2.28.2 Nature and Extent of Contamination

Based on the data presented in the investigation report (LANL 2010, 108528), the extent of contamination is not defined for the following:

- the lateral and vertical extent of Aroclor-1260.

Concentrations of Aroclor-1260 exceeded the residential SSL (2.22 mg/kg) at four locations (00-604287, 00-604289, 00-604291, and 00-604532). Soil removal is recommended to reduce the concentrations of Aroclor-1260 to below the residential SSL.

2.28.3 Proposed Extent Sampling and Soil Removal at SWMU 61-007

Subsurface samples will be collected at one previously sampled location (00-604291), extending the depth to define the vertical extent of Aroclor-1260. Six new sampling locations (7-1 through 7-6) will be placed along the north and south sides of the site to define the lateral extent of Aroclor-1260. Samples collected to define extent will be analyzed for PCBs.

Soil will be excavated to remove elevated concentrations of Aroclor-1260 until site concentrations meet a residential scenario. Confirmation samples will be collected from the floor of the excavated area at a minimum of four confirmation sampling locations when the excavation has been completed. Confirmation samples will be analyzed for PCBs. The proposed samples to define extent at SWMU 61-007 and the analyses to be performed are presented in Table 2.28-1; the proposed sampling locations to define extent are shown in Figure 2.28-1. SWMU 61-007 is located entirely on DOE property.

The site contains numerous under- and aboveground utility lines that run directly through the area proposed for soil removal. The presence of utilities will complicate both the additional extent sampling and the soil removal activities. All activities will be subject to worker health and safety requirements, and the methods used for sampling and soil removal will be selected to achieve the desired results to the degree practicable while ensuring worker safety.

3.0 INVESTIGATION METHODS

A summary of investigation methods to be implemented is presented in Table 3.0-1. The standard operating procedures (SOPs) used to implement these methods are available at http://www.lanl.gov/environment/all/qa/adep.shtml.

Descriptions of the field-investigation methods are provided below. Additional procedures may be added as necessary to describe and document quality-affecting activities.

Chemical analyses will be performed in accordance with the current analytical statement of work (LANL 2008, 109962). Accredited, non-Laboratory contract analytical laboratories will use the most recent EPA- and industry-accepted extraction and analytical methods for chemical analyses of analytical suites.

3.1 Establish Sampling Locations

Proposed sampling locations are identified for each site based on engineering drawings, surveyed locations of existing structures (from the geographic information system database), previous sampling locations, and topography or other features identified in the field (e.g., drainage channels, sediment accumulation areas, etc.). The coordinates of proposed new sampling locations will be obtained by georeferencing the points from the proposed sampling maps. The coordinates will be located and flagged

or otherwise marked in the field using a differential global-positioning system (GPS) unit. If any proposed sampling locations are moved because of field conditions, utilities, or other unexpected reasons, the new locations will be surveyed immediately following sample collection as described in section 3.2.

3.2 Geodetic Surveys

Geodetic surveys will be conducted in accordance with the latest version of SOP-5028, Coordinating and Evaluating Geodetic Surveys, to locate historical structures and previous sampling locations and to document field activities such as sample collection. The surveyors will use a Trimble GeoXT hand-held GPS or equivalent for the surveys. The coordinate values will be expressed in the New Mexico State Plane Coordinate System (transverse Mercator), Central Zone, North American Datum 1983. Elevations will be reported as per the National Geodetic Vertical Datum of 1929. All GPS equipment used will meet the accuracy requirements specified in the SOP.

3.3 Surface Sampling

Soil and rock samples will be collected by the most efficient and least invasive method practicable. The methods will be determined by the field team based on site conditions such as topography, the nature of the material to be sampled, the depth intervals required, accessibility, and the level of disruption to Laboratory activities, local residents, and businesses. Typically, samples will be collected using spade and scoop, hand auger, or drill rig methods.

3.3.1 Spade-and-Scoop Method

Surface and subsurface samples will be collected in accordance with SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples. Stainless-steel shovels, spades, scoops, and bowls will be used for ease of decontamination. If the surface location is at bedrock, an axe or hammer and chisel may be used to collect samples. Samples collected for analyses will be placed in the appropriate sample containers depending on the analytical method requirement.

3.3.2 Sediment Samples

Sediment samples will be collected from areas of sediment accumulation that include sediments judged to be representative of the historical period of Laboratory operations (i.e., post-1943). The proposed sediment sampling locations will be selected based on geomorphic relationships in areas likely to have been affected by discharges from Laboratory operations. The figures in this work plan show the proposed sediment sampling locations. However, because sediment is dynamic and subject to redistribution by runoff events, some locations may have to be adjusted when this work plan is implemented. In the course of collecting sediment samples, it may be determined, based on field conditions, that the selected location is not appropriate (e.g., the sediment is much shallower than anticipated, the sediment is predominantly coarse-grained, or the sediment shows evidence of being older than the target age). Sediment sampling locations will be adjusted as appropriate, any revised locations will be surveyed, and the updated coordinates will be submitted for inclusion in the appropriate database.

3.4 Subsurface Sampling

Subsurface sampling is proposed to include surface soil and fill, sediment, and tuff. Any adjustments will be noted in sample collection logs and recorded in the subsequent investigation report as deviations from this investigation work plan. Subsurface samples will be collected following the current version of

SOP-06.24, Sample Collection from Split-Spoon Samplers and Shelby-Tube Samplers, and SOP-06.26, Core-Barrel Sampling for Subsurface Earth Materials. If encountered, alluvial groundwater will be sealed off before the borehole is advanced to the desired sampling depths.

3.4.1 Hollow-Stem Auger

A hollow-stem auger may be used to drill holes deeper than approximately 15 ft or to shallower depths where hand-auger refusal is encountered. The hollow-stem auger consists of a hollow-steel shaft with a continuous spiraled steel flight welded onto the exterior of the stem. The stem is connected to an auger bit; when it is rotated, it transports cuttings to the surface. The hollow stem of the auger allows insertion of drill rods, split-spoon core barrels, Shelby tubes, and other samplers through the center of the auger so that samples may be retrieved during drilling operations. The hollow stem also acts to case the borehole core temporarily so that a well casing (riser) may be inserted down through the center of the auger once the desired depth is reached, thus minimizing the risk of possible collapse of the borehole. A bottom plug or pilot bit can be fastened onto the bottom of the auger to keep out most of the soil and/or water that tends to clog the bottom of augers during drilling. Drilling without a center plug is acceptable if the soil plug, formed in the bottom of the auger, is removed before sampling or installation of a well casing. The soil plug can be removed by washing out the plug using a side-discharge rotary bit or auguring out the plug with a solid-stem auger bit sized to fit inside the hollow-stem auger.

During sampling, the auger will be advanced to just above the desired sampling interval, and a sample will be collected by driving a split-spoon sampler into undisturbed soil/tuff to the desired depth. Samples will be collected in accordance with SOP-06.26, Core-Barrel Sampling for Subsurface Earth Materials.

3.4.2 Hand Auger

Hand augers may be used to drill shallow holes. The hand auger is advanced by turning the auger into the soil or tuff until the barrel is filled. The auger is removed and the sample is placed in a stainless-steel bowl. Hand-auger samples will be collected in accordance with SOP-06.10, Hand Auger and Thin-Wall Tube Sampler.

Because the chromium and nickel concentrations at some previous hand-augered sampling locations are suspected of being influenced by the use of stainless-steel auger buckets, carbon-steel auger buckets will be used to collect the proposed samples at locations that are not accessible to a drill rig and must be sampled by the hand auger method.

3.4.3 Split-Spoon Sampling

Subsurface samples will be collected from core extracted in a split-spoon core barrel following the current version of SOP-06.24, Sample Collection from Split-Spoon Samplers and Shelby-Tube Samplers. Samples collected for analyses will be placed in the appropriate sample containers depending on the requirements of the analytical method. The analytical suites for the samples from each location will vary according to the data requirements.

Field documentation will include detailed borehole logs to document the matrix material in detail; fractures and matrix samples will be assigned unique identifiers.

3.4.4 Borehole Abandonment

All boreholes will be abandoned according to the current version of SOP-5.03, Monitoring Well and RFI Borehole Abandonment.

Shallow boreholes (less than approximately 20 ft deep or advanced by methods other than a drill rig) will be abandoned by filling the borehole with bentonite chips, which are subsequently hydrated. Chips will be hydrated in 1- to 2-ft lifts. The borehole will be visually inspected while the bentonite chips are added to ensure that bridging does not occur.

Deeper boreholes will be pressure-grouted from the bottom of the borehole to the surface using the tremie pipe method. Acceptable grout materials include cement or bentonite grout, neat cement, or concrete.

The use of backfill materials, such as bentonite and grout, will be documented in a field logbook with regard to volume (calculated and actual), intervals of placement, and additives used to enhance backfilling. All borehole abandonment information will be provided in the investigation report.

3.4.5 Excavation

Excavations will be completed using a track excavator or backhoe, hand methods with a spade or scoop, or another method appropriate for site requirements. Excavated soil will be staged a minimum of 3 ft from the edge of the excavation, and excavations deeper than 4 ft bgs will be properly benched to allow access and egress, if necessary. Excavated overburden will be sampled to determine if contaminant concentrations are below residential SSLs or SALs. After confirmatory sampling and any necessary over-excavation work are completed, the excavations and/or trenches will be backfilled. If the excavated overburden sampling results are below residential SSLs or SALs, the material will be used to backfill the excavation, supplementing with clean fill material if necessary. If the excavated overburden does not meet residential SSLs or SALs, it will be containerized and disposed of as waste, and clean fill material will be used to backfill the excavation.

Excavation of shallow and spatially limited sediment accumulations, if necessary, will be coordinated with a geomorphic evaluation to determine the extent of sediment removal. In general, sediment will be removed to the underlying tuff bedrock. Existing sampling data from underlying tuff will be used where appropriate to demonstrate the extent of contamination is defined, or confirmation samples will be collected as necessary to confirm that the cleanup has been completed.

3.5 Chain of Custody for Samples

The collection, screening, and transport of samples will be documented on standard forms generated by the Laboratory's Sample Management Office (SMO). These forms include sample collection logs, chain-of-custody forms, and sample container labels. Sample collection logs will be completed at the time of sample collection and signed by the sampler and a reviewer who will verify the logs for completeness and accuracy. Corresponding labels will be initialed and applied to each sample container, and custody seals will be placed around container lids or openings. Chain-of-custody forms will be completed and signed to verify that the samples are not left unattended.

3.6 Field-Screening Methods

3.6.1 Radiological Screening

Radiological field screening will be conducted to meet of U.S. Department of Transportation requirements for shipping samples. Each sample will be field screened by a radiation control technician for gross-alpha, -beta, and -gamma radioactivity before the samples are transported to the SMO for processing. Instruments used for field screening will be calibrated in accordance with the Health Physics Operations Group procedures or equivalent procedures. All instrument calibration activities and field-screening results will be documented daily in the field logbooks in accordance with SOP-5181, Notebook Documentation for Waste and Environmental Services Technical Field Activities.

3.6.2 Organic Vapor Field Screening

Organic-vapor screening of surface and subsurface samples will be conducted for health and safety purposes only, using a photoionization detector (PID) with an 11.7-electron volt lamp. All samples will be screened for volatile organic compounds (VOCs) in headspace gas in accordance with SOP-06.33, Headspace Vapor Screening with a Photo Ionization Detector. Before each day's field work begins, the PID will be calibrated to the manufacturer's standard for instrument operation. All daily calibration results will be documented, and PID results for each sample will be recorded on sample collection logs in accordance with SOP-5181, Notebook Documentation for Waste and Environmental Services Technical Field Activities.

3.6.3 Quality Assurance/Quality Control Samples

Quality assurance/quality control (QA/QC) samples will include field duplicate, equipment rinsate, and field trip blank samples. Field duplicate samples will be collected at an overall frequency of at least 1 for every 10 regular samples as directed by the current version of SOP-5059, Field Quality Control Samples.

3.7 Laboratory Analytical Methods

The analytical suites for laboratory analyses are summarized in Table 3.7-1. All analytical methods are presented in the statement of work for analytical laboratories (LANL 2008, 109962). Sample collection and analysis will be coordinated with the SMO.

Alternative methods may be used for supplemental analyses of some samples in cases where additional information is desired or results from the standard analytical method appear inconsistent with other results. For example, uranium-235/236 results by the isotopic uranium method (alpha spectroscopy, HASL-300:ISOU) may indicate slightly elevated results for a single uranium isotope that are not consistent with site history or process knowledge. In such cases, a supplemental analysis (for example, uranium-235/236 by mass spectrometry) may be requested in addition to the standard analysis.

3.8 Health and Safety

The field investigations described in this investigation work plan will comply with all applicable requirements pertaining to worker health and safety. An integrated work document and a site-specific health and safety plan will be in place before conducting fieldwork.

3.9 Equipment Decontamination

Equipment for drilling and sampling will be decontaminated before and after sampling activities to minimize the potential for cross-contamination. All equipment will be decontaminated using dry decontamination methods whenever possible to minimize the generation of liquid waste. All sampling equipment will be decontaminated using dry decontamination methods if possible, as described in SOP-5061, Field Decontamination of Equipment. If dry decontamination methods are not effective as determined by field screening of the equipment after dry decontamination, drilling/exploration equipment that may come in contact with the borehole will be decontaminated by steam-cleaning, hot-water pressure-washing, or another method before each new borehole is drilled. If wet decontamination is necessary, the equipment will be decontaminated on a high-density polyethylene liner on a temporary decontamination pad. Cleaning solutions and wash water will be collected and contained for proper disposal. Decontamination solutions will be sampled and analyzed to determine the final disposition of the wastewater and the effectiveness of the decontamination procedures.

3.10 Investigation-Derived Waste

Investigation-derived waste (IDW) generated by the proposed investigation activities may include, but is not limited to, drill cuttings, excavated soil or other environmental media, excavated manmade debris, contact waste, decontamination fluids, and all other waste that has potentially come into contact with contaminants.

All IDW generated during field-investigation activities will be managed in accordance with applicable EPA and NMED regulations, DOE orders, and Laboratory requirements. Appendix B presents the IDW management plan.

4.0 MONITORING PROGRAMS

SWMUs 00-017, 01-001(d), 01-001(f), 01-001(g), 01-003(a), 01-003(b), 01-003(d), 01-006(a), 01-006(b), 01-006(c), 01-006(h), 03-055(c), and 32-002(b) and AOCs C-00-044, 32-003, 32-004, and C-43-001 are subject to the stormwater monitoring requirements of the Laboratory's National Pollutant Discharge Elimination System individual permit for stormwater discharges from SWMUs and AOCs.

5.0 SCHEDULE

The scheduled notice date for NMED to approve this investigation work plan is December 13, 2010. Following contracting activities, preparation for Phase II investigation is anticipated to begin in June 2011. Fieldwork is expected to begin in August 2011 and to be completed in February 2012. A submittal date of August 30, 2012, is proposed for the Phase II investigation report.

6.0 REFERENCES AND MAP DATA SOURCES

6.1 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. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

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

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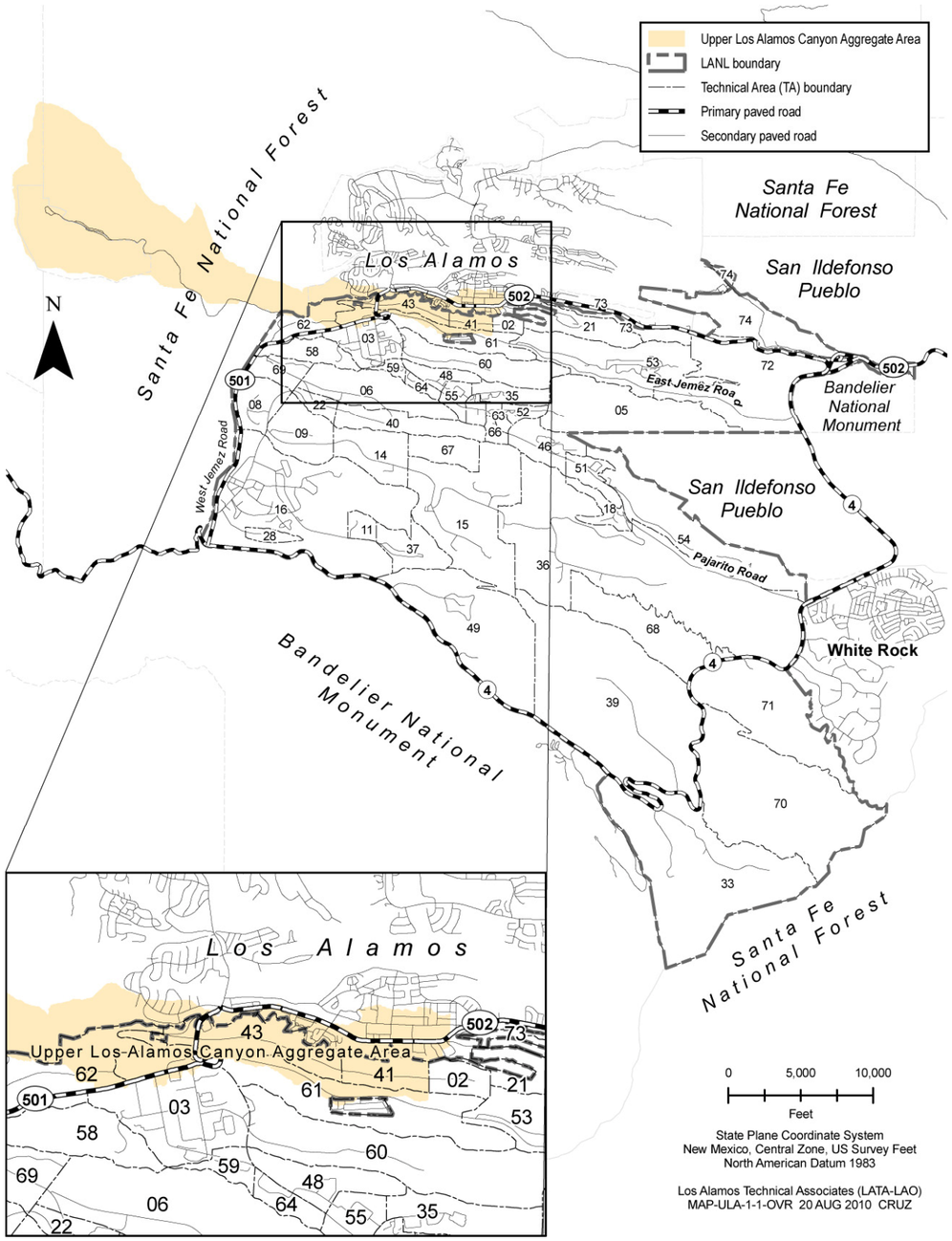


Figure 1.1-1 Location of Upper Los Alamos Canyon Aggregate Area with respect to Laboratory technical areas and surrounding land holdings

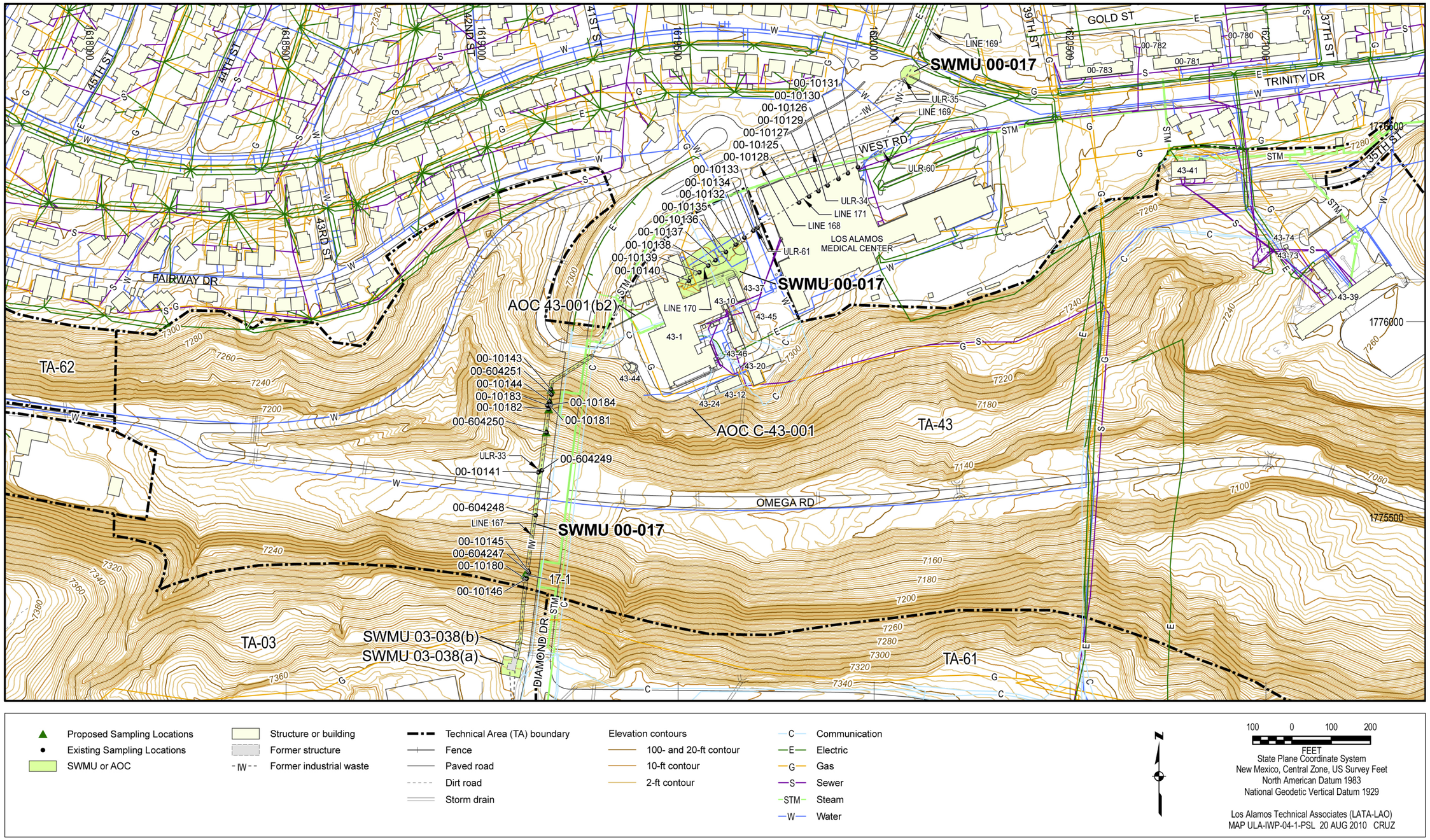


Figure 2.1-1 Existing and proposed locations of surface and subsurface samples at SWMU 00-017

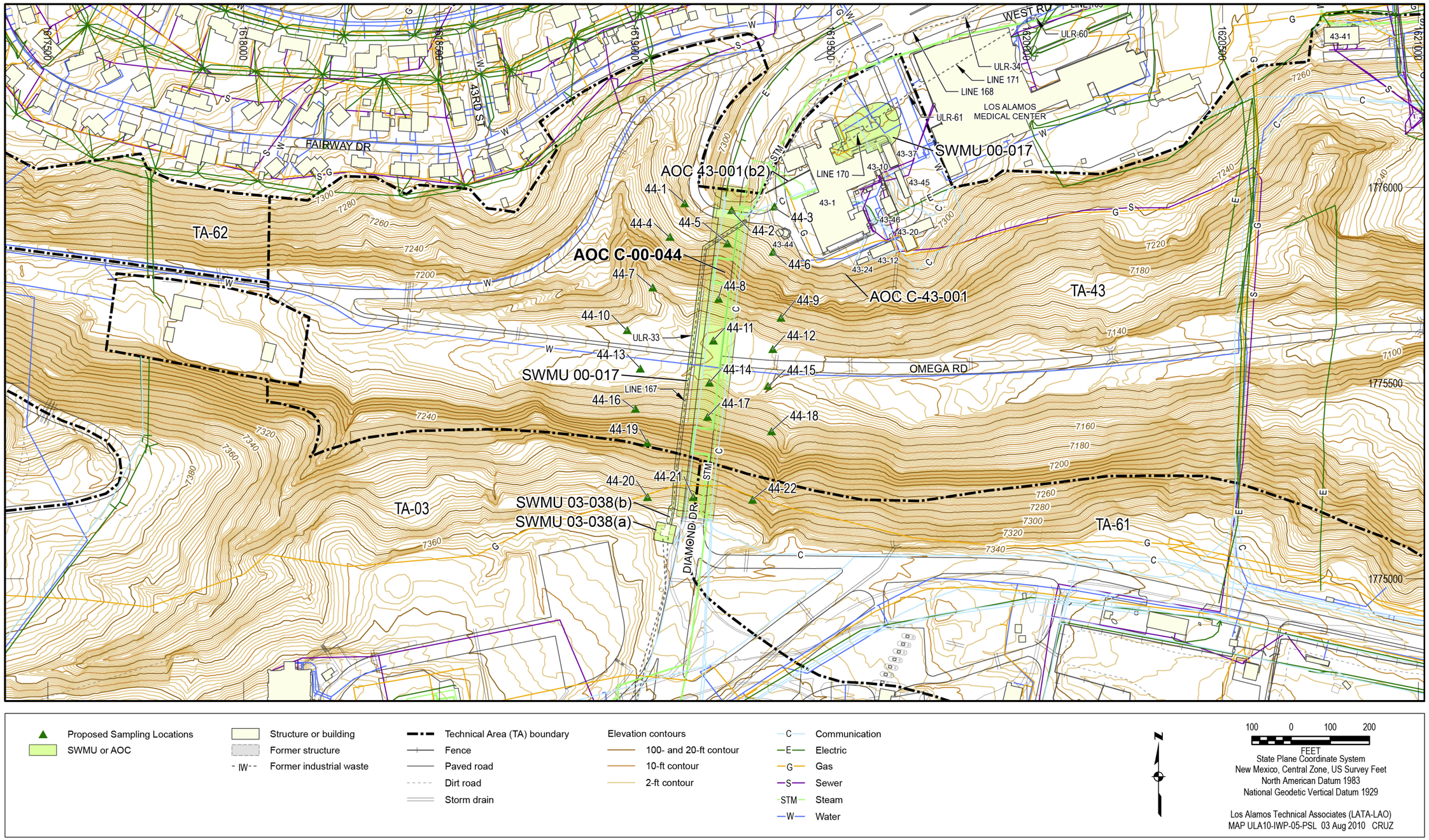


Figure 2.2-1 Proposed locations of surface and subsurface samples at AOC C-00-044

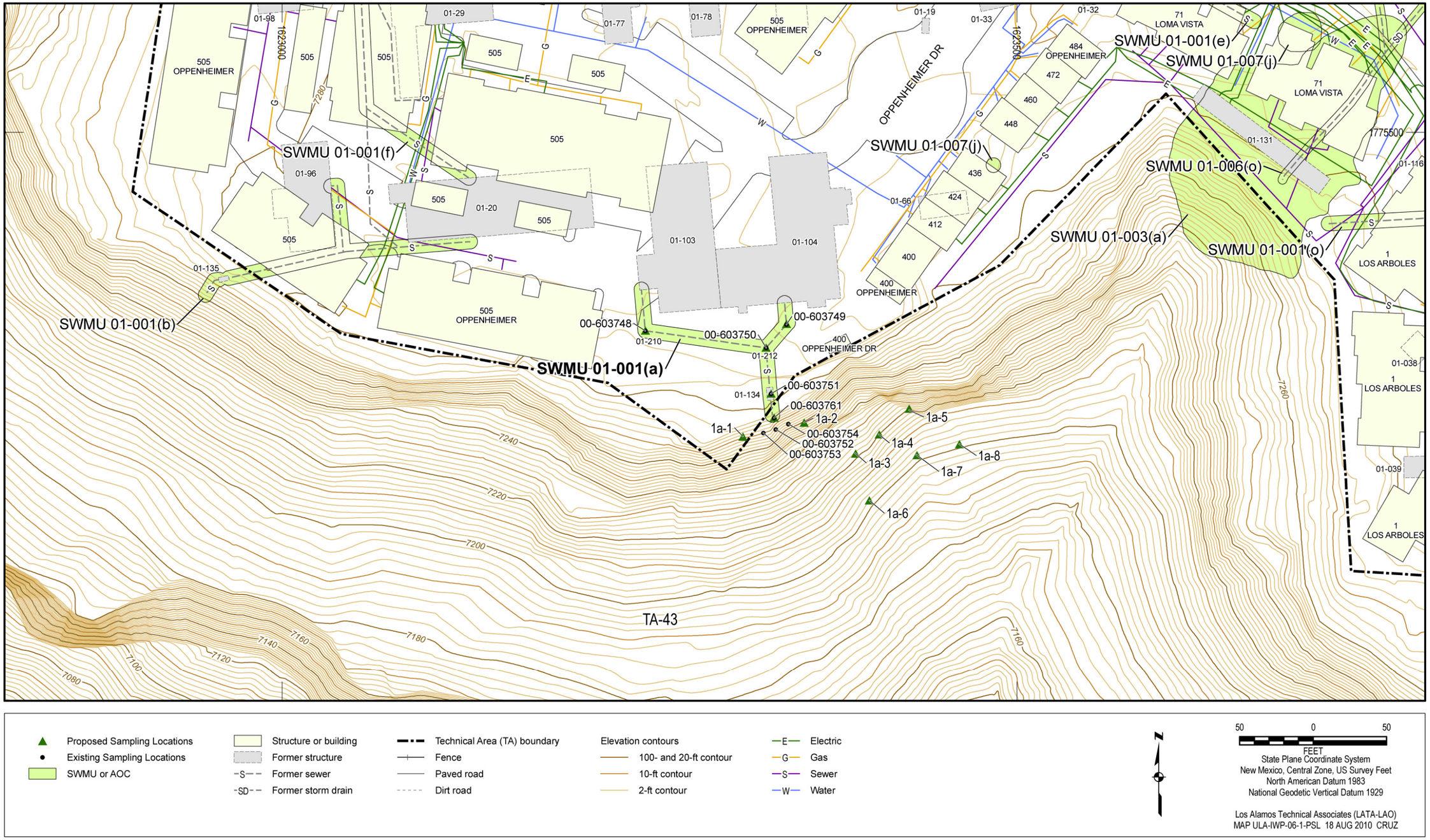


Figure 2.3-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-001(a)

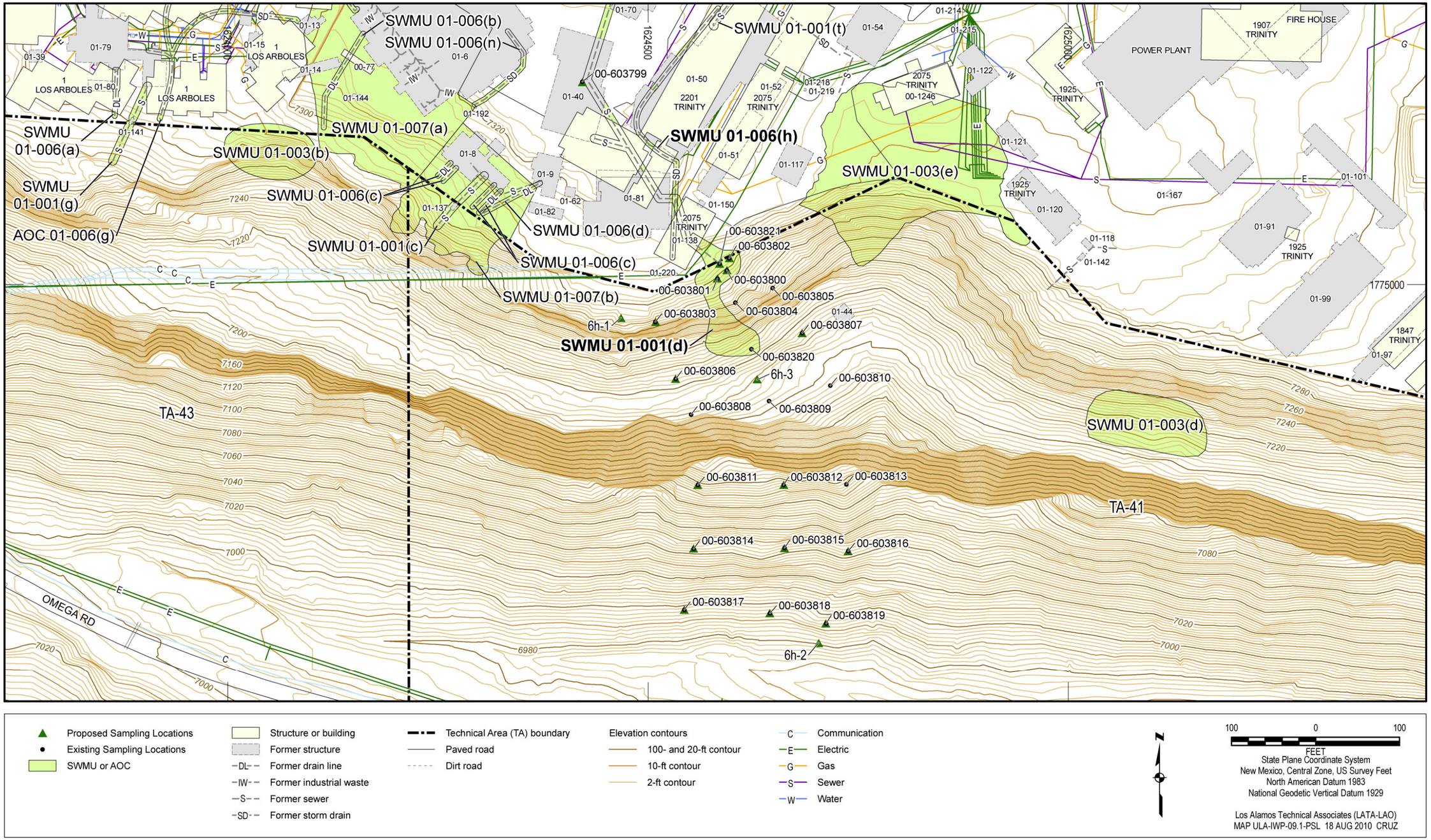


Figure 2.4-1 Existing and proposed locations of surface and subsurface samples at SWMUs 01-001(d) and 01-006(h)

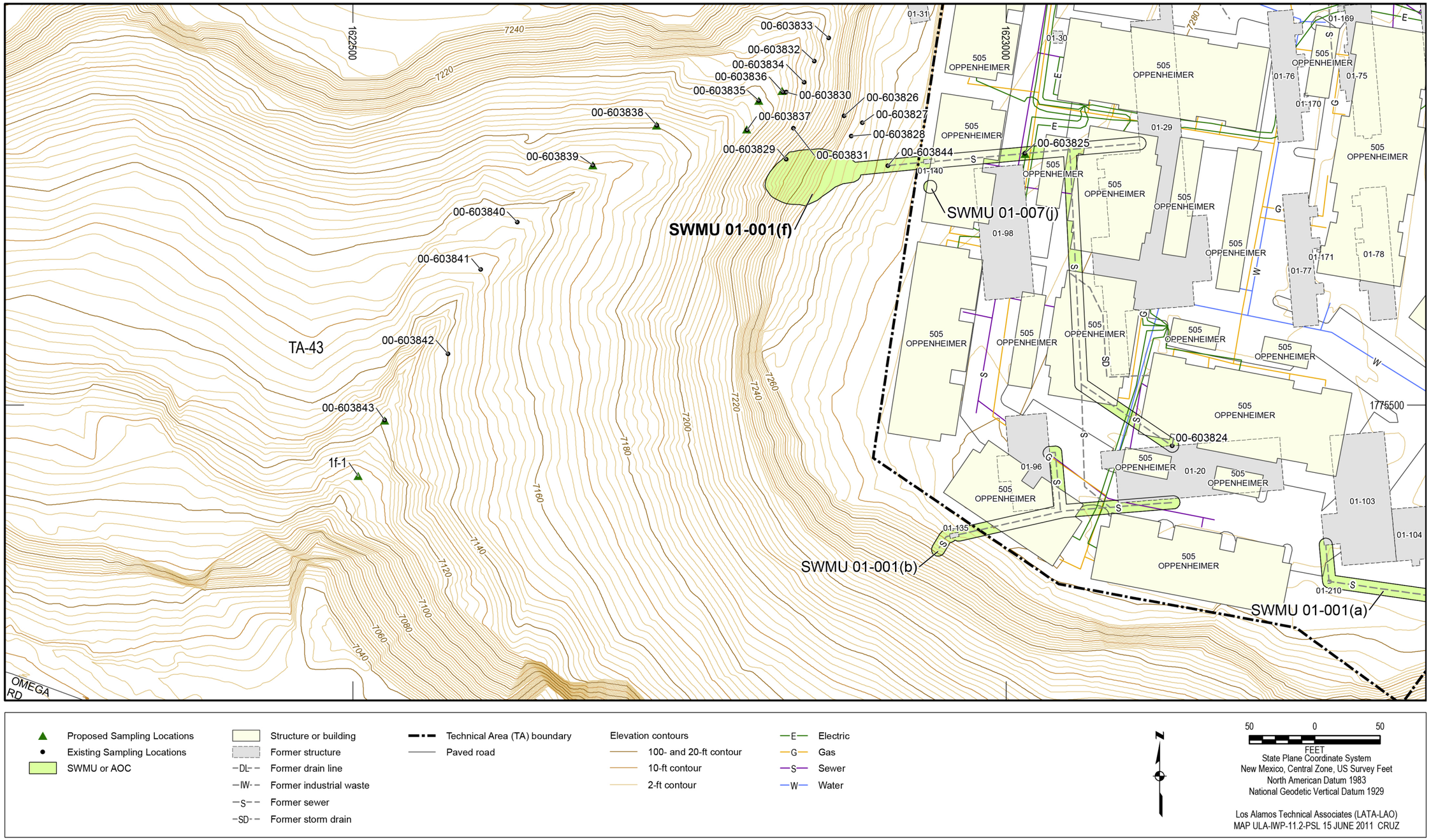


Figure 2.5-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-001(f)

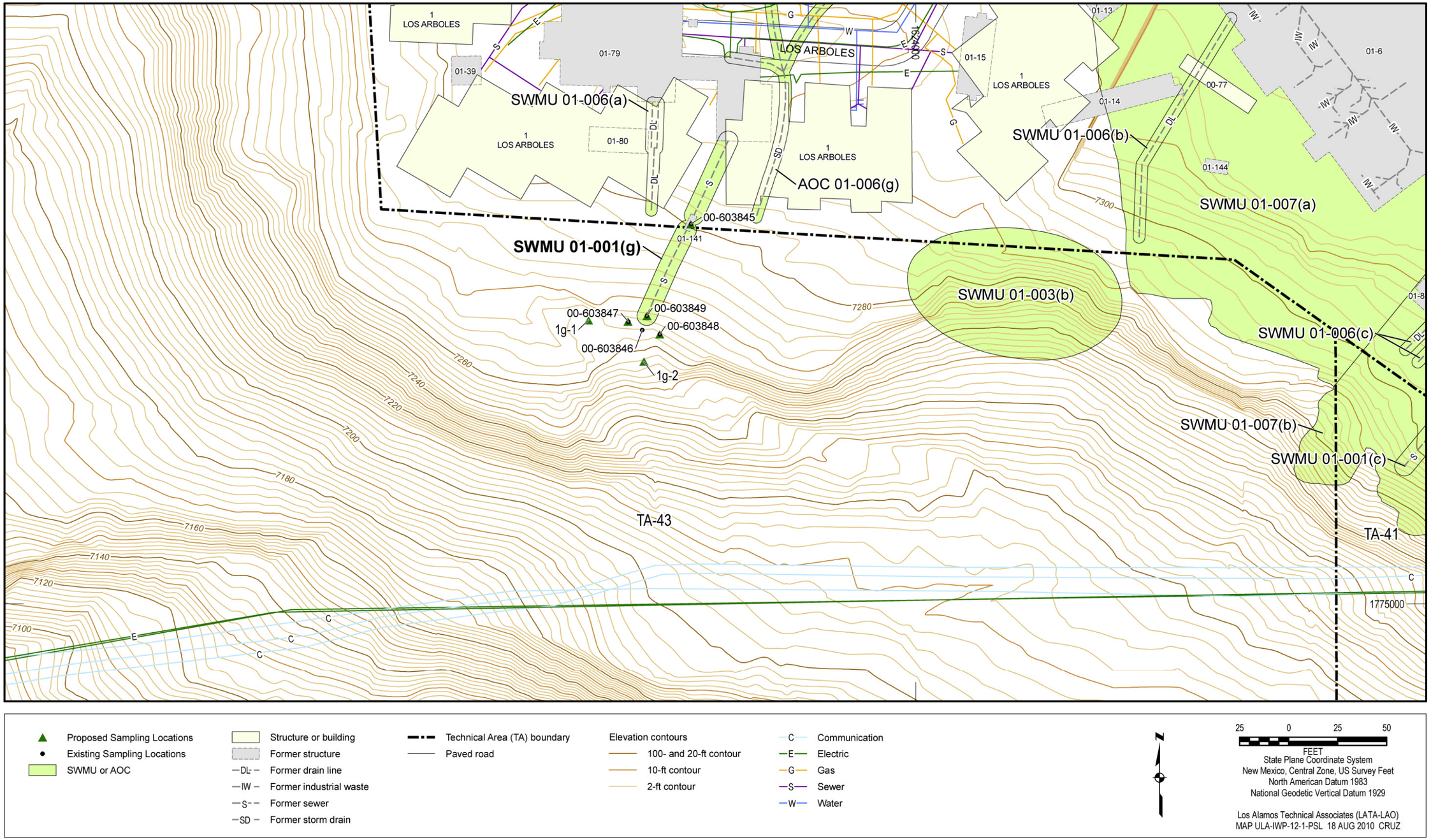
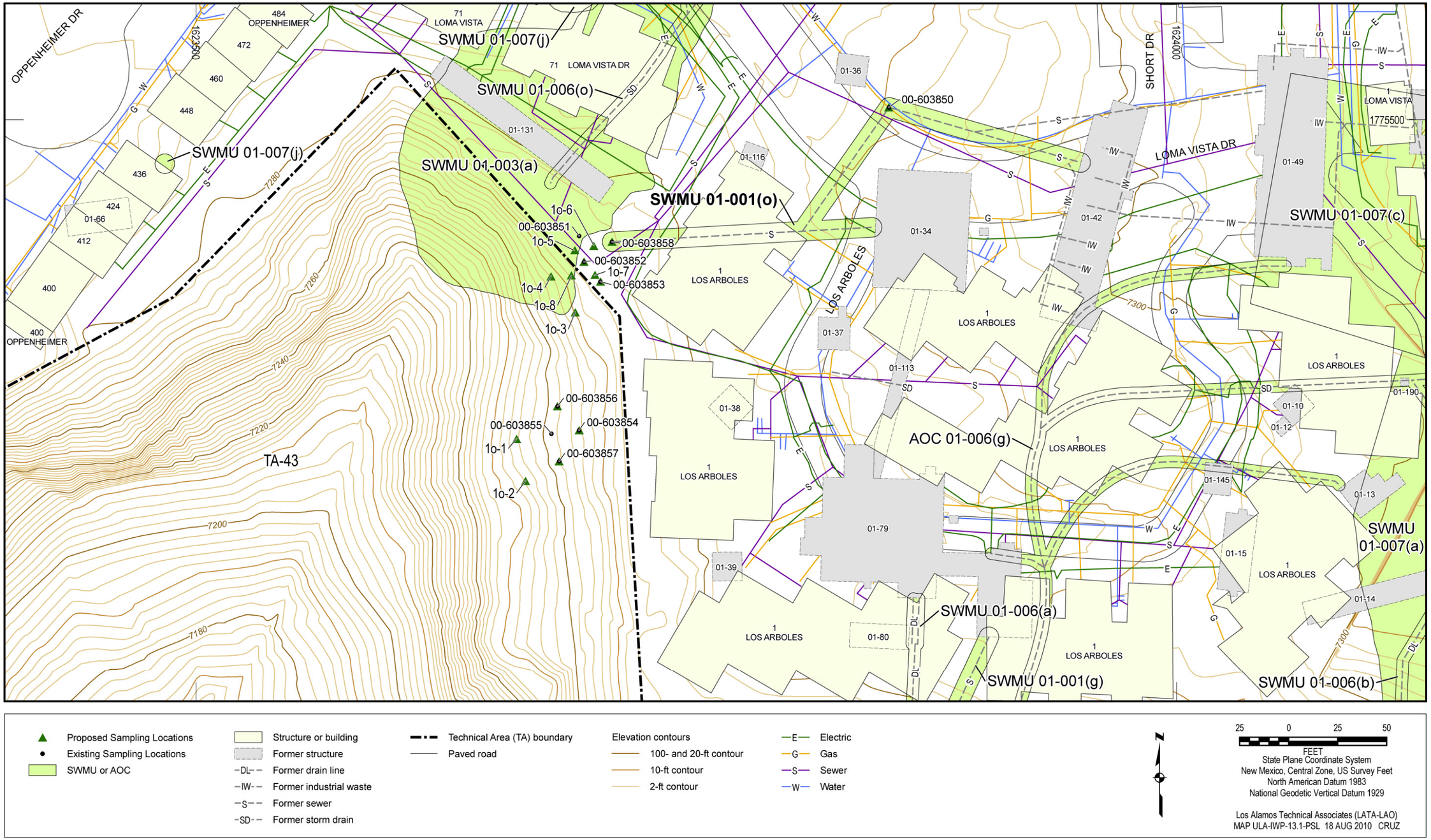


Figure 2.6-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-001(g)



Proposed Sampling Locations
Existing Sampling Locations
SWMU or AOC
Structure or building
Former structure
Former drain line
Former industrial waste
Former sewer
Former storm drain
Technical Area (TA) boundary
Paved road
Elevation contours
100- and 20-ft contour
10-ft contour
2-ft contour
Electric
Gas
Sewer
Water

25 0 25 50
FEET
State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929

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Figure 2.7-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-001(o)

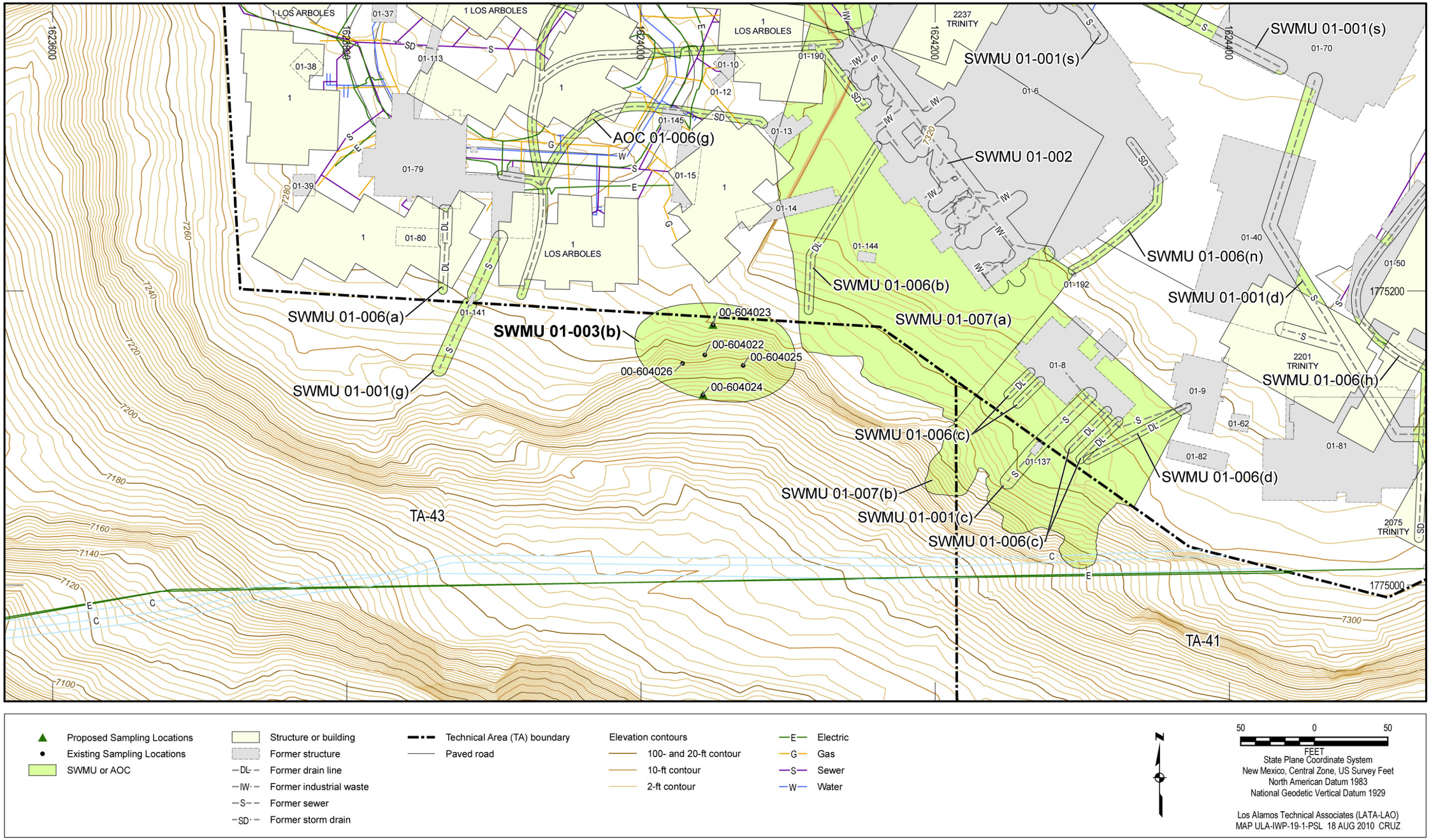


Figure 2.10-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-003(b)

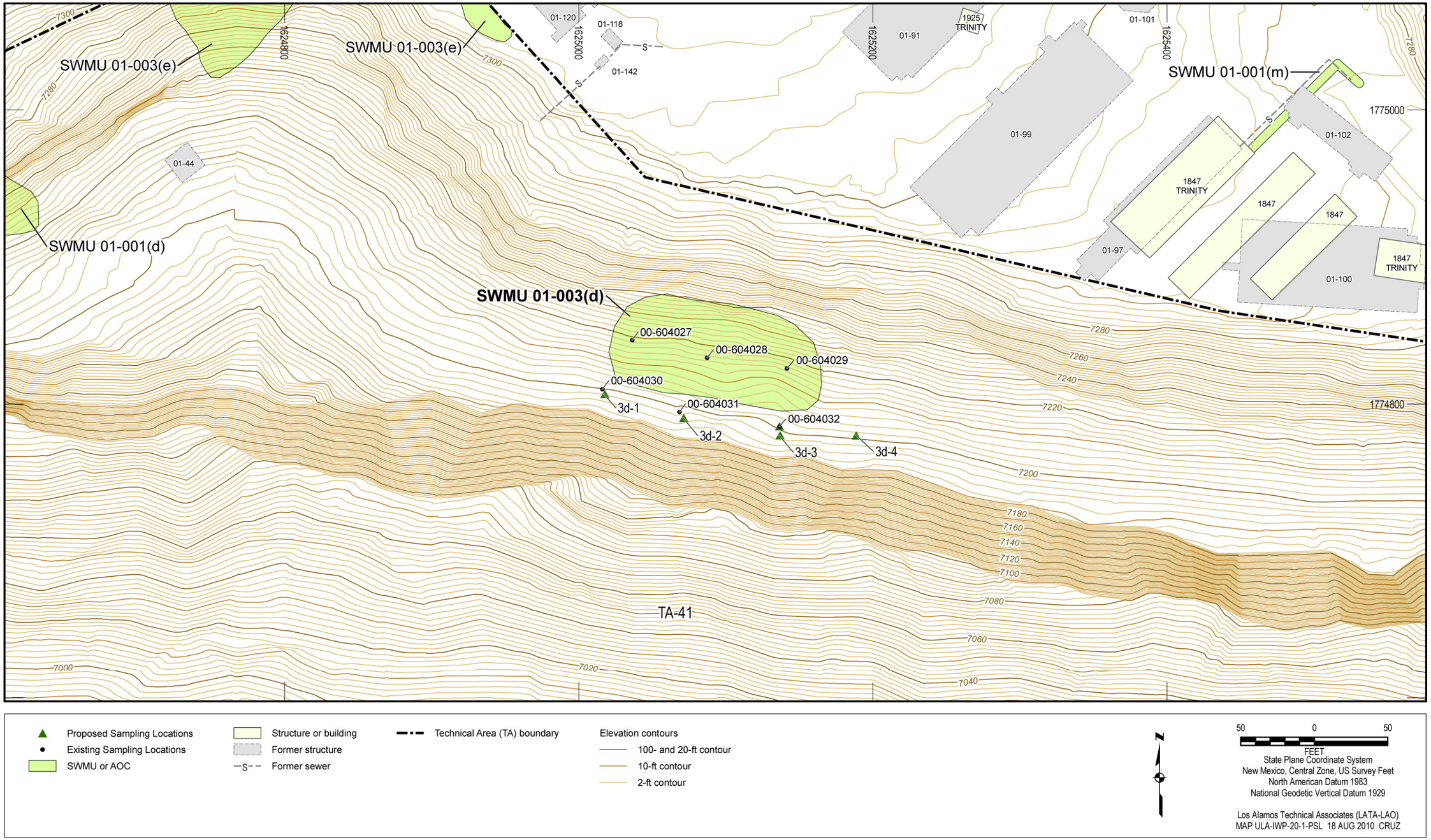


Figure 2.11-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-003(d)

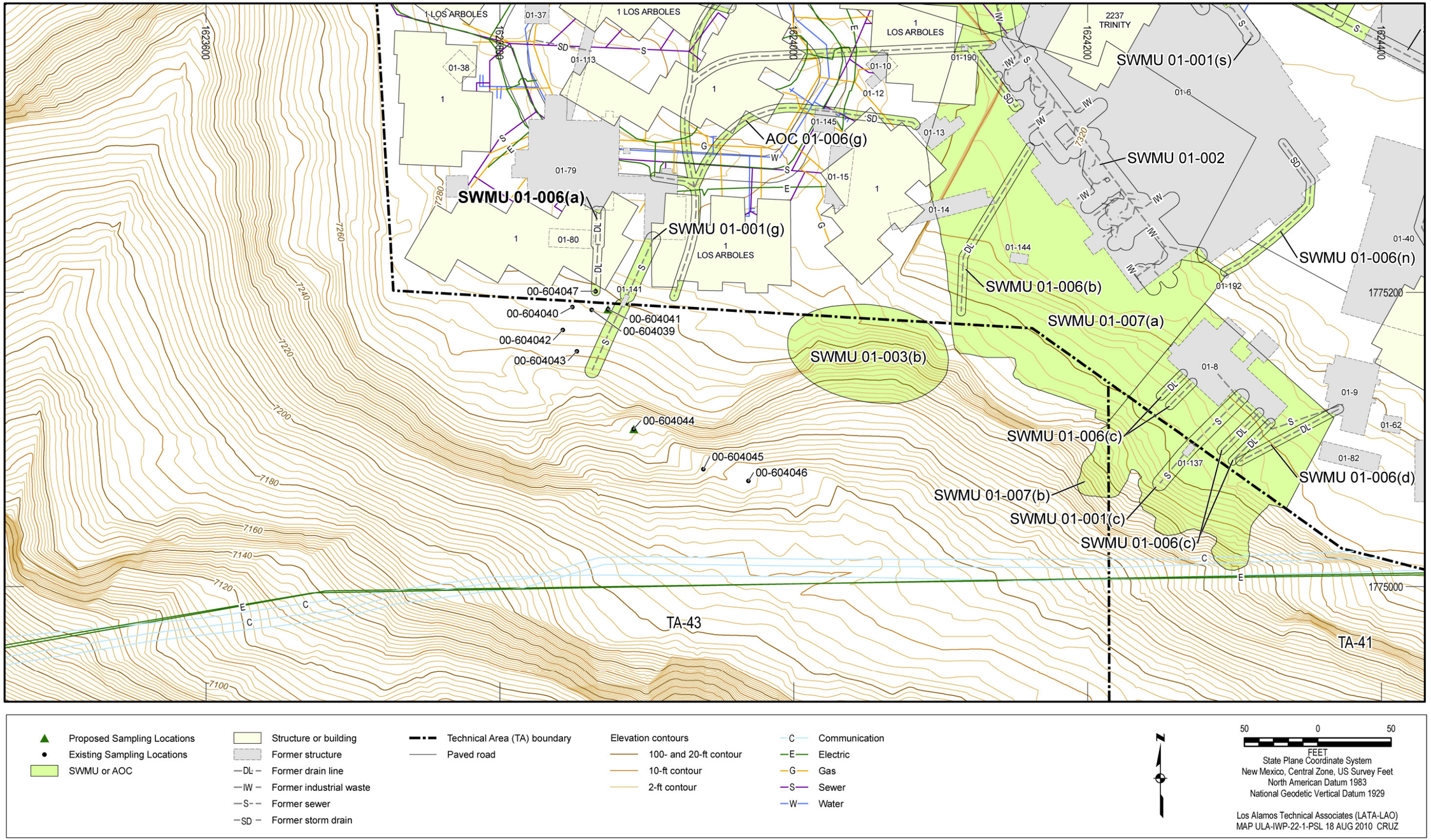


Figure 2.12-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-006(a)

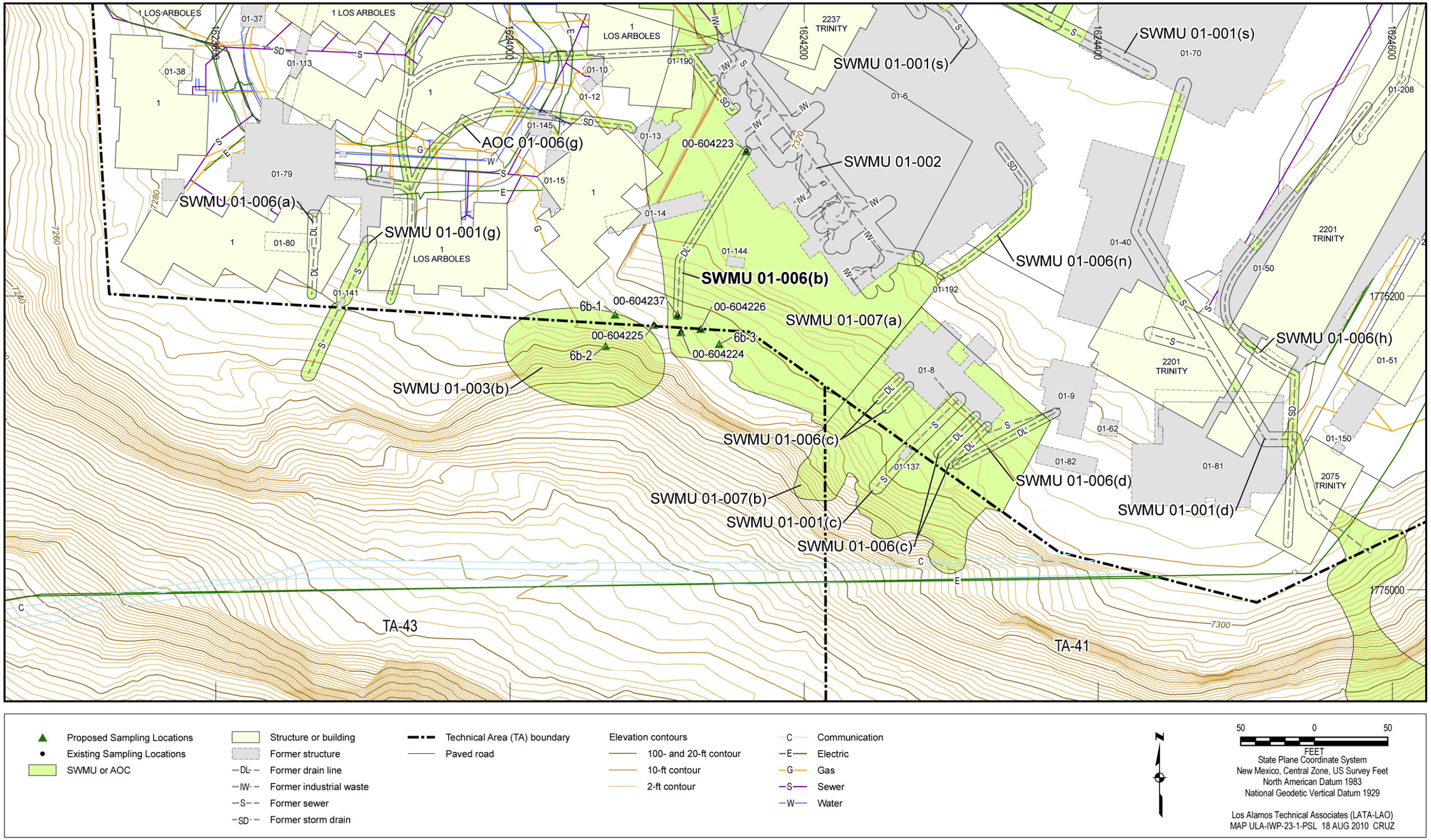


Figure 2.13-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-006(b)

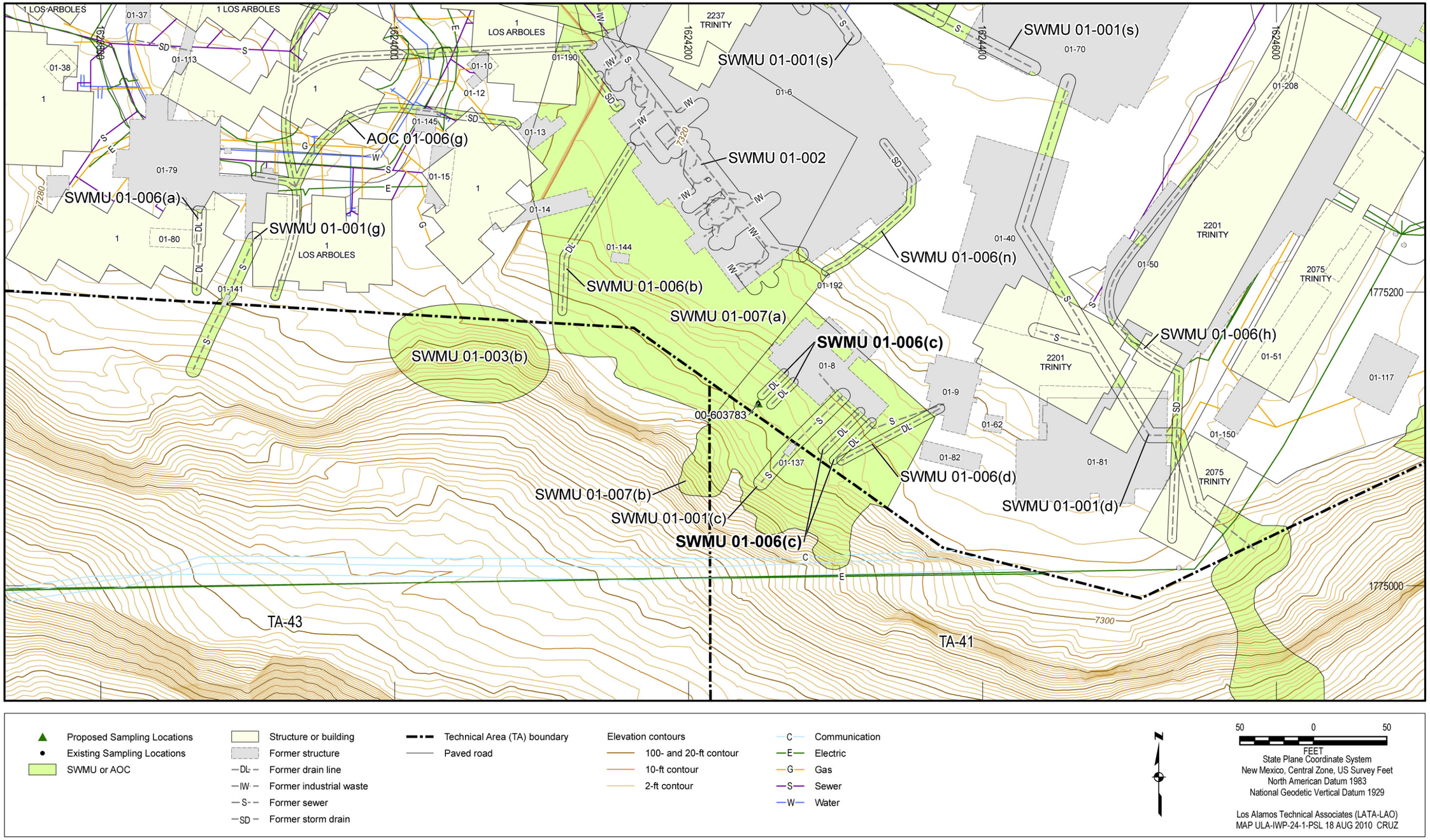


Figure 2.14-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-006(c)

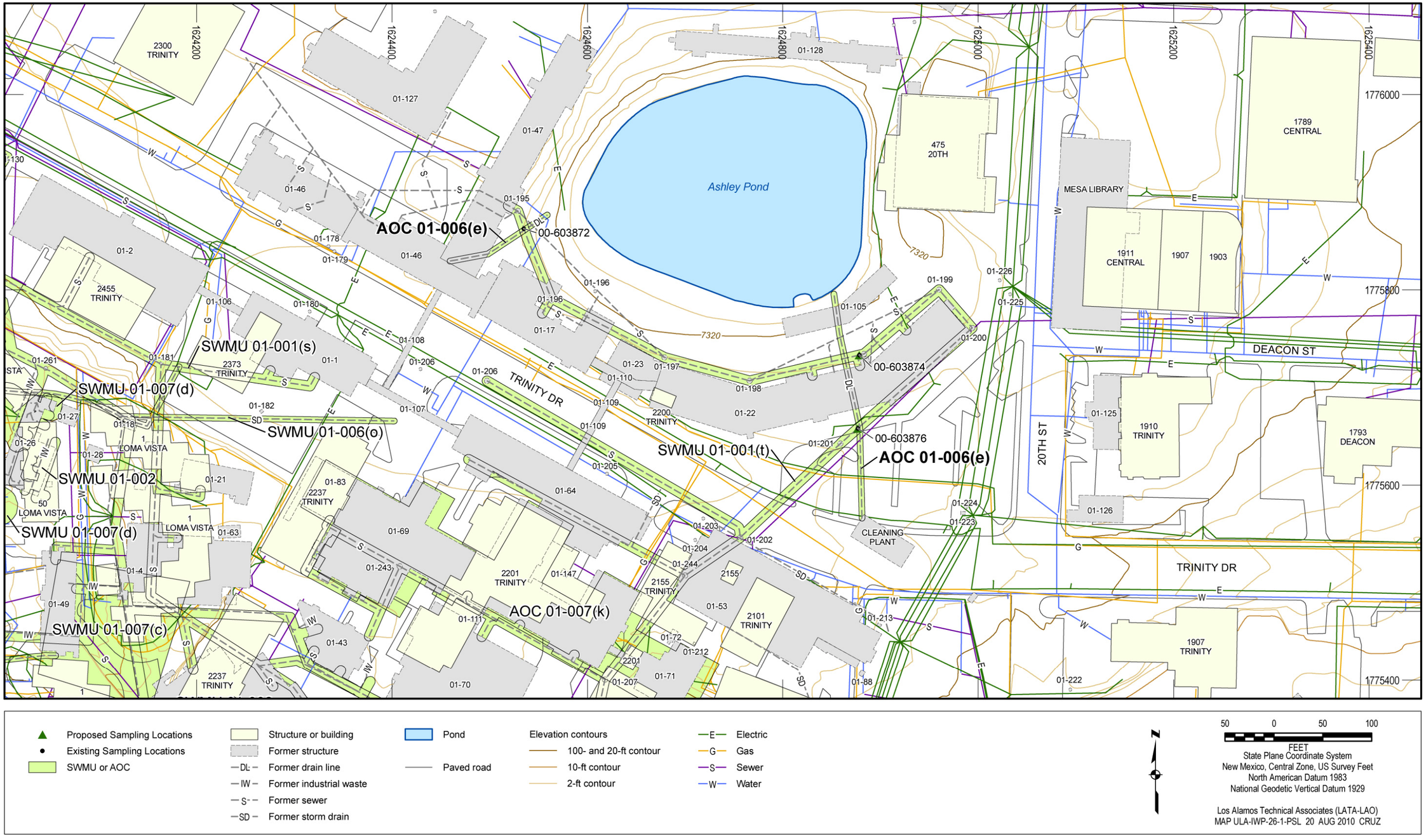


Figure 2.15-1 Existing and proposed locations of surface and subsurface samples at AOC 01-006(e)

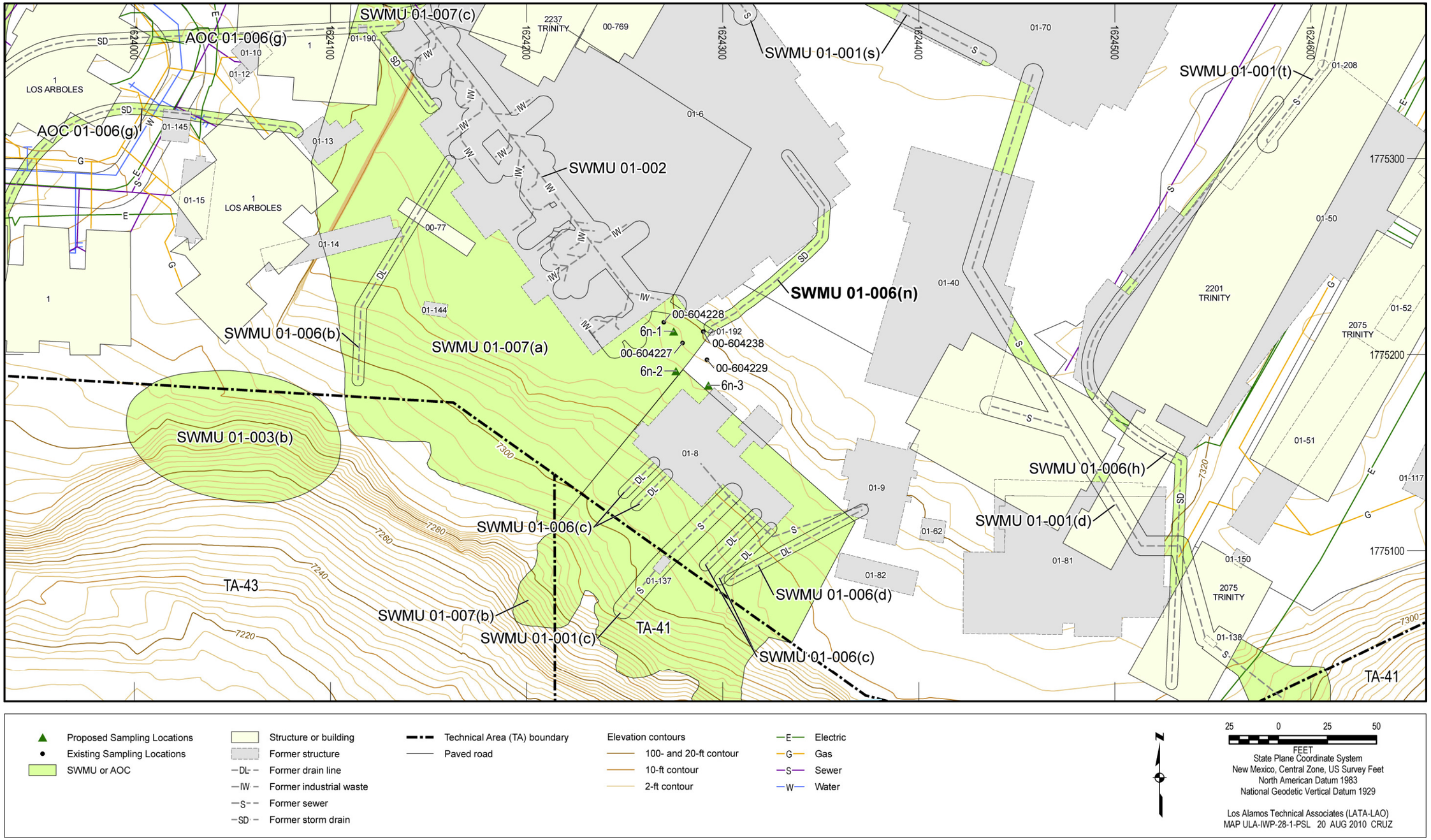


Figure 2.17-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-006(n)

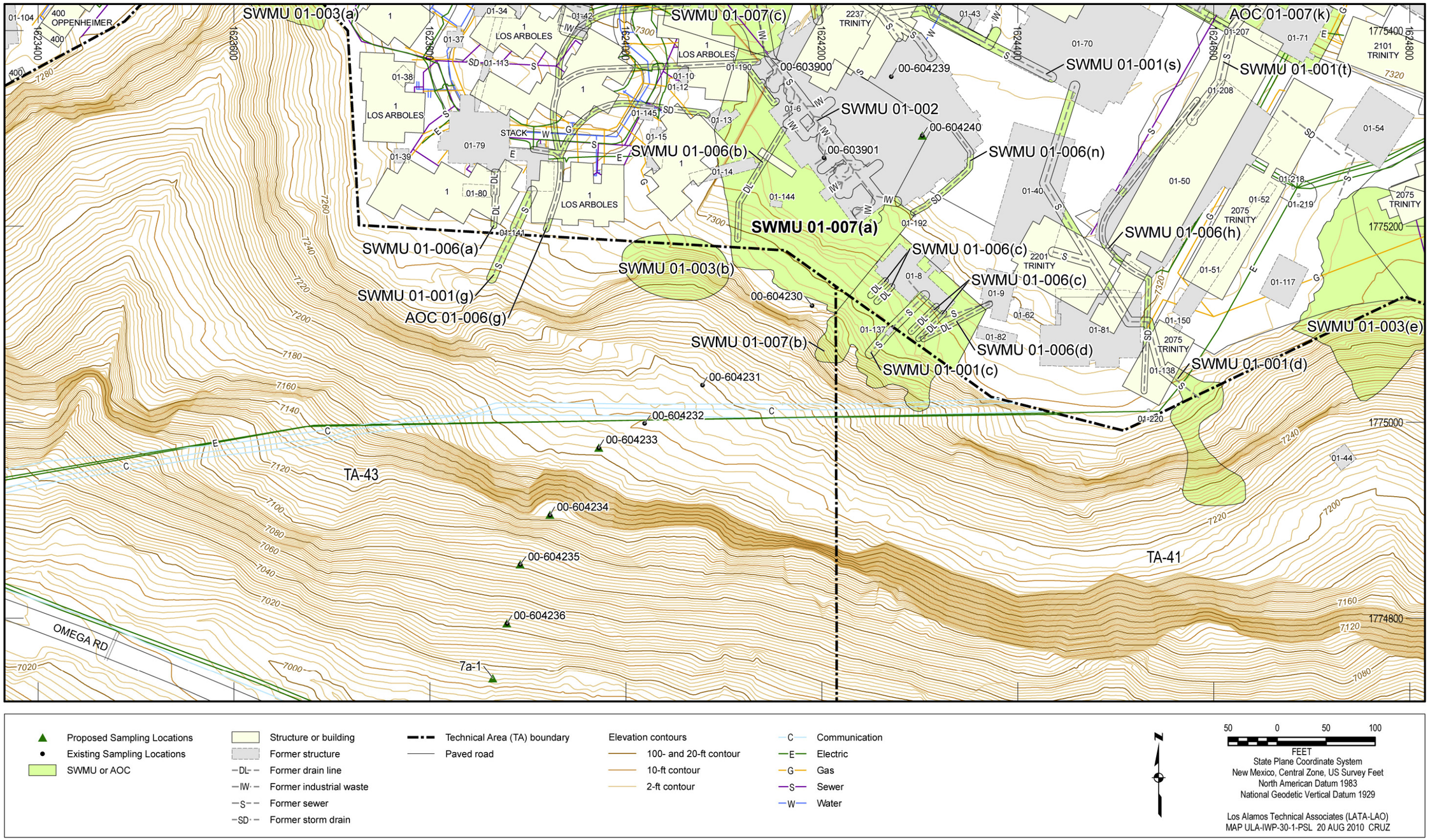


Figure 2.18-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-007(a)

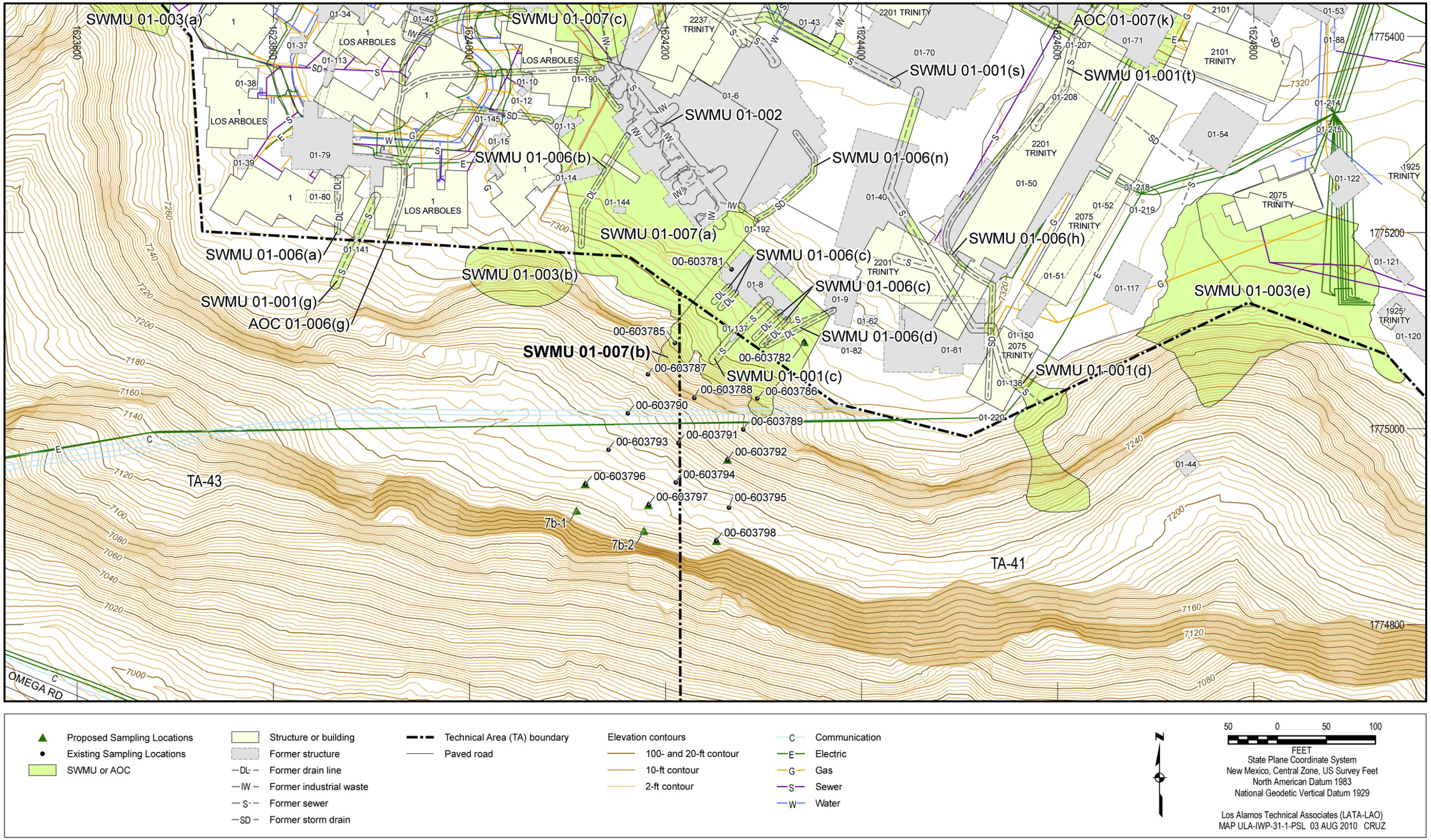
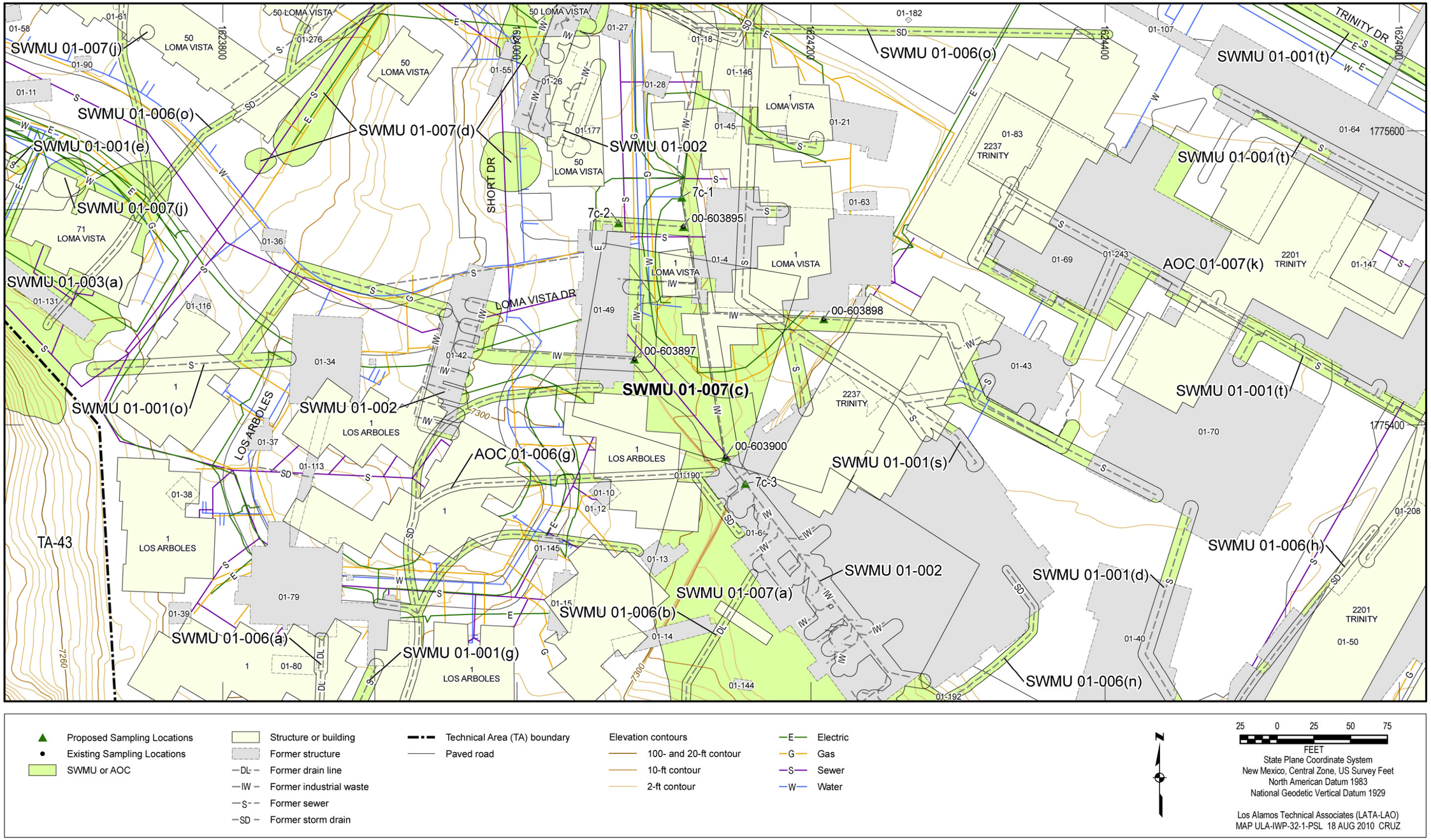


Figure 2.19-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-007(b)



Proposed Sampling Locations
Existing Sampling Locations
SWMU or AOC
Structure or building
Former structure
Former drain line
Former industrial waste
Former sewer
Former storm drain
Technical Area (TA) boundary
Paved road
Elevation contours
100- and 20-ft contour
10-ft contour
2-ft contour
Electric
Gas
Sewer
Water

25 0 25 50 75
FEET
State Plane Coordinate System
New Mexico, Central Zone, US Survey Feet
North American Datum 1983
National Geodetic Vertical Datum 1929

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MAP ULA-IWP-32-1-PSL 18 AUG 2010 CRUZ

Figure 2.20-1 Existing and proposed locations of surface and subsurface samples at SWMU 01-007(c)

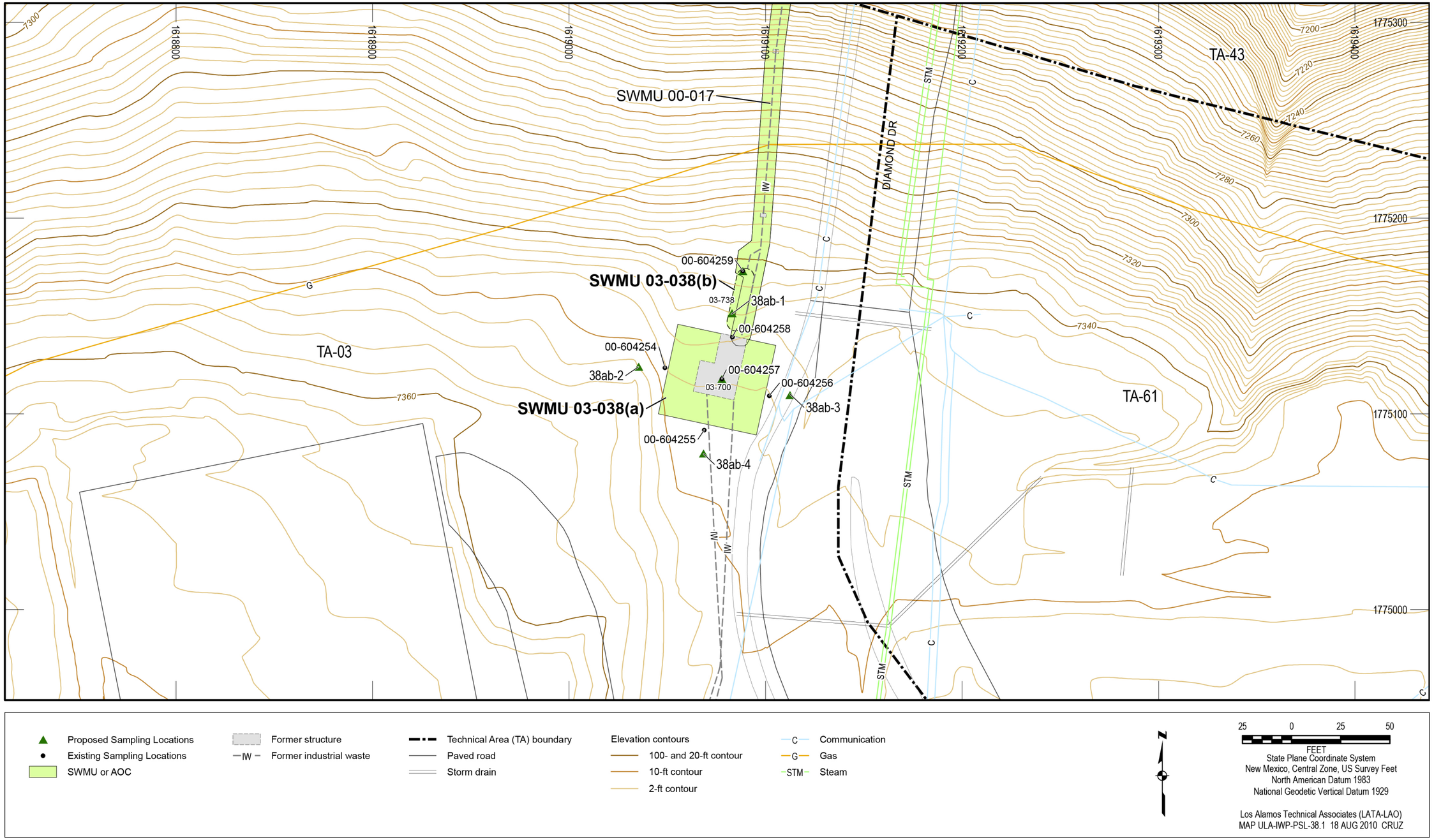


Figure 2.21-1 Existing and proposed locations of surface and subsurface samples at SWMUs 03-038(a) and 03-038(b)

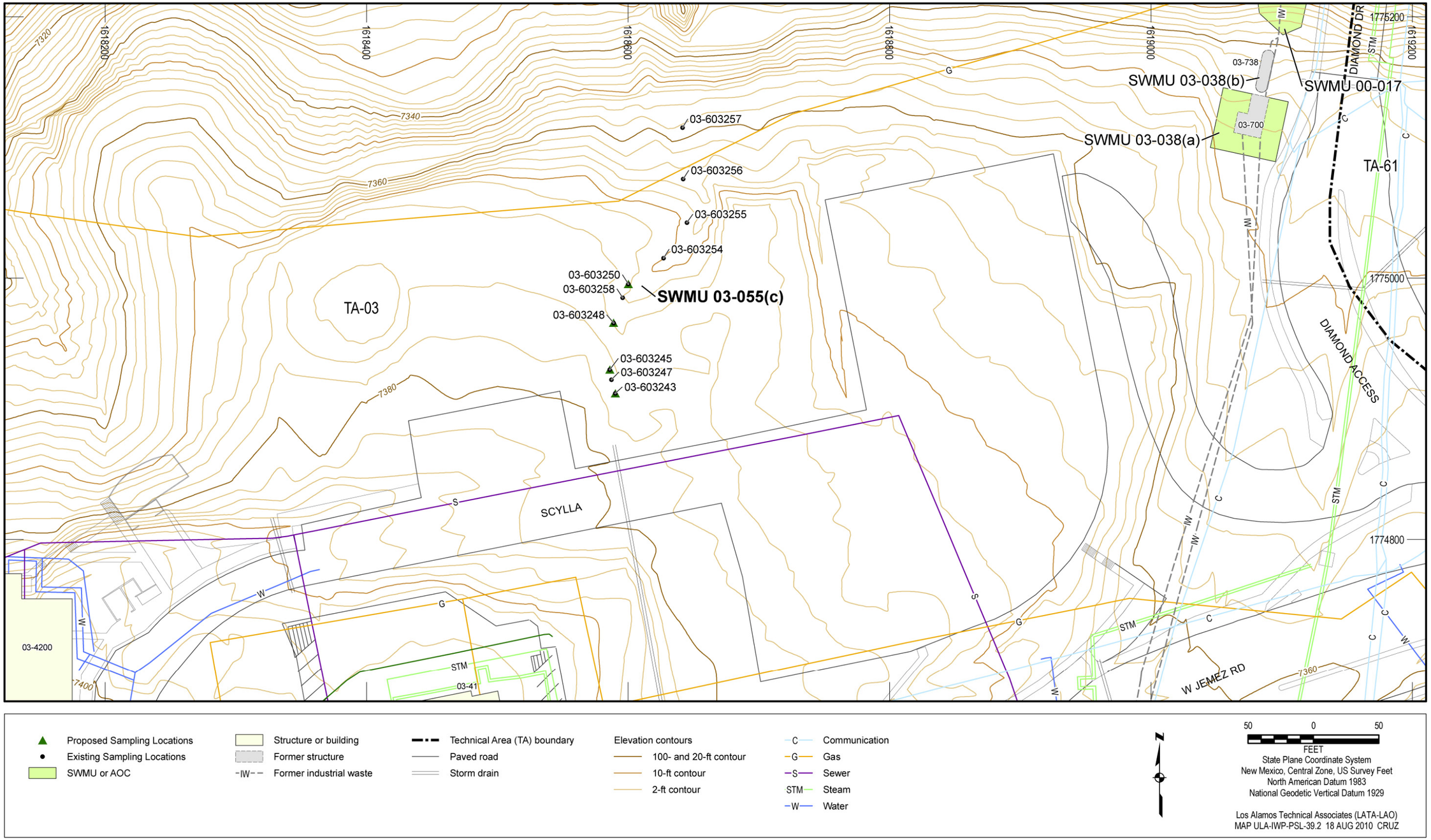


Figure 2.22-1 Existing and proposed locations of surface and subsurface samples at SWMU 03-055(c)

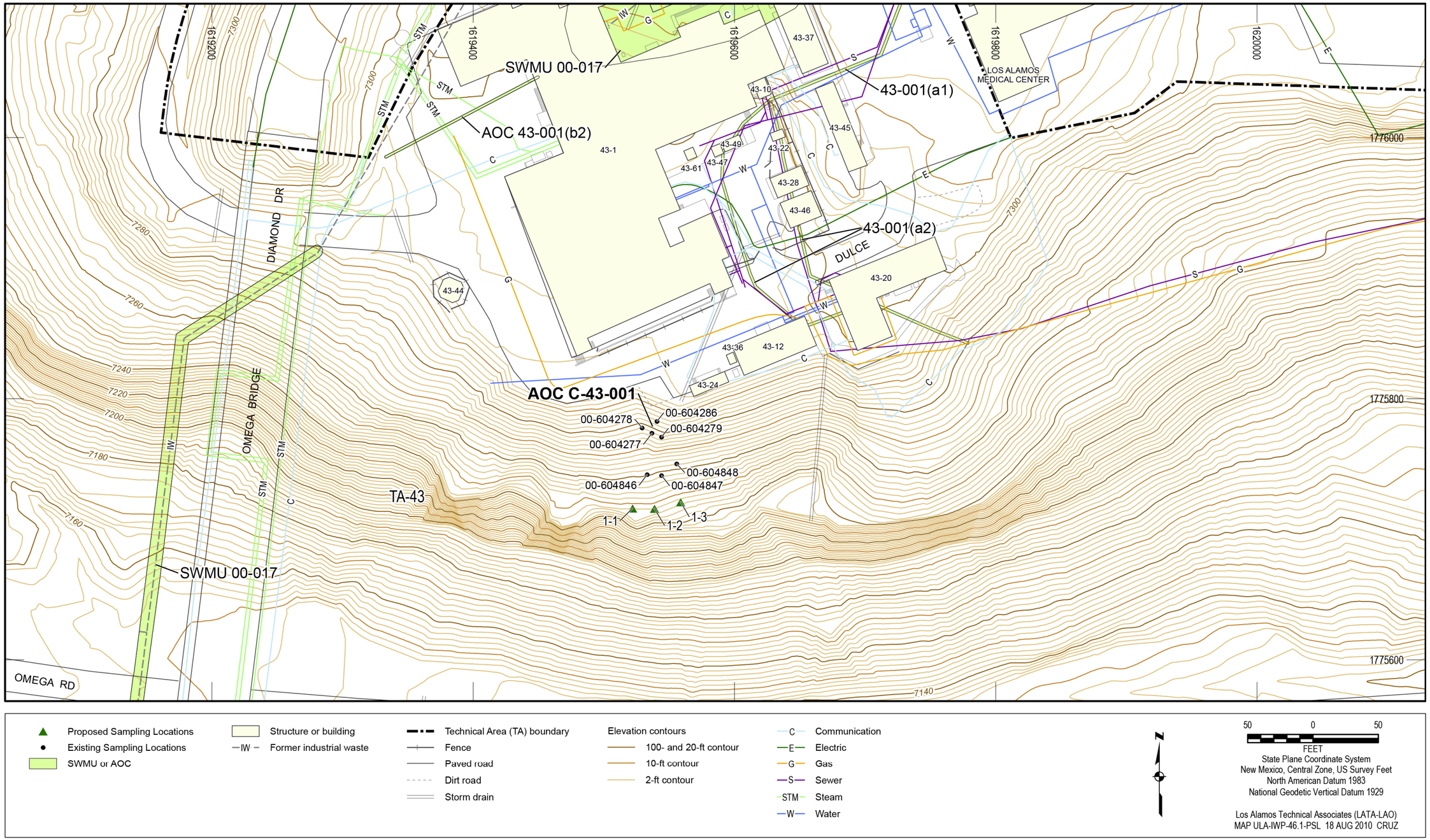


Figure 2.27-1 Existing and proposed locations of surface and subsurface samples at AOC C-43-001

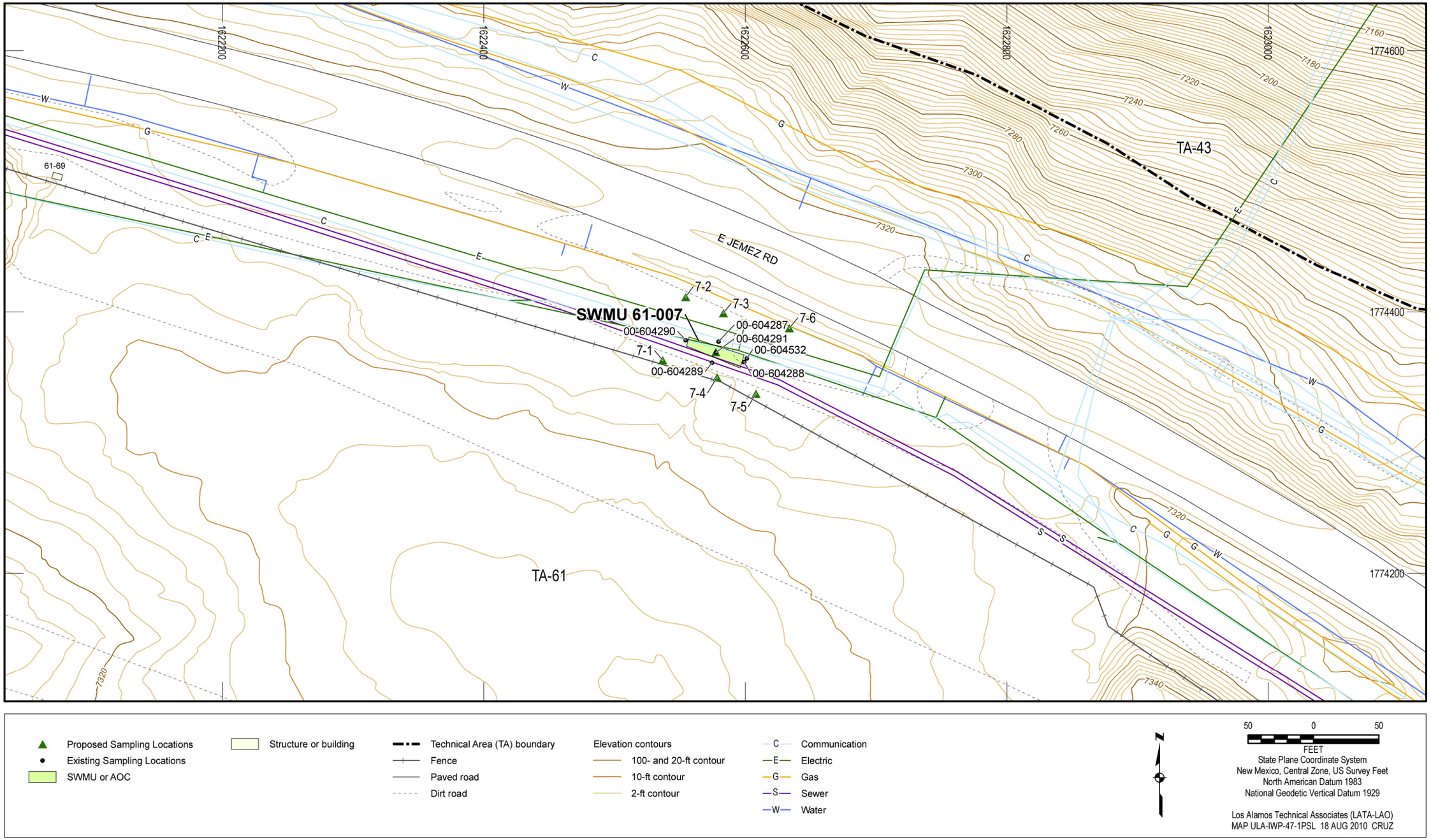


Figure 2.28-1 Existing and proposed locations of surface and subsurface samples at SWMU 61-007

Table 1.1-1
Sites under Investigation in Upper Los Alamos Canyon Aggregate Area

Consolidated Unit	SWMU/AOC	Site Description	Phase I Investigation Results	Proposed Activities
TA-00				
	SWMU 00-017	Industrial waste lines	Extent not defined: lead	Additional sampling for extent
	AOC 00-031(a)	Soil contamination beneath former service station (Zia building No. 5)	Corrective actions complete (NMED 2010, 110667)	None
	AOC 00-031(b)	Soil contamination beneath former Zia motor pool (two underground storage tanks [USTs])	None: previously approved for no sampling (NMED 2006, 095460)	None
	AOC 00-034(b)	Landfill, western area	Corrective actions complete (NMED 2010, 110667)	None
	AOC C-00-042	Waste oil UST beneath former Zia motor pool (formerly part of SWMU 00-032)	None: previously approved for no sampling (NMED 2006, 095460)	None
	AOC C-00-044	Surface contamination associated with Omega Bridge	None: not previously investigated. Sampling at this AOC performed in association with SWMU 00-017.	Sampling for extent
TA-01				
01-001(a)-99, Miscellaneous TA-01	SWMU 01-001(a)	Septic tank 134, served Warehouse 19 from 1949 to 1964	Extent not defined: TAL metals and bis(2-ethylhexyl)phthalate	Additional sampling for extent
	SWMU 01-001(b)	Septic tank 135, served the buildings FP (foundry) and M-1 (machining)	Corrective actions complete (NMED 2010, 110667)	None
	SWMU 01-001(c)	Septic tank 137, served the building D-2 (radioactive laundry)	Corrective actions complete (NMED 2010, 110667)	None
	SWMU 01-001(d)	Septic tank 138, served buildings K (chemical stock room), V (uranium and beryllium machining), and Y (physics laboratory)	Extent not defined: TAL metals, cesium-137, plutonium-239/240	Additional sampling for extent; soil removal to reduce mercury and plutonium-239/240
	SWMU 01-001(e)	Septic tank 139, served D-5 Sigma vault (plutonium and uranium storage), building I (beryllium machining), and Delta building (laboratory)	Corrective actions complete (NMED 2010, 110667)	None

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	Phase I Investigation Results	Proposed Activities
	SWMU 01-001(f)	Septic tank 140, served the buildings HT (heat treat and machining) and FP (foundry)	Extent not defined: inorganic chemicals, organic chemicals, and radionuclides	Additional sampling for extent; removal of Aroclor-1254 performed during interim action in 2009–2010.
	SWMU 01-001(g)	Septic tank 141, served building X (radioactive target testing)	Extent not defined: vertical extent of chromium and nickel, lateral and vertical extent of plutonium-239/240	Additional sampling for extent; removal to reduce plutonium-239/240
	SWMU 01-001(o)	Sanitary waste line, served buildings J (laboratory) and ML (medical laboratory)	Extent not defined: vertical extent of TAL metals, lateral and vertical extent of PCBs, di-n-butylphthalate, and radionuclides	Additional sampling for extent; removal to reduce Aroclor-1254
	SWMU 01-001(s)	Western sanitary waste line, main line	Extent not defined: lateral and vertical extent of TAL metals, vertical extent plutonium-239/240 and tritium	Additional sampling for extent
	SWMU 01-001(t)	Eastern sanitary waste line	Corrective actions complete (NMED 2010, 110667)	None
	SWMU 01-001(u)	Western sanitary waste line, branch line	Corrective actions complete (NMED 2010, 110667)	None
	SWMU 01-002	Industrial waste line, handled chemical and radioactive process wastes from 1943 to 1951	No additional sampling required (NMED 2010, 110667)	None
	SWMU 01-003(a)	Bailey Bridge landfill, used for disposal of demolition debris	Extent not defined: lateral and vertical extent of TAL metals, plutonium-239/240	Additional sampling for extent; removal to reduce Aroclor-1254 and lead
	SWMU 01-003(b)	Surface disposal area, used for surface disposal of construction debris	Extent not defined: vertical extent of TAL metals	Additional extent sampling
	AOC 01-003(c)	Surface disposal site (does not appear to exist)	Corrective actions complete (NMED 2010, 110667)	None
	SWMU 01-003(d)	Surface disposal site: Can Dump Site, empty paint and solvent cans from paint and carpentry operations	Extent not defined: lateral and vertical extent of TAL metals	Additional sampling for extent
	SWMU 01-003(e)	Surface disposal site (construction debris of unknown origin)	Corrective actions complete (NMED 2010, 110667)	None

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	Phase I Investigation Results	Proposed Activities
	SWMU 01-006(a)	Cooling tower drainline and outfall, served Cooling Tower 80	Extent not defined: vertical extent of plutonium-239/240 and uranium-235/236	Additional sampling for extent
	SWMU 01-006(b)	Drainline and outfall, served building D (plutonium processing)	Extent not defined: lateral and vertical extent of americium-241, plutonium-239/240	Additional sampling for extent; soil removal to reduce plutonium-239/240
	SWMU 01-006(c)	Drainlines and outfalls, served building D-2 (laundry facility for radioactively contaminated clothing)	Extent not defined: lateral and vertical extent of chromium and nickel, vertical extent of organic chemicals and plutonium-239/240	Additional sampling for extent
	SWMU 01-006(d)	Drainline and outfall, served building D-3 (counting room)	Corrective actions complete (NMED 2010, 110667)	None
	AOC 01-006(e)	Drainlines and outfalls to Ashley Pond, served building P (personnel offices) and the cleaning plant	Extent not defined: vertical extent of barium, chromium, nickel	Additional sampling for extent
	AOC 01-006(g)	Stormwater drainage system, served building D and several others	Corrective actions complete (NMED 2010, 110667)	None
	SWMU 01-006(h)	Stormwater drainage system, served buildings R (plumbing, carpentry, etc.) and Y (physics laboratory)	Extent not defined: lateral and vertical extent of TAL metals, cesium-137, and plutonium-239/240	Additional sampling for extent; soil removal to reduce mercury and plutonium-239/240
	SWMU 01-006(n)	Stormwater drainage system, served building D	Extent not defined: lateral and vertical extent of plutonium-239/240	Additional sampling for extent
	SWMU 01-006(o)	Stormwater drainage system, served administrative buildings, shops, storage, and building H (polonium preparation)	Corrective actions complete (NMED 2010, 110667)	None
	SWMU 01-007(a)	Suspected subsurface soil radiological contamination near building D	Extent not defined: vertical extent of chromium and nickel, lateral and vertical extent bis(2-ethylhexyl)phthalate	Additional sampling for extent
	SWMU 01-007(b)	Suspected subsurface soil radiological contamination near building D-2	Extent not defined: lateral and vertical extent of TAL metals, vertical extent bis(2-ethylhexyl)phthalate	Additional sampling for extent
	SWMU 01-007(c)	Suspected subsurface soil radiological contamination, northwest of building D	Extent not defined: lateral and vertical extent of chromium and nickel	Additional sampling for extent

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	Phase I Investigation Results	Proposed Activities
	SWMU 01-007(d)	Suspected subsurface soil radiological contamination due to overflow of the industrial waste line in 1946	Corrective actions complete (NMED 2010, 110667)	None
	SWMU 01-007(e)	Suspected subsurface soil radiological contamination near Sigma building (plutonium, uranium, and thorium machining)	Corrective actions complete (NMED 2010, 110667)	None
	SWMU 01-007(j)	12 areas of suspected subsurface soil radiological contamination	Corrective actions complete (NMED 2010, 110667)	None
	SWMU 01-007(l)	Suspected subsurface soil contamination; fill material under Trinity Drive suspected of originating from the building D area.	None: previously approved for no sampling (NMED 2006, 095460)	None
	AOC 01-007(k)	Soil contamination area near buildings U and W (physics laboratories)	Corrective actions complete (NMED 2010, 110667)	None
TA-03				
	AOC 03-008(a)	Former firing site	Corrective actions complete (NMED 2010, 110667)	
	SWMU 03-009(j)	Surface disposal site for construction debris	Corrective actions complete (NMED 2010, 110667)	None
03-038(a)-00, Tanks and/or Associated Equipment	SWMU 03-038(a) SWMU 03-038(b)	Acid-neutralizing and pumping building Steel 28,500-gal. acid waste holding tank	Extent not defined: vertical extent of TAL metals, lateral extent of barium	Additional sampling for extent
	SWMU 03-055(c)	Outfall, previously served fire station floor drains; currently handles stormwater from roads and parking lots	Extent not defined: vertical extent of zinc	Additional sampling for extent
TA-32				
	SWMU 32-001	Incinerator (former), received combustible waste from a medical research facility	Corrective actions complete (NMED 2010, 110667)	None

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	Phase I Investigation Results	Proposed Activities
	SWMU 32-002(a)	Septic tank (former) and drainlines; served medical research facility laboratory from 1944 to 1953	Extent not defined: vertical extent of barium, chromium, nickel	Additional sampling for extent; soil removal to reduce lead and arsenic completed in 2010 ACA.
	SWMU 32-002(b)	Septic system; served medical research facility laboratory from 1944 to 1953	Extent not defined: vertical extent of barium, lateral and vertical extent chromium and nickel	Additional sampling for extent completed in 2010 ACA.
	AOC 32-003	Transformer site (former location) consisting of three transformers located approximately 19.5 ft aboveground	Extent not defined: lateral extent of Aroclor-1260, lateral and vertical extent PAHs	Additional sampling for extent; soil removal to reduce Aroclor-1260 completed in 2010 ACA.
	AOC 32-004	Drainline and outfall from a former office building with a radiation source vault	Extent defined: potential unacceptable risk to human health from PAHs in 1996 samples	Additional sampling to confirm PAH concentrations and determine if soil removal was warranted to reduce risk completed in 2010 ACA.
TA-41				
	SWMU 41-001	Septic system, received sanitary waste from a guardhouse	Corrective actions complete (NMED 2010, 110667)	None
41-002(a)-99 TA-41, Sewage Treatment Plant	SWMU 41-002(a) SWMU 41-002(b) SWMU 41-002(c)	Imhoff tank Chlorine contact tank Sludge drying bed	None: previously approved for delayed action (NMED 2006, 095460)	None
	AOC 41-003	Sump, received effluent from floor and sink drains, stormwater, and rinse water	None: previously approved for delayed action (NMED 2006, 095460)	None
	AOC C-41-004	Storm drain system surrounding building 41-4 (laboratory)	None: previously approved for delayed action (NMED 2006, 095460)	None
TA-43				
	SWMU 43-001(a1)	Waste lines (pre-1981), served HRL	None: previously approved for delayed action (NMED 2006, 095460)	None
	AOC 43-001(a2)	Waste lines (post-1981), served HRL	None: previously approved for delayed action (NMED 2006, 095460)	None

Table 1.1-1 (continued)

Consolidated Unit	SWMU/AOC	Site Description	Phase I Investigation Results	Proposed Activities
	AOC 43-001(b2)	Outfall; previously received effluent from floor and roof drains and blow-down from an evaporative cooler	Corrective actions complete (NMED 2010, 110667)	None
	SWMU 43-002	Incinerator for wastes generated by health research activities	None: previously approved for delayed action (NMED 2006, 095460)	None
	AOC C-43-001	Storm drain outfall from the HRL loading dock; may also receive overflow from a sanitary sewer lift station	Extent not defined: lateral extent of TAL metals	Additional sampling for extent
TA-61				
	SWMU 61-007	Transformer site: systematic leak; PCB-only site	Extent not defined: lateral and vertical extent of Aroclor-1260	Additional sampling for extent; soil removal to reduce Aroclor-1260

Note: Shading denotes consolidated unit.

Table 2.1-1
Proposed Sampling at SWMU 00-017

Objective Addressed	Location Number	Location	Starting Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	pH (SW-846:9045C)
Define vertical extent of lead contamination	17-1	Upper slope, south side of canyon	5–6 ft, 7–8 ft	X[a,b]	X
Define vertical extent of lead contamination	00-10143 00-10144 00-10182 00-604250	Existing locations	2–3 ft bgs 3–4 ft bgs 2–3 ft bgs 8–9 ft bgs	X[b]	X

[a] X = Analysis will be performed.
[b] Lead only.

Table 2.2-1
Proposed Sampling at AOC C-00-044

Objective Addressed	Location Number	Location	Starting Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)	pH (SW-846:9045C)
Define nature and extent of contamination (no previously collected samples)	44-1 through 44-22	Footprint of bridge, east and west	0–1 ft bgs 2–3 ft bgs	X*	X	X

* X = Analysis will be performed.

Table 2.3-1
Proposed Sampling at SWMU 01-001(a)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)	pH (SW-846:9045C)
Define lateral/vertical extent of barium, cadmium, cobalt, chromium, copper, nickel, silver, vanadium, bis(2-ethylhexyl)phthalate	00-603748 00-603749 00-603750 00-603751 00-603761	Existing locations	5–6 ft bgs 6–7 ft bgs 8–9 ft bgs 13–14 ft bgs 6–7 ft bgs	X[a,b]	X	X
Define lateral/vertical extent of barium, cadmium, cobalt, chromium, copper, nickel, silver, vanadium, bis(2-ethylhexyl)phthalate	1a-1 1a-2 1a-3 through 1a-8	West East Downgradient	0–1, 2–3 ft, 4–5 ft bgs	X[b]	X	X

[a] X = Analysis will be performed.

[b] Barium, cadmium, cobalt, chromium, copper, nickel, silver, and vanadium only.

Table 2.4-1
Proposed Sampling at SWMUs 01-001(d) and 01-006(h)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	Gamma Spectroscopy (EPA:901.1)	Isotopic Plutonium (HASL-300)	pH (SW-846:9045C)
Define lateral/vertical extent of TAL metals, cesium-137, plutonium-239/240	00-603821 00-603802 00-603800 00-603801 00-603803 00-603807 00-603806 00-603811 00-603812 00-603814 00-603815 00-603816 00-603817 00-603818 00-603819	Existing locations	6–7 ft bgs 6–7 ft bgs 6–7 ft bgs 5–6 ft bgs 4–5 ft bgs 4–5 ft bgs 4–5 ft bgs 4–5 ft bgs 4–5 ft bgs 4–5 ft bgs 4–5 ft bgs 4–5 ft bgs 4–5 ft bgs 4–5 ft bgs 4–5 ft bgs	X[a]	X	X	X
Define lateral extent of TAL metals, cesium-137, plutonium-239/240	6h-1 6h-2 6h-3	West side Downgradient Mid-slope	0–1, 2–3 ft bgs	X[b]	X	X	X
Define remediation extent for plutonium-239/240	To be determined	Step-outs to east, west of 00-603801, 00-603804, and 00-603820	0–1, 4–5 ft bgs	—[c]	—	X	—
Confirm cleanup	To be determined, minimum four locations	To be determined	Floor of excavated areas, two depths per location	X[d]	—	X	—

[a] X = Analysis will be performed.

[b] Lead only.

[c] — = Analysis will not be performed.

[d] Mercury only.

Table 2.5-1
Proposed Sampling at SWMU 01-001(f)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	VOCs (EPA SW-846:8260B)	Isotopic Plutonium (HASL-300)	Isotopic Uranium (HASL-300)	pH (SW-846:9045C)
Define vertical extent of cadmium, copper, chromium, nickel, isotopic plutonium, isotopic uranium	00-603843	Existing locations	3–4 ft bgs	X[a] (chromium, nickel)	—[b]	X	X	X
	00-603839		6–7 ft bgs	X (chromium)	—	—[b]	X	X
	00-603838		4–5 ft bgs	X (chromium, nickel)	—	—	X	X
	00-603837		5–6 ft bgs	X (lead)	—	—	X	X
	00-603836		5–6 ft bgs	X (chromium, copper)	—	—	X	X
	00-603835		4–5 ft bgs	—	—	—	X	X
	00-603825		9–10 ft bgs	X (copper, lead)	—	X	X	X
	00-603824		6–7 ft bgs	X (cadmium, copper)	—	—	—	X
Define lateral extent of methylene chloride	1f-1	Downgradient	0–1 ft bgs 3–4 ft bgs 5–6 ft bgs	—	X[c]	—	—	X

[a] X = Analysis will be performed.

[b] — = Analysis will not be performed.

[c] Methylene chloride only.

Table 2.6-1
Proposed Sampling at SWMU 01-001(g)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	Isotopic Plutonium (HASL-300)	pH (SW-846:9045C)
Define vertical extent of chromium and nickel	00-603845 00-603847 00-603849 00-603848	Existing locations	9–10, 10–11 ft bgs 3–4 ft bgs 6–7 ft bgs 3–4 ft bgs	X[a,b]	—[c]	X
Define lateral extent of plutonium-239/240	1g-1 1g-2	West side downgradient	0–1, 3–4 ft bgs	—	X	X
Define remediation extent for plutonium-239/240	To be determined	Step-outs to east, west of 00-603849, downgradient of 00-603846	0–1, 4–5 ft bgs	—	X	—
Confirm cleanup	To be determined, minimum four locations	To be determined	Floor of excavated areas, two depths per location	—	X	—

[a] X = Analysis will be performed.

[b] Chromium and nickel only.

[c] — = Analysis will not be performed.

Table 2.7-1
Proposed Sampling at SWMU 01-001(o)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	PCBs (EPA SW-846:8082)	SVOCs (EPA SW-846:8270C)	Americium-241 (HASL-300:AM-241)	Gamma Spectroscopy (EPA:901.1)	Isotopic Plutonium (HASL-300)	Strontium-90 (EPA 905.0)	pH (SW-846:9045C)
Define vertical extent chromium, copper lead, mercury, nickel, silver, zinc, lateral and/or vertical extent Aroclor-1254, di-n-butylphthalate, americium-241, plutonium-239/240, cesium-137, strontium-90	00-603856 00-603854 00-603857 00-603853 00-603852 00-603858 00-603850	Existing locations	11–12, 13–14 ft bgs 9–10, 11–12 ft bgs 5–6, 7–8 ft bgs 5–6, 7–8 ft bgs 3–4, 5–6 ft bgs 3–4, 5–6 ft bgs 5–6, 7–8 ft bgs	X[a,b]	X	X	X	X	X	X	X
Define lateral and vertical extent Aroclor-1254, di-n-butylphthalate, americium-241, plutonium-239/240, cesium-137, strontium-90	1o-1 1o-2 1o-3 1o-4	Downgradient Downgradient Downgradient Downgradient	0–1, 3–4, 5–6 ft bgs	—[c]	X	X	X	X	X	X	X
Define extent of cleanup for Aroclor-1254	1o-5 1o-6 1o-7 1o-8	Step-out Step-out Step-out Step-out	0–1, 3–4, 5–6 ft bgs	—	X	—	—	—	—	—	—
Confirm cleanup of Aroclor-1254	To be determined, minimum four locations	To be determined	Floor of excavated areas, two depths per location	—	X	—	—	—	—	—	—

[a] X = Analysis will be performed.

[b] Chromium, copper lead, mercury, nickel, silver, and zinc only.

[c] — = Analysis will not be performed.

Table 2.8-1
Proposed Sampling at SWMU 01-001(s)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	Isotopic Plutonium (HASL-300)	Tritium (EPA 906.0)	pH (SW-846:9045C)
Vertical extent of barium, copper, lead, nickel, plutonium-239/240, and tritium	03-603859 03-603865 03-603860	Existing locations	9–10 ft bgs 7–8 ft bgs 13–14 ft bgs	X[a,b] X X	X —[c] X X	X X X	X X X
Lateral extent of barium, copper, lead, nickel, plutonium-239/240, and tritium	1s-1 1s-2 1s-3 1s-4	Lateral step-out locations	4–5, 9–10 ft bgs 4–5, 9–10 ft bgs 8–9, 13–14 ft bgs 8–9, 13–14 ft bgs	X X X X	X X X X	X X X X	X X X X

[a] X = Analysis will be performed.
[b] Barium, copper, lead, and nickel only.
[c] — = Analysis will not be performed.

Table 2.9-1
Proposed Sampling at SWMU 01-003(a)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	PCBs (EPA SW-846:8082)	Isotopic Plutonium (HASL-300)	pH (SW-846:9045C)
Vertical extent of arsenic, barium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, plutonium-239/240	00-603918 00-603919 00-603903 00-603904 00-603906 00-603908 00-603910 00-603911 00-603912 00-603913 00-603917	Existing locations	4–5, 5–6 ft bgs 6–7–7–8 ft bgs 6–7, 7–8 ft bgs 3–4, 5–6 ft bgs 3–4, 5–6 ft bgs 3–4, 5–6 ft bgs 3–4, 5–6 ft bgs 3–4, 5–6 ft bgs 3–4, 5–6 ft bgs 5–6, 7–8 ft bgs 5–6, 7–8 ft bgs	X[a,b]	—[c]	X	X
Lateral/vertical extent of arsenic, barium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, plutonium-239/240	3a-1 3a-2 3a-3 3a-4	Toe of slope	0–1, 2–3, 5–6 ft bgs	X	—	X	X
Define extent of cleanup for Aroclor-1254	To be determined	Step-out	0–1, 3–4, 5–6 ft bgs	—	X	—	—
Confirm cleanup of Aroclor-1254	To be determined, minimum four locations	To be determined	Floor of excavated areas, two depths per location	—	X	—	—

[a] X = Analysis will be performed.

[b] Arsenic, barium, chromium, copper, iron, lead, manganese, mercury, nickel, and zinc only.

[c] — = Analysis will not be performed.

Table 2.10-1
Proposed Sampling at SWMU 01-003(b)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	Perchlorate (EPA SW-846:6850)	pH (SW-846:9045C)
Vertical extent of TAL metals, perchlorate	00-604023 00-604024	Existing locations	6–7 ft bgs 3–4 ft bgs	X*	X	X

* X = Analysis will be performed.

Table 2.11-1
Proposed Sampling at SWMU 01-003(d)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	pH (SW-846:9045C)
Lateral extent of antimony, barium, lead, selenium, and zinc	3d-1 3d-2 3d-3 3d-4	Downgradient Downgradient Downgradient East	0–1, 2–3, 4–5 ft bgs	X[a,b]	X
Vertical extent of selenium	00-604032	Existing location	4–5, 6–7 ft bgs	X[c]	X

[a] X = Analysis will be performed.

[b] Antimony, barium, lead, selenium, and zinc only.

[c] Selenium only.

Table 2.12-1
Proposed Sampling at SWMU 01-006(a)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	Isotopic Plutonium (HASL-300)	Isotopic Uranium (HASL-300)	pH (SW-846:9045C)
Vertical extent of plutonium-239/240, uranium-235/236	00-604041 00-604044	Existing locations	6–7, 8–9 ft bgs 3–4, 5–6 ft bgs	X[a]	X[b]	X

[a] X = Analysis will be performed.

[b] Uranium-235/236 only. Supplemental analyses of uranium-235/236 by mass spectroscopy or other appropriate method may be added if results warrant further evaluation.

Table 2.13-1
Proposed Sampling at SWMU 01-006(b)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	Americium-241 (HASL-300:AM-241)	Isotopic Plutonium (HASL-300)	pH (SW-846:9045C)
Vertical extent of plutonium-239/240	00-604223 00-604237 00-604225 00-604224 00-604226	Existing locations	17–18, 19–20 ft bgs 4–5, 6–7 ft bgs 4–5, 6–7 ft bgs 4–5, 6–7 ft bgs 7–8, 9–10 ft bgs	—[a] X X — —	X[b] X X X X	X X X X X
Lateral extent of americium-241, plutonium-239/240	6b-1 6b-2 6b-3	West Downgradient East	0–1, 4–5, 6–7 ft bgs	X	X	X
Define cleanup area for plutonium-239/240	To be determined	To be determined	0–1, 4–5, 6–7 ft bgs	—	X	—
Confirm cleanup	To be determined, minimum three locations	To be determined	Floor of excavation, two depths per location	—	X	—

[a] — = Analysis will not be performed.

[b] X = Analysis will be performed.

Table 2.14-1
Proposed Sampling at SWMU 01-006(c)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)	VOCs (EPA SW-846:8260B)	Isotopic Plutonium (HASL-300)	pH (SW-846:9045C)
Define vertical extent of chromium, nickel, plutonium-239/240, PAHs, dibenzofuran, and methylene chloride	00-603783	Existing location	5–6, 7–8 ft bgs	X[a,b]	X	X	X	X

[a] X = Analysis will be performed.

[b] Chromium and nickel only.

Table 2.15-1
Proposed Sampling at SWMU 01-006(e)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	pH (SW-846:9045C)
Vertical extent of barium, chromium, nickel	00-603874 00-603876	Existing locations	9–10 ft bgs	X[a,b]	X

[a] X = Analysis will be performed.
[b] Barium, chromium, and nickel only.

Table 2.17-1
Proposed Sampling at SWMU 01-006(n)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	Isotopic Plutonium (HASL-300)	pH (SW-846:9045C)
Vertical extent of plutonium-239/240	6n-1	Between 00-604227 and 00-604228	10–11, 12–13 ft bgs	X*	X
Lateral extent of plutonium-239/240	6n-2 6n-3	Downgradient Downgradient	0–1, 4–5, 10–11 ft bgs 0–1, 4–5, 10–11 ft bgs	X	X

* X = Analysis will be performed.

Table 2.18-1
Proposed Sampling at SWMU 01-007(a)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)	pH (SW-846:9045C)
Vertical extent of chromium, nickel, bis(2-ethylhexyl)phthalate	00-604240 00-604233 00-604234 00-604235 00-604236	Existing locations	19–20 ft bgs 3–4, 5–6 ft bgs 3–4, 5–6 ft bgs 3–4, 5–6 ft bgs 3–4, 5–6 ft bgs	X[a,b]	X	X
Lateral extent of bis(2-ethylhexyl)phthalate	7a-1	Downgradient	0–1, 3–4, 5–6 ft bgs	—[c]	X[d]	X

[a] X = Analysis will be performed.
[b] Chromium and nickel only.
[c] — = Analysis will not be performed.
[d] Bis(2-ethylhexyl)phthalate only.

Table 2.19-1
Proposed Sampling at SWMU 01-007(b)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	SVOCs (EPA SW-846:8270C)	pH (SW-846:9045C)
Vertical extent of chromium, nickel, selenium, bis(2-ethylhexyl)phthalate	00-603782 00-603796 00-603797 00-603792 00-603798	Existing locations	10–11, 13–14 ft bgs 3–4, 5–6 ft bgs 4–5, 6–7 ft bgs 4–5, 6–7 ft bgs 4–5, 6–7 ft bgs	X[a,b]	X	X
Lateral extent of chromium, nickel, selenium	7b-1 7b-2	Downgradient	0–1, 3–4, 5–6 ft bgs	X[b]	—[c]	X

[a] X = Analysis will be performed.
[b] Chromium, nickel, and selenium only.
[c] — = Analysis will not be performed.

Table 2.20-1
Proposed Sampling at SWMU 01-007(c)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	pH (SW-846:9045C)
Vertical extent of chromium, nickel	00-603895 00-603897 00-603898 00-603900	Existing locations	7–8, 9–10 ft bgs 9–10, 11–12 ft bgs 5–6, 7–8 ft bgs 5–6, 7–8 ft bgs	X[a,b]	X
Lateral extent of chromium, nickel	7c-1 7c-2 7c-3	North Northwest South	1–2, 4–5, 7–8 ft bgs 1–2, 4–5, 7–8 ft bgs 1–2, 4–5, 7–8 ft bgs	X[b]	X

[a] X = Analysis will be performed.
[b] Chromium and nickel only.

Table 2.21-1
Proposed Sampling at SWMUs 03-038(a) and 03-038(b)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	pH (SW-846:9045C)
Vertical extent of barium, chromium, copper, lead, nickel	00-604259 00-604257	Existing locations	8–9, 10–11 ft bgs 7–8, 9–10 ft bgs	X[a,b]	X
Vertical extent of barium, chromium, copper, lead, nickel	38ab-1 38ab-2 38ab-3 38ab-4	Step-out locations	8–9, 10–11 ft bgs 7–8, 9–10 ft bgs 9–10, 11–12 ft bgs 7–8, 9–10 ft bgs	X[b]	X

[a] X = Analysis will be performed.
[b] Barium, chromium, copper, lead, and nickel only.

Table 2.22-1
Proposed Sampling at SWMU 03-055(c)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	pH (SW-846:9045C)
Vertical extent of zinc	00-603250 00-603248 00-603245 00-603243	Existing locations	4–5, 6–7 ft bgs 5–6, 7–8 ft bgs 2–3, 4–5 ft bgs 3–4, 5–6 ft bgs	X[a,b]	X

[a] X = Analysis will be performed.
[b] Zinc only.

Table 2.23-1
Proposed Sampling at SWMU 32-002(a)

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	pH (SW-846:9045C)
Define vertical extent of aluminum, barium, beryllium, chromium, copper, lead, and nickel	00-603582 00-603585 32-06372	Existing locations	9–10 ft, 14–15 ft bgs 6–7 ft, 9–10 ft bgs 6–7 ft, 9–10 ft bgs	X[a,b] X[c] X[d]	X X X

[a] X = Analysis will be performed.
[b] Aluminum, barium, beryllium, copper, lead, and nickel only.
[c] Aluminum, barium, and copper only.
[d] Chromium and nickel only.

Table 2.27-1
Proposed Sampling at AOC C-43-001

Objective Addressed	Location Number	Location	Depth of Sampling Interval	TAL Metals (EPA SW-846:6010B/6020)	pH (SW-846:9045C)
Lateral extent of chromium, copper, lead, zinc	1-1 1-2 1-3	Downgradient	0–1, 2–3 ft bgs	X[a,b]	X

[a] X = Analysis will be performed.

[b] Chromium, copper, lead, and zinc only.

Table 2.28-1
Proposed Sampling at SWMU 61-007

Objective Addressed	Location Number	Location	Depth of Sampling Interval	PCBs (EPA SW-846:8082)	pH (SW-846:9045C)
Vertical extent of Aroclor-1260	00-604291	Existing location	15–16, 19–20 ft bgs	X[a]	X
Lateral extent of Aroclor-1260	7-1 7-2 7-3 7-4 7-5 7-6	South North North South South North	1–2, 10–11, 19–20 ft bgs	X	X
Confirmation of cleanup	To be determined, minimum four locations	Floor of excavation	To be determined; two depths at each location	X	—[b]

[a] X = Analysis will be performed.

[b] — = Analysis will not be performed.

Table 3.0-1
Summary of Investigation Methods

Method	Summary
Spade-and-Scoop Collection of Soil Samples	This method is typically used to collect shallow (e.g., approximately 0–12 in.) soil or sediment samples. The spade-and-scoop method involves digging a hole to the desired depth, as prescribed in the sampling and analysis plan, and collecting a discrete grab sample. The sample is typically placed in a clean stainless-steel bowl for transfer into various sample containers.
Hand-Auger Sampling	This method is typically used for sampling soil or sediment at depths of less than 10–15 ft but may in some cases be used for collecting samples of weathered or nonwelded tuff. The method involves hand-turning a stainless-steel bucket auger (typically 3–4 in. inside diameter), creating a vertical hole that can be advanced to the desired sampling depth. When the desired depth is reached, the auger is decontaminated before the hole is advanced to the sampling depth. The sample material is transferred from the auger bucket to a stainless-steel sampling bowl before the various required sample containers are filled. Carbon-steel auger buckets may be used, particularly in cases where chromium and nickel are the primary constituents of interest and cross-contamination from stainless-steel equipment is a concern.
Handling, Packaging, and Shipping of Samples	Field team members seal and label samples before packing and ensure that the sample containers and the containers used for transport are free of external contamination. Field team members package all samples so as to minimize the possibility of breakage during transportation. After all environmental samples are collected, packaged, and preserved; a field team member transports the samples either to the SMO or to an SMO-approved radiation screening laboratory under chain of custody. The SMO arranges to ship samples to the analytical laboratories. The field team member must inform the SMO and/or the radiation screening laboratory coordinator when levels of radioactivity are in the action-level or limited-quantity ranges.
Sample Control and Field Documentation	The collection, screening, and transport of samples are documented on standard forms generated by the SMO. These forms include sample collection logs, chain-of-custody forms, and sample container labels. Collection logs are completed at the time of sample collection and are signed by the sampler and a reviewer who verifies the logs for completeness and accuracy. Corresponding labels are initialed and applied to each sample container, and custody seals are placed around container lids or openings. Chain-of-custody forms are completed and assigned to verify that the samples are not left unattended. Site attributes (e.g., former and proposed soil sampling locations, sediment sampling locations) are located by using a GPS. Horizontal locations will be measured to the nearest 0.5 ft. The survey results for this field event will be presented as part of the investigation report. Sample coordinates will be uploaded into the Sample Management Database.
Field Quality-Control Samples	Field quality-control samples are collected 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 blanks are containers of certified clean sand that are opened and kept with the other sample containers during the sampling process.

Table 3.0-1 (continued)

Method	Summary
Field Decontamination of Drilling and Sampling Equipment	Dry decontamination is the preferred method to minimize generating liquid waste. Dry decontamination may include using a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by using a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes. Dry decontamination may be followed by wet decontamination if necessary. Wet decontamination may include washing with a nonphosphate detergent and water, followed by a water rinse and a second rinse with deionized water. Alternatively, steam-cleaning may be used.
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on EPA guidance for environmental sampling, preservation, and QA. Specific requirements for each sample are printed on the sample collection logs provided by the SMO (size and type of container [glass, amber glass, polyethylene, preservative, etc.]). All samples are preserved by placing them in insulated containers with ice to maintain a temperature of 4˚C. Other requirements such as nitric acid or other preservatives may apply to different media or analytical requests.
Management, Characterization, and Storage of IDW	IDW is 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 complies with on-site or off-site waste acceptance criteria. All stored IDW will be marked with appropriate signage and labels, as appropriate. Drummed IDW will be stored on pallets to prevent the containers from deterioration. Generators are required to reduce the volume of waste generated as much as technically and economically feasible. Means to store, control, and transport each potential waste type and classification shall be determined before field operations that generate waste begin. A waste storage area will be established before waste is generated. Waste storage areas located in controlled areas of the Laboratory will be controlled as needed to prevent inadvertent addition or management of wastes by unauthorized personnel. Each container of waste generated will be individually labeled as to waste classification, item identification number, and radioactivity (if applicable), immediately following containerization. All waste shall be segregated by classification and compatibility to prevent cross-contamination. See Appendix B for additional information.
Geodetic Surveys	This method describes the methodology for coordinating and evaluating geodetic surveys and establishing QA and QC for geodetic survey data. The procedure covers evaluating geodetic survey requirements, preparing to perform a geodetic survey, performing geodetic survey field activities, preparing geodetic survey data for QA review, performing QA review of geodetic survey data, and submitting geodetic survey data.
Hollow-Stem Auger Drilling Methods	In this method, hollow-stem augers (sections of seamless pipe with auger flights welded to the pipe) act as a screw conveyor to bring cuttings of sediment, soil, and/or rock to the surface. Auger sections are typically 5 ft in length and have outside diameters of 4.25 to 14 in. Drill rods, split-spoon core barrels, Shelby tubes, and other samplers can pass through the center of the hollow-stem auger sections for collection of discrete samples from desired depths. Hollow-stem augers are used as temporary casings when setting wells to prevent cave-ins of the borehole walls.

Table 3.7-1
Summary of Analytical Methods

Analyte	Analytical Method
TAL metals	SW-846:6010B; SW-846:6020
Perchlorate	SW-846:6850
PCBs	SW-846:8082
SVOCs	SW-846:8270C
VOCs	SW-846:8260B
Americium-241	HASL-300:AM-241
Gamma-emitting radionuclides	EPA:901.1
Isotopic plutonium	HASL-300:ISOPU
Isotopic uranium	HASL-300:ISOU
Strontium-90	EPA 90.5.0
Tritium	Liquid Scintillation
pH	SW-846:9045C

Appendix A

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

A-1.0 ACRONYMS AND ABBREVIATIONS

ACA	accelerated corrective action
amsl	above mean sea level
AOC	area of concern
bgs	below ground surface
Consent Order	Compliance Order on Consent
cpm	counts per minute
D&D	decontamination and decommissioning
DOE	Department of Energy (U.S.)
EPA	Environmental Protection Agency (U.S.)
GPS	global-positioning system
HRL	Health Research Laboratory
IDW	investigation-derived waste
LANL	Los Alamos National Laboratory
MDA	material disposal area
NMED	New Mexico Environment Department
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
QA	quality assurance
QC	quality control
RFI	Resource Conservation and Recovery Act facility investigation
RPF	Records Processing Facility
SAL	screening action level
SMO	Sample Management Office
SOP	standard operating procedure
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
TAL	target analyte list (EPA)
ULR	unassigned land release
UST	underground storage tank

VOC	volatile organic compound
WCSF	waste characterization strategy form
WSWL	Western Sanitary Waste Line

A-2.0 METRIC CONVERSION TABLE

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

A-3.0 DATA QUALIFIER DEFINITIONS

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

Appendix B

Management Plan for Investigation-Derived Waste

B-1.0 INTRODUCTION

This appendix describes how investigation-derived waste (IDW) generated during the Upper Los Alamos Canyon Aggregate Area Phase II investigation at Los Alamos National Laboratory (the Laboratory) will be managed. IDW may include, but is not limited to, drill cuttings, excavated media, excavated manmade debris, contact waste, decontamination fluids, and all other waste that has potentially come into contact with contaminants.

B-2.0 IDW

If required based on the estimated amount of material and size of excavation, requests for area of contamination designations will be submitted for approval to New Mexico Environment Department (NMED) for remediation sites in which excavation is planned.

All IDW generated during investigation activities will be managed in accordance with applicable standard operating procedures (SOPs). These SOPs incorporate the requirements of all applicable U.S. Environmental Protection Agency and NMED regulations, U.S. Department of Energy orders, and Laboratory requirements. The SOP applicable to the characterization and management of IDW is SOP-5238, Characterization and Management of Environmental Program Waste, (http://www.lanl.gov/environment/all/qa.shtml).

The most recent version of the Laboratory's Hazardous Waste Minimization Report will be implemented during the investigation to minimize waste generation. The report is updated annually as a requirement of Module VIII of the Laboratory's Hazardous Waste Facility Permit.

A waste characterization strategy form (WCSF) will be prepared and approved per requirements of SOP-5238, Characterization and Management of Environmental Program Waste. The WCSF will provide detailed information on IDW characterization methods, management, containerization, and potential volumes. IDW characterization is completed through review of sampling data and/or documentation or by direct sampling of the IDW or the media being investigated (e.g., surface soil, subsurface soil). Waste characterization may include a review of historical information and process knowledge to identify whether listed hazardous waste may be present (i.e., due diligence reviews). If low levels of listed hazardous waste are identified, a "contained in" determination may be submitted for approval to NMED.

Wastes will be containerized and placed in clearly marked, appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements will be based on the type of IDW and its classification. Container and storage requirements, as well as transportation and disposal requirements, will be detailed in the WCSF and approved before waste is generated. Table B-2.0-1 summarizes the estimated IDW waste streams, waste types, waste volumes, and other data.

The waste streams that are anticipated to be generated during implementation of the work plan are described below.

B-2.1 Drill Cuttings

This waste stream consists of soil and rock chips generated by the drilling of boreholes to collect samples. Drill cuttings include excess core sample not submitted for analysis and any returned samples sent for analysis. Drill cuttings will be stored in accordance with the approved WCSF.

This waste stream will be characterized based either on direct sampling of the waste in each container or on the results from core samples collected during drilling. The WCSF will specify the sampling suites for direct sampling of the waste stream. Constituents may be analyzed as necessary to meet the waste acceptance criteria for a receiving facility or if visual observations indicate additional contaminants may be present.

Cuttings will be land applied if they meet the criteria in the NMED-approved Notice of Intent Decision Tree for Land Application of Investigation Derived Waste Solids from Construction of Wells and Boreholes. The Laboratory expects that cuttings will be land-applied or disposed of in accordance with the approved WCSF at a permitted off-site facility for which waste meets acceptance criteria or Technical Area 54 (TA-54), Area G. Table B-2.0-1 presents the estimated volumes, characterization and management methods, and expected disposition of this waste stream.

B-2.2 Excavated Environmental Media

Excavated environmental media will consist of soil and rock removed to meet the proposed cleanup levels where cleanup is recommended. During the excavation process, the excavated material will be field screened and examined for visible evidence of contamination. The excavated material will remain within the boundary of the site from which it was excavated and will be placed in appropriate containers in accordance with the approved WCSF.

A minimum of one direct sample will be collected from each 50 yd^3 or each container of material excavated and submitted for laboratory analyses for the analytical suites specified in the WCSF. The Laboratory expects most of the excavated environmental media to be designated as nonhazardous, hazardous, or low-level radioactive waste that will be disposed of in accordance with the approved WCSF. Table B-2.0-1 presents the estimated volumes, characterization and management methods, and expected disposition of this waste stream.

B-2.3 Contact Waste

The contact waste stream consists of potentially contaminated materials that contacted waste during sampling and excavation. This waste stream consists primarily of, but is not limited to, personal protective equipment such as gloves; decontamination wastes such as paper wipes; and disposable sampling supplies. Contact waste will be stored in containers and characterized in accordance with the approved WCSF.

Characterization of this waste stream will use acceptable knowledge based on data from the media with which it came into contact (e.g., drill cuttings, soil, sumps, etc.). The Laboratory expects most of the contact waste to be designated as nonhazardous, nonradioactive waste that will be disposed of in accordance with the approved WCSF. Table B-2.0-1 presents the estimated volumes, characterization and management methods, and expected disposition of this waste stream.

B-2.6 Decontamination Fluids

Decontamination fluids consist of liquid wastes generated from decontamination of excavation, sampling, and drilling equipment. For waste minimization, dry decontamination methods will be used to avoid the generating liquid waste and to minimize the IDW. The dry decontamination method uses disposable paper towels and over-the-counter cleaner such as Fantastik or equivalent. All sampling and measuring equipment, including but not limited to stainless-steel sampling tools and split-barrel or core samplers, will

be decontaminated in accordance with SOP-01.08, Field Decontamination of Drilling and Sampling Equipment.

Dry decontamination may be followed by wet decontamination, if necessary. Wet decontamination may include washing with a nonphosphate detergent and water, followed by a water rinse and a second rinse with deionized water. Alternatively, steam-cleaning may be used. The decontamination fluids will be characterized by direct sampling of the containerized waste for the suites specified in approve WCSF. The Laboratory expects most of these wastes to be nonhazardous liquid waste that will be sent to one of the Laboratory's wastewater treatment facilities in accordance with the approved WCSF. Table B-2.0-1 presents the estimated volumes, characterization and management methods, and expected disposition of this waste stream.

Table B-2.0-1
Summary of Estimated IDW Generation and Management

Waste Stream	Expected Waste Type	Estimated Volume	Characterization Method	On-Site Management	Expected Disposition
Drill Cuttings	Industrial waste, nonhazardous, nonradioactive	20 yd^3	Analytical results from direct sampling of waste or core samples	Accumulation in 55-gal. drums, covered rolloff containers, or other appropriate containers	Land application, or permitted off-site facility for which waste meets acceptance criteria or TA-54, Area G
Excavated Environmental Media	Industrial waste, nonhazardous, hazardous, low-level radioactive, nonradioactive	30 yd^3	Field-screening and analytical results from direct sampling of waste	On ground within site boundary or accumulation in 55-gal. drums, covered rolloff containers, or other appropriate containers	Permitted off-site facility for which waste meets acceptance criteria or TA-54, Area G
Contact Waste	Industrial waste, nonhazardous, nonradioactive	0.5 yd^3	Acceptable knowledge	Accumulation in 55-gal. drums	Permitted off-site facility for which waste meets acceptance criteria or TA-54, Area G
Decontamination Fluids	Industrial waste, nonhazardous, nonradioactive	10 gal.	Acceptable knowledge; analytical results from direct sampling of waste	Accumulation in 30-gal. plastic drums	Treatment at an on-site facility for which waste meets acceptance criteria

Plate 1 Upper Los Alamos Canyon Aggregate Area SWMUs and AOCs

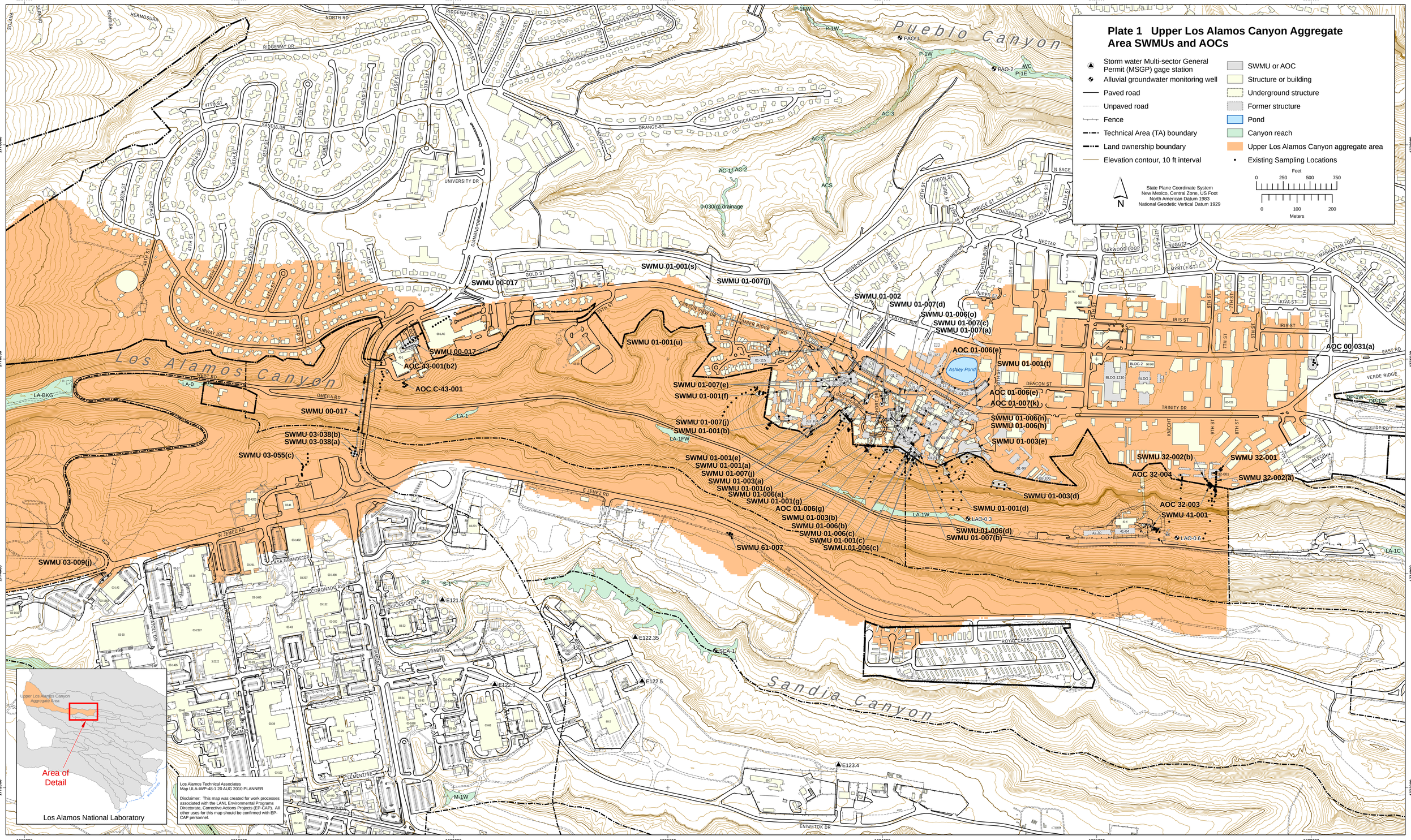
- Storm water Multi-sector General Permit (MSGP) gage station
- Alluvial groundwater monitoring well
- Paved road
- Unpaved road
- Fence
- Technical Area (TA) boundary
- Land ownership boundary
- Elevation contour, 10 ft interval
- SWMU or AOC
- Structure or building
- Underground structure
- Former structure
- Pond
- Canyon reach
- Upper Los Alamos Canyon aggregate area
- Existing Sampling Locations

N

State Plane Coordinate System
New Mexico, Central Zone, US Foot
North American Datum 1983
National Geodetic Vertical Datum 1929

Feet: 0 250 500 750

Meters: 0 100 200



Los Alamos Technical Associates
Map ULA-IWP-48-1 20 AUG 2010 PLANNER

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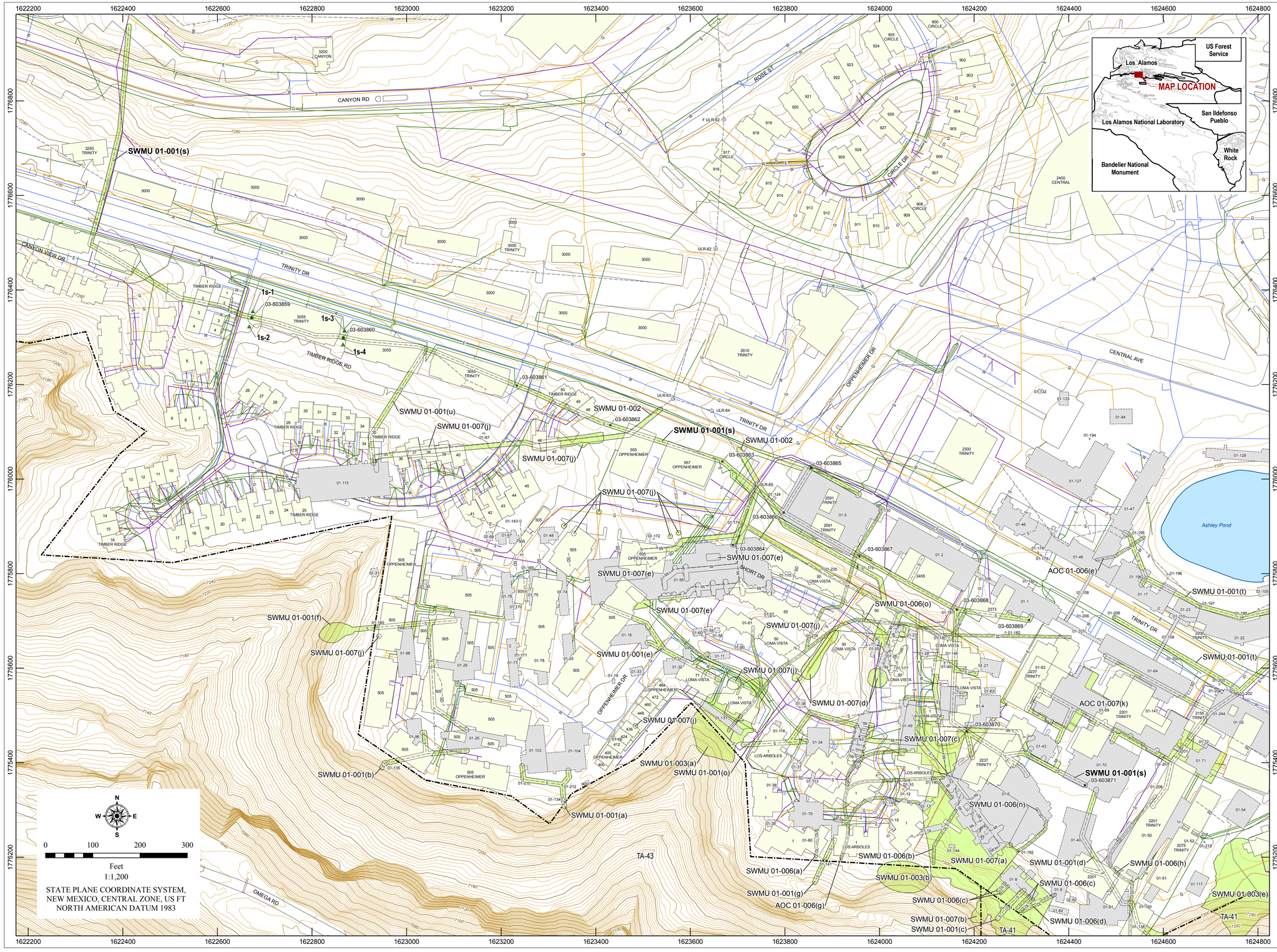

- Proposed Sampling Locations
- Existing Sampling Locations
- SWMU or AOC

- Structure or building
- Former structure
- Former drain line
- Former industrial waste
- Former sewer
- Former storm drain
- Pond

- Technical Area (TA) boundary
- Paved road

Elevation contours
- 100- and 20-ft contour
- 10-ft contour
- 2-ft contour

Utilities
- Communication
- Electric
- Gas
- Sewer
- Water

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Plate 2

Existing and proposed locations of surface and subsurface samples at SWMU 01-001(s)

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ENVIRONMENTAL PROGRAMS DIRECTORATE
CORRECTIVE ACTIONS PROJECTS
Los Alamos, New Mexico 87545

Map ULA-IWP-PLT-2-PSL 20 AUG 2010 CRUZ
Los Alamos Technical Associates (LATA-LAO)

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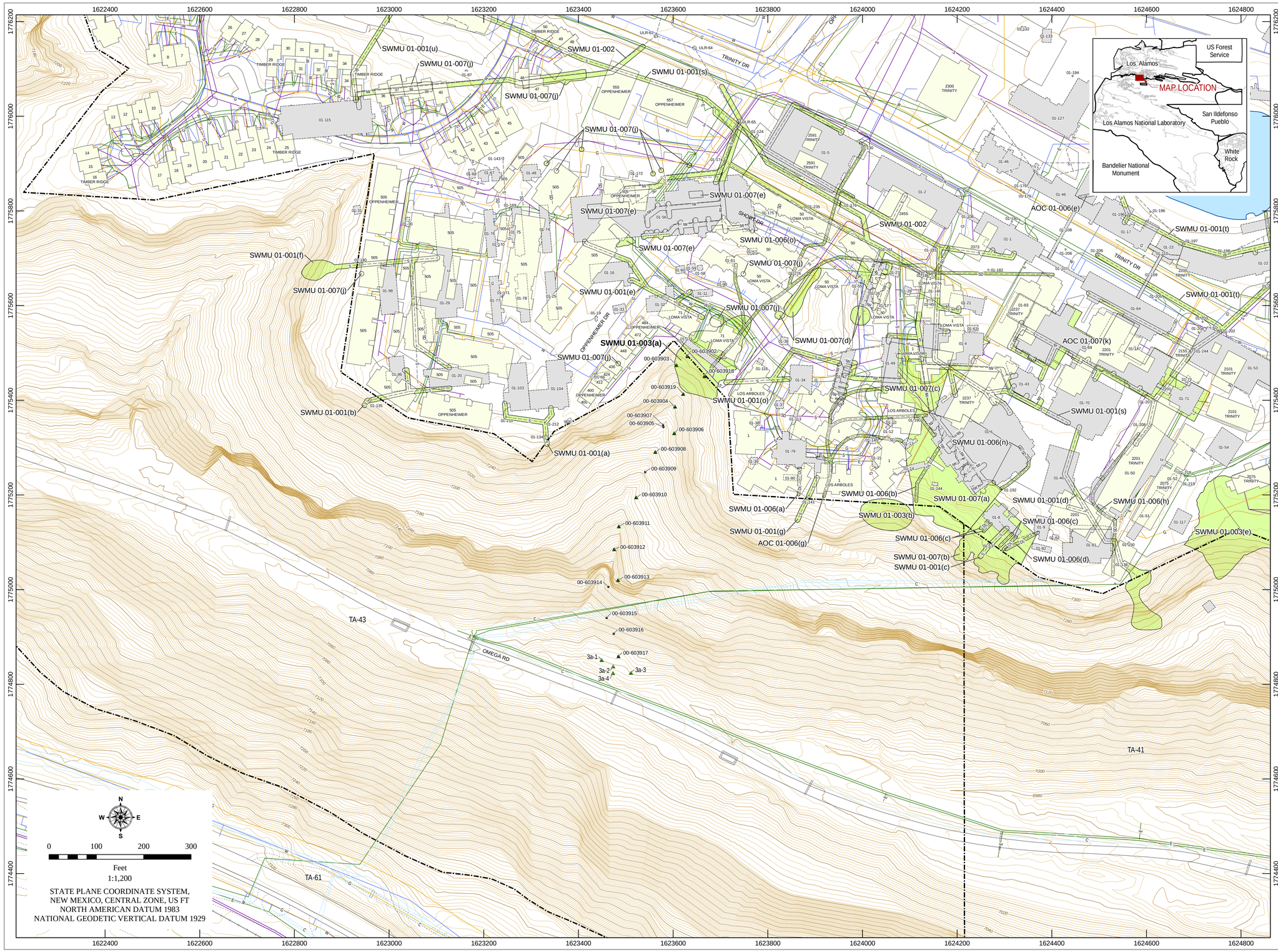

- Proposed Sampling Locations
- Existing Sampling Locations
- SWMU or AOC
- Structure or building
- Former structure
- Former drain line
- Former industrial waste
- Former sewer
- Former storm drain
- Pond
- Technical Area (TA) boundary
- Paved road

Elevation contours
- 100- and 20-ft contour
- 10-ft contour
- 2-ft contour

Utilities
- Communication
- Electric
- Gas
- Sewer
- Water

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Plate 3

Existing and proposed locations of surface and subsurface samples at SWMU 01-003(a)

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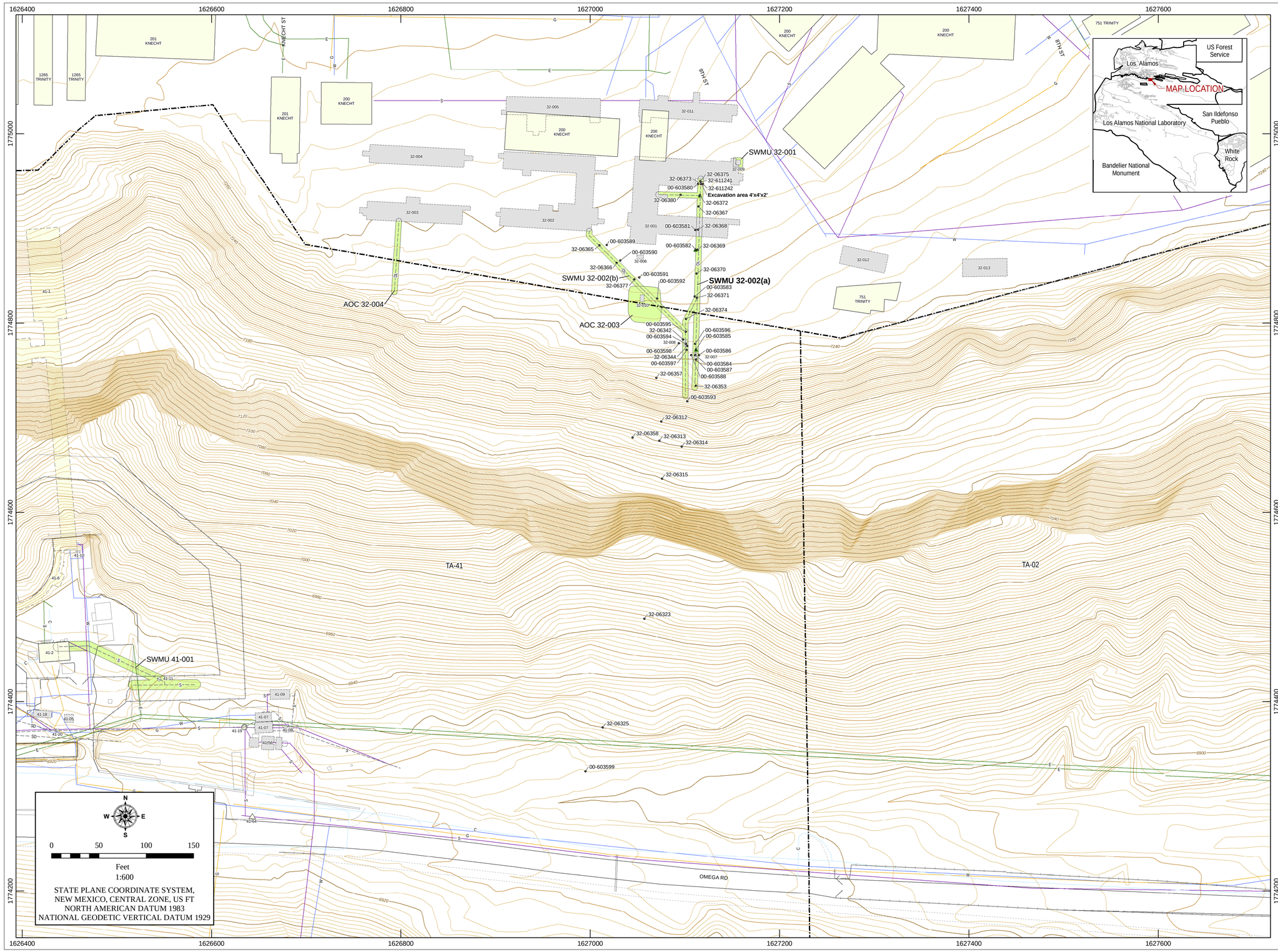

Proposed sampling locations
Existing sampling locations
SWMU or AOC

Structure or building
Underground structure
Former structure
Former drain line
Former sewer
Former storm drain

Technical Area (TA) boundary
Fence
Paved road
Dirt road
Storm drain
Excavation area

Elevation contours
100- and 20-ft contour
10-ft contour
2-ft contour

Utilities
Communication
Electric
Gas
Sewer
Water

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Plate 4

Existing and proposed sampling locations at SWMU 32-002(a)

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Map ULA-IWP-41-1 SITE & PSL PLT 4 29 SEPT 2010 CRUZ
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