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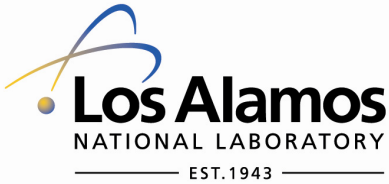
Historical Investigation Report for Technical Area 57 Aggregate Area (Fenton Hill)



Prepared by the Environmental Programs Directorate

EP2012-0094

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April 2012

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EXECUTIVE SUMMARY

The Technical Area 57 (TA-57) Aggregate Area includes TA-57, located on U.S. Forest Service property west of Los Alamos National Laboratory, and consists of 10 areas of concern (AOCs). Of these sites, three were previously approved for no further action (NFA) by the U.S. Environmental Protection Agency. Five other sites were used to manage geothermal exploration wastes not subject to regulation under the Resource Conservation and Recovery Act (RCRA). These sites were approved for NFA by the New Mexico Oil Conservation Division. These eight sites are not discussed in this historical investigation report. The remaining two sites were used to manage RCRA-regulated waste and require further investigation. The two sites consist of a waste storage drum and a leach field.

This report provides site descriptions, summarizes previous investigations, and presents analytical results of investigations for these two sites. The background information and supporting data form the basis for the proposed sampling design necessary to complete the site investigations, as presented in the TA-57 Aggregate Area investigation work plan.

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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 Laboratory is participating in a national effort by DOE to clean up contaminated sites and facilities. The goal of the Laboratory's efforts is to ensure past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, the Laboratory is currently investigating sites potentially contaminated by past Laboratory operations. These sites are designated as either solid waste management units or areas of concern (AOCs).

The Technical Area 57 (TA-57) Aggregate Area is located at Fenton Hill, which lies on the western side of the Jemez Mountains at an elevation of approximately 8700 ft amsl (Figure 1.0-1). TA-57 is located on property owned by the U.S. Forest Service and used by DOE under an Interagency Agreement with the Forest Service. Laboratory operations have been conducted in the aggregate area since 1974.

This historical investigation report (HIR) describes operational histories, previous investigations, and analytical data for AOCs that 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 435.1, "Radioactive Waste Management," and DOE Order 458.1, Administrative Change 2, "Radiation Protection of the Public and the Environment." 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 a Compliance Order on Consent (the Consent Order). The TA-57 site, which is located in Sandoval County, is not part of the Laboratory facility, as defined in Sections II.A.2 and III.B of the Consent Order; therefore, releases from the TA-57 sites are not subject to the Consent Order. However, the Laboratory is voluntarily implementing the Consent Order corrective action process for those sites at TA-57 that managed Resource Conservation and Recovery Act– (RCRA-) regulated waste and that have not previously been approved for no further action (NFA) under other regulatory programs.

1.1 HIR Overview

The TA-57 Aggregate Area includes 10 AOCs, 8 of which have previously been approved for NFA. Three sites were approved for NFA by the U.S. Environmental Protection Agency. Five sites were used to manage geothermal exploration wastes not subject to regulation as hazardous wastes under RCRA (40 Code of Federal Regulations [CFR] 261.4[b][5]). These sites were approved for NFA by the New Mexico Oil Conservation Division (NMOCD). The remaining two sites managed RCRA-regulated wastes and require additional characterization. Table 1.1-1 provides a summary of the 10 sites within the TA-57. For the eight sites approved for NFA, brief descriptions and the references for the approval documents are provided in Table 1.1-1. Section 2 of this HIR provides descriptions of the two sites requiring additional investigation, summarizes previous investigations, and presents analytical results. Section 3 provides references cited in the HIR and the map data sources.

1.2 Data Overview

Data evaluated in this HIR include historical data collected in 1994 as part of a RCRA facility investigation (RFI) and a voluntary corrective action (VCA).

All data records include a vintage code field denoting how and where samples were submitted for analyses. In the early years, the samples were submitted to the Laboratory's Chemical Science and Technology (CST) Division and either were analyzed at a CST laboratory (on-site) or submitted to one of several off-site contract analytical laboratories. Samples analyzed at a CST laboratory are identified by the vintage code "CST Onsite." Two vintage codes identify samples CST Division submitted to off-site contract analytical laboratories—"CST Offsite" if validation was not performed and "CSTROUT03" if validation was performed.

From late 1995 to the present, samples have been submitted through the Sample Management Office (SMO) to off-site contract analytical laboratories. Two vintage codes identify samples the SMO submitted to off-site contract analytical laboratories—"AN95" if validation was not performed and "SMO" if validation was performed.

All of the data collected during the 1994 RFI and VCA are screening-level data. These data are summarized in this HIR. Screening-level data are used to identify potential contamination and to guide sample collection and analyses proposed in the TA-57 Aggregate Area investigation work plan (LANL 2012, 214550) but will not be used in defining the nature and extent of contamination or in risk-screening evaluations.

2.0 SITES UNDER INVESTIGATION

TA-57 was established at the Fenton Hill site in 1974 to support the Laboratory's Hot Dry Rock (HDR) program. HDR was an experimental geothermal energy development program designed to test the feasibility of extracting heat from deep geologic units near the Valles Caldera. The first site investigated was in Barley Canyon north of the current TA-57 site. After one test well had been drilled, this location was abandoned because of poor winter access and topographic limitations. Operations were moved to the current TA-57 site, which offered a large flat area with easier access. Operations at the TA-57 site began in 1974.

The HDR energy recovery concept was based on drilling two deep (i.e., 10,000 to 15,000 ft) boreholes into the low-permeability, hot crystalline rock beneath the site. Hydraulic fracturing was then used to create a permeable fractured zone between the two boreholes. During operation, pressurized water was injected into one well and extracted from the other after it flowed through the fractured zone and became heated. Heat exchangers on the surface were used to extract heat from the water, which was then circulated through settling ponds for further cooling before it was reinjected.

The first geothermal well drilled at TA-57 was well GT-2, which was started in 1974 and completed in 1975. After hydraulic fracturing of well GT-2 was completed, drilling began on well EE-1, which was to be the extraction well used with GT-2. Well EE-1 was completed in 1976 but did not initially intersect the fractured zone from well GT-2. Additional drilling and fracturing were performed, and testing of the two-well system began in 1978. Work on a larger Phase II system began in 1979 with the drilling of well EE-2, the injection well for the Phase II system. Well EE-2 was completed in 1980, and drilling began on extraction well EE-3, which was completed in 1981. Various fracturing and redrilling activities occurred until good hydraulic connection between the two wells was made in 1985. Testing of the system continued until 1992, when operations were substantially reduced because of funding limitations.

When the extraction wells were drilled, drilling muds were discharged to mud pits and settling ponds near the drill sites. Drilling fluids, produced waters, and other wastes associated with exploration, development, or production of geothermal energy are specifically excluded from management as hazardous wastes under RCRA (40 CFR 261.4[b][5]), and these waste management sites were regulated by NMOCD and were closed in accordance with NMOCD requirements.

After the HDR project ended, the 5-million-gal. covered pond originally constructed for the HDR program was converted to a gamma-ray observatory for a project known as Milagro. To construct the observatory, liquid was removed from the pond, the interior of the pond was cleaned, over 700 photomultiplier tubes were placed in the pond, and the pond was refilled with treated water. This water was obtained from an on-site supply well and off-site sources and treated with ion-exchange, granular activated carbon, and ultraviolet light. The Milagro observatory began operating in 1996, and it was decommissioned in June 2008.

TA-57 is currently used to operate a fully automated observatory in support of the Thinking Telescopes project in the Laboratory's International, Space, and Response Division. This project combines automated telescope observation, feature extraction from image data, change and anomaly detection, and automated response. An automated measurement program continuously scans the sky to detect optical transients. Transients may be a gamma-ray burst that is of interest to the open science community or a manmade object of interest for space situational awareness.

2.1 AOC 57-006, Former Waste Storage Drum

2.1.1 Description and History

AOC 57-006 is the former location of a plastic-lined 55-gal. drum that was buried in the ground beneath a trailer that served as an analytical chemistry laboratory at TA-57 (structure 57-23) (Figure 2.1-1). The collection drum consisted of a polyethylene drum liner located within an open 55-gal. metal drum placed within a buried 85-gal. metal overpack drum. The chemistry trailer was used from about 1976 to 1989 to provide real-time analytical services for the geothermal project. A sink in the trailer was used to dispose of wastewater associated with chemical analyses. The sink drained to a leach field (AOC 57-007) near the trailer. Chemicals that could not be discharged to the leach field because of their toxicity were poured into a special drain connected to the polyethylene drum. When the drum was full, its contents were transported to the Laboratory for disposal. In 1994, the drum was removed as part of a VCA. The former chemistry trailer was removed from the site in March 1994.

The site of the former waste drum is currently vegetated with grasses. The ground surface where the trailer was located is level, and then slopes to the southeast toward a drainage swale.

2.1.2 Previous Investigations

A VCA was conducted in 1994 to remove the waste collection drum (LANL 1995, 054336). The contents of the drum had been removed previously in January 1994. Sampling of the contents indicated elevated levels of lead and mercury as well as various organic solvents, and the waste was classified as hazardous waste (LANL 1995, 054336). During the VCA, the polyethylene drum and the outer two metal drums were removed. No evidence of leakage was observed during the removal. After the 85-gal. overpack drum was removed, a sample was collected from the bottom of the excavation at a depth of 0.0 to 0.5 ft below the bottom of the excavation (3.0 to 3.5 ft below ground surface [bgs]) and submitted for laboratory analysis of target analyte list (TAL) metals, total cyanide, uranium, and volatile organic

compounds (VOCs). The results of the sampling were reported as part of the Phase I RFI report (LANL 1996, 053801).

2.1.3 Analytical Results

No decision-level data are available for AOC 57-006. Data from the 1994 VCA are screening level and are not presented in this report but are summarized below.

Lead and mercury were detected above current background values (BVs) for soil (LANL 1998, 059730) in the sample collected below the collection drum. Antimony and cadmium were not detected in this sample but had detection limits (DLs) above current BVs for soil (LANL 1998, 059730). No inorganic chemicals were detected above the current soil screening levels (SSLs) (NMED 2012, 210142). No organic chemicals were detected.

2.2 AOC 57-007, Leach Field

2.2.1 Description and History

AOC 57-007 is a leach field that served a trailer used as an analytical chemistry laboratory at TA-57 (structure 57-23) (Figure 2.1-1). The chemistry trailer was used from about 1976 to 1989 to provide real-time analytical services for the geothermal project. A sink in the trailer drained to the leach field and was used to dispose of wastewater associated with chemical analyses. Chemicals that could not be discharged to the leach field because of their toxicity were poured into a special drain connected to polyethylene drum (AOC 57-006). The former chemistry trailer was removed from the site in March 1994.

The RFI Work Plan for Operable Unit 1154 (LANL 1994, 034757) described the leach field as located approximately 20 ft southeast of the trailer 8 to 10 ft bgs. During the 1994 Phase I RFI at this site, the leach field was discovered to be northeast of the trailer and at a depth of 1 to 2 ft bgs.

The site of the former leach field is currently vegetated with grasses, shrubs, and small trees. The ground surface slopes to the southeast toward a drainage swale.

2.2.2 Previous Investigations

The Laboratory conducted a Phase I RFI at AOC 57-007 in 1994 (LANL 1996, 053801). The drainline from the trailer to the leach field was found to be in place and was uncovered to locate the leach field. One sample was collected from the location where the drainline discharged to the leach field. The sample was collected from a depth 0.0 ft to 1.0 ft below the bottom of the drainline and was submitted for laboratory analysis of TAL metals, total cyanide, uranium, and semivolatile organic compounds.

2.2.3 Analytical Results

No decision-level data are available for AOC 57-007. Data from the 1994 VCA are screening level and are not presented in this report but are summarized below.

Mercury, uranium, and zinc were detected above current BVs for soil (LANL 1998, 059730) in the sample collected below the drainline. Antimony and cadmium were not detected in this sample but had DLs above current BVs for soil (LANL 1998, 059730). No inorganic chemicals were detected above the current SSLs (NMED 2009, 108070). No organic chemicals were detected.

3.0 REFERENCES AND MAP DATA SOURCES

3.1 References

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

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

EPA (U.S. Environmental Protection Agency), January 21, 2005. "EPA's Prior Decisions on SWMU/AOC Sites at Los Alamos National Laboratory (LANL)," U.S. Environmental Protection Agency letter to J. Bearzi (NMED-HRMB) from L.F. King (EPA Federal Facilities Section Chief), Dallas, Texas. (EPA 2005, 088464)

LANL (Los Alamos National Laboratory), May 1994. "RFI Work Plan for Operable Unit 1154," Los Alamos National Laboratory document LA-UR-94-1096, Los Alamos, New Mexico. (LANL 1994, 034757)

LANL (Los Alamos National Laboratory), September 1995. "Voluntary Corrective Action Completion Report for Potential Release Site 57-006, A Buried Chemical Waste Vessel, Revision 1," Los Alamos National Laboratory document LA-UR-96-465, Los Alamos, New Mexico. (LANL 1995, 054336)

LANL (Los Alamos National Laboratory), April 1996. "RFI Report for Potential Release Sites at TA-57, 57-001(b), 57-001(c), 57-002, 57-004(a), 57-006, 57-007 (located in former Operable Unit 1154)," Los Alamos National Laboratory document LA-UR-96-1062, Los Alamos, New Mexico. (LANL 1996, 053801)

LANL (Los Alamos National Laboratory), September 22, 1998. "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-98-4847, Los Alamos, New Mexico. (LANL 1998, 059730)

LANL (Los Alamos National Laboratory), April 2012. "Investigation Work Plan for Technical Area 57 Aggregate Area (Fenton Hill)," Los Alamos National Laboratory document LA-UR-12-20545, Los Alamos, New Mexico. (LANL 2012, 214550)

NMED (New Mexico Environment Department), December 2009. "Technical Background Document for Development of Soil Screening Levels, Revision 5.0," with revised Table A-1, New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2009, 108070)

NMED (New Mexico Environment Department), February 2012. "Risk Assessment Guidance for Site Investigations and Remediation," Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2012, 210142)

NMOCD (New Mexico Oil Conservation Division), August 29, 2003. "Termination of Discharge Plan Gw-031, Fenton Hill Geothermal Facility," New Mexico Oil Conservation Division letter to B. Beers (LANL) from W. Price (NMOCD), Santa Fe, New Mexico. (NMOCD 2003, 101265)

3.2 Map Data Sources

Data sources used in original figures created for this report are described below and identified by legend title.

Legend Item	Data Source
LANL technical areas	Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 04 December 2008.
Unpaved roads	Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
LANL structures	Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
LANL electric lines	Primary Electric Grid; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
LANL sewer lines	Sewer Line System; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.
LANL AOC boundaries	Areas of Concern; Los Alamos National Laboratory, Waste and Environmental Services Division, Environmental Data and Analysis Group, EP2009-0137; 1:2,500 Scale Data; 25 January 2010.
Contours	Hypsography, 2, 10, 20, and 100 Foot Contour Interval; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.

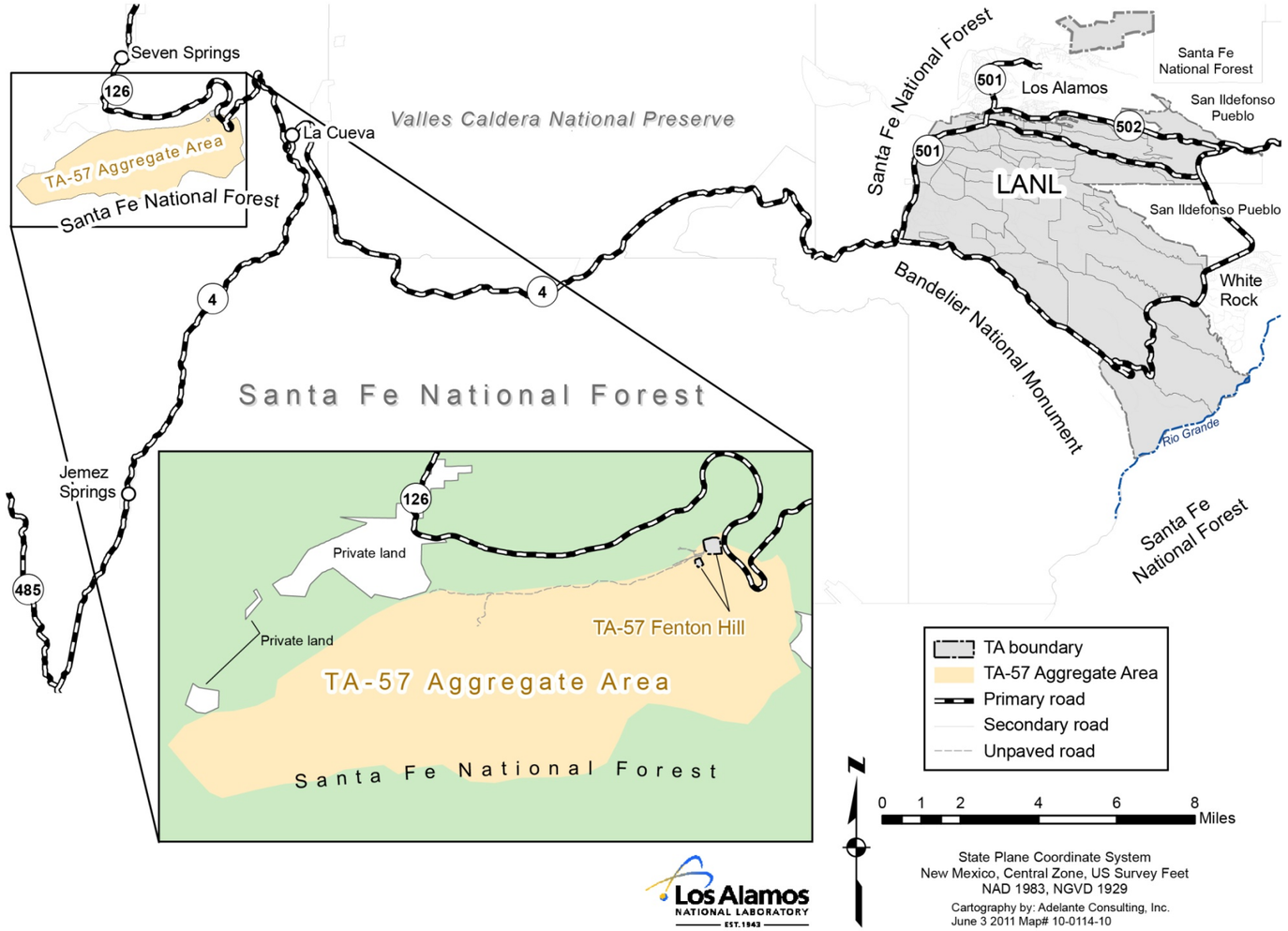

Figure 1.0-1 Location of TA-57 Aggregate Area

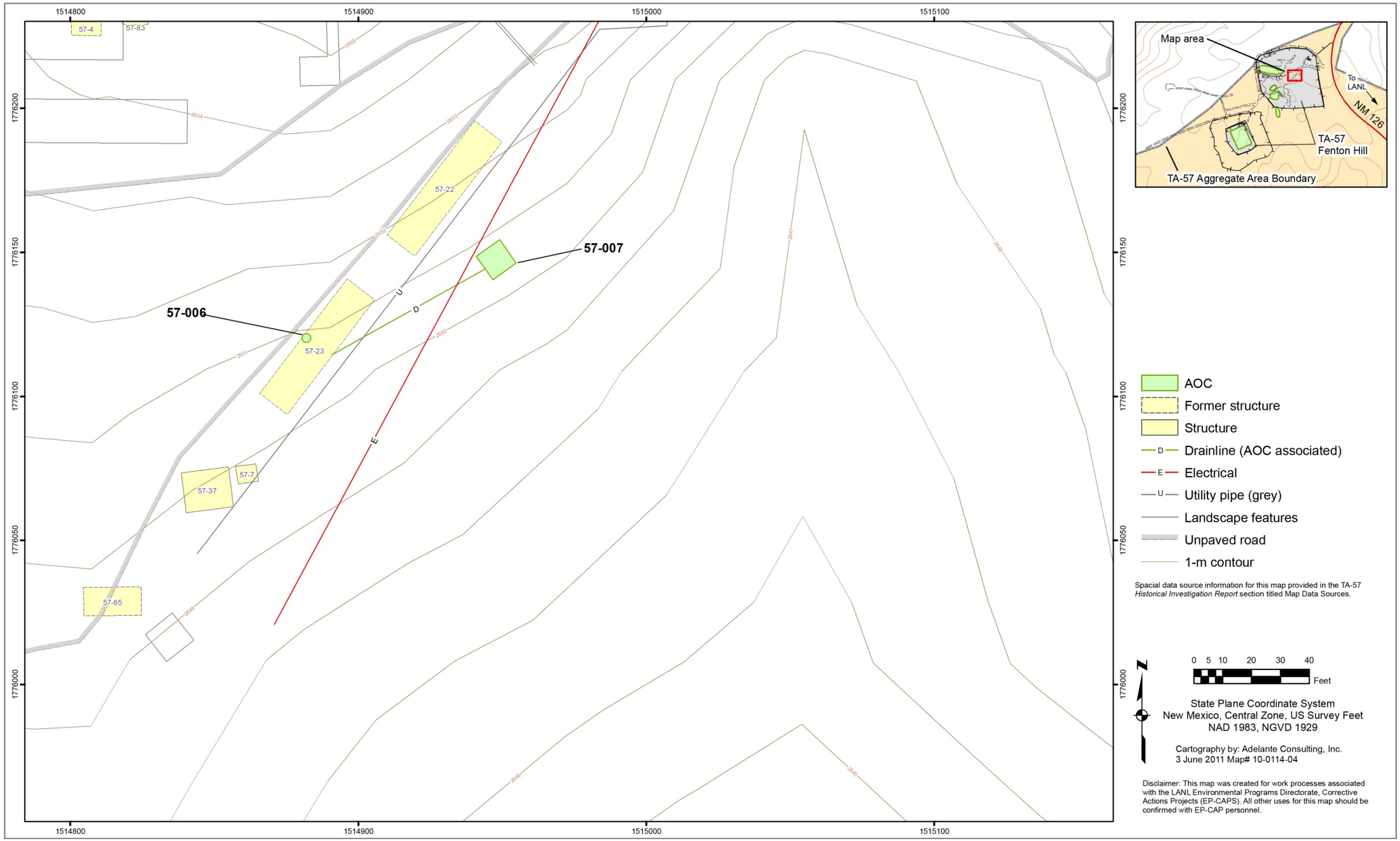

Figure 2.1-1 Site features for AOCs 57-006 and 57-007

Table 1.1-1
Status of AOCs in TA-57 Aggregate Area

Site ID	Brief Description	Site Status	Reference
AOC 57-001(a)	Drilling mud pits	NFA approved 01/21/05	EPA 2005, 088464
AOC 57-001(b)	Former settling ponds	NFA approved 08/13/03	NMOCD 2003, 101265
AOC 57-001(c)	Former settling pond	NFA approved 08/13/03	NMOCD 2003, 101265
AOC 57-002	Sludge pit	NFA approved 08/13/03	NMOCD 2003, 101265
AOC 57-003	Container storage facility	NFA approved 01/21/05	EPA 2005, 088464
AOC 57-004(a)	Former settling ponds	NFA approved 08/13/03	NMOCD 2003, 101265
AOC 57-004(b)	Settling pond	NFA approved 08/13/03	NMOCD 2003, 101265
AOC 57-005	Pond filtration unit	NFA approved 01/21/05	EPA 2005, 088464
AOC 57-006	Former waste storage drum	Under investigation	Section 2.1
AOC 57-007	Leach field	Under investigation	Section 2.2

Note: Shading denotes NFA approved.

Appendix A

Acronyms and Abbreviations and Metric Conversion Table

A-1.0 ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
AOC	area of concern
bgs	below ground surface
BV	background value
CFR	Code of Federal Regulations
Consent Order	Compliance Order on Consent
CST	Chemical Science and Technology (a Laboratory division)
DL	detection limit
DOE	Department of Energy (U.S.)
HDR	Hot Dry Rock
HIR	historical investigation report
LANL	Los Alamos National Laboratory
NFA	no further action
NMED	New Mexico Environment Department
NMOCD	New Mexico Oil Conservation Division
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RPF	Records Processing Facility
SMO	Sample Management Office
SSL	soil screening level
TA	technical area
TAL	target analyte list
VCA	voluntary corrective action
VOC	volatile organic compound

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)