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Remedy Completion Report for the Investigation and Remediation of Area of Concern 16-024(v) and Solid Waste Management Units 16-026(r) and 16-031(f) at Technical Area 16

Los Alamos
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Prepared by the Environmental Programs Directorate

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March 2007

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Professional Engineer Certification

This certification was prepared in accordance with generally accepted engineering principles and practice pursuant to the requirements of Section VII.E.6 of the March 1, 2005, Compliance Order on Consent signed by the New Mexico Environment Department (NMED) and the United States Department of Energy (DOE) and the Regents of the University of California for a registered professional engineer's certification. These activities have been performed with the care and skill ordinarily exercised by members of the profession practicing under similar conditions in the same manner or in a similar locality. I make no other warranty either expressed or implied. The finding and certification are based on (1) review of the NMED-approved work plan, (2) review of the remedy completion report and supporting records and documentation, and (3) reviewing the analytical results and supporting documentation.

With the signature and seal below, I certify that, except for the deviations presented in section 3.3, the investigation and/or remediation of Area of Concern 16-024(v) and Solid Waste Management Units 16-026(r) and 16-031(f) was conducted in accordance with the accelerated corrective action work plan [Accelerated Corrective Action Work Plan for the Investigation and Remediation of Area of Concern 16-024(v) and Solid Waste Management Units 16-026(r) and 16-031(f)], approved by NMED on March 20, 2006. The information presented in this report is, to the best of my knowledge and belief, true, accurate, and complete.

CHARLES J. ENGLISH, JR.
17350

3-7-07

Charles J. English, Jr.
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CERTIFICATION

CERTIFICATION BY THE ENVIRONMENTAL PROGRAMS – CORRECTIVE ACTION PROGRAM TECHNICAL REPRESENTATIVES

Document Title: **Remedy Completion Report for Area of Concern 16-024(v) and Solid Waste Management Units 16-026(r) and 16-031(f)**

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

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EXECUTIVE SUMMARY

This remedy completion report presents the results of accelerated corrective action (ACA) activities conducted at Area of Concern (AOC) 16-024(v) and Solid Waste Management Unit (SWMU) 16-026(r) at Technical Area (TA) 16 within the Cañon de Valle Aggregate Area at Los Alamos National Laboratory (LANL or the Laboratory). This ACA was prompted by planned underground utilities upgrades associated with the TA-16 Weapons Campus Facility Infrastructure Upgrade Project. AOC 16-024(v) and SWMU 16-026(r) are located within the planned TA-16 utility upgrade footprint and were investigated and remediated before the planned commencement of construction activities, as described in the approved ACA work plan. The ACA objectives included (1) removing potentially contaminated soil from AOC 16-024(v), (2) inspecting the oil/water separator and removing the overflow drainline associated with SWMU 16-026(r), and (3) collecting confirmation samples to define the nature and extent of contamination and assess potential risk at both sites.

SWMU 16-031(f), located in the Upper Water Canyon Aggregate Area, will also be impacted by the infrastructure upgrades; however, neither characterization nor remediation activities were performed at this site because historical information indicates that past operations could not have impacted the area. Information on SWMU 16-031(f) is included in this remedy completion report to support LANL's request for a Certificate of Completion for this site.

The results of the 2006 data evaluation show that the nature and extent of contamination have been defined for AOC 16-024(v). In addition, results of the human health screening assessments for AOC 16-024(v) indicate that there is no potential unacceptable risk to human health under a residential land use scenario. There is no potential risk to ecological receptors because the site has been excavated to approximately 8 ft below ground surface (bgs). Historical operating information reviewed for SWMU 16-031(f) confirm that the site could not have adversely impacted surrounding soil; therefore, characterization/remediation activities were not performed at this site during the ACA. As a result, the Laboratory requests that Certificates of Completion (corrective action complete without controls) be granted for AOC 16-024(v) and SWMU 16-031(f).

During the investigation of SWMU 16-026(r), it was discovered that the overflow drainline from the oil/water separator did not outfall 80 ft south of Building 16-180 (Fire Station #5), as was reported in historical documents, but that it was tied into the roof drainline for the building. The active roof drainline discharges to a subsurface outfall area 3 ft bgs located 200 ft southeast of the fire station in an open field. The results of the 2006 data evaluation for the samples collected from SWMU 16-026(r) demonstrate that the nature and extent of contamination has been defined for SWMU 16-026(r). However, polyaromatic hydrocarbon (PAH) contamination from the roof drain and asphalt parking lot remains at some locations under the asphalt parking area and within the roof drain outfall area. The results of the human health screening assessments indicate no potential unacceptable risk to human health for the industrial and construction worker scenarios under current conditions. The human health screening assessment for a residential scenario indicates potential risk due to the presence of PAHs from the roof drain and asphalt parking lot but not from the SWMU. The ecological screening assessment found no potential risk to ecological receptors. LANL is therefore requesting that a Certificate of Completion (corrective action complete without controls) be granted for SWMU 16-026(r).

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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 (LANS), LLC. The Laboratory is located in northcentral 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 finger-like mesas separated by deep canyons. These canyons contain ephemeral and intermittent streams that run west to east. Mesa tops range in elevation from approximately 6200 ft to 7800 ft. The plateau's eastern portion stands 300 ft to 900 ft above the Rio Grande valley.

The Laboratory's Environmental Programs (EP) Directorate (which includes the former Environmental Restoration Project) is involved in a national DOE effort to reduce risk to human health and the environment at its facilities. The goal of the EP Directorate is to ensure that past operations do not threaten human or environmental health and safety in and around Los Alamos County. To achieve this goal, the EP Directorate is investigating and, as necessary, remediating sites potentially contaminated by past Laboratory operations. The EP Directorate has recently performed accelerated corrective action (ACA) activities at Area of Concern (AOC) 16-024(v) and Solid Waste Management Unit (SWMU) 16-026(r) located within the Cañon de Valle Aggregate Area.

In accordance with the March 1, 2005, Compliance Order on Consent (hereafter, Consent Order), the investigation work plan for the Cañon de Valle Aggregate Area was submitted to the New Mexico Environment Department (NMED) in September 2006 (LANL 2006, 091698). The Laboratory conducted the ACA at AOC 16-024(v) and SWMU 16-026(r) within the aggregate area in advance of the implementation of the aggregate area work plan because these sites lie in the path of planned construction activities related to the Weapons Campus Infrastructure Upgrade Project at Technical Area (TA) 16. This remedy completion report describes the ACA activities completed at AOC 16-024(v) and SWMU 16-026(r). The ACA work plan was submitted to NMED on January 19, 2006 (LANL 2006, 092087). A notice of disapproval (NOD) was issued by NMED on February 3, 2006 (NMED 2006, 091524); LANL responded to NMED's NOD comments on March 9, 2006 (LANL 2006, 092076). The ACA work plan was subsequently approved by NMED on March 20, 2006 (NMED 2006, 091832).

The characterization and remediation activities were to be implemented during the installation of a new gas line at AOC 16-024(v) and a water line at SWMU 16-026(r); however, after the work plan was approved by NMED, the utility upgrade project was put on hold. Since the ACA work plan had already been submitted and approved by NMED, the ACA activities proceeded as planned. It is currently unknown when or if the infrastructure upgrades at TA-16 will occur.

An additional site, SWMU 16-031(f), the location of a former drinking water chlorination station, will also be impacted by the proposed construction activities. Based on historical information presented in the approved ACA work plan, it was determined that past operations at SWMU 16-031(f) would not have adversely impacted surrounding soil; therefore, characterization and remediation activities were not performed as part of these ACA activities (LANL 2006, 092087; NMED 2006, 091524; LANL 2006, 092076; and NMED 2006, 091832).

1.1 Location of ACA Activities

AOC 16-024(v) and SWMU 16-026(r) are located in an area of proposed utility upgrades associated with the TA-16 Weapons Campus Infrastructure Upgrade Project in the western portion of TA-16 (Figures 1.1-1 and 1.1-2). AOC 16-024(v) was the former location of a high explosive (HE) storage magazine and SWMU 16-026(r) was an overflow drainline associated with an oil/water separator located inside Building 16-180 (Fire Station #5).

1.2 Purpose of ACA Activities

The purpose of the ACA activities described in this remedy completion report was to complete investigation and remediation activities in support of requesting a Certificate of Completion for both AOC 16-024(v) and SWMU 16-026(r). The ACA activities included the excavation of potentially contaminated soil, the removal of a water overflow drainline, soil sampling to confirm that the lateral and vertical extent of contamination has been determined, and the evaluation of the sampling results to determine if there are potential risks to human health and the environment.

ACA investigation and remediation activities were implemented at AOC 16-024(v) and SWMU 16-026(r) because the two sites may be inaccessible during and after the installation of underground utilities and associated infrastructure. The investigation and remediation activities were conducted in accordance with the approved ACA work plan (LANL 2006, 092087; NMED 2006, 091524; LANL 2006, 092076; and NMED 2006, 091832) and the Consent Order.

1.3 Report Organization

This report follows the approved format for remedy completion reports for accelerated corrective actions submitted by LANL to NMED on August 8, 2005 (LANL 2005, 089553). This remedy completion report describes investigation and remediation activities performed at AOC 16-024(v) and SWMU 16-026(r) and contains information on the sampling results from these activities. This report also describes SWMU 16-031(f) and presents the justification for not conducting ACA activities at this site. Section 2 presents background information on each site, including a site description, operational history, types of waste historically present at each site, and a summary of previous investigations, if any. Section 3 provides a description of the characterization and remediation activities implemented in accordance with the approved ACA work plan (LANL 2006, 092087; NMED 2006, 091524; LANL 2006, 092076; and NMED 2006, 091832); regulatory criteria; deviations from the work plan; and a description of the final disposition of each site. Section 4 summarizes the data and risk assessment results and includes a request for Certificates of Completion for AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f). Appendix A provides an acronyms and abbreviations list, glossary, and metric conversion table. Appendix B presents site photographs taken during ACA activities, while Appendix C (on compact disc [CD]) provides copies of the sample collection logs (SCLs), chain-of-custody (COC) forms, original field-screening and monitoring data, and sample coordinates. Appendix D (on CD) contains analytical data, data packages, and data validation reports. Appendix E presents the risk assessment results. Appendix F provides copies of waste characterization data, shipping manifests, disposal records, and waste tables.

2.0 BACKGROUND

2.1 Facility Description

AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f) are located within the administration area in the northwestern portion of TA-16, outside the HE security fence. The majority of TA-16 is situated east of the administration area behind a security fence where the core operational facilities associated with HE research and production for the Laboratory are located. The facility associated with SWMU 16-026(r) (Fire Station #5) is still in operation, while the facilities associated with AOC 16-024(v) (former magazine) and SWMU 16-031(f) (former chlorination plant) were demolished and removed many years ago.

2.1.1 AOC 16-024(v), Former Magazine

AOC 16-024(v), a former HE storage magazine (former Building 16-62), was located approximately 100 ft east of the former steam plant (former Building 16-540) (Figure 2.1-1). The magazine measured 6 ft wide x 6 ft long x 7 ft high and was constructed of wood, with a concrete floor. Soil was piled along three sides of the building but not over the roof. Building 16-62 was retired from use as a storage magazine in 1946. Because it was not contaminated, carpenters and plumbers used the building to store equipment and material between 1946 and 1968. Building 16-62 was demolished in 1968 (LANL 1995, 057225), and the location remains undeveloped and unpaved.

2.1.2 SWMU 16-026(r), Oil/Water Separator Drainline and Outfall

SWMU 16-026(r) consists of the overflow drainline and outfall from the oil/water separator at Building 16-180 (Fire Station #5) (Figure 2.1-2). The oil/water separator was intended to be used to skim oil from water discharged to the floor drains of the fire house (LANL 1995, 057225). The fire station, including the oil/water separator, was constructed in 1952 and is currently active. The oil/water separator was equipped with a 2-in overflow line. This steel line exited the southern side of the building, ran under the asphalt parking lot, and connected with the roof drainline (a 6-in. vitrified clay pipe [VCP]) approximately 80 ft south of the building. The age of the separator overflow drainline and the roof drainline are unknown, but it is assumed that they were installed during the original construction of the fire station in 1952 since the oil/water separator is part of building foundation. The configuration of the overflow drainline is shown on the Building 16-180 construction plans (LASL 1951, 090191; LASL 1951, 024052) and on the 1961 parking area modification plan (LASL 1961, 094823). It is unknown why the two lines were tied together; this configuration is not shown on any of the historical documents available for this facility.

Upon excavation, it was discovered that the steel overflow drainline was buried at a depth of 4.0 ft below ground surface (bgs) and the VCP roof drainline was buried in the same trench approximately 8 in. from the overflow drainline, also at a depth of 4.0 ft bgs. The 2-in. steel overflow drainline and the 6-in. VCP roof drainline ran parallel to one another for approximately 80 ft, at which point the 2-in. line was tied into the 6-in. line. The roof drainline discharges to the subsurface in an open field approximately 200 ft southeast of the fire station at a depth of 3 ft bgs. The soil above and below the steel overflow drainline was observed to be moist and the exterior of the steel line was heavily corroded, with numerous visible holes (Photographs B-8, B-9, B-10, B-14, B-15, and B-16 in Appendix B). In addition, visible sections of the 6-in. VCP roof drainline were observed to be cracked and leaking water into the same trench occupied by the overflow drainline (Photographs B-14, B-15, and B-16 in Appendix B).

It is important to note that according to the facility manager, the asphalt parking area adjacent to the southern side of Building 16-180 and above the drainlines has experienced significant subsidence and cracking for many years due to the leaking roof drainline (Photographs B-7, B-12, B-20, and B-21 in Appendix B). As a result, stormwater runoff has seeped into cracks in the pavement, and the parking area has been routinely patched and repaired throughout the years with asphalt oil emulsion and patching compounds.

2.1.3 SWMU 16-031(f), Former Chlorination Station Outfall

SWMU 16-031(f) is the drainline and outfall from a decommissioned chlorination station (former Building 16-21) (Figure 2.1-3). The station was a wooden structure, 18 ft square and 10 ft high, and had been constructed in 1944. The building housed a chlorinator connected to potable water-inlet and -outlet water lines. Building 16-21 was stripped of all usable equipment in 1953 when the new chlorination station (Building 16-560) was brought online (LANL 1995, 057225). Building 16-21 and the drainline were subsequently removed and the outfall area was graded and paved in 1992 to accommodate a new communications equipment building and parking lot. This site was previously recommended for no further action (NFA) in Addendum 2 to the Operable Unit 1082 Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan (LANL 1995, 057225). The basis for the NFA request was that there had been no recorded use or release of hazardous waste or hazardous constituents associated with this facility. This RFI work plan addendum and associated NFA recommendations were never formally reviewed or commented on by NMED.

2.2 Facility Process

2.2.1 AOC 16-024(v), Former Magazine

AOC 16-024(v) was a former HE storage magazine (Building 16-62) constructed in 1944. The building was used to store packaged HE from 1944 until 1946. From 1946 to 1968 the building was used to store plumbing and carpentry supplies and was subsequently demolished in 1968 (LANL 1995, 057225).

2.2.2 SWMU 16-026(r), Oil/Water Separator Drainline and Outfall

SWMU 16-026(r) consists of the former overflow drainline and outfall associated with the oil/water separator located in Building 16-180 (Fire Station #5). The oil/water separator is a 40-ft^3 cement pit constructed into the southwestern corner of the building foundation; six floor drains in the fire station truck bays and shop discharge to the oil/water separator. Fire station personnel indicated that fire trucks have rarely been washed down inside the building and the truck bays are regularly swept out. Discharges to the floor drains consist primarily of snowmelt from the trucks and minor amounts of wash-down that likely contained only trace amounts of oil. This practice was verified during an inspection of the interior of the oil/water separator, which was dry and showed no signs of oil staining and no petroleum hydrocarbon odors (see Photograph B-6 in Appendix B). Because of the relatively large capacity of the oil/water separator (approximately 300 gal.), water discharged to the separator from snowmelt or wash-down would likely not have been sufficient to reach the overflow line. During the ACA, it was confirmed that the 2 in. drainline exited the southern side of the building and ended approximately 80 ft southeast of Building 16-180. However, it was discovered that where the 2-in. overflow drainline was believed to terminate, it tied into the 6-in. VCP roof drainline for Building 16-180. The roof drainline eventually discharges to a subsurface outfall area 3 ft bgs that is located 200 ft southeast of the fire station in an open field. The roof on Building 16-180 is the original flat composite tar-and-gravel roof installed when the building was constructed in 1952.

2.2.3 SWMU 16-031(f), Former Chlorination Station Outfall

SWMU 16-031(f) is the former drainline and outfall from a decommissioned potable water chlorination station (former Building 16-21) (Figure 2.1-3). The building housed a chlorinator connected to potable water-inlet and -outlet water lines. The chlorinator injected chlorine gas into the water for disinfection purposes, which is a standard method performed at thousands of chlorinating stations across the country. A trough was formed into the concrete floor of the building to collect any potable water released from the inlet and outlet lines. The water was discharged at the southeastern corner of the building into a VCP that day-lighted 26 ft southeast of the building (Figure 2.1-3). The only potential release from this site was a mixture of chlorinated and unchlorinated potable water (LANL 1995, 057225).

2.3 Description of Waste

2.3.1 AOC 16-024(v), Former Magazine

AOC 16-024(v), the former HE storage magazine (former Building 16-62), was used to store HE from 1944 to 1946 (LANL 1995, 057225). Magazines located outside the HE exclusion area at TA-16 were only used to store the packaged HE, and the HE were not otherwise handled. The chemicals of potential concern (COPCs) for this site are HE and HE byproducts. Since the building was also used to store plumbing and carpentry supplies, additional COPCs may include volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals; however, there is no documentation indicating that materials containing VOCs, SVOCs, or metals were actually stored in, or released from, the building.

2.3.2 SWMU 16-026(r), Oil/Water Separator Drainline and Outfall

SWMU 16-026(r) consists of the former overflow drainline and outfall associated with the oil/water separator located in Building 16-180. Oil/water separators are "in-line" devices used to remove oils and greases (and sometimes solids) from industrial waste streams and storm water discharges. Oil/water separators operate by employing various physical or chemical separation methods, including gravity separation, filters, coagulation/flocculation, and flotation; the oil/water separator at Fire Station #5 operated by gravity separation. The performance of gravity separation systems is a function of the relatively low solubility of petroleum products in water and their different specific gravities. Solids, if present in the waste stream, will collect at the bottom of the oil/water separator holding tank and can be removed when the tank is drained for maintenance. Wash-down water, ice melt, and possibly small drips of oil from fire trucks would have been collected in the oil/water separator at Fire Station #5 through a series of floor drains. The oil water separator at Fire Station #5 is equipped with a metal box with a screen around the top where any floating oil would have separated from the water. The 2-in. steel overflow drainline was located near the top of the south side of the oil/water separator several inches above the top of the screen box in the center of the separator (Photograph B-6 in Appendix B). In the event the volume of water in the separator was sufficient, water was discharged through the overflow drainline. COPCs identified for SWMU 16-026(r) include total petroleum hydrocarbon (TPH)-gasoline range organic (GRO), TPH-diesel range organic (DRO), VOCs, SVOCs, and metals.

2.3.3 SWMU 16-031(f), Former Chlorination Station Outfall

At SWMU 16-031(f), chlorine gas was used to disinfect drinking water. Because chlorine gas does not persist if released to the environment, no COPCs are identified for this SWMU.

2.4 Previous Investigation Activities

No previous sampling activities have been conducted at any of the three sites included in this remedy completion report.

3.0 ACCELERATED CORRECTIVE ACTION ACTIVITIES

In anticipation of construction activities associated with the ongoing TA-16 Weapons Campus Infrastructure Upgrade Project, the ACA investigation and remediation activities were initiated in the summer of 2006. ACA activities were conducted at AOC 16-024(v) and SWMU 16-026(r). Historical information available for SWMU 16-031(f) indicates that no materials or substances were used or stored at the site that could have contributed to environmental contamination, and it was determined that characterization and/or confirmation sampling at this site were not warranted. Therefore, an ACA was not implemented at SWMU 16-031(f). The scope of the ACA included the following activities at AOC 16-024(v) and SWMU 16-026(r):

- mobilization and site preparation
- geodetic surveys
- excavation, packaging, hauling, and disposal of contaminated media
- collection of characterization/confirmation samples
- site restoration

ACA investigation and remediation activities were performed in accordance with appropriate quality assurance (QA) requirements addressed in the EP-Environment and Remediation Support Services (ERSS) quality management plan (QMP), and thus were implemented by using applicable quality procedures (QPs), standard operating procedures (SOPs), and Laboratory requirement documents (e.g., Laboratory implementation requirements and Laboratory performance requirements), or equivalent Laboratory-approved subcontractor documents (e.g., statements of work or field implementation plans). Table 3.0-1 presents a summary of the investigation methods used during the ACA implemented at AOC 16-024(v) and SWMU 16-026(r).

Details regarding the ACA investigation and remediation activities implemented at each site are presented in section 3.1. A discussion of the target cleanup goals selected for the sites, and their regulatory framework, is presented in section 3.2. Additional details regarding deviations from the activities prescribed in the approved ACA work plan (LANL 2006, 092087; NMED 2006, 091524; LANL 2006, 092076; and NMED 2006, 091832) for AOC 16-024(v) and SWMU 16-026(r) are summarized in section 3.3.

3.1 Investigation and Remediation Activities

The ACA investigation and remediation of AOC 16-024(v) and SWMU 16-026(r) included site mobilization and preparation, excavation and removal, field-screening, collection of confirmation samples, the characterization and disposal of waste, and site restoration. The main objective of the ACA remediation and confirmation sampling activities was to ensure that upon completion both sites would meet target cleanup goals and that no further corrective action would be required.

For both AOC 16-024(v) and SWMU 16-026(r), there are no records to indicate that a historical release had occurred; therefore, the primary focus of both investigations was to verify that the sites had not been impacted by past operations. Field-screening was conducted during all excavation and sampling activities to identify any areas of soil contamination. A photoionization detector (PID) was used at AOC 16-024(v) and SWMU 16-026(r) to identify areas of VOC contamination. A D-Tech immunoassay test kit and an HE spot test kit were also used at AOC 16-024(v) to identify areas of HE soil contamination.

Shallow samples were extracted using a stainless scoop, while deeper samples were collected directly from the backhoe bucket. The sampled interval was described and recorded on applicable SCLs (Appendix C). Samples were collected in accordance with SOP-01.08, “Field Decontamination of Drilling and Sampling Equipment”; SOP-06.10, “Hand Auger and Thin-Wall Tube Sampler”; and SOP-06.09, “Spade and Scoop Method for Collection of Soil Samples.” When appropriate, VOC samples were collected using EnCore samplers to ensure minimal loss of VOCs from the sampled media (see Appendix C). During the ACA implemented at AOC 16-024(v) and SWMU 16-026(r), EnCore samplers were used to collect VOC samples at confirmation sample locations where in-situ soils had not been disturbed. EnCore samplers were not used to collect the four confirmation samples from the 8–9-ft-bgs interval from AOC 16-024(v) because the samples were collected from a backhoe bucket. Samples were also collected for QA/quality control (QC) purposes in accordance with SOP-01.05, “Field Quality Control Samples.” Field duplicates were collected to evaluate the reproducibility of the sampling technique. Field trip blanks were used to evaluate sample exposure to other VOCs. Sampling equipment was decontaminated after each use in accordance with the decontamination procedures outlined in SOP-01.08, “Field Decontamination of Drilling and Sampling Equipment.” Field rinsate samples were collected to evaluate the effectiveness of sampling decontamination procedures. Table 3.1-1 presents a summary of QA/QC samples collected during the ACA of AOC 16-024(v) and SWMU 16-026(r) by sampling location, sample type, media, and the analyses requested. A post-investigation geodetic survey was conducted to confirm the exact sampling locations in accordance with SOP-03.11, “Coordinating and Evaluating Geodetic Surveys.” Sample survey coordinates are provided in Appendix C.

Sampled media were placed into preapproved sample containers in the field and stored on ice in accordance with SOP-01.02, “Sample Container and Preservation.” Samples remained in field-team custody until they were delivered to the Sample Management Office (SMO) for shipment to off-site laboratories for analysis in accordance with SOP-01.03, “Handling, Packaging, and Shipping of Samples.” All samples were field-screened on-site by LANL’s Health, Safety, and Radiation Protection (HSR-1) Group for alpha, beta, and gamma activity before transporting and releasing them to the SMO. To document sample handling, COCs were completed for all samples and are provided in Appendix C. Sample analyses were requested in accordance with the Laboratory’s statement of work for analytical services (LANL 2000, 071233).

Field-screening for VOCs was conducted in conjunction with sample collection at both sites. Headspace VOC screening was performed for all collected samples by using a MiniRae 2000 PID equipped with an 11.7-eV lamp, and the results were recorded on daily field-screening logs in accordance with SOP-06.33, “Headspace Vapor Screening with a Photo Ionization Detector” and on each corresponding SCL (Appendix C). During excavation activities, random field-screening was also conducted of both soil and the ambient air within the work zone.

Analytical results of the ACA confirmation sampling for both AOC 16-024(v) and SWMU 16-026(r) are provided in Appendix D and summarized in section 4.1 of this report. ACA investigation and remediation activities at AOC 16-024(v) and SWMU 16-026(r) are detailed in the following subsections.

3.1.1 Detailed Description of the ACA at AOC 16-024(v), Former Magazine

Excavation activities were initiated on August 16, 2006, to remove soil from an area 8 ft wide x 8 ft long x 8 ft deep corresponding to the footprint of the former magazine. Because of the small size of the AOC it was determined that the complete removal of the soil beneath the former building footprint would ensure closure of the site. The excavation was conducted with a mini excavator. Excavation activities continued until August 24, 2006, and generated approximately 40 yd^3 of potentially HE-contaminated soil.

During excavation activities, field-screening was conducted using a PID (for organic vapors) and a D-Tech immunoassay test kit for HE compounds. The D-Tech kit uses a semiquantitative method for detection of hexahydro-1,3,5-trinitro-1,3,5 triazine (RDX), the primary HE compound used at TA-16 in accordance with U.S. Environmental Protection Agency (EPA) Field Method SW-486 (Update III) Method 4051 (EPA 1997, 057589). The detection limit for RDX using this method is 1.0 milligram per kilogram (mg/kg). Field-screening was also conducted with HE spot test kits. In accordance with the approved ACA work plan (LANL 2006, 092087; NMED 2006, 091524; LANL 2006, 092076; and NMED 2006, 091832), eight confirmation samples were collected from four locations corresponding to each of the four building corners of former Building 16-21 from a depth of 0.5 ft bgs to 1.0 ft bgs (ahead of excavation) and 8.0 ft bgs to 9.0 ft bgs (Figure 3.1-1). HE was not detected using either the HE spot test or the D-Tech kit, and organic vapors were not detected using a PID (Appendix C).

Before removing the samples from the site for shipping, the samples were also screened for radioactivity by HSR-1 to ensure that U.S. Department of Transportation (DOT) shipping requirements were met. All radiological screening results showed no detectable activity (NDA). All radiological field-screening results obtained during the characterization sampling at AOC 16-024(v) are provided on the SCLs in Appendix C.

Characterization samples collected at AOC 16-024(v) were submitted to the SMO for off-site contract laboratory analysis of VOCs, SVOCs, Target Analyte List (TAL) metals, explosive compounds, and perchlorate. In addition, field duplicates were collected and submitted for the same suite of analyses. Table 3.1-2 presents a summary of all investigative samples collected during the ACA at AOC 16-024(v) by location identification (ID), sample ID, sample type, corresponding sampled depths, media, and the analyses requested.

Excavated soil was immediately placed into one of three roll-off bins. One composite waste characterization sample was collected from five locations within each bin in accordance with SOP-06.09, “Spade and Scoop Method for the Collection of Soil Samples.” The waste characterization samples were sent to an off-site laboratory for analysis of VOCs, SVOCs, TAL metals, TPH (DRO and GRO), and methyl tertiary butyl ether (MTBE) in accordance with the waste acceptance criteria for the Waste Management landfill in Rio Rancho, New Mexico. A summary of the collected waste samples is presented in Appendix F, Table F1-2. Waste characterization data classified the soil as as nonregulated and nonhazardous; the waste will be shipped to the Waste Management facility in Rio Rancho, New Mexico.

3.1.2 Detailed Description of the ACA at SWMU 16-026(r), Oil/Water Separator Drainline and Outfall

Investigation activities at SWMU 16-026(r) included an evaluation of the oil/water separator and the associated overflow drainline and outfall. Historical records for the site were unclear as to whether the overflow line from the oil/water separator discharged to the sanitary sewer (Santa Fe Engineering Ltd. 1992, 015326) or to the surface as shown on at least one engineering drawing (LASL 1951, 090191).

Excavation activities were initiated at SWMU 16-026(r) on June 12, 2006, using a Bobcat mini excavator and hand tools. Several potholes were excavated to identify the locations of various buried utilities in the area. Once the utility lines were exposed, the excavator was used to expose the 2-in. steel overflow drainline and the adjacent 6-in. VCP roof drainline. The steel overflow drainline was buried at a depth of 4.0 ft bgs and the VCP roof drainline was buried in the same trench approximately 8 in. from the overflow drainline, also at a depth of 4.0 ft bgs. Upon excavation, the soil above and below the steel overflow drainline and the roof drainline was observed to be moist, and the exterior of the steel line was heavily corroded from the surrounding moisture, with numerous visible holes (Photographs B-9 and B-10 in Appendix B). Soil immediately surrounding the overflow drainline was stained from the corroded line. In addition, visible sections of the 6-in. VCP roof drainline were observed to be cracked and crumbling (Photograph B-19 in Appendix B). The entire length of the steel overflow line was uncovered to a location approximately 80 ft southeast of the fire station building, where engineering drawings of the oil/water separator system had shown the 2-in. steel drainline ending (LASL 1951, 090191; LASL 1951, 024052; LASL 1961, 094823). Once the entire length of the overflow drainline was exposed, it was discovered that this drainline was tied into the 6-in. VCP roof drainline at a location approximately 80 ft south of the building. The roof drainline subsequently runs another 120 ft and discharges to an open field southeast of Building 16-180.

Field-screening for VOCs was conducted in conjunction with all excavation activities using a PID equipped with an 11.7-eV bulb. Headspace screening was conducted as specified in SOP-06.33, “Headspace Vapor Screening with a Photo Ionization Detector.” Headspace samples were collected from each sampling location, and soil located in the base of the trench was also scanned in-situ for the presence of any gross contamination. The field-screening results were only slightly elevated (Appendix C); the highest PID reading was recorded along the third leg of the drainline at a concentration of 12.8 ppm. The PID screening of the drainline trench did not reveal the presence of elevated organic vapors.

In accordance with the approved work plan (LANL 2006, 092087; NMED 2006, 091524; LANL 2006, 092076; and NMED 2006, 091832), the oil/water separator overflow drainline was removed and not replaced. Several inches of stained soil directly adjacent to the corroded overflow drainline were also removed. The steel overflow drainline was cut near where it exited the building and also where it connected to the 6-in. VCP roof drainline. Both locations were plugged with concrete. Although there was evidence of liquid (water) inside portions of the steel overflow drainline, there was no evidence of oil or oil residue inside the pipe. Based on PID screening results and visual inspection there was no evidence of petroleum contamination in soil below the line, although the corroded overflow drainline had discolored the surrounding soils.

During the excavation of the 2-in. steel drainline, the second elbow of the 6-in. VCP roof drainline collapsed because the elbow was cracked and full of gravel from the fire station roof. The line was repaired using rubber boots to splice in a section of 6-in. PVC pipe. Two PVC clean-outs were also installed as part of the roof drain repairs (Photographs B-15 and B-16 in Appendix B).

Between June 12, 2006, and December 4, 2006, a total of 15 confirmation samples were collected from nine locations (Figure 3.1-2). In accordance with the approved work plan, samples were collected from 0.5 ft bgs to 1.0 ft bgs and at the interval immediately below the 2-in. overflow drainline (LANL 2006, 092087; NMED 2006, 091524; LANL 2006, 092076; and NMED 2006, 091832). Based on field observations, an additional location was sampled, where an unusually large corrosion hole in the steel pipe was found. Additional samples were collected from the third elbow along the roof drainline and at the outfall location (Figure 3.1-2). The roof drain outfall is located approximately 200 ft southeast of the fire station in an open field. The discharge pipe was located by hand-digging at a depth of approximately 3 ft bgs. Field observations and field-screening did not show any evidence of petroleum contamination at the outfall or at any other point along the drainline; however, gravel from the fire station roof was observed in the damaged roof drainline elbows and at the outfall.

Immediately upon collection, sampled media from each corresponding depth interval were field-screened for VOCs using a PID. Results ranged from nondetect (≤1 ppm) to 12.8 ppm (Appendix C). Before removing the samples from the site, the samples were also screened for radioactivity by HSR-1 to ensure that DOT shipping requirements were met (Appendix C). All radiological screening results showed NDA. All radiological field-screening results obtained during the characterization sampling at SWMU 16-026(r) are provided on the SCLs in Appendix C.

All confirmation samples were collected and submitted to the SMO for the analysis of VOCs, SVOCs, TAL metals, TPH-GRO, and TPH-DRO. Since no gross radiological screening results were measured above local background levels, radionuclides were not included in the analytical suite for in the confirmation samples collected from SWMU 16-026(r) (LANL 2006, 092076). In addition, field duplicates were collected and submitted for the same suites of analysis. Table 3.1-2 presents a summary of investigation samples collected during the ACA at SWMU 16-026(r) by location ID, sample ID, sample type, corresponding sampled depths, media, and the analyses requested.

Approximately 20 yd^3 of soil and 30 yd^3 of asphalt were excavated from the 120-ft-long by 2-ft-wide by 4-ft-deep trench. The asphalt was segregated and recycled by LANL's Materials Recycling Facility (MRF). The overburden soil (from 1 ft bgs to 3 ft bgs) was segregated and staged in roll-off bins on-site for reuse as backfill. The soil immediately above and below the steel overflow drainline was excavated and placed into a separate roll-off bin pending waste characterization results. The steel line itself was also placed into this container. Waste characterization data classified the pipe and the surrounding soil as nonregulated/nonhazardous waste; this waste will be disposed of at the Waste Management facility in Rio Rancho, New Mexico.

3.2 Regulatory Criteria and Target Cleanup Levels

This section describes the regulatory criteria used for screening COPCs and for evaluating the potential risk to ecological and human receptors. Regulatory screening criteria identified in the Consent Order include cleanup standards, risk-based screening levels, and risk-based cleanup goals and are established by medium. These criteria are discussed in the following subsections, and applicable criteria identified in this section are included in the Appendix E tables.

3.2.1 Current and Future Land Use

Historically, AOC 16-024(v) and SWMU 16-026(r) have been used for industrial purposes only. Current land use remains industrial, and access control is maintained by the Laboratory. It is expected that the land use at these sites will remain industrial for the reasonably foreseeable future but may also include potential construction activities.

Administrative controls are currently in place to prevent inadvertent contact with contaminated soil during construction or other intrusive activities. The LANL excavation permit (EX-ID) and permits and requirements identification (PR-ID) systems require a review of all new projects involving excavation or soil disturbance. EP Directorate personnel review all proposed new projects identified through the EX-ID and PR-ID processes to evaluate whether the project is at the location of a SWMU or AOC and whether contaminated soil will be disturbed. Based on the results of these evaluations, appropriate health and safety requirements are developed to prevent unacceptable risk to construction workers or other site workers.

3.2.2 Screening Levels and Cleanup Standards

Soil screening levels (SSLs) are presented in NMED's technical background document for the development of soil screening levels (NMED 2006, 092513). If a NMED SSL is unavailable for a chemical, the EPA Region 6 screening level is used (adjusted to 1×10^{-5} for carcinogens) (EPA 2006, 094321). As specified in Section VIII.B.1 of the Consent Order, the appropriate SSLs will be used as soil cleanup levels unless determined to be impracticable or unless SSLs do not exist for the current and reasonably foreseeable future land use. Because the current and reasonably foreseeable future land use for both sites is industrial, the industrial SSLs are the cleanup levels for these sites. However, the potential also exists for construction activities to take place at these sites, and COPCs were screened against NMED construction worker SSLs.

Although TPH was detected at low concentrations at SWMU 16-026(r), TPH is not considered a contaminant as defined by the Consent Order, and the cleanup levels specified in Section VIII of the Consent Order are not applicable to TPH (although they are applicable to the chemical components of TPH). TPH results were compared with the NMED TPH screening guidelines for industrial and residential land uses (NMED 2006, 094614).

Ecological risk is screened using ecological screening levels (ESLs) established through LANL's screening-level ecological risk assessment methods (LANL 2004, 087630). The ESLs were obtained from the ECORISK Database, Version 2.2 (LANL 2005, 090032).

3.2.3 Cleanup Goals

The cleanup goals specified in Section VIII of the Consent Order are a target risk level of 1×10^{-5} for carcinogens or a hazard index (HI) of 1 for noncarcinogens.

3.3 Deviations from the Accelerated Corrective Action Work Plan

The following sections discuss deviations from the approved ACA work plan for AOC 16-024(v) and SWMU 16-026(r).

3.3.1 AOC 16-024(v), Former Magazine

The ACA activities at AOC 16-024(v) were completed with one deviation from the approved work plan (LANL 2006, 092087; NMED 2006, 091524; LANL 2006, 092076; and NMED 2006, 091832). The approved ACA work plan states that eight samples would be collected from "four locations at two depth intervals (0 to 6 in. [changed to 6 to 12 in. at the request of NMED]) and at the soil/tuff interface or from the bottom of the gas line excavation, whichever is deeper." Based on information obtained from other TA-16 projects in the area, the soil/tuff interface was expected to be encountered at a depth of approximately 3 ft bgs. During excavation activities at AOC 16-024(v), the soil/tuff interface was not encountered after excavating to a depth of 8 ft bgs. Once this depth was reached, excavation was briefly halted until further inquiries into the local geology were made.

A seismic study conducted in 2000 revealed that AOC 16-024(v) is actually located on the downthrown side of a north-south trending fault (Gardner et al. 2001, 070106). Although the fault trace is not evident on the surface, the survey indicates that there is a 30–50-ft vertical displacement of the upper tuff in this area. Because excavating to a depth of 30 ft bgs was not feasible, LANL contacted Ms. Darlene Goering at the NMED Hazardous Waste Bureau on August 22, 2006, to discuss these circumstances. Based on the fact that HE and VOC field-screening showed no evidence of soil contamination while excavating to a depth of 8 ft, Ms. Goering indicated that the collection of the excavation confirmation samples from the 8-9-ft interval would be adequate. This recommendation was documented in an e-mail between Ms. Goering and Melanee Shurter on August 22, 2006 (Goering 2006, 095024). Four samples were collected from this interval, one from each corner of the former building.

3.3.2 SWMU 16-026(r), Oil/Water Separator Drainline and Outfall

The ACA activities at SWMU 16-026(r) were completed with one deviation from the approved work plan (LANL 2006, 092087; NMED 2006, 091524; LANL 2006, 092076; and NMED 2006, 091832). The ACA work plan was originally prepared with the assumption that the 2-in. steel drainline was inactive and ended approximately 80 ft south of the fire station, as shown in the construction drawings (LASL 1951, 090191; LASL 1951, 024052; LASL 1961, 094823). The Santa Fe Engineering report (Santa Fe Engineering 1992, 015326) contradicted what was shown on these construction drawings and stated that the floor drains and the roof drains had been plumbed to the sanitary sewer. Since the Santa Fe Engineering Report contained more recent information, it was believed that the 2-in. overflow drainline shown on the construction drawings referenced above may have been removed from service. However, ACA activities revealed that the 2-in. steel overflow drainline was in place and was still connected to the oil/water separator. Further excavation of the 2-in. steel line revealed that it did end approximately 80 ft south of the fire station. However, the end of the line had been tied into the VCP roof drainline, which subsequently discharges another 120 ft farther to the south and east of the fire station in an open field. At this location, the end of the roof drainline was discovered to be buried at a depth of 3 ft bgs (Photograph B-19 in Appendix B). Based on the current configuration of the drain system, two additional samples (beyond what was specified in the approved ACA work plan) were collected below the last 90-degree elbow of the 6-in. VCP roof drainline and at the roof drain outfall. Both samples were collected and field-screened as specified in the approved work plan (LANL 2006, 092087; NMED 2006, 091524; LANL 2006, 092076; and NMED 2006, 091832). Because there was no visual or field-screening evidence of soil contamination at either sampling location, no additional samples were collected.

3.4 Final Site Conditions

The excavation at AOC 16-024(v) was backfilled with imported clean fill and the site was returned to original grade. Additional areas near AOC 16-024(v) disturbed by equipment and vehicles were reseeded with a native seed mix and mulched with straw. All best management practices (BMPs) (wattles and silt fencing) will remain at the site until the new vegetation takes hold.

Although discharges from the oil/water separator have been eliminated, the oil/water separator tank will continue to be used to collect water from the fire station floor drains. The water level in the tank will be monitored by fire station personnel and the tank will be pumped if and/or when it reaches capacity. The point at which the 2-in. steel drainline and the 6-in. VCP roof drainline connected was also plugged with concrete to prevent leakage from the roof drainline. Upon completion of the ACA activities at SWMU 16-026(r), the trench was backfilled with the original soil and a small amount of imported clean fill. Approximately 12 in. of road base coarse were added to bring the trench up to the proper grade before repaving with asphalt. The trench was compacted to a 95% LANL specification for backfilling parking areas or roads. The area was reasphalted in November 2006. Dirt areas that were disturbed during the investigation were reseeded with a native grass seed mix. BMPs, including silt fencing and wattles, were left in place until revegetation has taken place. The roof drainline and outfall will be rerouted by Facility Management and Engineering (FME) Institutional Facilities and Central Services (IFCS) pursuant to Title 20, Chapter 6, Part 2, Section 1203 – Notification of Discharge Removal of the New Mexico Administrative Code (NMAC) of the New Mexico Water Quality Control Commission (WQCC) regulations.

4.0 REQUESTS FOR CERTIFICATES OF COMPLETION

Historical operating information associated with SWMU 16-031(f) indicates that there have been no activities conducted at the former chlorination facility that would warrant an environmental investigation. The approved ACA work plan (LANL 2006, 092087; NMED 2006, 091524; LANL 2006, 092076; and NMED 2006, 091832) indicated that no sampling was needed at SWMU 16-031(f) based on the operating history of the site and that a request for a Certificate of Completion would be included in the remedy completion report. Thus, the Laboratory requests that a Certificate of Completion (corrective action complete without controls) be granted for SWMU 16-031(f).

The review and evaluation of the 2006 analytical results for the samples collected at AOC 16-024(v) demonstrate that the characterization and remediation is complete. The results show that the nature and extent of contamination is defined for AOC 16-024(v). In addition, the results of the human health screening assessments for AOC 16-024(v) indicate that there is no potential unacceptable risk to human health under a residential scenario. There is no potential risk to ecological receptors because the site has been excavated to approximately 8 ft bgs. Thus, the Laboratory requests that a Certificate of Completion (corrective action complete without controls) be granted for AOC 16-024(v).

During the investigation of SWMU 16-026(r), it was discovered that the overflow drainline from the oil/water separator did not outfall 80 ft south of Building 16-180 (Fire Station #5), but that it was actually tied into the active roof drainline for the building. The roof drainline eventually discharges 3 ft bgs and 200 ft southeast of the fire station in an open field. Results of the 2006 data evaluation for the samples collected from SWMU 16-026(r) demonstrate that the nature and extent of contamination associated with SWMU 16-026(r) has been defined. However, concentrations of polyaromatic hydrocarbons (PAHs) were detected beneath the asphalt parking lot, beneath the drainlines, and within the roof drain outfall area. Based on visual observations of the drainline conditions and the presence of roofing gravel and asphalt within the roof drainline as well as the lack of TPH contamination in the samples collected, the presumed source of the PAHs detected in the samples from SWMU 16-026(r) is the flat composite tar-and-gravel roof and the asphalt parking area. The results of the human health screening assessments indicate that there is no potential unacceptable risk to human health for the industrial and construction worker scenarios under current conditions. The human health screening assessment for a residential scenario indicates potential risk due to the presence of PAHs from the roof drain and asphalt parking lot but not from the SWMU. The ecological screening assessment found no potential risk to ecological receptors. Thus, the Laboratory requests that a Certificate of Completion (corrective action complete without controls) be granted for SWMU 16-026(r).

The following discussion presents a detailed evaluation of COPC identification at AOC 16-024(v) and SWMU 16-026(r) and the nature and extent of inorganic and organic COPCs at each site. A summary of the results of the risk screening assessments conducted at both sites is presented in section 4.2, and the detailed risk screening assessment results are presented in Appendix E.

4.1 Nature and Extent of Contamination

The 2006 data are used for (1) the identification of COPCs at AOC 16-024(v) and SWMU 16-026(r), (2) the evaluation of the nature and extent of contamination at both sites, and (3) a comparison with appropriate target cleanup levels and goals (section 4.2).

4.1.1 Data Quality Review

A total of eight samples, plus two field duplicates, were collected from four locations at AOC 16-024(v). A total of 15 samples, plus five field duplicates, were collected from nine locations at SWMU 16-026(r). The data are of good quality, except as described below, and are representative of current site conditions.

4.1.1.1 AOC 16-024(v)

Several inorganic chemical results were qualified as estimated (J) because the results were less than the estimated detection limit but greater than the method detection limit (MDL). Several inorganic chemical results were qualified as estimated and biased low (J-) because the matrix spike percent recoveries were less than the lower acceptance level but greater than 30% (nondetected results were qualified as estimated detection limits [UJ]). Several inorganic chemicals were qualified as estimated and biased high (J+) because the matrix spike percent recoveries were either above 150% or above the UAL but less than 150%. Other inorganic chemicals were qualified as J+ because the laboratory control sample recovery was above the upper warning limit or the associated initial calibration verification or the continuing calibration verification recovery was above the upper warning limit, but less than or equal to, the UAL. Antimony results in four samples were qualified as rejected (R) because the matrix spike percent recovery was less than 30%.

Several SVOC results were qualified as J because the results were less than the estimated quantitation limit (EQL) but greater than the MDL. The associated percent relative standard deviation (%RSD) or percent difference (%D) exceeded the criteria in the initial or continuing calibration standards for several SVOCs and were either qualified as J if results were detected or UJ if results were nondetects. Four benzoic acid results were qualified as not detected (U) because the associated sampling results were detected at less than 5 times the blank concentration. One benzo(a)anthracene result was qualified as U because the associated mass spectrum did not meet specifications.

Four tetryl results were qualified as UJ because the associated laboratory control sample recovery was less than the lower acceptance level but greater than 10%.

The associated %RSD/%D exceeded the criteria in the initial or continuing calibration standards for several VOCs and were either qualified as J if results were detected or UJ if results were nondetects. Two acetone and one 2-butanone sampling results were qualified as U because the associated sampling results were less than 10 times the method blank concentration. Three toluene, three 1,3+1,4-xylene, one 1,2-xylene, and two 1,2,4-trimethylbenzene sampling results were qualified as U because the associated sampling results were less than 5 times the method blank concentrations.

4.1.1.2 SWMU 16-026(r)

Several inorganic chemical results were qualified as J for one of the following reasons: the results were less than the estimated detection limit but greater than the MDL; the duplicate relative percent difference (RPD) was greater than 35%; the serial dilution sample RPD was greater than 10%; and the sampling result was greater than 50 times the MDL. Several inorganic chemical detects were qualified as J- because the matrix spike percent recoveries were less than the lower acceptance level but greater than 30% (nondetected results were qualified as UJ). Barium, magnesium, and potassium (six sampling results each), zinc (four sampling results), and calcium (three sampling results) were qualified as J+ because the matrix spike percent recoveries were above 150%. Calcium (four sampling results), sodium (two sampling results), and potassium and magnesium (one sampling result each) were qualified as J+ because the matrix spike percent recoveries were above the UAL but less than 150%. Aluminum (12 sampling results) and iron (four sampling results) were qualified as J+ because the laboratory control sample recovery was above the upper warning limit or the associated initial calibration verification; or the continuing calibration verification recovery was above the upper warning limit but less than or equal to the UAL. Antimony results in nine samples were qualified as R because the matrix spike recovery was less than 30%.

Several SVOC results were qualified as J because the results were less than the EQL but greater than the MDL. One benzo(a)pyrene and benzo(b)fluoranthene sampling result each was qualified as J and one benzo(k)fluoranthene, benzo(g,h,i)perylene, dibenz(a,h)anthracene, di-n-octyl phthalate, and indeno(1,2,3-cd)pyrene sampling result each was qualified as UJ because the associated internal standard area counts were less than 50% but greater than 10%. One bis(2-ethylhexyl)phthalate sampling result was qualified as J and several SVOC sampling results were qualified as UJ because the associated %RSD/%D exceeded the criteria in the initial or continuing calibration standards. One 2-methylnaphthalene sampling result was qualified as U because the associated sampling result was detected at less than 5 times the method blank concentration. One benzo(a)anthracene result was qualified as U because the associated mass spectrum did not meet specifications.

Two 1,3+1,4-xylene sampling results, and one sampling result each of acetone, 1,2-xylene, 1,3,5-trimethylbenzene, and 1,1-dichloroethene, were qualified as J because the results were less than the EQL but greater than the MDL. Three dichlorodifluoromethane sampling results and one chloromethane sampling result were qualified as UJ because the associated laboratory control sample recoveries were less than the lower acceptance level but greater than 10%. Several VOC results in one sample were qualified as UJ because the associated internal standard area counts were less than 50% but greater than 10%. Several VOC sampling results were qualified as UJ because the associated %RSD/%D exceeded the criteria in the initial or continuing calibration standards. One acetone sampling result was qualified as U because the associated sampling result was less than 10 times the method blank concentration. Five toluene, three 1,3+1,4-xylene, one 1,2-xylene, and one ethylbenzene sampling results were qualified as U because the associated sampling results were less than 5 times the method blank concentrations. One n-butylbenzene, 1,4-dichlorobenzene, isopropylbenzene, and toluene sampling result each was qualified as U because the associated mass spectrum did not meet specifications.

Three TPH sampling results (two DRO results and one GRO result) were qualified as J because the results were less than the EQL but greater than the MDL. One TPH-GRO sampling result was qualified as J- and two TPH-GRO sampling results were qualified as UJ because the surrogate recovery was less than the lower acceptance level but greater than 10%. Three TPH-DRO sampling results were qualified as U because the associated sampling results were detected at less than 5 times the method blank concentration.

4.1.2 AOC 16-024(v) Data Review

The shallow (0.5–1-ft-bgs) and deep (8–9-ft-bgs) data from the four sampling locations form the basis for the evaluation of the nature and extent of contamination (Figure 3.1-1). Data from the four sampling locations at the 8–9-ft-bgs sampling depth, which is the bottom of the excavation at AOC 16-024(v), represent current conditions; the excavation has subsequently been backfilled with clean fill material. Only the data from 8–9 ft bgs are used in the human health risk screening assessments presented in Appendix E because the shallow material has been excavated. These data are summarized in the following paragraphs.

4.1.2.1 Evaluation of Inorganic Chemicals

Eight soil samples and two field duplicates were collected from four locations at AOC 16-024(v) and analyzed for inorganic chemicals, including TAL metals and perchlorate. Table 3.1-2 summarizes the samples collected and the inorganic chemical analyses requested for each sample.

Eight inorganic chemicals (barium, calcium, cobalt, copper, lead, manganese, perchlorate, and zinc) were detected or detected above background values (BVs) (LANL 1998, 059730) in at least one soil sample (Table 4.1-1). Cadmium was not detected but had detection limits above the soil BV in six samples. Barium, cadmium, calcium, lead, and manganese concentrations and detection limits were within the range of soil background concentrations for each inorganic chemical (LANL 1998, 059730). Barium was detected in two samples at 348 mg/kg and 324 mg/kg, while the background concentrations range from 21 mg/kg to 410 mg/kg (LANL 1998, 059730). Calcium was detected in one sample at a concentration of 6180 mg/kg (compared with a range of background concentrations from 500 mg/kg to 14,000 mg/kg) (LANL 1998, 059730). Cadmium had detection limits in six samples at approximately 0.53 mg/kg to 0.59 mg/kg, while the background concentrations range from 0.2 mg/kg to 2.6 mg/kg (LANL 1998, 059730). Lead and manganese were detected in one sample each at concentrations of 23 mg/kg and 1060 mg/kg, respectively, compared with background concentrations ranging from 2 mg/kg to 28 mg/kg and 76 mg/kg to 1100 mg/kg, respectively (LANL 1998, 059730). None of these inorganic chemicals were retained as COPCs.

Cobalt, copper, and zinc were each detected at a concentration above their soil BVs and above the range of soil background concentrations in one sample (LANL 1998, 059730). Selenium had one detection limit above the soil BV and the range of soil background concentrations (LANL 1998, 059730). Copper, selenium, and zinc were not retained as COPCs because the results exceeding background were in samples collected from 0.5–1 ft bgs, which have been excavated. Perchlorate has no BV and cobalt was detected above soil background in one sample from the 8–9-ft-bgs sampling interval. Cobalt and perchlorate were the only inorganic chemicals retained as COPCs at AOC 16-024(v). Figure 4.1-1 presents the inorganic chemicals detected above background at AOC 16-024(v).

4.1.2.2 Evaluation of Organic Chemicals

Eight soil samples and two field duplicates were collected from four locations at AOC 16-024(v) and analyzed for organic chemicals. Organic chemical analyses included VOCs, SVOCs, and explosive compounds. Table 3.1-2 summarizes the soil samples collected and the organic chemical analyses requested for each sample.

Sixteen organic chemicals were detected in at least one sample (Table 4.1-2). Detected organic chemicals were all PAHs (typically associated with asphalt); no VOCs or explosive compounds were detected. Fourteen of the organic chemicals detected were retained as COPCs because they were detected in at least one of the 8–9-ft-bgs samples. Acenaphthylene and dibenzofuran were not retained as COPCs because each was detected in only the 0.5–1-ft-bgs samples, which have been excavated. Figure 4.1-2 presents the detected organic chemicals at AOC 16-024(v).

4.1.2.3 Spatial Distribution of COPCs at AOC 16-024(v)

The COPCs identified at AOC 16-024(v) are summarized in Table 4.1-3. The samples at AOC 16-024(v) were collected from 0.5–1 ft bgs and from 8–9 ft bgs (Figure 3.1-1). Because the AOC was excavated to a depth of approximately 8 ft, the shallow samples are no longer present. The deeper samples are now covered with approximately 8 ft of clean fill material. The COPCs identified include inorganic chemicals (cobalt and perchlorate) and organic chemicals (PAHs) (Table 4.1-3). The spatial distribution of COPCs detected in samples is depicted in Figures 4.1-1 and 4.1-2.

Cobalt was detected in one 8–9-ft sample above background at a concentration of 14.4 mg/kg; it was not detected above background in the shallower sample at this or other locations. The concentration is less than twice the BV (8.64 mg/kg) and less than twice the maximum soil background concentration (9.5 mg/kg)] (LANL 1998, 059730). In addition, it was not detected above background in any of the other 8–9-ft samples collected at AOC 16-024(v). The extent of cobalt at AOC 16-024(v) is defined and no further sampling is warranted. Perchlorate was detected in all four 8–9-ft samples. Concentrations of perchlorate increased slightly from what had been detected in the shallow samples; concentrations increased by only 0.0006 to 0.007 mg/kg. Based on the low concentrations at depth, no further sampling for the extent of perchlorate is warranted at AOC 16-024(v).

The PAH concentrations, with one exception, in the 8–9-ft samples at each location were less than the concentrations detected in the shallower samples. The one exception was methylnaphthalene[2-] at location 16-26572, which increased slightly at 8–9 ft; the concentration increased from 0.0106 mg/kg at 0.5–1 ft to 0.0727 mg/kg and represents a 0.062 mg/kg change. Methylnaphthalene[2-] was not detected in any other 8-9-ft sample. Therefore, further sampling for methylnaphthalene[2-] is not warranted. The extent of PAHs at AOC 16-024(v) is defined.

4.1.3 SWMU 16-026(r) Data Review

Data from the 15 samples collected above and beneath the overflow drainline at SWMU 16-026(r), beneath the third VCP roof drainline elbow and at the roof drain outfall represent current site conditions (Figure 3.1-2). Several inches of soil located immediately above and below the corroded steel overflow drainline was excavated and placed into a separate roll-off bin pending waste characterization results. The data for the 15 samples collected are summarized in the following paragraphs. Some or all of the data are used in the human health risk screening assessments presented in Appendix E, depending on the scenario evaluated.

4.1.3.1 Evaluation of Inorganic Chemicals

Fifteen soil samples and five field duplicates were collected from nine sampling locations at SWMU 16-026(r) and analyzed for inorganic chemicals, including TAL metals. Table 3.1-2 summarizes the samples collected and the inorganic chemical analyses requested for each sample.

Six inorganic chemicals (calcium, iron, lead, mercury, selenium, and zinc) were detected above BVs (LANL 1998, 059730) in at least one soil sample (Table 4.1-4). Cadmium was not detected but had detection limits above the soil BV in seven samples. Cadmium, calcium, and iron concentrations and detection limits were within the range of soil background concentrations for each inorganic chemical (LANL 1998, 059730). Cadmium had detection limits in seven samples at approximately 0.58 mg/kg to 0.68 mg/kg, while the background concentrations range from 0.2 mg/kg to 2.6 mg/kg (LANL 1998, 059730). Calcium was detected in two samples at concentrations of 8220 mg/kg and 13,600 mg/kg (compared with the range of background concentrations from 500 mg/kg to 14,000 mg/kg) (LANL 1998, 059730). Iron was detected in one sample at a concentration of 22,200 mg/kg compared with background concentrations ranging from 3300 mg/kg to 36,000 mg/kg (LANL 1998, 059730). None of these inorganic chemicals were retained as COPCs.

Lead, mercury, and zinc were each detected at a concentration above their soil BVs and above the range of soil background concentrations in at least one sample (LANL 1998, 059730). Selenium was detected above the soil BV in one sample and had detection limits above the soil BV in four samples. The selenium detection limits in three samples were above the soil BV and the range of soil background concentrations (LANL 1998, 059730); the detected concentration (1.63 mg/kg) above the soil BV was within the range of background concentrations (0.1 mg/kg to 1.7 mg/kg) (LANL 1998, 059730). Lead, mercury, selenium, and zinc were retained as COPCs at SWMU 16-026(r). Figure 4.1-3 presents the inorganic chemicals detected above background at SWMU 16-026(r).

4.1.3.2 Evaluation of Organic Chemicals

Fifteen soil samples and five field duplicates were collected from nine locations at SWMU 16-026(r) and analyzed for organic chemicals. Organic chemical analyses included VOCs, SVOCs, TPH-DRO, and TPH-GRO. Table 3.1-2 summarizes the soil samples collected and the organic chemical analyses requested for each sample.

Twenty-seven organic chemicals were detected in at least one sample (Table 4.1-5). Detected organic chemicals were primarily PAHs, with two other SVOCs and seven VOCs also detected. All of the organic chemicals detected were retained as COPCs. In addition, TPH-DRO was detected in nine samples and TPH-GRO was detected in two samples all at low concentrations (16.0 mg/kg or less and less than 0.1 mg/kg, respectively). Figure 4.1-4 presents the detected organic chemicals at SWMU 16-026(r).

4.1.3.3 Spatial Distribution of COPCs at SWMU 16-026(r)

The COPCs identified at SWMU 16-026(r) are summarized in Table 4.1-6. The spatial distribution of COPCs detected in confirmation samples is depicted in Figures 4.1-3 and 4.1-4. In accordance with the approved work plan, 15 samples were collected from nine locations, including seven locations along the 2-in. steel overflow drainline, one location beneath a cracked bend/elbow in the active roof drainline, and one location at the roof drain outfall (LANL 2006, 092087; NMED 2006, 091524; LANL 2006, 092076; and NMED 2006, 091832).

The SWMU 16-026(r) samples were collected from 0.5–1.0 ft bgs and 4–5 ft bgs (Figure 3.1-2). The deeper samples were collected after the removal of the overflow drainline and surrounding soil (4–5 ft bgs) and at the roof drain outfall (3-3.5 ft bgs). The COPCs identified include inorganic chemicals (lead, mercury, selenium, and zinc) (Figure 4.1-3 and Table 4.1-4) and organic chemicals [PAHs, acetone, bis(2-ethylhexyl)phthalate, butanone(2-), dibenzofuran, dichloroethene(1,1-), methylphenol(2-), TPH-DRO, TPH-GRO, trimethylbenzene(1,2,4-), trimethylbenzene(1,3,5-), xylene(1,2-), and xylene(1,3+1,4-)] (Figure 4.1-4 and Table 4.1-5). The source of the PAHs in the shallow samples is presumed to be the asphalt-paved areas. The source of the PAHs measured in the deeper samples is presumed to be the flat composite tar-and-gravel roof and the active roof drain for Building 16-180 (the fire station).

Metals detected in the deeper confirmation samples from SWMU 16-026(r) were likely from the corroded overflow drainline. Lead was detected in only one sample collected beneath the former overflow drainline (location 16-26981) at a concentration slightly above the soil background concentrations (33.7 mg/kg compared with a maximum soil background concentration of 28 mg/kg). The extent is defined for lead and no further sampling for lead is warranted. Mercury was detected above BV (0.1 mg/kg) in the sample from the outfall (location 16-26980) at a concentration of 0.282 mg/kg. Mercury was not detected above BV beneath the overflow drainline. The extent for mercury is defined beneath the overflow drainline, but the extent is not defined at the roof drain outfall. Selenium was detected in one sample beneath the former overflow drainline (location 16-26575) at a concentration within the range of soil background concentrations (1.63 mg/kg compared with a maximum soil background concentration of 1.7 mg/kg). The extent is defined for selenium and no further sampling for selenium is warranted. Zinc was detected in one sample collected beneath the former overflow drainline (location 16-26977) at a concentration above soil background concentrations, which likely is the result of the corroded overflow drainline and not from a release from that drainline. The other detected concentrations from samples beneath the former overflow drainline were within the range of soil background concentrations (49.4 mg/kg to 52.9 mg/kg compared with a maximum soil background concentration of 75.5 mg/kg). Zinc was not detected above BV at location 16-26579, which is approximately 15 ft north of location 16-26977 and was detected within the range of background at location 16-26978, which is approximately 20 ft south of location 16-26977. The extent of zinc is defined beneath the overflow drainline and is defined at the roof drain outfall.

PAHs were detected in samples collected above and beneath the former overflow drainline and in the roof drain outfall sample. The highest concentrations of all but one PAH were detected in the roof drain outfall sample (location 16-26980), which are presumed to be from the flat composite tar-and-gravel roof and the active roof drain and not from the oil/water separator. The concentrations of PAHs at the outfall were 8 to 31 times higher than the next highest detected concentration, which are generally in shallow samples above the overflow drainline and not from samples below the overflow drainline. The concentrations of PAHs at the roof drain outfall location were 97 to 891 times higher than the highest concentrations detected beneath the overflow drainline. PAHs were also detected in three shallow samples, which are not related to the oil/water separator. Two of the shallow samples had the next highest concentrations of PAHs, which came from the asphalt parking area overlying the overflow drainline. The asphalt has experienced subsidence and cracking and has required regular asphalt patching over the years. The extent of PAHs at the active roof drain outfall is not defined, although the type and distribution of PAHs indicates that SWMU 16-026(r) is not the source of the PAHs.

TPH–DRO was detected in three samples collected from beneath the former overflow drainline and in six shallow samples above the overflow drainline at concentrations of 16 mg/kg or less. The four highest TPH-DRO concentrations were detected in the shallow samples collected above the overflow drainline. TPH-GRO was detected in two shallow samples at concentrations less than the EQLs. Neither TPH-DRO nor TPH-GRO was detected in the outfall sample (sampling location 16-26980) or in the sample collected beneath the bend in the active roof drainline (sampling location 16-26981). Years of vehicles parking and driving on the damaged asphalt parking area on the southern side of Building 16-180 (the fire station) and the flat composite tar-and-gravel roof likely are the sources of the TPH-DRO and TPH-GRO detects in the shallow samples and along the former overflow drainline. Based on the low and vertically decreasing concentrations and the distribution of the sampling results, further sampling for the extent of TPH is not warranted.

In addition to the PAHs, acetone, dibenzofuran, and methylphenol[4-] were detected in the roof drain outfall sample. The acetone and methyphenol[4-] concentrations were less than the EQLs and further sampling for extent is not warranted. The extent of dibenzofuran at the roof drain outfall is not defined. Acetone, bis(2-ethylhexyl)phthalate, butanone(2-), xylene(1,2-), and xylene(1,3+1,4-) were detected in only one sample beneath the overflow drainline at concentrations less than or slightly above the EQLs. Further sampling for extent of these COPCs beneath the overflow drainline is not warranted. Dichloroethene[1,1-] and xylene[1,3+1,4-] were each detected in one shallow sample above the overflow drainline, and dibenzofuran was detected in two shallow samples above the overflow drainline at concentrations less than or slightly above (one dibenzofuran result) the EQLs. Further sampling for extent of dichloroethene[1,1-], xylene[1,3+1,4-], and dibenzofuran is not warranted. The distribution of PAHs and other organic chemicals does not indicate that SWMU 16-026(r) was the source of these chemicals. The most common source of the PAHs and dibenzofuran detected in the deeper samples, the roof drain outfall, and in shallow soil samples collected above the oil/water separator overflow drainline are coal tar products, including asphalt/tar roofing and asphalt paving and patching compounds (ATSDR 2002, 095015). Based on visual observations during ACA activities (corroded lines and gravel/asphalt in the roof drainline), the sampling results, and the distribution of the contaminants, the contamination encountered is from the asphalt-paved area, the flat composite tar-and-gravel roof, and the active roof drain and not from SWMU 16-026(r).

4.2 Cleanup Levels

The industrial SSLs are the most appropriate target cleanup levels for the evaluations because the current and reasonably foreseeable future land use at the sites is industrial. Construction worker SSLs were evaluated because construction activity may occur in the future. Residential SSLs were also evaluated and AOC 16-024(v) was found to meet NMED's target levels under this scenario. Therefore, residential SSLs are the basis for recommendations at AOC 16-024(v), while industrial SSLs are used for SWMU 16-026(r).

4.2.1 AOC 16-024(v)

The residential SSLs were the target cleanup levels for this AOC. In addition, construction worker SSLs were evaluated. The evaluation compared the COPC concentrations from the 8–9-ft depth interval (the only depth interval with sampling results after excavation) with residential and construction worker SSLs.

The exposure point concentrations (EPCs) for noncarcinogenic COPCs were less than their respective residential and construction worker SSLs. The HIs for the noncarcinogenic COPCs are approximately 0.01 and 0.2, respectively (Table E-1.1-4 in Appendix E), which are less than NMED's target HI of 1.0 (NMED 2006, 092513). The EPCs for carcinogenic COPCs were less than their respective construction worker SSLs and resulted in a total excess cancer risk of approximately 4×10^{-7} (Table E-1.1-8 in Appendix E), which is less than the NMED target level for carcinogenic risk of 1×10^{-5} (NMED 2006, 092513). The EPCs for carcinogenic COPCs were also less than their respective residential SSLs, except for benzo(a)pyrene, which slightly exceeded its residential SSL (Table E-1.1-5 in Appendix E). The total excess cancer risk for the residential scenario is approximately 1×10^{-5} (Table E-1.1-5 in Appendix E), which is equivalent to the NMED target level for carcinogenic risk of 1×10^{-5} (NMED 2006, 092513).

The AOC also does not present a potential ecological risk because the site has been excavated to approximately 8 ft bgs and no complete pathways to receptors exist.

4.2.2 SWMU 16-026(r)

The industrial SSLs were the target cleanup levels for SWMU 16-026(r). In addition, construction worker and residential SSLs were evaluated. The evaluation compared the COPC concentrations from the 0.5–1-ft depth interval with industrial SSLs and concentrations from the 0.5–5-ft depth interval with residential and construction worker SSLs.

The EPCs for noncarcinogenic COPCs were less than their respective industrial, construction worker, and residential SSLs. The HIs for the noncarcinogenic COPCs are approximately 0.08, 0.1, and 0.5, respectively (Tables E-1.1-6 and E-1.1-7 in Appendix E), which are less than NMED's target HI of 1.0 (NMED 2006, 092513). The EPCs for carcinogenic COPCs were less than their respective industrial and construction worker SSLs and resulted in a total excess cancer risk of approximately 1×10^{-5} and 7×10^{-6}, respectively (Tables E-1.1-8 and E-1.1-9 in Appendix E), which are equivalent to or less than the NMED target level for a carcinogenic risk of 1×10^{-5} (NMED 2006, 092513). The EPCs for carcinogenic COPCs exceeded their respective residential SSLs for several COPCs (Appendix E's Table E-1.1-9). The total excess cancer risk for the residential scenario is approximately 3×10^{-4} (Appendix E's Table E-1.1-9), which is above the NMED target level for carcinogenic risk of 1×10^{-5} (NMED 2006, 092513).

The TPH-DRO concentrations were less than NMED's industrial and residential screening guidelines for diesel fuel #2/crankcase oil (NMED 2006, 094614) (Appendix E's Table E-1.1-10). Although there are no NMED screening guidelines for TPH-GRO, the detected concentrations (0.0352 mg/kg and 0.0371 mg/kg) are low and do not indicate a release of gasoline.

The ecological screening assessment found no potential risk to ecological receptors.

4.3 Controls

The Laboratory is requesting a Certificate of Completion (corrective action complete without controls) from NMED for SWMU 16-031(f) based on historical operating information for the former drinking water chlorinating station. The current and reasonably foreseeable future land use for SWMU 16-031(f) is industrial. However, because SWMU 16-031(f) poses no unacceptable risk to human health or the environment it is appropriate to conclude that no site controls and future actions are necessary.

The Laboratory is requesting a Certificate of Completion (corrective action complete without controls) from NMED for AOC 16-024(v) based on results of the 2006 investigation and remediation activities. The current and reasonably foreseeable future land use for AOC 16-024(v) is industrial. However, the risk screening assessment did not indicate a potential unacceptable risk under a residential scenario (risks were less than or equivalent to NMED's target levels) as well as a construction worker scenario. The AOC also does not present a potential ecological risk because the site has been excavated to approximately 8 ft bgs and no complete pathways to receptors exist. Because AOC 16-024(v) poses no unacceptable risk to human health for the residential scenario and the environment it is appropriate to conclude that no site controls and future actions are necessary.

The Laboratory is requesting a Certificate of Completion (corrective action complete without controls) from NMED for SWMU 16-026(r) based on results of the 2006 investigation and remediation activities. The current and reasonably foreseeable future land use for SWMU 16-026(r) is industrial; the results of the human health screening assessments indicate no potential unacceptable risk to human health for the industrial and construction worker scenarios under current conditions. The human health screening assessment for a residential scenario indicates potential risk due to the presence of PAHs from the roof drain and asphalt parking lot but not from the SWMU. The Laboratory intends to retain ownership of the property indefinitely and will continue to restrict the property to industrial use only. The ecological screening assessment found no potential risk to ecological receptors. The roof drainline and outfall will be rerouted by FME-IFCS pursuant to Title 20, Chapter 6, Part 2, Section 1203 – Notification of Discharge Removal of NMAC of the New Mexico WQCC regulations.

4.4 Conclusions and Recommendations

SWMU 16-031(f), located in the Upper Water Canyon Aggregate Area, will be impacted by the infrastructure upgrades; however, neither characterization nor remediation activities were performed at this site since historic information indicates that past operations could not have impacted the area. As a result, the Laboratory requests that SWMU 16-031(f) be approved as corrective action complete without controls.

The review and evaluation of the 2006 analytical data collected from AOC 16-024(v) demonstrate that the ACA activities conducted at the site have satisfied Consent Order requirements. The site analytical data demonstrate that inorganic chemical and organic chemical contamination is adequately characterized, with concentrations decreasing with depth in almost all cases. The low COPC concentrations indicate that increasing concentrations in deeper depth intervals are unlikely. Further, the site does not pose an unacceptable risk to human health under the residential (and construction worker) scenario or to the environment, and no further action is required. As a result, the Laboratory requests that AOC 16-024(v) be approved as corrective action complete without controls.

The review and evaluation of the 2006 analytical data collected from SWMU 16-026(r) demonstrate that the ACA activities conducted at the site have satisfied Consent Order requirements. The analytical data demonstrate that inorganic chemical and organic chemical contamination associated with the oil/water separator overflow drainline is adequately characterized. Characteristics of the PAHs detected beneath the asphalt parking lot and within the roof drain outfall indicate that increasing concentrations at deeper depth intervals are unlikely because PAHs tend to bind strongly to soil particles and do not dissolve readily in water. In addition, the visual observations of the drainline and soil conditions made during the ACA as well as the sampling results and the distribution of contaminants indicate that the PAHs and the other inorganic and organic chemicals detected are not related to releases from the oil/water separator. The human health risk assessments indicate that no potential unacceptable risk is posed to human health under the industrial and construction worker scenarios or to the environment. The human health screening assessment for a residential scenario indicates potential risk due to the presence of PAHs from the roof drain and asphalt parking lot but not from the SWMU. As a result, the Laboratory requests that SWMU 16-026(r) be approved as corrective action complete without controls.

5.0 REFERENCES AND MAP DATA SOURCES

5.1 References

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

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the DOE–Los Alamos Site Office (LASO); EPA, Region 6; and the EP 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.

ATSDR (Agency for Toxic Substances and Disease Registry), September 2002. "Toxicological Profile for Wood Creosote, Coal Tar Creosote, Coal Tar, Coal Tar Pitch, and Coal Tar Pitch Volatiles," Atlanta, Georgia. (ATSDR 2002, 095015)

EPA (U.S. Environmental Protection Agency), 1997. "Test Methods for Evaluating Solid Waste, Laboratory Manual, Physical/Chemical Methods," SW-846, 3rd ed., Update III, Office of Solid Waste and Emergency Response, Washington, D.C. (EPA 1997, 057589)

EPA (U.S. Environmental Protection Agency), December 2006. "EPA Region 6 Human Health Medium-Specific Screening Levels," Environmental Protection Agency Region 6, Dallas, Texas. (EPA 2006, 094321)

Gardner, J.L., S.L. Reneau, C.J. Lewis, A. Lavine, D.J. Krier, G. WoldeGabriel, and G.D. Guthrie, 2001. "Geology of the Pajarito Fault Zone in the Vicinity of S-Site (TA-16), Los Alamos National Laboratory, Rio Grande Rift, New Mexico," Los Alamos National Laboratory report LA-13831-MS, Los Alamos, New Mexico. (Gardner et al. 2001, 070106)

Goering, D., August 22, 2006. AOC 16-024(v). E-mail message to M. Shurter (LANL) from D. Goering (NMED), Santa Fe, New Mexico. (Goering 2006, 095024)

LANL (Los Alamos National Laboratory), July 1995. "RFI Work Plan for Operable Unit 1082, Addendum 2," Los Alamos National Laboratory document LA-UR-95-1038, Los Alamos, New Mexico. (LANL 1995, 057225)

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

LANL (Los Alamos National Laboratory), December 2000. "University of California, Los Alamos National Laboratory (LANL), I8980SOW0-8S, Statement of Work for Analytical Laboratories," Rev. 1, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2000, 071233)

LANL (Los Alamos National Laboratory), December 2004. "Screening Level Ecological Risk Assessment Methods, Revision 2," Los Alamos National Laboratory document LA-UR-04-8246, Los Alamos, New Mexico. (LANL 2004, 087630)

LANL (Los Alamos National Laboratory), August 8, 2005. “Proposed Format for Remedy Completion Reports for Accelerated Corrective Actions,” Los Alamos National Laboratory letter (ER2005-0420) to J.P. Bearzi (NMED HWB) from D. McInroy (ENV-ERS Deputy Program Director), and D. Gregory (DOE Federal Project Director), Los Alamos, New Mexico. (LANL 2005, 089553)

LANL (Los Alamos National Laboratory), September 2005. “ECORISK Database Release 2.2,” Los Alamos National Laboratory document LA-UR-05-7424, Los Alamos, New Mexico. (LANL 2005, 090032)

LANL (Los Alamos National Laboratory), September 2006. “Investigation Work Plan for Cañon de Valle Aggregate Area,” Los Alamos National Laboratory document LA-UR-06-4960, Los Alamos, New Mexico. (LANL 2006, 091698)

LANL (Los Alamos National Laboratory), January 2006. “Accelerated Corrective Action Work Plan for Area of Concern 16-024(v) and Solid Waste Management Units 16-026(r) and 16-031(f) at Technical Area 16,” Los Alamos National Laboratory document LA-UR-05-3979, Los Alamos, New Mexico. (LANL 2006, 092087)

LANL (Los Alamos National Laboratory), March 9, 2006. “Response to the Notice of Disapproval for the Accelerated Corrective Action Work Plan for Area of Concern 16-024(v) and Solid Waste Management Units 16-026(r) and 16-031(f) at Technical Area 16,” Los Alamos National Laboratory letter (ER2006-0136) to J.P. Bearzi (NMED HWB) from D. McInroy (ENV-ERS Deputy Program Director), and D. Gregory (DOE Federal Project Director), Los Alamos, New Mexico. (LANL 2006, 092076)

LASL (Los Alamos Scientific Laboratory), August 15, 1951. “Service Area Project "N" TA-16 Phase B Plumbing, Bldg #(180), Plans & Details,” Engineering Drawing ENG-C 7160, sheet number 58 of 80, Los Alamos, New Mexico. (LASL 1951, 090191)

LASL (Los Alamos Scientific Laboratory), August 15, 1951. “Service Area Project "N," TA-16 Phase B, Utilities Plot Plan,” Engineering Drawing ENG-C 7158, sheet number 56 of 80, Los Alamos, New Mexico. (LASL 1951, 024052)

LASL (Los Alamos Scientific Laboratory), June 9, 1961. “Modification of Parking Area Fire Station Building No. 180, TA-16, Plot and Plan Sections,” Engineering Drawing Z-2223, Los Alamos, New Mexico. (LASL 1961, 094823)

NMED (New Mexico Environment Department), February 3, 2006. “Notice of Disapproval, Accelerated Corrective Action Work Plan for Area of Concern 16-024(v) and Solid Waste Management Units 16-026(r) and 16-031(f) at Technical Area 16, Los Alamos National Laboratory, EPA ID #NM0890010515, HWB-LANL-06-003,” New Mexico Environment Department letter to D. Gregory (DOE Federal Project Director), and D. McInroy (ENV-ERS Deputy Program Director) from J.P. Bearzi (NMED HWB), Santa Fe, New Mexico. (LANL 2006, 091524)

NMED (New Mexico Environment Department), June 2006. “Technical Background Document for Development of Soil Screening Levels, Revision 4.0,” Vol. 1, Tier 1: Soil Screening Guidance Technical Background Document, New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2006, 092513)

NMED (New Mexico Environment Department), October 2006. “New Mexico Environment Department TPH Screening Guidelines,” Santa Fe, New Mexico. (NMED 2006, 094614)

Santa Fe Engineering Ltd., 1992. "Wastewater Stream Characterization for TA-16-7, -10, -13, -16, -21, -27, -54, -58, -59, -61, -63, -73, -76, -75, -77, -78, -80, -88, -99, -164, -171, -180, -210, -243, -245, -246, -247, -332, -404, -412, -421, 445, -515, -516, -518, -519, -520, -560, -599, -1371, -1371, -1407, -1413, -1414, -1415, -1461, and 1421, at Los Alamos National Laboratory," Santa Fe Engineering, Ltd., Santa Fe, New Mexico. (Santa Fe Engineering 1992, 015326)

5.2 Map Data Sources

Data Sources for Figures 1.1-1 through 4.1-4.

Communication Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 08 August 2002, as published 27 October 2006.

Former Sanitary Sewer Lines, Industrial Waste Lines, Building Drain Lines and Storm Drain Lines of the Los Alamos Site; Los Alamos National Laboratory, ERSS Division, EP2007-0128; 1:2,500 Scale Data; 27 February 2007.

Former Structures of the Los Alamos Site; Los Alamos National Laboratory, Environment and Remediation Support Services Division, EP2007-0124; 1:2,500 Scale Data; 22 February 2007.

Hypsography: 2, 10, 20, and 100 Foot Contour Interval; Los Alamos National Laboratory, RRES Remediation Services Project; 1991.

LANL Occupation and Exterior Perimeter of DOE Land; Los Alamos National Laboratory, Site Planning & Project Initiation Group Infrastructure Planning Division; 21 December 2006.

LANL Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group Infrastructure Planning Division; 21 December 2006.

Paved and Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004, as published 27 October 2006.

Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Environment and Remediation Support Services Division, EP2007-0083; 06 February 2007.

Potential Release Sites; Los Alamos National Laboratory, Environment and Remediation Support Services Division, GIS/Geotechnical Services Group, EP2007-0117;1:2,500 Scale Data; 16 February 2007.

Primary Electric Grid; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 27 October 2006.

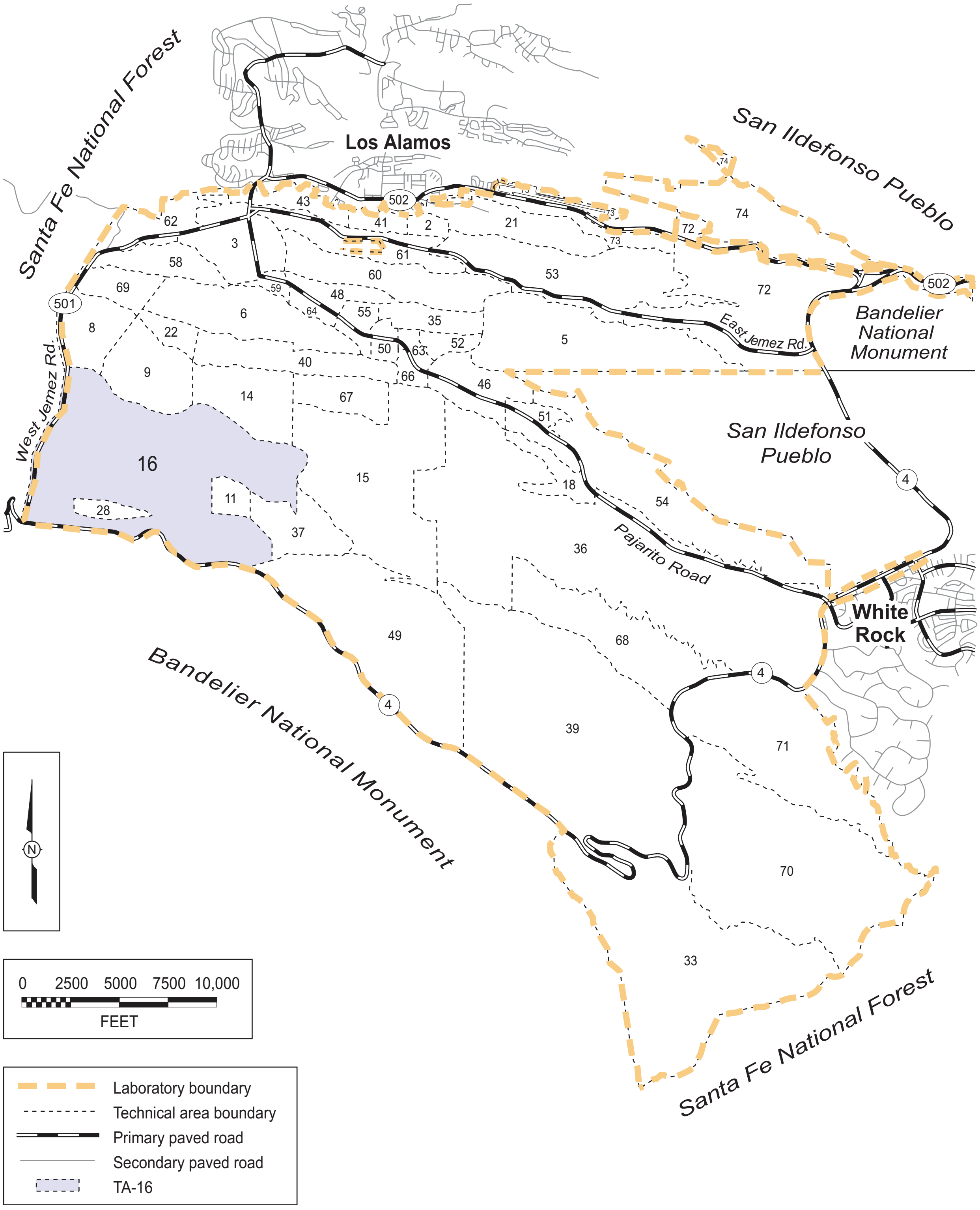
Primary Gas Distribution Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 27 October 2006.

Security and Industrial Fences and Gates; LANL, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 27 October 2006.

Sewer Line System; LANL, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 27 October 2006.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 27 October 2006.

Water Lines; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 27 October 2006.



F1, ACA WP TA-16, 011106, ptm

Figure 1.1-1 **Location of TA-16 with respect to the Laboratory TAs and surrounding land holdings**

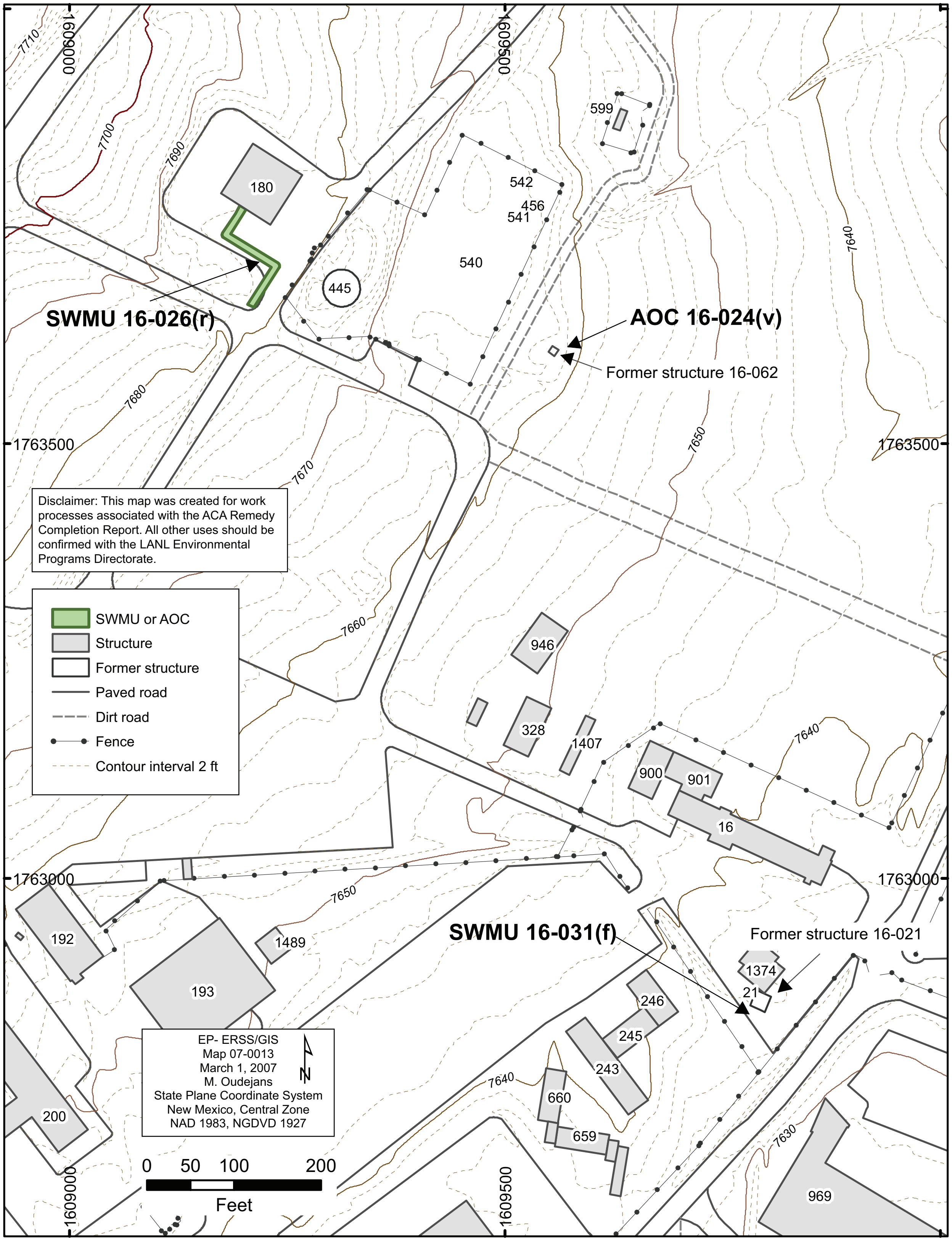
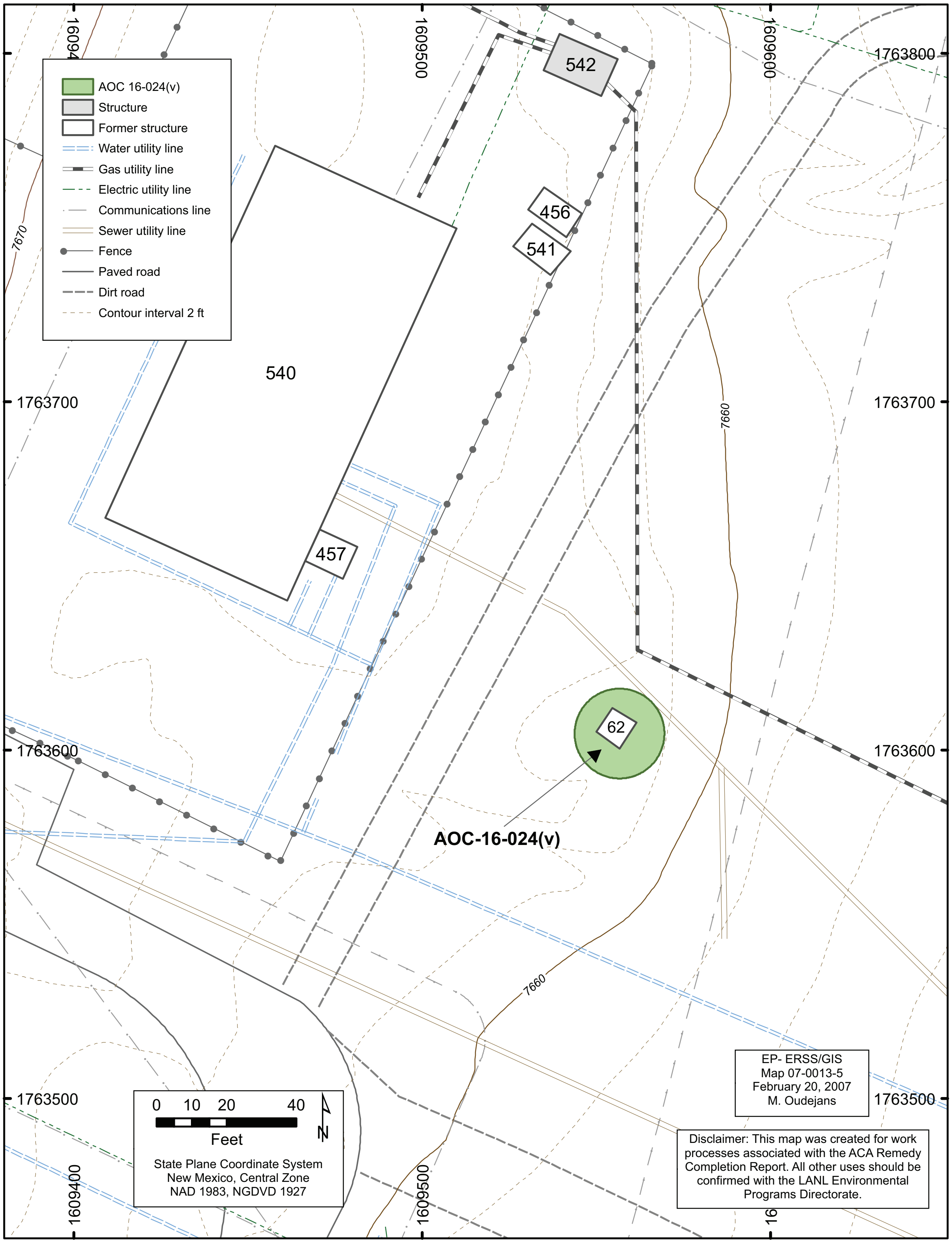


Figure 1.1-2 Locations of AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f) at TA-16



EP- ERSS/GIS
Map 07-0013-5
February 20, 2007
M. Oudejans

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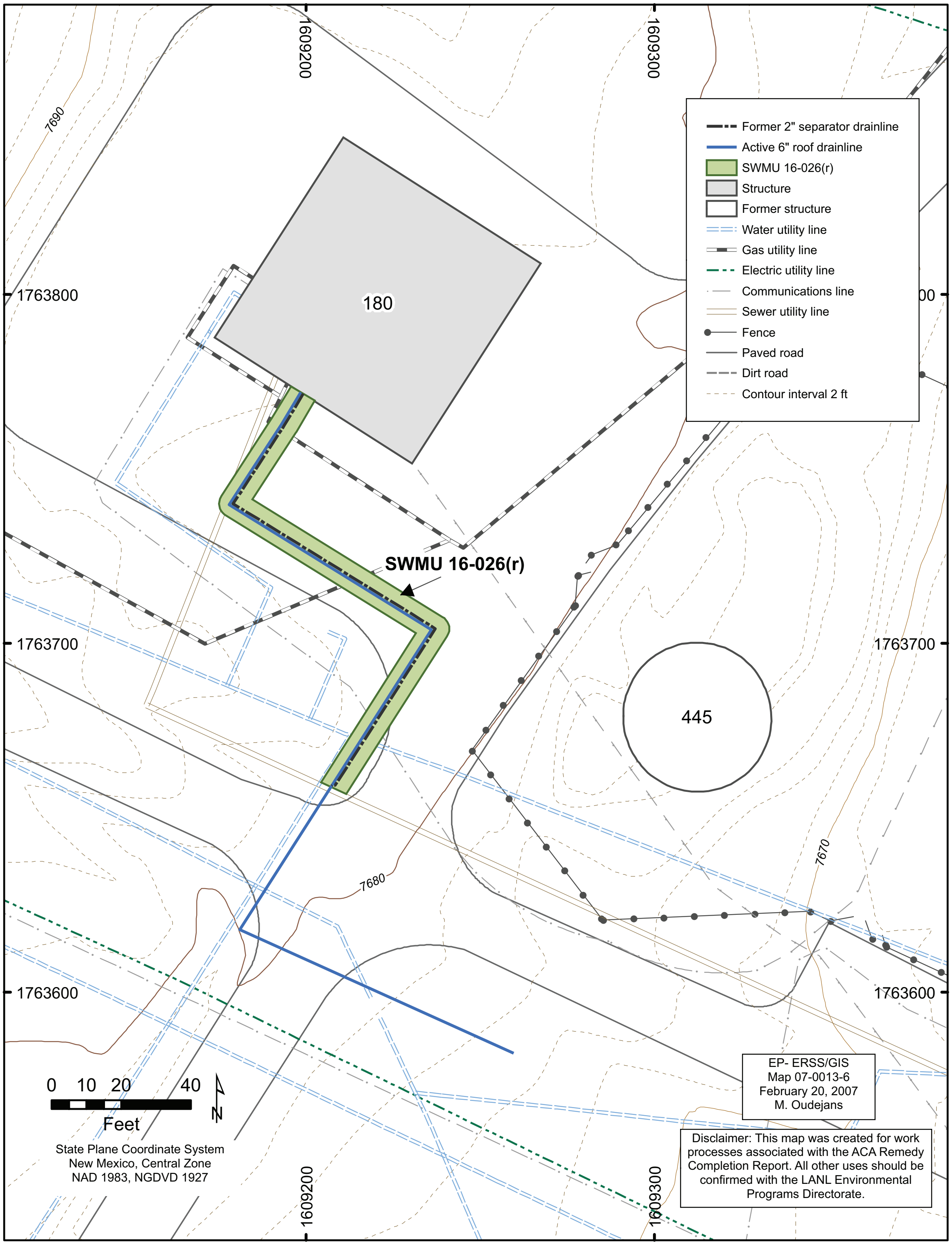
Figure 2.1-1 Location of AOC 16-024(v)



State Plane Coordinate System
New Mexico, Central Zone
NAD 1983, NGDVD 1927

EP- ERSS/GIS
Map 07-0013-6
February 20, 2007
M. Oudejans

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Figure 2.1-2 Location of SWMU 16-026(r)

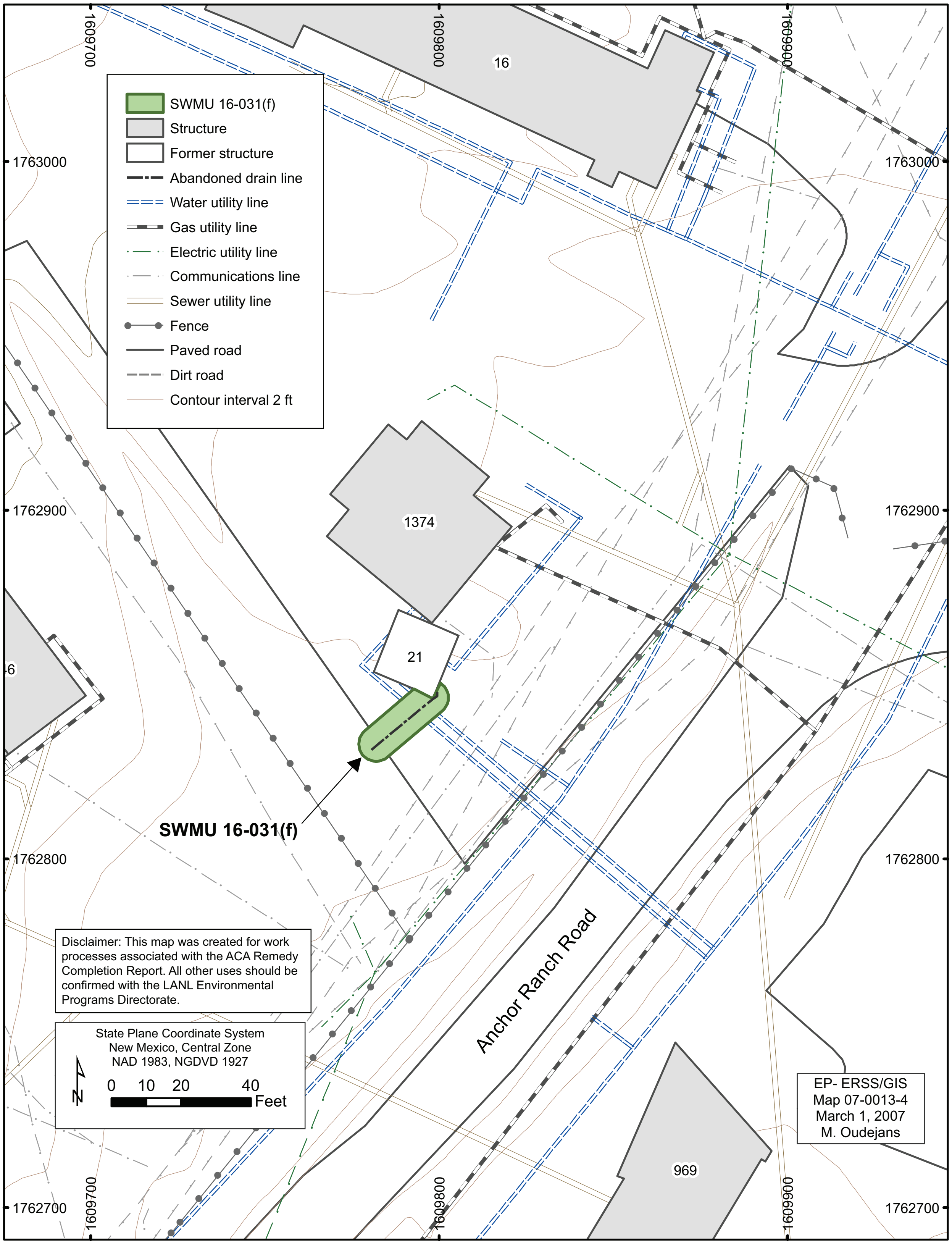


Figure 2.1-3 Location of SWMU 16-031(f)

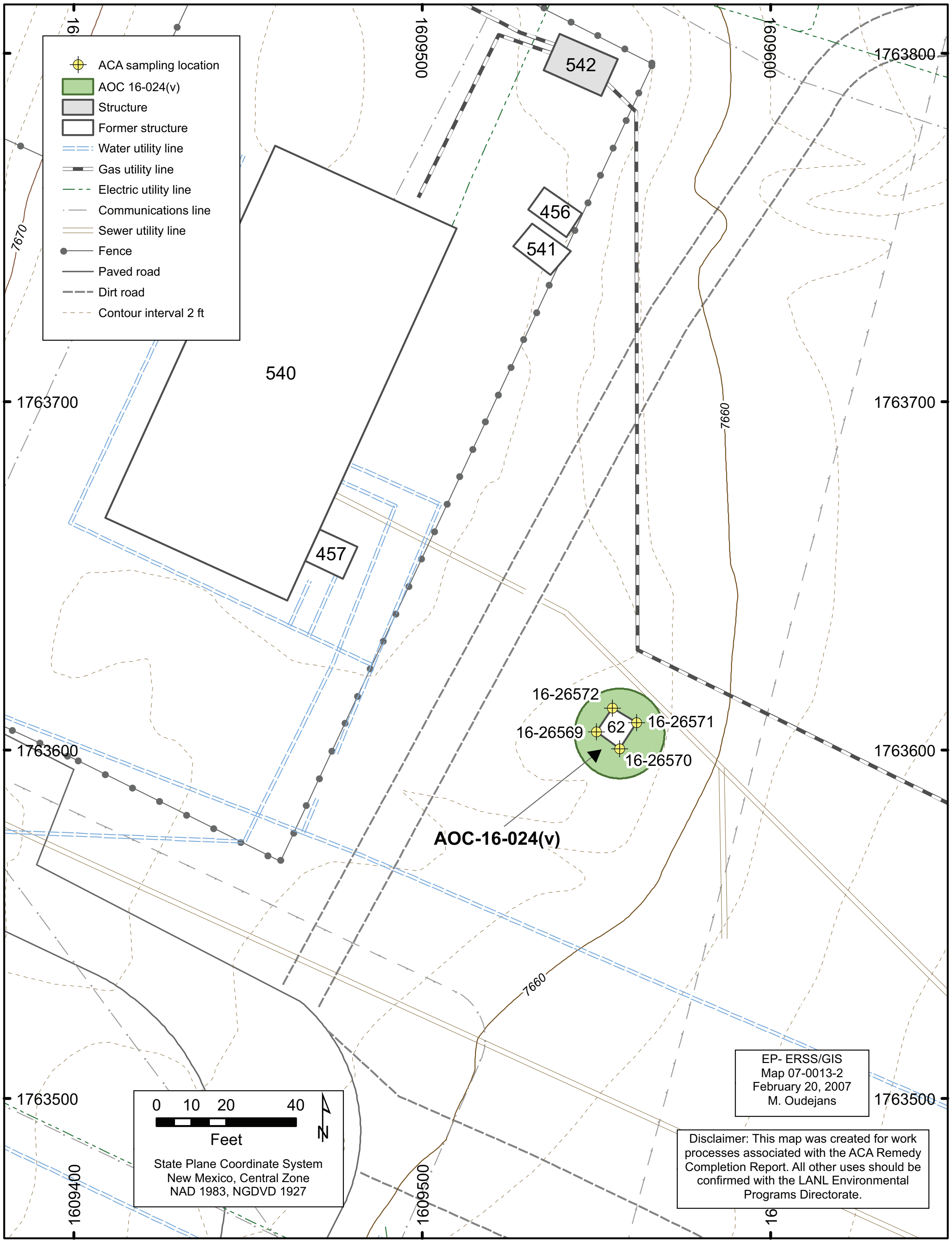


Figure 3.1-1 ACA sampling locations at AOC 16-024(v)

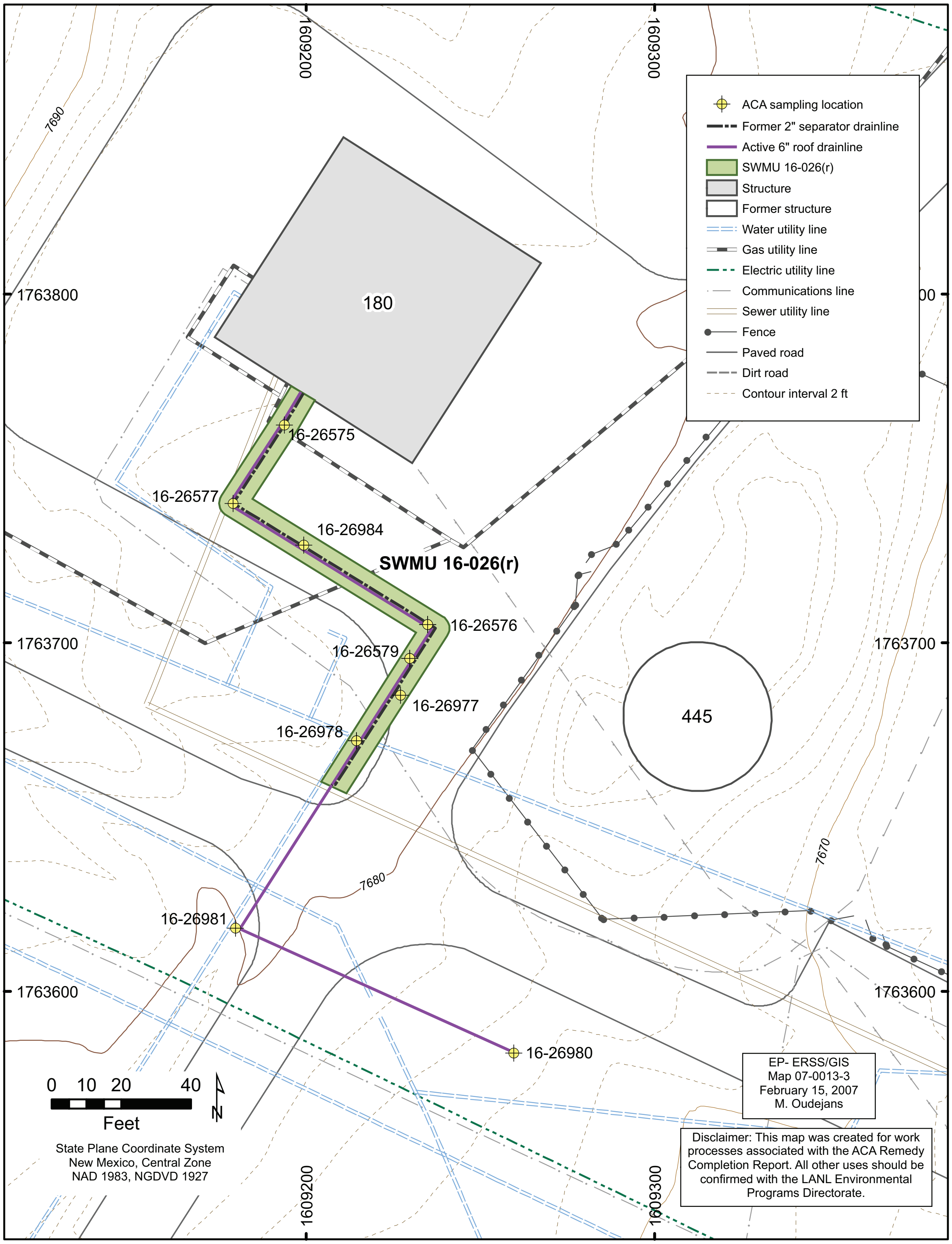


Figure 3.1-2 ACA sampling locations at SWMU 16-026(r)

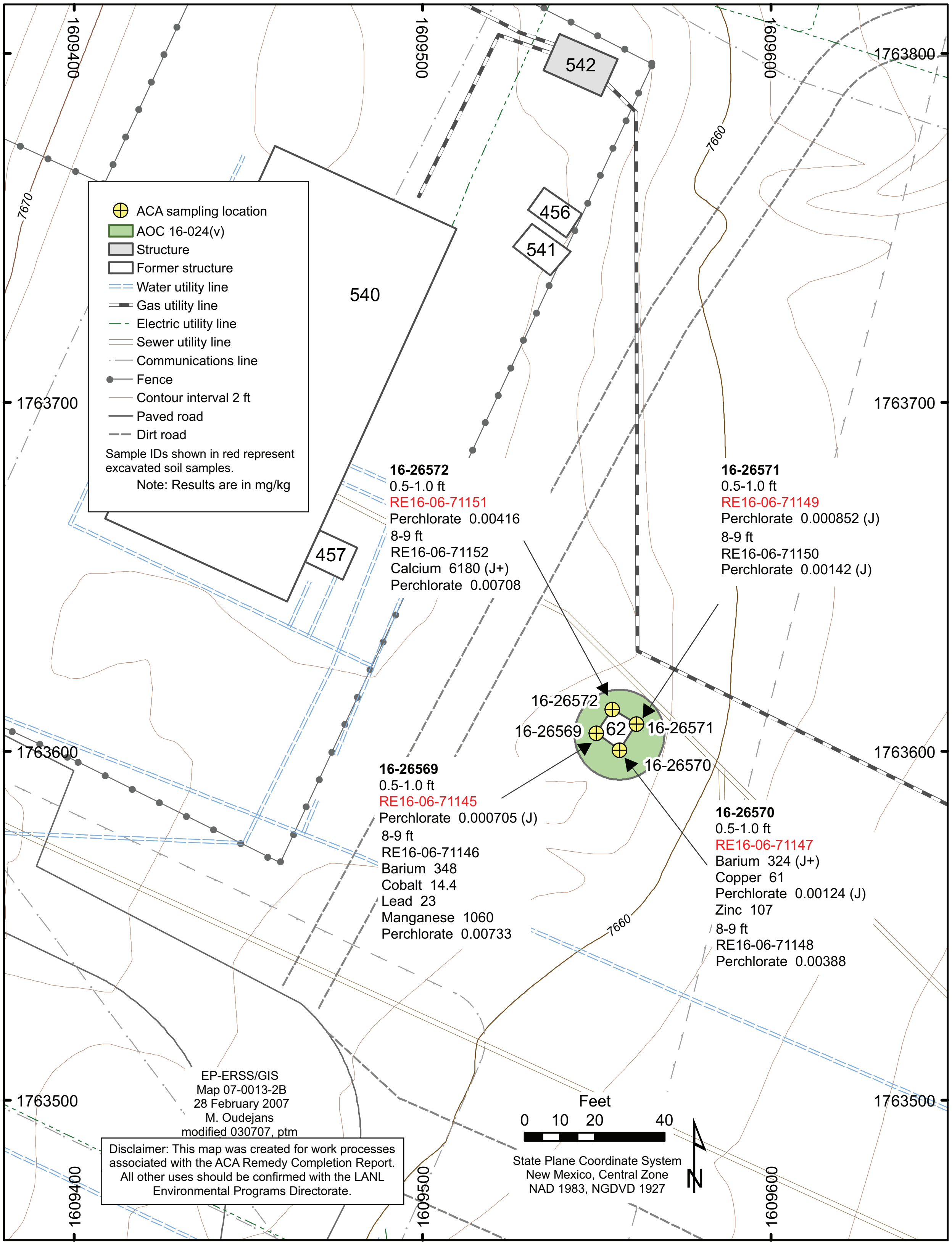
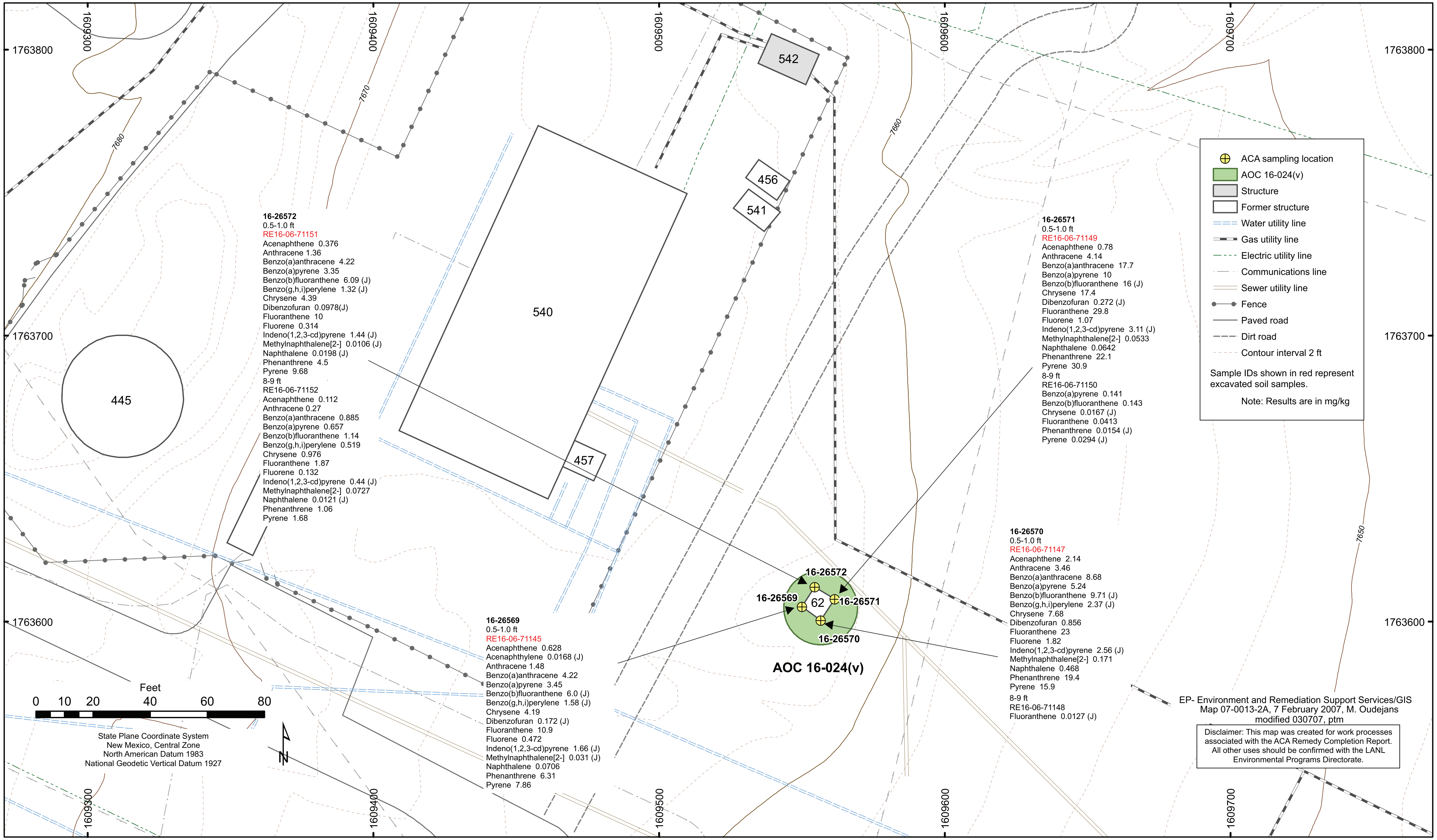


Figure 4.1-1 Inorganic chemicals detected above BVs at AOC 16-024(v)



16-26572
0.5-1.0 ft
RE16-06-71151
Acenaphthene 0.376
Anthracene 1.36
Benzo(a)anthracene 4.22
Benzo(a)pyrene 3.35
Benzo(b)fluoranthene 6.09 (J)
Benzo(g,h,i)perylene 1.32 (J)
Chrysene 4.39
Dibenzofuran 0.0978(J)
Fluoranthene 10
Fluorene 0.314
Indeno(1,2,3-cd)pyrene 1.44 (J)
Methylnaphthalene[2-] 0.0106 (J)
Naphthalene 0.0198 (J)
Phenanthrene 4.5
Pyrene 9.68
8-9 ft
RE16-06-71152
Acenaphthene 0.112
Anthracene 0.27
Benzo(a)anthracene 0.885
Benzo(a)pyrene 0.657
Benzo(b)fluoranthene 1.14
Benzo(g,h,i)perylene 0.519
Chrysene 0.976
Fluoranthene 1.87
Fluorene 0.132
Indeno(1,2,3-cd)pyrene 0.44 (J)
Methylnaphthalene[2-] 0.0727
Naphthalene 0.0121 (J)
Phenanthrene 1.06
Pyrene 1.68

16-26571
0.5-1.0 ft
RE16-06-71149
Acenaphthene 0.78
Anthracene 4.14
Benzo(a)anthracene 17.7
Benzo(a)pyrene 10
Benzo(b)fluoranthene 16 (J)
Chrysene 17.4
Dibenzofuran 0.272 (J)
Fluoranthene 29.8
Fluorene 1.07
Indeno(1,2,3-cd)pyrene 3.11 (J)
Methylnaphthalene[2-] 0.0533
Naphthalene 0.0642
Phenanthrene 22.1
Pyrene 30.9
8-9 ft
RE16-06-71150
Benzo(a)pyrene 0.141
Benzo(b)fluoranthene 0.143
Chrysene 0.0167 (J)
Fluoranthene 0.0413
Phenanthrene 0.0154 (J)
Pyrene 0.0294 (J)

16-26570
0.5-1.0 ft
RE16-06-71147
Acenaphthene 2.14
Anthracene 3.46
Benzo(a)anthracene 8.68
Benzo(a)pyrene 5.24
Benzo(b)fluoranthene 9.71 (J)
Benzo(g,h,i)perylene 2.37 (J)
Chrysene 7.68
Dibenzofuran 0.856
Fluoranthene 23
Fluorene 1.82
Indeno(1,2,3-cd)pyrene 2.56 (J)
Methylnaphthalene[2-] 0.171
Naphthalene 0.468
Phenanthrene 19.4
Pyrene 15.9
8-9 ft
RE16-06-71148
Fluoranthene 0.0127 (J)

16-26569
0.5-1.0 ft
RE16-06-71145
Acenaphthene 0.628
Acenaphthylene 0.0168 (J)
Anthracene 1.48
Benzo(a)anthracene 4.22
Benzo(a)pyrene 3.45
Benzo(b)fluoranthene 6.0 (J)
Benzo(g,h,i)perylene 1.58 (J)
Chrysene 4.19
Dibenzofuran 0.172 (J)
Fluoranthene 10.9
Fluorene 0.472
Indeno(1,2,3-cd)pyrene 1.66 (J)
Methylnaphthalene[2-] 0.031 (J)
Naphthalene 0.0706
Phenanthrene 6.31
Pyrene 7.86

State Plane Coordinate System
New Mexico, Central Zone
North American Datum 1983
National Geodetic Vertical Datum 1927

EP- Environment and Remediation Support Services/GIS
Map 07-0013-2A, 7 February 2007, M. Oudejans
modified 030707, ptm

Disclaimer: This map was created for work processes associated with the ACA Remedy Completion Report. All other uses should be confirmed with the LANL Environmental Programs Directorate.

Figure 4.1-2 Organic chemicals detected at AOC 16-024(v)

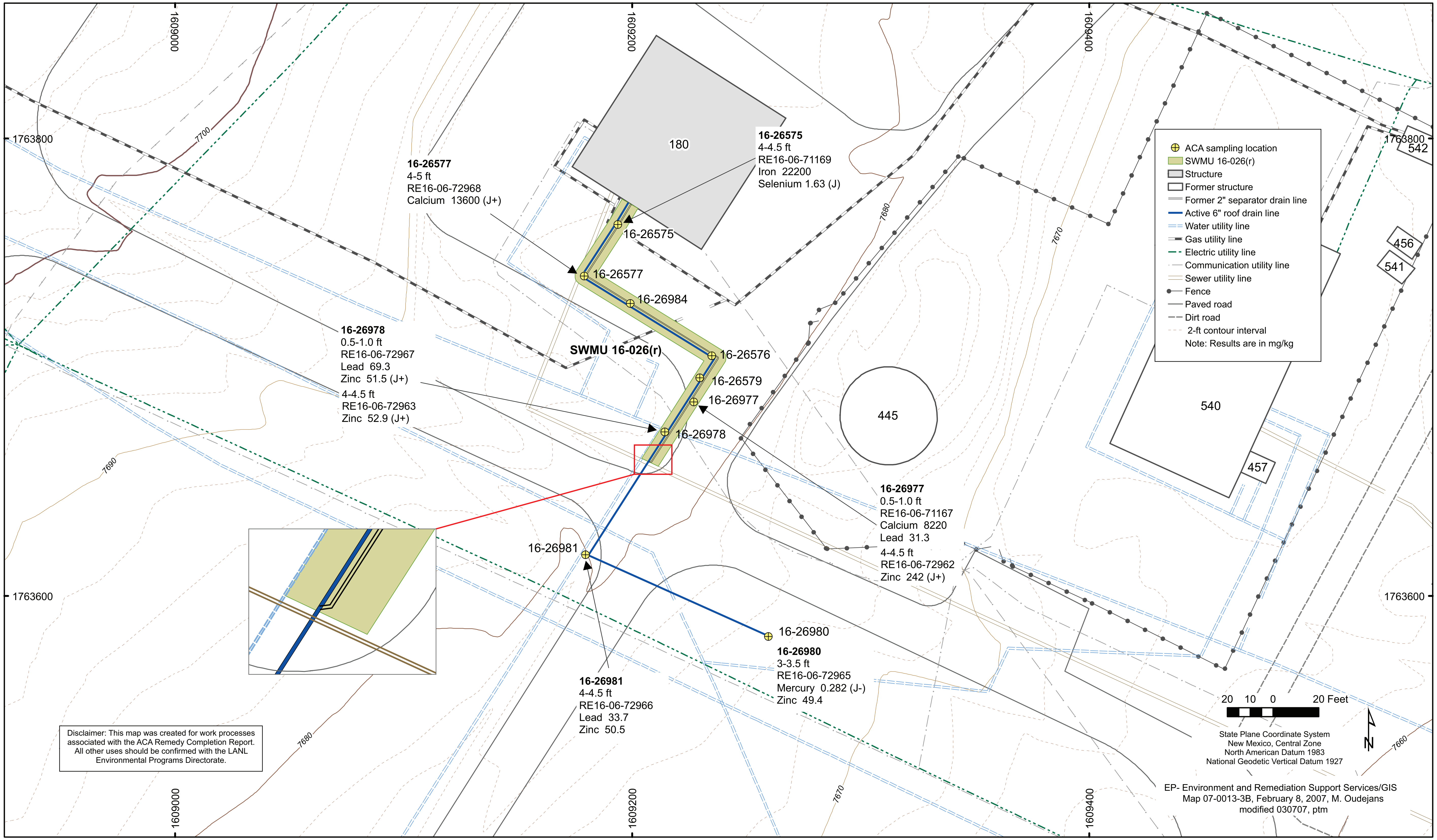


Figure 4.1-3 Inorganic chemicals detected above BVs at SWMU 16-026(r)

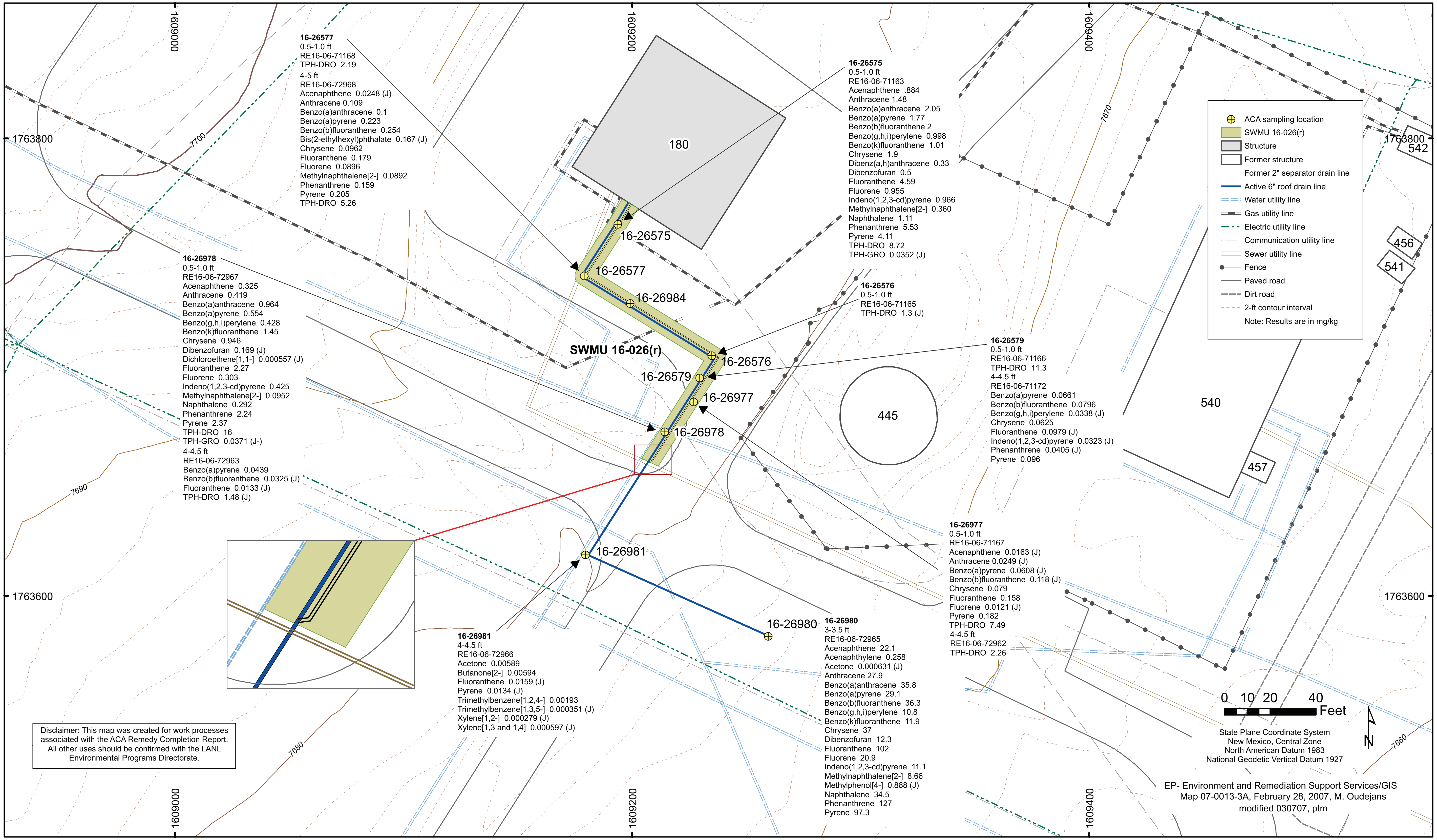


Figure 4.1-4 **Organic chemicals detected at SWMU 16-026(r)**

Table 3.0-1
Summary of Investigation Methods for the 2006 ACA at AOC 16-024(v) and SWMU 16-026(r)

Method	Summary
Spade-and-Scoop Collection of Soil Samples	This method is typically used for collection of shallow (i.e., approximately 0- to 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 to 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- to 4-in. inner diameter) and creating a vertical hole that can be advanced to the desired sampling depth. When the desired depth is reached, the auger is decontaminated before advancing the hole through the sampling depth. The sample material is transferred from the auger bucket to a stainless-steel sampling bowl before filling the various required sample containers.
Headspace Vapor Screening	Individual soil, rock, or sediment samples may be field screened for volatile organic compounds by placing a portion of the sample in a plastic sample bag or in a glass container with a foil-sealed cover. The container is sealed and gently shaken and allowed to equilibrate for 5 min. The sample is then screened by inserting a photoionization detector (PID) probe into the container and measuring and recording any detected vapors.
D Tech RDX Explosives Field Test Kit	Individual soil, rock, or sediment samples may be screened for explosive compounds by placing a portion of the sample in the extraction vial provided with the test kit. The extraction solution is added to the sample vial and the vial is shaken to extract any HE compounds present in the sample material. The extract is then transferred into a test vial. Two different reagents are added to the extracted solution; the reagents will react with any HE compounds present in the sample material. The colorimetric results are compared to the color card provided with the test kit to confirm the presence of and approximate concentration of one of 17 explosive compounds.
Sample Control and Field Documentation	The collection, screening, and transport of samples is documented on standard forms generated by the Sample Management Office (SMO). These 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.
Field Quality Control Samples	Field quality control samples are collected as directed in the March 1, 2005, Compliance Order on Consent as follows: • Field Duplicate: At a frequency of 10%; collected at the same time as a regular sample and submitted for the same analyses. • Equipment Rinsate Blank: At a frequency of 10%; collected by rinsing sampling equipment with deionized water and submitting the rinsate for laboratory analysis. • Trip Blanks: Required for all field events that include the collection of samples for volatile organic compound analysis. Trip blanks are containers of certified clean sand that are opened and kept with the other sample containers during the sampling process.
Field Decontamination of Drilling and Sampling Equipment	Dry decontamination is the preferred method to minimize the generation of liquid waste. Dry decontamination may include the use of a wire brush or other tool for removal of soil or other material adhering to the sampling equipment, followed by use of a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes. 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.

Table 3.0-1 (continued)

Method	Summary
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on U.S. Environmental Protection Agency guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample are printed on the sample collection logs provided by the SMO (size and type of container, e.g., glass, amber glass, polyethylene, preservative). All samples are preserved by placing them in insulated containers with ice to maintain a temperature of 4°C. Other requirements, such as the use of nitric acid or other preservatives, may apply to different media or analytical requests.
Management of Environmental Restoration Project Waste	The management of waste generated during corrective action activities requires documentation of the underlying hazardous constituents present in the characteristic hazardous waste. Wastes are characterized based on a review of historical site information, existing site data, and/or waste analysis. Means to store, control, and transport potential wastes are identified before the start of field operations. Wastes are segregated by classification and compatibility to prevent crosscontamination and are packaged to meet on-site and/or off-site waste acceptance criteria. Disposal is coordinated with an approved disposal facility or through Los Alamos National Laboratory's waste operations group. Wastes are managed in accordance with U.S. Department of Energy orders, state and federal regulations, and specific project policies. Under specific conditions, environmental media may be returned to their points of origin; however, environmental media contaminated with hazardous waste are managed as hazardous waste until the media no longer "contain" the hazardous waste.
Waste Characterization	Project wastes are characterized by the field waste management coordinator, field team leader, or other member of the project team using a waste characterization strategy form (WCSF). The waste characterization strategy involves a review of existing analytical data or documentation for the waste stream, development of a sampling strategy, and verification of facility waste acceptance criteria. The WCSF includes site characteristics; site activities; responsible parties; waste stream characterization information; and storage, treatment, and disposal options. The WCSF is reviewed, and waste management documentation is prepared.
Collection of Soil and Water Samples in Explosive Areas	The collection, handling, and transport of samples potentially contaminated with high explosives (HE) require prior visual examination and field analytical screening to characterize the level of HE contamination. Contamination characterization is completed before sample collection and involves identification of homogeneous and heterogeneous soil sample areas within the site, visual examination of the areas, and quantitative field screening of homogeneous soil mixtures with an HE spot test kit or other field test. Based on characterization results, the sampling site is categorized according to the level of HE contamination. The sample collection method specifies the use of equipment that does not produce heat, open flames, or sparks. Samples collected from areas determined to be positively contaminated are packaged and transported to the Materials Dynamics Group (DX-2) or a host-group-approved laboratory with written approval for removal from the HE corridor.
Coordination and Evaluation of Geodetic Surveys	A designated project participant determines the type of survey to be performed. This consists of either a "stakeout" survey, used for surveying previously defined locations, or an "unknown location survey," when the surveying of unknown locations is performed using existing coordinates. Survey personnel who perform control, property, easement, or boundary surveys must be registered professional land surveyors. Preparation for survey activities includes communication of expectations and requirements (e.g., degree of accuracy, locations, type of survey) to survey personnel. Survey personnel must chronologically document all survey activities and mark, identify, and record all survey locations, as instructed. Survey personnel prepare geodetic survey data for quality assurance review. The survey data are submitted to the project team leader and the quality program project leader for review. When the data are determined to be acceptable, they are finalized (i.e., assigned point labels), uploaded to a survey location template, and saved to a local disk or hard drive. The final files are archived by submitting them to the following email address: ERLocationUpload@lanl.gov.

Table 3.1-1
Summary of QA/QC Samples Collected and Analyses Performed during the ACA Investigation at AOC 16-024(v) and SWMU 16-026(r)

SWMU / AOC	Date Collected	Location ID	Sample ID	Depth (ft)	Sample Type[a]	Medium[b]	Analytical Suites Requested						
							VOCs	SVOCs	TAL Metals	Explosive Compounds	Perchlorate	TPH-GRO	TPH-DRO
16-024(v)	8/16/2006	16-26570	RE16-06-71157	0.5–1.0	FD	S	5866S	5866S	5867S	5866S	5867S	—[c]	—
16-024(v)	8/24/2006	16-26572	RE16-06-71158	8.0–9.0	FD	S	5935S	5935S	5936S	5935S	5936S	—	—
16-024(v)	8/16/2006	n/a[d]	RE16-06-71159	n/a	FTB	S	5866S	—	—	—	—	—	—
16-024(v)	8/24/2006	n/a	RE16-06-71160	n/a	FTB	S	5935S	—	—	—	—	—	—
16-024(v)	8/16/2006	n/a	RE16-06-71161	n/a	FR	W	—	—	5867S	—	—	—	—
16-024(v)	8/24/2006	n/a	RE16-06-71162	n/a	FR	W	—	—	5936S	—	—	—	—
16-026(r)	8/24/2006	16-26577	RE16-06-72971	4.0–5.0	FD	S	5933S	5933S	5933S	—	—	5933S	5933S
16-026(r)	7/27/2006	n/a	RE16-06-72972	n/a	FR	W	—	—	5640S	—	—	—	—
16-026(r)	8/24/2006	n/a	RE16-06-72973	n/a	FR	W	—	—	5933S	—	—	—	—
16-026(r)	7/27/2006	n/a	RE16-06-72974	n/a	FTB	S	5640S	—	—	—	—	—	—
16-026(r)	8/24/2006	n/a	RE16-06-72975	n/a	FTB	S	5933S	—	—	—	—	—	—
16-026(r)	6/22/2006	16-26577	RE16-06-71175	0.5–1.0	FD	S	5523S	5523S	5523S	—	—	5523S	5523S
16-026(r)	7/13/2006	16-26576	RE16-06-71176	4.0–4.5.0	FD	S	5563S	5563S	5563S	—	—	5563S	5563S
16-026(r)	7/13/2006	n/a	RE16-06-71177	n/a	FTB	S	5563S	—	—	—	—	—	—
16-026(r)	6/22/2006	n/a	RE16-06-71178	n/a	FTB	S	5523S	—	—	—	—	—	—
16-026(r)	7/13/2006	n/a	RE16-06-71179	n/a	FR	W	—	—	5564S	—	—	—	—
16-026(r)	12/4/2006	n/a	RE16-06-71180	n/a	FR	W	—	—	6513S	—	—	—	—
16-026(r)	6/22/2006	n/a	RE16-06-71197	n/a	FTB	S	5532S	—	—	—	—	—	—
16-026(r)	12/4/2006	16-26980	RE16-06-72964	3.0–3.5	FD	S	6512S	6512S	6512S	—	—	6512S	6512S
16-026(r)	7/27/2006	16-26984	RE16-06-72970	4.0–4.5	FD	S	5640S	5640S	5640S	—	—	5640S	5640S

[a] FD = Field duplicate. FTB = Field trip blank. FR = Field rinsate.

[b] S = Soil (Solid). W = Water.

[c] — = Not requested.

[d] n/a = Not applicable.

Table 3.1-2
Summary of Characterization and Confirmation Samples Collected and Analyses Performed during the 2006 ACA at AOC 16-024(v) and SWMU 16-026(r)

SWMU/AOC	Date Collected	Location ID	Sample ID	Depth (ft)	Excavated during 2006 Field Activities	Analytical Suites Requested						
						VOCs	SVOCs	TAL Metals	Explosive Compounds	Perchlorate	TPH-DRO	TPH-GRO
16-024(v)	8/16/2006	16-26569	RE16-06-71145	0.5–1.0	Y	5866S	5866S	5867S	5866S	5867S	—*	—
16-024(v)	8/24/2006	16-26569	RE16-06-71146	8.0–9.0	N	5935S	5935S	5936S	5935S	5936S	—	—
16-024(v)	8/16/2006	16-26570	RE16-06-71147	0.5–1.0	Y	5866S	5866S	5867S	5866S	5867S	—	—
16-024(v)	8/24/2006	16-26570	RE16-06-71148	8.0–9.0	N	5935S	5935S	5936S	5935S	5936S	—	—
16-024(v)	8/16/2006	16-26571	RE16-06-71149	0.5–1.0	Y	5866S	5866S	5867S	5866S	5867S	—	—
16-024(v)	8/24/2006	16-26571	RE16-06-71150	8.0–9.0	N	5935S	5935S	5936S	5935S	5936S	—	—
16-024(v)	8/16/2006	16-26572	RE16-06-71151	0.5–1.0	Y	5866S	5866S	5867S	5866S	5867S	—	—
16-024(v)	8/24/2006	16-26572	RE16-06-71152	8.0–9.0	N	5935S	5935S	5936S	5935S	5936S	—	—
16-026(r)	6/12/2006	16-26575	RE16-06-71163	0.5–1.0	N	5435S	5435S	5435S	—	—	5435S	5435S
16-026(r)	6/22/2006	16-26576	RE16-06-71165	0.5–1.0	N	5523S	5523S	5523S	—	—	5523S	5523S
16-026(r)	6/22/2006	16-26579	RE16-06-71166	0.5–1.0	N	5523S	5523S	5523S	—	—	5523S	5523S
16-026(r)	6/22/2006	16-26977	RE16-06-71167	0.5–1.0	N	5523S	5523S	5523S	—	—	5523S	5523S
16-026(r)	6/22/2006	16-26577	RE16-06-71168	0.5–1.0	N	5523S	5523S	5523S	—	—	5523S	5523S
16-026(r)	7/13/2006	16-26575	RE16-06-71169	4.0–4.5	N	5563S	5563S	5563S	—	—	5563S	5563S
16-026(r)	7/13/2006	16-26579	RE16-06-71172	4.0–4.5	N	5563S	5563S	5563S	—	—	5563S	5563S
16-026(r)	7/13/2006	16-26576	RE16-06-71174	4.0–4.5	N	5563S	5563S	5563S	—	—	5563S	5563S
16-026(r)	7/27/2006	16-26977	RE16-06-72962	4.0–4.5	N	5640S	5640S	5640S	—	—	5640S	5640S
16-026(r)	7/27/2006	16-26978	RE16-06-72963	4.0–4.5	N	5640S	5640S	5640S	—	—	5640S	5640S
16-026(r)	12/4/2006	16-26980	RE16-06-72965	3.0–3.5	N	6512S	6512S	6512S	—	—	6512S	6512S
16-026(r)	12/4/2006	16-26981	RE16-06-72966	4.0–4.5	N	6512S	6512S	6512S	—	—	6512S	6512S
16-026(r)	7/27/2006	16-26978	RE16-06-72967	0.5–1.0	N	5640S	5640S	5640S	—	—	5640S	5640S
16-026(r)	8/24/2006	16-26577	RE16-06-72968	4.0–5.0	N	5933S	5933S	5933S	—	—	5933S	5933S
16-026(r)	7/27/2006	16-26984	RE16-06-72969	4.0–4.5	N	5640S	5640S	5640S	—	—	5640S	5640S

*— = Not requested.

Table 4.1-1
Inorganic Chemicals above BVs at AOC 16-024(v)

Sample ID	Location ID	Depth (ft)	Media	Barium	Cadmium	Calcium	Cobalt	Copper	Lead	Manganese	Perchlorate	Selenium	Zinc
Soil Background Value[a]				**295**	**0.4**	**6120**	**8.64**	**14.7**	**22.3**	**671**	**na**[b]	**1.52**	**48.8**
Construction Worker Soil Screening Level[c]				**60200**	**154**	**na**	**61**	**12400**	**800**	**150**	**na**	**1550**	**92900**
Residential Soil Screening Level[c]				**15600**	**39**	**na**	**1520**	**3130**	**400**	**3590**	**55**[d]	**391**	**23500**
RE16-06-71145	16-26569	0.5–1	Soil	—[e]	0.587(U)	—	—	—	—	—	0.000705(J)	—	—
RE16-06-71146	16-26569	8–9	Soil	348	0.556(U)	—	14.4	—	23	1060	0.00733	—	—
RE16-06-71147	16-26570	0.5–1	Soil	324(J+)	—	—	—	61	—	—	0.00124(J)	—	107
RE16-06-71148	16-26570	8–9	Soil	—	0.551(U)	—	—	—	—	—	0.00388	—	—
RE16-06-71149	16-26571	0.5–1	Soil	—	—	—	—	—	—	—	0.000852(J)	1.79(U)	—
RE16-06-71150	16-26571	8–9	Soil	—	0.529(U)	—	—	—	—	—	0.00142(J)	—	—
RE16-06-71151	16-26572	0.5–1	Soil	—	0.575(U)	—	—	—	—	—	0.00416	—	—
RE16-06-71152	16-26572	8–9	Soil	—	0.547(U)	6180(J+)	—	—	—	—	0.00708	—	—

Note: All units are mg/kg.

[a] BVs from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs are from NMED (2006, 092513), unless noted otherwise.

[d] Screening value for perchlorate from EPA Region 6 (2006, 094321).

[e] — = Not detected or detected below BV.

Table 4.1-2
Organic Chemicals Detected at AOC 16-024(v)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenzofuran
Construction Worker Soil Screening Level[a]				**14100**	**9010[b]**	**86000**	**212**	**21.2**	**212**	**9010[b]**	**21200**	**552**
Residential Soil Screening Level[a]				**3730**	**2290[b]**	**22000**	**6.21**	**0.621**	**6.21**	**2290[b]**	**615**	**142**
RE16-06-71145	16-26569	0.5–1	Soil	0.628	0.0168(J)	1.48	4.22	3.45	6(J)	1.58(J)	4.19	0.172(J)
RE16-06-71147	16-26570	0.5–1	Soil	2.14	—[c]	3.46	8.68	5.24	9.71(J)	2.37(J)	7.68	0.856
RE16-06-71148	16-26570	8–9	Soil	—	—	—	—	—	—	—	—	—
RE16-06-71149	16-26571	0.5–1	Soil	0.78	—	4.14	17.7	10	16(J)	—	17.4	0.272(J)
RE16-06-71150	16-26571	8–9	Soil	—	—	—	—	0.141	0.143	—	0.0167(J)	—
RE16-06-71151	16-26572	0.5–1	Soil	0.376	—	1.36	4.22	3.35	6.09(J)	1.32(J)	4.39	0.0978(J)
RE16-06-71152	16-26572	8–9	Soil	0.112	—	0.27	0.885	0.657	1.14	0.519	0.976	—

Table 4.1-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Methylnaphthalene[2-]	Naphthalene	Phenanthrene	Pyrene
Construction Worker Soil Screening Level[a]				**8730**	**10200**	**212**	**262[d]**	**262**	**6990**	**9010**
Residential Soil Screening Level[a]				**2290**	**2660**	**6.21**	**79.5[d]**	**79.5**	**1830**	**2290**
RE16-06-71145	16-26569	0.5–1	Soil	10.9	0.472	1.66(J)	0.031(J)	0.0706	6.31	7.86
RE16-06-71147	16-26570	0.5–1	Soil	23	1.82	2.56(J)	0.171	0.468	19.4	15.9
RE16-06-71148	16-26570	8–9	Soil	0.0127(J)	—	—	—	—	—	—
RE16-06-71149	16-26571	0.5–1	Soil	29.8	1.07	3.11(J)	0.0533	0.0642	22.1	30.9
RE16-06-71150	16-26571	8–9	Soil	0.0413	—	—	—	—	0.0154(J)	0.0294(J)
RE16-06-71151	16-26572	0.5–1	Soil	10	0.314	1.44(J)	0.0106(J)	0.0198(J)	4.5	9.68
RE16-06-71152	16-26572	8–9	Soil	1.87	0.132	0.44(J)	0.0727	0.0121(J)	1.06	1.68

Note: All units are mg/kg.

[a] SSLs obtained from NMED (2006, 092513).

[b] Pyrene used as a surrogate based on structural similarity.

[c] — = Not detected.

[d] Naphthalene used as a surrogate based on structural similarity.

Table 4.1-3
Summary of COPCs at AOC 16-024(v)

COPCs	Rationale
Inorganic Chemicals	
Cobalt	Detected concentration above BV in 1 sample from 8–9 ft.
Perchlorate	Detected but no background data available.
Organic Chemicals	
Acenaphthene	Detected in 1 sample from 8–9 ft.
Anthracene	Detected in 1 sample from 8–9 ft.
Benzo(a)anthracene	Detected in 1 sample from 8–9 ft.
Benzo(a)pyrene	Detected in 2 samples from 8–9 ft.
Benzo(b)fluoranthene	Detected in 2 samples from 8–9 ft.
Benzo(g,h,i)perylene	Detected in 1 sample from –9 ft.
Chrysene	Detected in 2 samples from 8–9 ft.
Fluoranthene	Detected in 3 samples from 8–9 ft.
Fluorene	Detected in 1 sample from 8–9 ft.
Indeno(1,2,3-cd)pyrene	Detected in 1 sample from 8–9 ft.
Methylnaphthalene[2-]	Detected in 1 sample from 8–9 ft.
Naphthalene	Detected in 1 sample from 8–9 ft.
Phenanthrene	Detected in 2 samples from 8–9 ft.
Pyrene	Detected in 2 samples from 8–9 ft.

Table 4.1-4
Inorganic Chemicals above BVs at SWMU 16-026(r)

Sample ID	Location ID	Depth (ft)	Media	Cadmium	Calcium	Iron	Lead	Mercury	Selenium	Zinc
Soil Background Value[a]				**0.4**	**6120**	**21500**	**22.3**	**0.1**	**1.52**	**48.8**
Industrial Soil Screening Level[b]				**564**	**na**[c]	**100000**	**800**	**340**[d]	**5680**	**100000**
Construction Worker Soil Screening Level[b]				**154**	**na**	**92900**	**800**	**927**[e]	**1550**	**92900**
Residential Soil Screening Level[b]				**39**	**na**	**23500**	**400**	**23**[d]	**391**	**23500**
RE16-06-71163	16-26575	0.5–1	Soil	—[f]	—	—	—	—	17.4(U)	—
RE16-06-71165	16-26576	0.5–1	Soil	—	—	—	—	—	1.53(U)	—
RE16-06-71168	16-26577	0.5–1	Soil	—	—	—	—	—	1.74(U)	—
RE16-06-72967	16-26978	0.5–1	Soil	—	—	—	69.3	—	—	51.5(J+)
RE16-06-71166	16-26579	0.5–1	Soil	—	—	—	—	—	1.71(U)	—
RE16-06-71167	16-26977	0.5–1	Soil	—	8220	—	31.3	—	—	—
RE16-06-71169	16-26575	4–4.5	Soil	0.6(U)	—	22200	—	—	1.63(J)	—
RE16-06-71172	16-26579	4–4.5	Soil	0.681(U)	—	—	—	—	—	—
RE16-06-71174	16-26576	4–4.5	Soil	0.594(U)	—	—	—	—	—	—
RE16-06-72962	16-26977	4–4.5	Soil	0.636(U)	—	—	—	—	—	242(J+)
RE16-06-72963	16-26978	4–4.5	Soil	0.611(U)	—	—	—	—	—	52.9(J+)
RE16-06-72966	16-26981	4–4.5	Soil	—	—	—	33.7	—	—	50.5
RE16-06-72968	16-26577	4–5	Soil	0.609(U)	13600(J+)	—	—	—	—	—
RE16-06-72969	16-26984	4–4.5	Soil	0.582(U)	—	—	—	—	—	—
RE16-06-72965	16-26980	3–3.5	Soil	—	—	—	—	0.282(J-)	—	49.4

Note: All units are mg/kg.

[a] BVs from LANL (1998, 059730).

[b] SSLs are from NMED (2006, 092513), unless noted otherwise.

[c] na = Not available.

[d] Residential screening value for inorganic mercury from EPA Region 6 (2006, 094321).

[e] Construction worker SSL is for elemental mercury from NMED (2006, 092513).

[f] — = Not detected or detected below BV.

Table 4.1-5
Organic Chemicals Detected at SWMU 16-026(r)

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-ethylhexyl)phthalate
Industrial Soil Screening Level[a]				**33500**	**30900[b]**	**100000**	**100000**	**23.4**	**2.34**	**23.4**	**30900[b]**	**234**	**1370**
Construction Worker Soil Screening Level[a]				**14100**	**9010[b]**	**98500**	**86000**	**212**	**21.2**	**212**	**9010[b]**	**2120**	**4660**
Residential Soil Screening Level[a]				**3730**	**2290[b]**	**28100**	**22000**	**6.21**	**0.621**	**6.21**	**2290[b]**	**62.1**	**347**
RE16-06-71163	16-26575	0.5–1	Soil	0.884	—[c]	—	1.48	2.05	1.77	2	0.998	1.01	—
RE16-06-71165	16-26576	0.5–1	Soil	—	—	—	—	—	—	—	—	—	—
RE16-06-71168	16-26577	0.5–1	Soil	—	—	—	—	—	—	—	—	—	—
RE16-06-72967	16-26978	0.5–1	Soil	0.325	—	—	0.419	0.964	0.554	—	0.428	1.45	—
RE16-06-71166	16-26579	0.5–1	Soil	—	—	—	—	—	—	—	—	—	—
RE16-06-71167	16-26977	0.5–1	Soil	0.0163(J)	—	—	0.0249(J)	—	0.0608(J)	0.118(J)	—	—	—
RE16-06-71172	16-26579	4–4.5	Soil	—	—	—	—	—	0.0661	0.0796	0.0338(J)	—	—
RE16-06-72962	16-26977	4–4.5	Soil	—	—	—	—	—	—	—	—	—	—
RE16-06-72963	16-26978	4–4.5	Soil	—	—	—	—	—	0.0439	0.0325(J)	—	—	—
RE16-06-72966	16-26981	4–4.5	Soil	—	—	0.00589	—	—	—	—	—	—	—
RE16-06-72968	16-26577	4–5	Soil	0.0248(J)	—	—	0.109	0.1	0.223	0.254	—	—	0.167(J)
RE16-06-72965	16-26980	3–3.5	Soil	22.1	0.258	0.000631(J)	27.9	35.8	29.1	36.3	10.8	11.9	—

Table 4.1-5 (continued)

Sample ID	Location ID	Depth (ft)	Media	Butanone[2-]	Chrysene	Dibenz(a,h)anthracene	Dibenzofuran	Dichloroethene[1,1-]	Fluoranthene	Fluorene	Indeno[1,2,3-cd]pyrene	Methylnaphthalene[2-]	Methylphenol[4-]
Industrial Soil Screening Level[a]				**48700[d]**	**2310**	**2.34**	**1620**	**777**	**24400**	**26500**	**23.4**	**300[e]**	**34000[f]**
Construction Worker Soil Screening Level[a]				**48700[d]**	**21200**	**21.2**	**552**	**678**	**8730**	**10200**	**212**	**262[e]**	**11650[g]**
Residential Soil Screening Level[a]				**31800**	**615**	**0.621**	**142**	**206**	**2290**	**2660**	**6.21**	**79.2[e]**	**3100[f]**
RE16-06-71163	16-26575	0.5–1	Soil	—	1.9	0.33	0.5	—	4.59	0.955	0.966	0.36	—
RE16-06-71165	16-26576	0.5–1	Soil	—	—	—	—	—	—	—	—	—	—
RE16-06-71168	16-26577	0.5–1	Soil	—	—	—	—	—	—	—	—	—	—
RE16-06-72967	16-26978	0.5–1	Soil	—	0.946	—	0.169(J)	0.000557(J)	2.27	0.303	0.425	0.0952	—
RE16-06-71166	16-26579	0.5–1	Soil	—	—	—	—	—	—	—	—	—	—
RE16-06-71167	16-26977	0.5–1	Soil	—	0.079	—	—	—	0.158	0.0121(J)		—	—
RE16-06-71172	16-26579	4–4.5	Soil	—	0.0625	—	—	—	0.0979(J)	—	0.0323(J)	—	—
RE16-06-72962	16-26977	4–4.5	Soil	—	—	—	—	—	—	—	—	—	—
RE16-06-72963	16-26978	4–4.5	Soil	—	—	—	—	—	0.0133(J)	—	—	—	—
RE16-06-72966	16-26981	4–4.5	Soil	0.00594	—	—	—	—	0.0159(J)	—	—	—	—
RE16-06-72968	16-26577	4–5	Soil	—	0.0962	—	—	—	0.179	0.0896	—	0.0892	—
RE16-06-72965	16-26980	3–3.5	Soil	—	37	—	12.3	—	102	20.9	11.1	8.66	0.888(J)

Table 4.1-5 (continued)

Sample ID	Location ID	Depth (ft)	Media	Naphthalene	Phenanthrene	Pyrene	TPH-DRO	TPH-GRO	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene[1,2-]	Xylene[1,3+1,4]
Industrial Soil Screening Level[a]				**300**	**20500**	**30900**	**1120[h]**	**na[i]**	**213**	**69.2[j]**	**99.5[k]**	**82[l]**
Construction Worker Soil Screening Level[a]				**262**	**6990**	**9010**	**na**	**na**	**190**	**69.2[j]**	**99.5[k]**	**82[l]**
Residential Soil Screening Level[a]				**79.2**	**1830**	**2290**	**520[h]**	**na**	**58**	**24.8**	**99.5[k]**	**82[l]**
RE16-06-71163	16-26575	0.5–1	Soil	1.11	5.53	4.11	8.72	0.0352(J)	—	—	—	0.000549(J)
RE16-06-71165	16-26576	0.5–1	Soil	—	—	—	1.3(J)	—	—	—	—	—
RE16-06-71168	16-26577	0.5–1	Soil	—	—	—	2.19	—	—	—	—	—
RE16-06-72967	16-26978	0.5–1	Soil	0.292	2.24	2.37	16	0.0371(J-)	—	—	—	—
RE16-06-71166	16-26579	0.5–1	Soil	—	—	—	11.3	—	—	—	—	—
RE16-06-71167	16-26977	0.5–1	Soil	—	—	0.182	7.49	—	—	—	—	—
RE16-06-71172	16-26579	4–4.5	Soil	—	0.0405(J)	0.096	—	—	—	—	—	—
RE16-06-72962	16-26977	4–4.5	Soil	—	—	—	2.26	—	—	—	—	—
RE16-06-72963	16-26978	4–4.5	Soil	—	—	—	1.48(J)	—	—	—	—	—
RE16-06-72966	16-26981	4–4.5	Soil	—	—	0.0134(J)	—	—	0.00193	0.000351(J)	0.000279(J)	0.000597(J)

Table 4.1-5 (continued)

Sample ID	Location ID	Depth (ft)	Media	Naphthalene	Phenanthrene	Pyrene	TPH-DRO	TPH-GRO	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene[1,2-]	Xylene[1,3+1,4]
Industrial Soil Screening Level[a]				**300**	**20500**	**30900**	**1120[h]**	**na[i]**	**213**	**69.2[j]**	**99.5[k]**	**82[l]**
Construction Worker Soil Screening Level[a]				**262**	**6990**	**9010**	**na**	**na**	**190**	**69.2[j]**	**99.5[k]**	**82[l]**
Residential Soil Screening Level[a]				**79.2**	**1830**	**2290**	**520[h]**	**na**	**58**	**24.8**	**99.5[k]**	**82[l]**
RE16-06-72968	16-26577	4–5	Soil	—	0.159	0.205	5.26	—	—	—	—	—
RE16-06-72965	16-26980	3–3.5	Soil	34.5	127	97.3	—	—	—	—	—	—

Note: All units are mg/kg.

[a] SSLs obtained from NMED (2006, 092513), unless noted otherwise.

[b] Pyrene used as a surrogate based on structural similarity.

[c] — = Not detected.

[d] Industrial and construction worker SSLs for 2-butanone is the soil saturation concentration from NMED (2006, 095213).

[e] Naphthalene used as a surrogate based on structural similarity.

[f] Screening values from EPA Region 6 (2006, 094321).

[g] Construction worker SSL for 2-methylphenol calculated using reference dose (RfD) of 0.05 mg/kg-d from EPA Region 6 (2006, 094321) and equation and parameters from NMED (2006, 095213).

[h] Screening guideline is for TPH from diesel fuel #2/crankcase oil from NMED (2006, 094614).

[i] na = Not available.

[j] SSL for 1,3,5-trimethylbenzene is the soil saturation concentration from NMED (2006, 095213).

[k] SSL for 1,2-xylene is the soil saturation concentration for o-xylene from NMED (2006, 095213).

[l] SSL for 1,3+1,4-xylene is the soil saturation concentration for xylenes from NMED (2006, 095213).

Table 4.1-6
Summary of COPCs at SWMU 16-026(r)

COPCs	Scenario	Rationale
Inorganic Chemicals		
Lead	Industrial, construction worker, residential	Detected above background in 3 samples; 2 samples from 0.5–1 ft; and 1 sample from 4–4.5 ft.
Mercury	Construction worker, residential	Detected above BV in 1 sample from 3–3.5 ft.
Selenium	Industrial, construction worker, residential	Detected above BV in 1 sample and detections limits above background in 4 samples; 4 samples from 0.5–1 ft; and 1 sample from 4–4.5 ft.
Zinc	Construction worker, residential	Detected above background in 5 samples; 3 samples from 4–4.5 ft; 1 sample from 3–3.5 ft; and 1 sample from 0.5–1 ft.
Organic Chemicals		
Acenaphthene	Industrial, construction worker, residential	Detected in 3 samples from 0.5–1 ft and 2 samples from 3–5 ft.
Acenaphthylene	Construction worker, residential	Detected in 1 sample from 3–3.5 ft.
Acetone	Construction worker, residential	Detected in 2 samples from 3–4.5 ft.
Anthracene	Industrial, construction worker, residential	Detected in 3 samples from 0.5–1 ft and 2 samples from 3–5 ft.
Benzo(a)anthracene	Industrial, construction worker, residential	Detected in 2 samples from 0.5–1 ft and 2 samples from 3–5 ft.
Benzo(a)pyrene	Industrial, construction worker, residential	Detected in 3 samples from 0.5–1 ft and 4 samples from 3–5 ft.
Benzo(b)fluoranthene	Industrial, construction worker, residential	Detected in 2 samples from 0.5–1 ft and 4 samples from 3–5 ft.
Benzo(g,h,i)perylene	Industrial, construction worker, residential	Detected in 2 samples from 0.5–1 ft and 2 samples from 3–4.5 ft.
Benzo(k)fluoranthene	Construction worker, residential	Detected in 2 samples from 0.5–1 ft and 1 sample from 3–3.5 ft.
Bis(2-ethylhexyl)phthalate	Construction worker, residential	Detected in 1 sample from 4–5 ft.
Butanone[2-]	Construction worker, residential	Detected in 1 sample from 4–4.5 ft.
Chrysene	Industrial, construction worker, residential	Detected in 3 samples from 0.5–1 ft and 3 samples from 3–5 ft.
Dibenz(a,h)anthracene	Industrial, construction worker, residential	Detected in 1 sample from 0.5–1 ft.
Dibenzofuran	Industrial, construction worker, residential	Detected in 2 samples from 0.5–1 ft and 1 sample from 3–3.5 ft.
Dichloroethene[1,1-]	Industrial, construction worker, residential	Detected in 1 sample from 0.5–1 ft.
Fluoranthene	Industrial, construction worker, residential	Detected in 3 samples from 0.5–1 ft and 5 samples from 3–5 ft.
Fluorene	Industrial, construction worker, residential	Detected in 3 samples from 0.5–1 ft and 2 samples from 3–5 ft.
Indeno(1,2,3-cd)pyrene	Industrial, construction worker, residential	Detected in 2 samples from 0.5–1 ft and 2 samples from 3–4.5 ft.

Table 4.1-6 (continued)

COPCs	Scenario	Rationale
Methylnaphthalene[2-]	Industrial, construction worker, residential	Detected in 2 samples from 0.5–1 ft and 2 samples from 3–5 ft.
Methylphenol[2-]	Construction worker, residential	Detected in 1 sample from 3–3.5 ft.
Naphthalene	Industrial, construction worker, residential	Detected in 2 samples from 0.5–1 ft and 1 sample from 3–3.5 ft.
Phenanthrene	Industrial, construction worker, residential	Detected in 2 samples from 0.5–1 ft and 3 samples from 3–5 ft.
Pyrene	Industrial, construction worker, residential	Detected in 3 samples from 0.5–1 ft and 4 samples from 3–5 ft.
TPH-DRO	Industrial, residential	Detected in 6 samples from 0.5–1 ft and 3 samples from 4–5 ft.
TPH-GRO	Industrial, residential	Detected in 2 samples from 0.5–1 ft.
Trimethylbenzene[1,2,4-]	Construction worker, residential	Detected in 1 sample from 4–4.5 ft.
Trimethylbenzene[1,3,5-]	Construction worker, residential	Detected in 1 sample from 4–4.5 ft.
Xylene[1,2-]	Construction worker, residential	Detected in 1 sample from 4–4.5 ft.
Xylenes [1,3+1,4-]	Industrial, construction worker, residential	Detected in 1 sample from 0.5–1 ft and 1 sample from 4–4.5 ft.

Appendix A

Acronyms and Abbreviations, Glossary, and Metric Conversion Table

A-1.0 ACRONYMS AND ABBREVIATIONS

ACA	accelerated corrective action
AOC	area of concern
AUF	area use factor
bgs	below ground surface
BMP	best management practice
BV	background value
CD	compact disc
CFR	Code of Federal Regulations (U.S.)
COC	chain of custody
Consent Order	Compliance Order on Consent
COPC	chemical of potential concern
COPEC	chemicals of potential ecological concern
C_{sat}	soil saturation limit
CWDR	chemical waste disposal request
DOE	Department of Energy (U.S.)
DOT	Department of Transportation (U.S.)
DRO	diesel range organic
EP	Environmental Programs (a LANL directorate)
EPA	Environmental Protection Agency (U.S.)
EPC	exposure point concentration
EQL	estimated quantitation limit
ER	environmental restoration
ERDB	Environmental Restoration Database
ER ID	environmental restoration identifier
ERSS	Environment and Remediation Support Services (an EP Directorate division)
ESL	ecological screening level
EX-ID	excavation permit
FME	Facility Management and Engineering
GRO	gasoline range organic
ha	hectare
HE	high explosive(s)
HI	hazard index

HQ	hazard quotient
HR	home range
HSR-1	Health, Safety, and Radiation Protection (a LANL group)
ID	identification
IDL	instrument detection limit
IFCS	Institutional Facilities and Central Services
J	analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis (data qualifier)
J-	analyte was positively identified, and the result is likely to be biased low (data qualifier)
J+	analyte was positively identified, and the result is likely to be biased high (data qualifier)
LAL	lower acceptance limit
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC (current LANL manager)
LASO	Los Alamos Site Office (DOE)
LCS	laboratory control sample
MDL	method detection limit
MRF	Materials Recycling Facility
MTBE	methyl tertiary butyl ether
NDA	no detectable activity
NFA	no further action
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NOAEL	no-observed-adverse-effect level
NOD	notice of deficiency
%D	percent difference
%R	percent recovery
%RSD	percent relative standard deviation
PAH	polycyclic aromatic hydrocarbon
PAUF	population area use factor
PID	photoionization detector
PR-ID	permits and requirements identification
QA	quality assurance
QC	quality control
QMP	quality management plan

QP	quality procedure
R	data are rejected as a result of major problems with quality assurance/quality control parameters (data qualifier)
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5 triazine
RfD	reference dose
RfDi	inhalation reference dose
RfDo	oral reference dose
RFI	RCRA facility investigation
RPD	relative percent difference
RPF	Records Processing Facility (an EP Directorate archive)
RSD	risk-specific dose
SCL	sample collection log
SF	slope factor
SMO	Sample Management Office
SOP	standard operating procedure
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
T&E	threatened and endangered
TAL	Target Analyte List
TPH	total petroleum hydrocarbon
TRV	toxicity reference value
UAL	upper acceptance limit
UCL	upper confidence limit
UTL	upper tolerance limit
U	analyte was analyzed for but not detected (data qualifier)
UJ	analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit (data qualifier)
VCP	vitrified clay pipe
VOC	volatile organic compound
WQCC	Water Quality Control Commission

A-2.0 GLOSSARY

accelerated corrective action—A cleanup process used to implement presumptive remedies at small-scale and relatively simple sites where groundwater contamination is not a component of the accelerated cleanup, where the remedy is considered to be the final remedy for the site, and where the fieldwork will be accomplished within 180 days of the start of field activities. Accelerated corrective actions may be implemented before the approval of the accelerated corrective action work plan by the New Mexico Environment Department.

administrative authority—For Los Alamos National Laboratory, one or more regulatory agencies, such as the New Mexico Environment Department, the U.S. Environmental Protection Agency, or the U.S. Department of Energy, as appropriate.

aggregate—At the Los Alamos National Laboratory, an area within a *watershed* containing solid waste management units (SWMUs) and/or areas of concern (AOCs), and the media affected or potentially affected by releases from those SWMUs and/or AOCs. Aggregates are designated to promote efficient and effective corrective action activities.

analysis—A critical evaluation, usually made by breaking a subject (either material or intellectual) down into its constituent parts, then describing the parts and their relationship to the whole. Analyses may include physical analysis, chemical analysis, toxicological analysis, and knowledge-of-process determinations.

analyte—The element, nuclide, or ion a chemical analysis seeks to identify and/or quantify; the chemical constituent of interest.

area of concern—(1) A release that may warrant investigation or remediation and is not a solid waste management unit (SWMU). (2) An area at Los Alamos National Laboratory that may have had a release of a hazardous waste or a hazardous constituent but is not a SWMU.

area use factor—The ratio of an organism’s home range, breeding range, or feeding/foraging range to the area of the site under investigation.

artificial fill—A material that has been imported and typically consists of disturbed *soils* mixed with crushed Bandelier Tuff or other rock types.

assessment—(1) The act of reviewing, inspecting, testing, checking, conducting surveillance, auditing, or otherwise determining and documenting whether items, processes, or services meet specified requirements. (2) An evaluation process used to measure the performance or effectiveness of a system and its elements. In this glossary, assessment is an all-inclusive term used to denote any one of the following: audit, performance evaluation, management system review, peer review, inspection, or surveillance.

assessment endpoint—In an ecological risk assessment, the expression of an environmental value to be protected (e.g., fish biomass or reproduction of avian populations).

background concentration—Naturally occurring concentrations of an inorganic chemical or radionuclide in soil, sediment, or tuff.

background data—Data that represent naturally occurring concentrations of inorganic and radionuclide constituents in a geologic medium. Los Alamos National Laboratory’s (the Laboratory’s) background data are derived from samples collected at locations that are either within, or adjacent to, the Laboratory. These locations (1) are representative of geological media found within Laboratory boundaries, and (2) have not been affected by Laboratory operations.

background level—(1) The concentration of a substance in an environmental medium (air, water, or soil) that occurs naturally or is not the result of human activities. (2) In exposure assessment, the concentration of a substance in a defined control area over a fixed period of time before, during, or after a data-gathering operation.

background radiation—The amount of radioactivity naturally present in the environment, including cosmic rays from space and natural radiation from soils and rock.

background value (BV)—A statistically derived concentration (i.e., the upper tolerance limit [UTL]) of a chemical used to represent the background data set. If a UTL cannot be derived, either the detection limit or maximum reported value in the background data set is used.

best management practices—Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.

bias—The systematic deviation from a true value that remains constant over replicated measurements within the statistical precision of the measurement process.

blank—A sample that is expected to have a negligible or unmeasurable amount of an analyte. Results of blank sample analyses indicate whether field samples might have been contaminated during the sample collection, transport, storage, preparation, or analysis processes.

certificate of completion—A document to be issued by the New Mexico Environment Department (NMED) under the March 1, 2005, Compliance Order on Consent (Consent Order) once NMED determines that the requirements of the Consent Order have been satisfied for a particular solid waste management unit or area of concern.

certification—A signed statement required by permits, or certain enforcement documents (e.g., a compliance order), that is submitted with reports and other information requested by the administrative authority. Certification ensures that a document and all of its attachments were prepared under the direction or supervision of an authorized person in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Known violations of certification carry significant penalties.

chain of custody—An unbroken, documented trail of accountability that is designed to ensure the uncompromised physical integrity of samples, data, and records.

chemical—Any naturally occurring or human-made substance characterized by a definite molecular composition.

chemical analysis—A process used to measure one or more attributes of a sample in a clearly defined, controlled, and systematic manner. Chemical analysis often requires treating a sample chemically or physically before measurement.

chemical of potential concern (COPC)—A detected chemical compound or element that has the potential to adversely affect human receptors as a result of its concentration, distribution, and toxicity.

chemical of potential ecological concern—A detected chemical compound or element that has the potential to adversely affect ecological receptors as a result of its concentration, distribution, and toxicity.

cleanup—A series of actions taken to deal with the release, or threat of a release, of a hazardous substance that could affect humans and/or the environment. The term cleanup is sometimes used interchangeably with the terms remedial action, removal action, or corrective action.

cleanup levels—Media-specific contaminant concentration levels that must be met by a selected corrective action. Cleanup levels are established by using criteria such as the protection of human health and the environment; compliance with regulatory requirements; reduction of toxicity, mobility, or volume through treatment; long- and short-term effectiveness; implementability; and cost.

Compliance Order on Consent (Consent Order)—For the Environmental Remediation and Surveillance Program, an enforcement document signed by the New Mexico Environment Department, the U.S. Department of Energy, and the Regents of the University of California on March 1, 2005, which prescribes the requirements for corrective action at Los Alamos National Laboratory. The purposes of the Consent Order are (1) to define the nature and extent of releases of contaminants at, or from, the facility; (2) to identify and evaluate, where needed, alternatives for corrective measures to clean up contaminants in the environment and prevent or mitigate the migration of contaminants at, or from, the facility; and (3) to implement such corrective measures. The Consent Order supersedes the corrective action requirements previously specified in Module VIII of the Laboratory's Hazardous Waste Facility Permit.

Consent Order—See Compliance Order on Consent.

construction worker scenario—A land-use condition that evaluates exposures to a human receptor throughout a construction project. The activities typically involve substantial short-term on-site exposures.

contaminant—(1) Chemicals and radionuclides present in environmental media or on debris above background levels. (2) According to the March 1, 2005, Compliance Order on Consent (Consent Order), any hazardous waste listed or identified as characteristic in 40 Code of Federal Regulations (CFR) 261 (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]); any hazardous constituent listed in 40 CFR 261 Appendix VIII (incorporated by 20.4.1.200 NMAC) or 40 CFR 264 Appendix IX (incorporated by 20.4.1.500 NMAC); any groundwater contaminant listed in the Water Quality Control Commission (WQCC) Regulations at 20.6.3.3103 NMAC; any toxic pollutant listed in the WQCC Regulations at 20.6.2.7 NMAC; explosive compounds; nitrate; and perchlorate. (Note: Under the Consent Order, the term "contaminant" does not include radionuclides or the radioactive portion of mixed waste.)

continuing calibration—A combination of calibration blank and check standards used to determine if an instrument's response to an analyte concentration is within acceptable bounds relative to its initial calibration. A continuing calibration is performed every 12 h of operation or every 10 injections, depending on the analytical test method, thus verifying the satisfactory performance of an instrument on a day-to-day basis. The continuing-calibration 12-h period assumes that the instrument has not been shut down since the initial calibration.

contract analytical laboratory—An analytical laboratory under contract to the University of California to analyze samples from work performed at Los Alamos National Laboratory.

corrective action—(1) In the Resource Conservation and Recovery Act, an action taken to rectify conditions potentially adverse to human health or the environment. (2) In the quality assurance field, the process of rectifying and preventing nonconformances.

data package—The hard copy deliverable for each sample delivery group produced by a contract analytical laboratory in accordance with the statement of work for analytical services.

data-quality assessment—The statistical and/or scientific evaluation of a data set that establishes whether the data set is adequate for its intended use.

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

data verification—The process of evaluating the completeness, correctness, consistency, and compliance of a laboratory data package against a specified standard or contract.

- Completeness: All required information is present—in both hard copy and electronic forms.
- Correctness: The reported results are based on properly documented and correctly applied algorithms.
- Consistency: The values are the same when they appear in different reports or are transcribed from one report to another.
- Compliance: The data pass numerical quality-control tests based on parameters or limits specified in a contract or in an auxiliary document.

detect (detection)—An analytical result, as reported by an analytical laboratory, that denotes a chemical or radionuclide to be present in a sample at a given concentration.

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

discharge—The accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying, or dumping of hazardous waste into, or on, any land or water.

disposal—The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into, or on, any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwaters.

duplicate analysis—An analysis performed on one member of a pair of identically prepared subsamples taken from the same sample.

ecological screening levels—Soil, sediment, or water concentrations that are used to screen for potential ecological effects. The concentrations are based on a chemical's no-observed-adverse-effect level for a receptor, below which no risk is indicated.

Environmental Restoration (ER) Project—A Los Alamos National Laboratory project established in 1989 as part of a U.S. Department of Energy nationwide program, and precursor of today's Environmental Remediation and Surveillance (ERS) Program. This program is designed (1) to investigate hazardous and/or radioactive materials that may be present in the environment as a result of past Laboratory operations, (2) to determine if the materials currently pose an unacceptable risk to human health or the environment, and (3) to remediate (clean up, stabilize, or restore) those sites where unacceptable risk is still present.

environmental samples—Air, soil, water, or other media samples that have been collected from streams, wells, and soils, or other locations, and that are not expected to exhibit properties classified as hazardous by the U.S. Department of Transportation.

equipment blank (rinsate blank)—A sample used to rinse sample-collection equipment and expected to have negligible or unmeasurable amounts of analytes. The equipment blank is collected after the equipment decontamination is completed but before the collection of another field sample.

ER data—Data derived from samples that have been collected and paid for through Environmental Remediation and Surveillance Program funding.

ER database (ERDB)—A database housing analytical and other programmatic information for the Environmental Remediation and Surveillance Program. The ERDB currently contains about 3 million analyses in 300 tables.

estimated detection limit—A reporting limit required by a Los Alamos National Laboratory statement of work for analytical services.

estimated quantitation limit (EQL)—The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine analytical-laboratory operating conditions. The low point on a calibration curve should reflect this quantitation limit. The EQL is not used to establish detection status. Sample EQLs are highly matrix dependent, and the specified EQLs might not always be achievable.

exposure pathway—Any path from the sources of contaminants to humans and other species or settings through air, soil, water, or food.

facility—All contiguous land (and structures, other appurtenances, and improvements on the land) used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units. For the purpose of implementing a corrective action, a facility is all the contiguous property that is under the control of the owner or operator seeking a permit under Subtitle C of the Resource Conservation and Recovery Act.

field blank (field reagent blank)—A blank sample prepared in the field or carried to the sampling site, exposed to sampling conditions (e.g., by removing bottle caps), and returned to a laboratory to be analyzed in the same manner in which environmental samples are being analyzed. Field blanks are used to identify the presence of any contamination that may have been added during the sampling and analysis process.

field duplicate (replicate) samples—Two separate, independent samples taken from the same source, which are collected as collocated samples (i.e., equally representative of a sample matrix at a given location and time).

field matrix spike—A known amount of a field sample to which a known amount of a target analyte has been added and used to compute the proportion of the added analyte that is recovered upon analysis.

field reagent blank—See field blank.

field sample—See sample.

grab sample—A specimen collected by a single application of a field sampling procedure to a target population (e.g., the surface soil from a single hole collected after the spade-and-scoop sampling procedure, or a single air filter left in the field for three months).

hazard index—The sum of hazard quotients for multiple contaminants to which a receptor may have been exposed.

hazardous constituent (hazardous waste constituent)—According to the March 1, 2005, Compliance Order of Consent (Consent Order), any constituent identified in Appendix VIII of Part 261, Title 40 Code of Federal Regulations (CFR) (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]) or any constituent identified in 40 CFR 264, Appendix IX (incorporated by 20.4.1.500 NMAC).

hazardous waste—(1) Solid waste that is listed as a hazardous waste, or exhibits any of the characteristics of hazardous waste (i.e., ignitability, corrosivity, reactivity, or toxicity, as provided in 40 CFR, Subpart C). (2) According to the March 1, 2005, Compliance Order of Consent (Consent

Order), any solid waste or combination of solid wastes that, because of its quantity, concentration, or physical, chemical, or infectious characteristics, meets the description set forth in New Mexico Statutes Annotated 1978, § 74-4-3(K) and is listed as a hazardous waste or exhibits a hazardous waste characteristic under 40 CFR 261 (incorporated by 20.4.1.200 New Mexico Administrative Code).

Hazardous Waste Bureau—The New Mexico Environment Department bureau charged with providing regulatory oversight and technical guidance to New Mexico hazardous waste generators and to treatment, storage, and disposal facilities, as required by the New Mexico Hazardous Waste Act.

hazard quotient (HQ)—The ratio of the estimated site-specific exposure concentration of a single chemical from a site to the estimated daily exposure level at which no adverse health effects are likely to occur.

holding time—The maximum elapsed time a sample can be stored without unacceptable changes in analyte concentrations. Holding times apply under prescribed conditions, and deviations from these conditions may affect the holding times. Extraction holding time refers to the time lapsed between sample collection and sample preparation. Analytical holding time refers to the time lapsed between sample preparation and analysis.

industrial scenario—A land-use condition in which current Los Alamos National Laboratory operations or industrial/commercial operations within Los Alamos County are continued or planned. Any necessary remediation involves cleanup to standards designed to ensure a safe and healthy work environment for workers.

initial calibration—The process used to establish the relationship between instrument response and analyte concentration at several analyte concentration values in order to demonstrate that an instrument is capable of acceptable analytical performance.

institutional controls—Controls that prohibit or limit access to contaminated media. Institutional controls may include use restrictions, permitting requirements, standard operating procedures, laboratory implementation requirements, laboratory implementation guidance, and laboratory performance requirements.

instrument detection limit (IDL)—A measure of instrument sensitivity without any consideration for contributions to the signal from reagents. The IDL is calculated as follows: Three times the average of the standard deviations obtained on three nonconsecutive days from the analysis of a standard solution, with seven consecutive measurements of that solution per day. The standard solution must be prepared at a concentration of three to five times the instrument manufacturer’s estimated IDL.

internal standards—Compounds added to a sample after the sample has been prepared for qualitative and quantitative instrument analysis. The compounds serve as a standard of retention time and response that is invariant from run to run.

investigation-derived waste—Solid waste or hazardous waste that was generated as a result of corrective action investigation or remediation field activities. Investigation-derived waste may include drilling muds, cuttings, and purge water from the installation of test pits or wells; purge water, soil, and other materials from the collection of samples; residues from the testing of treatment technologies and pump-and-treat systems; contaminated personal protective equipment; and solutions (aqueous or otherwise) used to decontaminate nondisposable protective clothing and equipment.

laboratory control sample (LCS)—A known matrix that has been spiked with compound(s) representative of target analytes. LCSs are used to document laboratory performance, and the acceptance criteria for LCSs are method-specific.

laboratory qualifier (laboratory flag)—Codes applied to data by a contract analytical laboratory to indicate, on a gross scale, a verifiable or potential data deficiency. These flags are applied according to the U.S. Environmental Protection Agency contract-laboratory program guidelines.

LANL (Los Alamos National Laboratory) data validation qualifiers—The Los Alamos National Laboratory data qualifiers which are defined by, and used, in the Environmental Remediation and Surveillance (ERS) Program validation process. The qualifiers describe the general usability (or quality) of data. For a complete list of data qualifiers applicable to any particular analytical suite, consult the appropriate ERS standard operating procedure.

LANL (Los Alamos National Laboratory) data validation reason codes—The Los Alamos National Laboratory designations applied to sample data by data validators who are independent of the contract laboratory that performed a given sample analysis. Reason codes provide an analysis-specific explanation for applying a qualifier, with some description of the qualifier's potential impact on data use. For a complete list of data qualifiers applicable to any particular analytical suite, consult the appropriate Environmental Remediation and Surveillance Program standard operating procedure.

log book—A notebook used to record tabulated data (e.g., the history of calibrations, sample tracking, numerical data, or other technical data).

Los Alamos unlimited release (LA-UR) number—A unique identification number required for all documents or presentations prepared for distribution outside Los Alamos National Laboratory (the Laboratory). LA-UR numbers are obtained by filling out a technical information release form (http://enterprise.lanl.gov/alpha.htm) and submitting the form together with 2 copies of the document to the Laboratory's Classification Group (S-7) for review.

lower acceptance limit (LAL)—The lowest limit that is acceptable according to quality control (QC) criteria for a specific QC sample and for a specific method. Any results lower than the LAL are qualified following the routine validation procedure.

matrix—Relatively fine material in which coarser fragments or crystals are embedded; also called "ground mass" in the case of igneous rocks.

matrix spike—An aliquot of a sample to which a known concentration of target analyte has been added. Matrix spike samples are used to measure the ability to recover prescribed analytes from a native sample matrix. The spiking typically occurs before sample preparation and analysis.

matrix spike duplicate—An intralaboratory duplicate sample to which a known amount of target analyte has been added. Spiking typically occurs before sample preparation and analysis.

medium (environmental)—Any material capable of absorbing or transporting constituents. Examples of media include tuffs, soils and sediments derived from these tuffs, surface water, soil water, groundwater, air, structural surfaces, and debris.

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

method detection limit (MDL)—The minimum concentration of a substance that can be measured and reported with a known statistical confidence that the analyte concentration is greater than zero. After subjecting samples to the usual preparation, the MDL is determined by analyzing those samples of a given matrix type that contain the analyte. The MDL is used to establish detection status.

no further action—Under the Resource Conservation and Recovery Act, a corrective-action determination whereby, based on evidence or risk, no further investigation or remediation is warranted.

nondetect—A result that is less than the method detection limit.

notices of approval, of approval with modification, or of disapproval—Notices issued by the New Mexico Environment Department (NMED). Upon receipt of a work plan, schedule, report, or other deliverable document, NMED reviews the document and approves the document as submitted, modifies the document and approves it as modified, or disapproves the document. A notice of approval means that the document is approved as submitted. A notice of approval with modifications means that the document is approved but with modifications specified by NMED. A notice of disapproval means that the document is disapproved and it states the deficiencies and other reasons for disapproval.

outfall—A place where effluent is discharged into receiving waters.

percent recovery (%R)—The amount of material detected in a sample (less any amount already in the sample) divided by the amount added to the sample, expressed as a percentage.

population—(1) A group of interbreeding organisms occupying a particular space. (2) The number of humans or other living creatures in a designated area.

precision—The degree of mutual agreement among a series of individual measurements, values, or results.

quality assurance/quality control—A system of procedures, checks, audits, and corrective actions set up to ensure that all U.S. Environmental Protection Agency research design and performance, environmental monitoring and sampling, and other technical and reporting activities are of the highest achievable quality.

quality control—See quality assurance/quality control.

quality management plan (QMP)—A document providing a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance/quality control. A QMP is part of an organization’s structured and documented management system that describes the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan for ensuring quality in work processes, products, and services.

quality procedure—A document that describes the process, method, and responsibilities for performing, controlling, and documenting any quality-affecting activity governed by a quality management plan.

radiation—A stream of particles or electromagnetic waves emitted by atoms and molecules of a radioactive substance as a result of nuclear decay. The particles or waves emitted can consist of neutrons, positrons, alpha particles, beta particles, or gamma radiation.

radionuclide—Radioactive particle (human-made or natural) with a distinct atomic weight number.

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

record—Any book, paper, map, photograph, machine-readable material, or other documentary material, regardless of physical form or characteristics.

relative percent difference (RPD)—The measure used to assess the precision between parent results and their associated duplicate results. The RPD is calculated as follows:

$$\left|RPD\right| = \frac{S-R}{\left(\frac{S+R}{2}\right)100} \quad ,$$

where RPD = relative percent difference,
S = parent sample result, and
R = duplicate sample result.

The Environmental Remediation and Surveillance Program criteria for the RPD are less than 20% for aqueous samples and less than 35% for soil samples when the sample concentrations are greater than, or equal to, five times the method detection limit (MDL). For samples with concentrations less than five times the MDL, but greater than the MDL, the control is +/-MDL. No precision criterion applies to samples with concentrations less than the MDL.

release—Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of hazardous waste or hazardous constituents into the environment.

remediation—(1) The process of reducing the concentration of a contaminant (or contaminants) in air, water, or soil media to a level that poses an acceptable risk to human health and the environment. (2) The act of restoring a contaminated area to a usable condition based on specified standards.

request number—An identifying number assigned by the Environmental Remediation and Surveillance Program to a group of samples submitted for analysis.

residential scenario—The land use condition under which individuals may be exposed to contaminants as a result of living on or near contaminated sites.

Resource Conservation and Recovery Act—The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 (Public Law [PL] 94-580, as amended by PL 95-609 and PL 96-482, United States Code 6901 et seq.).

rinsate blank—See equipment blank.

risk—A measure of the probability that damage to life, health, property, and/or the environment will occur as a result of a given hazard.

routine analysis—The analysis categories of inorganic compounds, organic compounds, metals, radiochemistry, and high explosives, as defined in a contract laboratory's statement of work.

routine data—Data generated using analytical methods that are identified as routine methods in the current Environmental Remediation and Surveillance Program statement of work for analytical services.

routine data validation—The process of reviewing analytical data relative to quantitative routine acceptance criteria. The objective of routine data validation is two-fold— to estimate the technical quality of the data relative to minimum national standards adopted by the Environmental Remediation and Surveillance Program, and to indicate to data users the technical data quality at a gross level by assigning laboratory qualifiers to environmental data whose quality indicators do not meet acceptance criteria.

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

sample matrix—In chemical analysis, that portion of a sample that is exclusive of the analytes of interest. Together, the matrix and the analytes of interest form the sample.

screening risk assessment—A risk assessment that is performed with few data and many assumptions in order to identify exposures that should be evaluated more carefully for potential risk.

serial dilution sample—A requirement of the U.S. Environmental Protection Agency (EPA) Method 6010B (Inductively Coupled Plasma-Atomic Emission Spectroscopy). Serial dilutions are made by performing a series of dilutions on an aliquot taken from a stock solution for a target analyte. The first dilution of the original stock solution serves as the stock solution for the second dilution, and the second dilution serves as the stock solution for the third dilution, and so on. To meet the requirement of EPA Method 6010B, one serial dilution analysis must be performed for each matrix in every sample batch, with a minimum of 1 serial dilution sample per 20 samples.

site characterization—Defining the pathways and methods of migration of hazardous waste or constituents, including the media affected; the extent, direction and speed of the contaminants; complicating factors influencing movement; or concentration profiles.

soil—(1) A material that overlies bedrock and has been subject to soil-forming processes. (2) A sample media group that includes naturally occurring and artificial fill materials.

soil screening level (SSL)—The concentration of a chemical (inorganic or organic) below which no potential for unacceptable risk to human health exists. The derivation of an SSL is based on conservative exposure and land-use assumptions, and on target levels of either a hazard quotient of 1.0 for a noncarcinogenic chemical or a cancer risk of 10^{-5} for a carcinogenic chemical.

solid waste—Any garbage, refuse, or sludge from a waste treatment plant, water-supply treatment plant, or air-pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities. Solid waste does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges that are point sources subject to permits under section 402 of the Federal Water Pollution Control Act, as amended; or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954, as amended.

solid waste management unit (SWMU)—(1) Any discernible site at which solid wastes have been placed at any time, whether or not the site use was intended to be the management of solid or hazardous waste. SWMUs include any site at a facility at which solid wastes have been routinely and systematically released. This definition includes regulated sites (i.e., landfills, surface impoundments, waste piles, and land treatment sites), but does not include passive leakage or one-time spills from production areas and sites in which wastes have not been managed (e.g., product storage areas). (2) According to the March 1, 2005, Compliance Order on Consent (Consent Order), any discernible site at which solid waste has been placed at any time, and from which the New Mexico Environment Department determines there may be a risk of a release of hazardous waste or hazardous waste constituents (hazardous constituents), whether or not the site use was intended to be the management of solid or hazardous waste. Such sites include any area in Los Alamos National Laboratory at which solid wastes have been routinely and systematically released; they do not include one-time spills.

standard operating procedure—A document that details the officially approved method(s) for an operation, analysis, or action, with thoroughly prescribed techniques and steps.

surface sample—A sample taken at a collection depth that is (or was) representative of the medium's surface during the period of investigative interest. A typical depth interval for a surface sample is 0 to 6 in. for mesa-top locations, but may be up to several feet in sediment-deposition areas within canyons.

surrogate (surrogate compound)—An organic compound used in the analyses of organic target analytes that is similar in composition and behavior to the target analytes but is not normally found in field samples. Surrogates are added to every blank and spike sample to evaluate the efficiency with which analytes are being recovered during extraction and analysis.

target analyte—A chemical or parameter, the concentration, mass, or magnitude of which is designed to be quantified by a particular test method.

technical area (TA)—At Los Alamos National Laboratory, an administrative unit of operational organization (e.g., TA-21).

technical notebook—A record of the methodology, observations, and results of technical activity investigations.

trip blank—A sample of analyte-free medium taken from a sampling site and returned to an analytical laboratory unopened, along with samples taken in the field; used to monitor cross contamination of samples during handling and storage both in the field and in the analytical laboratory.

tuff—Consolidated volcanic ash, composed largely of fragments produced by volcanic eruptions.

upper acceptance limit (UAL)—The highest limit that is acceptable, based on the quality control (QC) criteria for a specific QC sample for a specific method. Any results greater than the UAL are qualified.

upper confidence limit—The statistic that represents the upper bound of the arithmetic mean (usually 95%) of the measured data and that is used in a risk assessment as the reasonable maximum exposure point concentration.

upper tolerance limit—A statistical measure of the upper end of a distribution. The 95th percentile upper tolerance limit, which is the 95% upper percentile of the 95th percentile of the data distribution, is the background value used to represent the background data distribution for an inorganic chemical or naturally occurring radionuclide.

U.S. Department of Energy—The federal agency that sponsors energy research and regulates nuclear materials for weapons production.

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

work plan—A document that specifies the activities to be performed when implementing an investigation or remedy. At a minimum, the work plan should identify the scope of the work to be performed, specify the procedures to be used to perform the work, and present a schedule for performing the work. The work plan may also present the technical basis for performing the work.

A-3.0 METRIC CONVERSION TABLE

Multiply SI (Metric) Unit	by	To Obtain US 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)

Appendix B

Site Photographs

Figure B-1 Excavation activities at AOC 16-024(v)

Figure B-2 Excavation activities at AOC 16-024(v)

Figure B-3 AOC 16-024(v) with Fire Station #5 in the background

Figure B-4 AOC 16-024(v) reseeded and mulched

**Figure B-5	Floor drain inside Fire Station #5**

**Figure B-6	The oil/water separator's interior shows little use.**

Figure B-7 Excavation activities at SWMU 16-026(r)

Figure B-8 Trench exposing the steel overflow line. A gas line crosses the trench and the 6-in. roof drainline is visible near the top of the photograph.

Figure B-9 Once exposed, numerous holes were visible in the steel drainline.

Figure B-10 The corroded drainline

Figure B-11 **Sample collection at SWMU 16-026(r)**

Figure B-12 **Sample collection at SWMU 16-026(r)**

Figure B-13 Sample collection at SWMU 16-026(r)

Figure B-14 Polyvinyl chloride (PVC) pipe was used in a recent repair of the roof drain at the first elbow. The steel drainline has been cut and is ready to be removed from the trench.

Figure B-15 **A damaged portion of the roof drainline at the second elbow. This section was later repaired by splicing in a section of PVC pipe. The steel drainline is also visible and has been cut before removal.**

Figure B-16 **Before backfilling, the second elbow of the roof drainline was repaired by splicing in a section of 6-in. PVC.**

Figure B-17 **The location where the 2-in. steel drainline connects to the 6-in. clay roof drainline**

Figure B-18 **Locating the roof drain at the third elbow**

Figure B-19 Roof drain discharge location

Figure B-20 The backfilled trench

Figure B-21 SWMU 16-026(r) post-ACA activities

Appendix C

Field Forms
(on CD included with this document)

Appendix D

Analytical Suites and Results
(on CD included with this document)

Appendix E

Risk Assessments

Human health and ecological risk screening assessments for Area of Concern (AOC) 16-024(v) and Solid Waste Management Unit (SWMU) 16-026(r) are presented in the following sections.

E-1.0 HUMAN HEALTH SCREENING ASSESSMENT

Laboratory workers currently have access to and may frequent the areas in and around AOC 16-024(v) and SWMU 16-026(r). However, AOC 16-024(v) has been excavated to a depth of 8–9 ft and covered with clean fill so the industrial scenario does not apply, which is based on a surface exposure. Therefore, the construction worker scenario is assessed for AOC 16-024(v). Samples were collected at SWMU 16-026(r) from 0.5–1 ft below ground surface (bgs) to assess the industrial worker scenario, even though the oil/water separator overflow drainline and outfall are below the surface and have no surface expression. The industrial (0.5–1-ft-bgs samples only) and construction worker (all samples) scenarios are assessed for SWMU 16-026(r). Residential exposure using data from all samples collected that are still in place at each site is also assessed even though it is not a current and potentially reasonably foreseeable future land use. If the residential scenario has acceptable risk, the site recommendation is made based on exposure to a resident.

Potential exposure pathways for industrial and construction worker exposures as well as a resident include incidental ingestion of soil, inhalation of fugitive dust or vapors, and dermal contact with soil. Potential pathways from subsurface releases are complete only if soil was excavated and brought to the surface. In such a case, the potential exposure pathways are the same as those of a surface soil release.

No complete exposure pathways to ecological receptors are present at AOC 16-024(v) because the site has been excavated to approximately 8 ft bgs. Complete exposure pathways to receptors are present at SWMU 16-026(r). The primary ecological exposure pathways for terrestrial animals include ingestion of contaminated soil and food web transport. The primary exposure pathway to plants is root uptake.

E-1.1 Screening Evaluation

Exposure point concentrations (EPCs) for chemicals of potential concern (COPCs) were compared with construction worker and residential soil screening levels (SSLs) for both sites as well as industrial SSLs for SWMU 16-026(r). Because the shallow samples (0.5–1 ft bgs) at AOC 16-024(v) have been excavated, there is no potential exposure to COPCs unless the subsurface material from 8–9 ft bgs is brought to the surface. The AOC is assessed for potential risk (construction worker and residential scenarios) using the maximum detected concentrations from the 8–9-ft-bgs depth interval (Table E-1.1-1). The EPCs for SWMU 16-026(r) are the 95% upper confidence limit (UCL) of the arithmetic mean or the maximum detected concentration in the depth interval of interest. The EPCs at SWMU 16-026(r) for the industrial scenario are from the 0.5–1-ft-bgs samples, while the EPCs for the construction worker and residential scenarios at SWMU 16-026(r) are from 0.5 ft to 5 ft.

The 95% UCLs were calculated as described in U.S. Environmental Protection Agency (EPA) guidance (EPA 2002, 073593). Tests for distributions were performed using ProUCL (EPA 2004, 090033) to determine the appropriate method for UCL calculations. The following methods were used to calculate 95% UCL concentrations (depending on the type of distribution found for the data set):

- Student’s t-statistic procedure – normal distributions
- Chebyshev (Mean, Std.) or Modified-t test procedure – nonparametric distributions
- Approximate Gamma procedure – gamma distributions

Results of the distribution testing and the EPCs used for the industrial, construction worker, residential, and ecological assessments at SWMU 16-026(r) are presented in Tables E-1.1-2 and E-1.1-3. One-half of the detection limit was used to represent the concentration for all undetected results in the UCL calculations.

The chemical SSLs used in the evaluations were obtained from New Mexico Environment Department (NMED) guidance (NMED 2006, 092513). If NMED does not have a SSL for a chemical, the EPA Region 6 screening levels were used (EPA 2006, 094321). In the case of perchlorate at AOC 16-024(v) and methylphenol[4-] at SWMU 16-026(r), NMED and EPA Region 6 do not have construction worker SSLs. Construction worker SSLs were calculated using the reference doses (RfDs) from EPA Region 6 (EPA 2006, 094321) (0.0007 mg/kg-d and 0.005 mg/kg-d, respectively) and the equation and parameters from NMED guidance (NMED 2006, 092513). The SSLs for carcinogens are equivalent to a 1 x 10^{-5} cancer risk (1 in 100,000) (EPA Region 6 values for carcinogens are adjusted to a 1 x 10^{-5} cancer risk) and for noncarcinogens represent a hazard quotient (HQ) of 1.0. The comparisons with SSLs are conducted separately for carcinogens and noncarcinogens for each scenario evaluated (Tables E-1.1-4 to E-1.1-9).

Four organic COPCs (butanone[2-]; trimethylbenzene[1,3,5-]; xylene[1,2-]; and xylenes[1,3+1,4-]) at SWMU 16-026(r) have one or more SSLs based on soil saturation limits (C_{sat}) rather than chemical-specific toxicological effects (NMED 2006, 092513; EPA 2006, 094321). To evaluate potential risk from these COPCs, risk-based SSLs were either obtained from the EPA Region 6 screening values Excel spreadsheet (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screenexpanded.xls) for the residential or outdoor worker scenario or calculated using the RfDs, the equation, and parameters from NMED guidance (NMED 2006, 092513). These risk-based SSLs are substituted for the C_{sat} SSLs in the screening assessments to provide a meaningful assessment of risk.

Total petroleum hydrocarbon (TPH)-diesel range organic (DRO) and TPH-gasoline range organic (GRO) data were evaluated using NMED's screening guidelines (NMED 2006, 094614). The industrial and residential screening guidelines for diesel #2/crankcase oil were used because the source of any releases of oil from the SWMU would have been from vehicles (Table E-1.1-10). Neither TPH-GRO nor the construction worker scenario has any screening guidelines (NMED 2006, 094614). In addition, the components of the TPH were screened using the SSLs described above.

AOC 16-024(v)

The EPCs for noncarcinogenic COPCs at AOC 16-024(v) were less than their respective construction worker and residential SSLs. The hazard indices (HIs) for the noncarcinogenic COPCs are approximately 0.2 and 0.01 for the construction worker and residential scenarios, respectively (Table E-1.1-4). The HIs are less than NMED's target HI of 1.0 (NMED 2006, 092513).

The EPCs for carcinogenic COPCs at AOC 16-024(v) were less than their respective construction worker SSLs. The EPC for benzo(a)pyrene (0.657 mg/kg) was slightly above the residential SSL of 0.621 mg/kg; all other EPCs were less than their respective residential SSLs. The total excess cancer risk for the construction worker scenario is approximately 4 x 10^{-7} (Table E-1.1-5), which is less than the NMED target level for carcinogenic risk of 1 x 10^{-5} (NMED 2006, 092513).The total excess cancer risk for the residential scenario is approximately 1 x 10^{-5} (Table E-1.1-5), which is equivalent to the NMED target level (NMED 2006, 092513).

SWMU 16-026(r)

The EPCs for noncarcinogenic COPCs at SWMU 16-026(r) were less than their respective industrial and construction worker SSLs. The HIs for the noncarcinogenic COPCs are approximately 0.08 and 0.1, respectively (Tables E-1.1-6 and E-1.1-7), which are less than NMED's target HI of 1.0 (NMED 2006, 092513). The EPCs for noncarcinogenic COPCs at SWMU 16-026(r) were less than their respective residential SSLs and resulted in a HI of 0.5, which is less than the NMED target level (Table E-1.1-7).

The EPCs for carcinogenic COPCs at SWMU 16-026(r) were less than their respective industrial and construction worker SSLs. The total excess cancer risks are approximately 1×10^{-5} and 7×10^{-6}, respectively (Tables E-1.1-8 and E-1.1-9), which are equivalent to, or less than, the NMED target level for carcinogenic risk of 1×10^{-5} (NMED 2006, 092513). Several COPCs (polyaromatic hydrocarbons [PAHs] from the roof and asphalt parking lot) exceeded the residential SSLs, which resulted in a total excess cancer risk of 3×10^{-4}, which is above the NMED target level (Table E-1.1-9).

The TPH-DRO concentrations were less than NMED's industrial and residential screening guidelines for diesel fuel #2/crankcase oil (NMED 2006, 094614) (Table E-1.1-10). Although there are no NMED screening guidelines for TPH-GRO, the detected concentrations are low (0.0352 mg/kg and 0.0371 mg/kg) and do not indicate a release of gasoline.

E-1.2 Uncertainty Analysis

The analysis for human health is subject to uncertainties associated with data evaluation, exposure assessment, and toxicity values. Each or all of these uncertainties may affect the assessment results.

Data Evaluation

Data evaluation uncertainties may include errors in sampling, laboratory analysis, and data analysis. Although concentrations used in this risk assessment were less than estimated quantitation limits for some COPCs, data evaluation uncertainties are expected to have little effect on the assessment results. The J (estimated) qualification of detected concentrations of some organic COPCs does not affect the assessment.

Another data evaluation uncertainty relates to the use of the 95% UCL as the EPC. Use of the 95% UCL may result in an overestimation of risk for analytes that have elevated detection limits. Use of the maximum detected concentration also overestimates the exposure. The maximum detected concentrations were used as the EPCs at AOC 16-024(v) because only four sampling results were available after the site's excavation to 8–9 ft bgs. Maximum detected concentrations were used as the EPCs for benzo(k)fluoranthene and pyrene at SWMU 16-026(r) because a representative 95% UCL could not be calculated. In either case, the receptors would not be exposed to these concentrations across the site.

Exposure Assessment

All four locations sampled at AOC 16-024(v) are at the bottom of the area excavated and are now covered with approximately 8 ft of clean fill. No complete pathways for exposure to a Laboratory worker exist at this AOC. If construction activity were to occur and result in the uncovering of residual contamination, there is no potential unacceptable risk to a construction worker at this site. The exposure of a resident to residual contamination is overestimated because the EPCs are the maximum detected concentrations, which result in a HI of 0.01 and a total excess cancer risk of approximately 1.4×10^{-5} as a result of primarily to benzo(a)pyrene. If the average concentration of the two detected sampling results for benzo(a)pyrene is assessed (approximately 0.4 mg/kg), the total excess cancer risk is approximately 6×10^{-6}. This result indicates that the potential risk to a resident at AOC 16-024(v) is overestimated by using the maximum detected concentration, and that the risk is acceptable.

SWMU 16-026(r) is located entirely below the surface and has no complete pathways under current conditions for exposure to an industrial worker on the surface. Based on the results of the screening assessment for the industrial scenario using the 0.5–1-ft data, the HI is less than NMED's target level and the potential cancer risk is equivalent to NMED's target level. The potential cancer risk is likely to the result of runoff and asphalt from the paved areas around the building and not from the oil/water separator drainline and outfall. This scenario also assumes that a worker would be exposed to contaminated material on the surface for a long period of time (exposure duration for the industrial scenario is 25 yr), which is unlikely given the use of the area. Therefore, the potential risk presented in the risk screening assessment for a worker is overestimated. In addition, the potential risks to an industrial worker and a resident are driven by single sampling results; for the worker, sampling location 16-26575, and for a resident, sampling location 16-26980 (outfall). The sampling results are an order of magnitude or higher, respectively, than the other samples collected. The potential cancer risks are reduced to approximately 2×10^{-6} and 2×10^{-5} for the industrial and residential scenarios, respectively, if these samples are eliminated. Because it is unlikely that a receptor will spend an inordinate amount of time on the locations where the highest concentrations were detected, the total excess cancer risk calculated for SWMU 16-026(r) for the industrial and residential scenarios are overestimated.

The receptors used in the assessment are subject to exposures in a different manner than the exposure assumptions used to derive the SSLs. Assumptions for the industrial SSLs are that the potentially exposed individual is a Laboratory (industrial) worker who is outside for 225 d/yr and 25 yr (NMED 2006, 092513) and spends the entire time on-site within the contaminated area. The construction worker is assumed to be exposed for 1 yr and 250 d/yr (NMED 2006, 092513) and also spends the entire time on-site within the contaminated area. Because neither site is used in the fashion evaluated, it is unlikely that either a Laboratory (industrial) worker or a construction worker would be present within the contaminated area for the entire work day and for the specified exposure frequencies and durations. Therefore, the risk screening assessments overestimate the exposures and the risks and hazards to these receptors.

Assumptions underlying the exposure parameters, routes of exposure, amount of contaminated media available for exposure, and intake rates for routes of exposure are consistent with EPA-approved parameters and default values (NMED 2006, 092513; EPA 2006, 094321). In the absence of site-specific data, several upper-bound values for the assumptions may be combined to estimate exposure for any one pathway, and the resulting risk estimate can exceed the 99th percentile. Therefore, uncertainties in the assumptions underlying the exposure pathways may contribute to risk assessments that exceed the reasonably expected range.

Toxicity Values

The primary uncertainty associated with the screening values relates to the derivation of screening values from the EPA toxicity values (RfDs and slope factors [SFs]) (EPA 1997, 058968; EPA 2002, 076870). Uncertainties were identified in the following three areas with respect to the toxicity values: (1) extrapolation from other animals to humans, (2) extrapolation from one route of exposure to another route of exposure, and (3) interindividual variability in the human population.

The SFs and RfDs are often determined by extrapolation from animal data to humans, which may result in uncertainties in toxicity values because differences exist in chemical absorption, metabolism, excretion, and toxic response between other animals and humans. The EPA takes into account differences in body weight, surface area, and pharmacokinetic relationships between animals and humans to minimize the potential to underestimate the dose-response relationship. However, more conservatism is usually incorporated in these steps.

The SFs and RfDs often contain extrapolations from one route of exposure to another. The extrapolation from the oral route to the inhalation and/or the dermal route is used in the derivation of some screening values. Differences in chemical absorption and/or toxicity between the two exposure routes could result in over- or underestimation of risk or hazard.

For noncarcinogenic effects, the amount of human variability in physical characteristics is important in determining the hazards that can be expected at low exposures and in determining the no-observed–adverse-effect level (NOAEL). The NOAEL/uncertainty factor approach incorporates a factor of 10 to reflect the possible interindividual variability in the human population; it is generally considered a conservative estimate.

Another uncertainty related to toxicity assessment is the assumption of additivity, which may result in an overestimate or underestimate of risk. For noncarcinogens, the effects of a mixture of chemicals generally are unknown and possible interactions could be synergistic or antagonistic. Additionally, the RfDs for different chemicals are not based on the same severity, effect, or target organ. Therefore, the potential for occurrence of noncarcinogenic effects may be overestimated for chemicals that are addressed additively but that act by different mechanisms and on different target organs.

The use of surrogates for some chemicals that do not have EPA-approved or provisional toxicity values also contributes to uncertainty in risk assessment. In this assessment, a surrogate was used to establish toxicity values for the following COPCs based on structural similarity (NMED 2003, 081172):

- acenaphthylene
- benzo(g,h,i)perylene
- 2-methylnaphthalene

None of these COPCs contributed substantially to the hazard indices of the scenarios assessed.

E-1.3 Interpretation

AOC 16-024(v)

Based on the residential scenario, the HI (0.01) is less than NMED's target level of 1.0, and the cancer risk (approximately 1 x 10^{-5}) is equivalent to the NMED target level of 1 x 10^{-5}. For a construction worker scenario, the HI (0.2) is less than NMED's target level of 1.0, and the cancer risk (approximately 4 x 10^{-7}) is less than the NMED target level of 1 x 10^{-5}. The screening assessments and associated uncertainty analysis indicates no potential unacceptable risk to human health at AOC 16-024(v) under a residential scenario.

SWMU 16-026(r)

Based on an industrial scenario, the HI (0.08) is less than NMED's target level of 1.0, and the cancer risk (approximately 1 x 10^{-5}) is equivalent to the NMED target level of 1 x 10^{-5}. For a construction worker, the

HI (0.1) is less than NMED's target level of 1.0, and the cancer risk (7 x 10^{-6}) is less than the NMED target level of 1 x 10^{-5}. Based on the residential scenario, the HI (0.5) is less than NMED's target level of 1.0, and the cancer risk (3 x 10^{-4}) is above the NMED target level of 1 x 10^{-5}. The screening assessments indicate no potential unacceptable risk to human health for the industrial and construction worker scenarios at SWMU 16-026(r). The human health screening assessment for a residential scenario indicates potential risk due to the presence of PAHs from the roof drain and asphalt parking lot but not from the SWMU.

E-2.0 ECOLOGICAL SCREENING ASSESSMENT

The scoping evaluation establishes the breadth and focus of the ecological screening assessment. The ecological scoping checklists, Attachment E-1 to this appendix, were used to determine whether ecological receptors might be affected, identify the types of receptors that might be present, and develop the ecological site conceptual model for the sites.

The sites are located in an industrially developed area and the surface at both sites has been disturbed as a result of accelerates corrective action activities. The surrounding area is made up of asphalt pavement, gravel surfacing, and fill, with sparse flora or fauna. The small amount of open area within the developed area contains native and nonnative grasses and invasive weeds and provides limited and fragmented habitat. The potential pathways to ecological receptors are by root uptake, soil ingestion, and food web transport.

E-2.1 Assessment Endpoints

An assessment endpoint is an explicit expression of the environmental value to be protected. These endpoints are ecologically relevant and help sustain the natural structure, function, and biodiversity of an ecosystem or its components (EPA 1998, 062809). In a screening-level assessment, assessment endpoints are any adverse effects on ecological receptors, where receptors are populations and communities (EPA 1997, 059370).

The ecological screening assessment is designed to protect populations and communities of biota rather than individual organisms, except for listed or candidate threatened and endangered (T&E) species or treaty-protected species (EPA 1999, 070086). The protection of individuals within these designated protected species may also be protected at the population level; the populations of these species tend to be small, and the loss of an individual adversely affects the species.

In accordance with this guidance, the Laboratory developed generic assessment endpoints (LANL 1999, 064137) to ensure that values at all levels of ecological organization are considered in the ecological screening process. These general assessment endpoints may be measured using impacts on reproduction, growth, and survival to represent categories of effects that may adversely impact populations. In addition, specific receptor species were chosen to represent each functional group. The receptor species were chosen because of their presence at the site, their sensitivity to the COPCs, and their potential for exposure to those COPCs. These categories of effects and the chosen receptor species were used to select the types of effects seen in toxicity studies considered in the development of the toxicity reference values (TRVs). Toxicity studies used in the development of TRVs included only studies in which the adverse effect evaluated affected reproduction, survival, and/or growth.

The selection of receptors and assessment endpoints is designed to be protective of both the representative species used as screening receptors and the other species within their feeding guilds and the overall food web for the terrestrial and aquatic ecosystems. Focusing the assessment endpoints on these general characteristics of species that affect populations (rather than the biochemical and behavioral changes that may affect only the studied species) also ensures the applicability to the ecosystem of concern.

E-2.2 Screening Evaluation

Analytical results from 0 ft to 5 ft are evaluated in the ecological screening assessment using the 95% UCL or maximum detected concentration as the EPC. Because AOC 16-024(v) has had all material excavated to a depth of approximately 8 ft, there is no potential exposure to ecological receptors at this site. As a result, an ecological screening assessment was not conducted. For SWMU 16-026(r), samples were collected from 0.5–5 ft bgs and the site was evaluated for potential ecological risk.

The numerical screening evaluation of SWMU 16-026(r) compared media-specific ecological screening levels (ESLs) for each receptor with the EPC. The ESLs are derived for each of the receptors where information is available. The ESLs are based on similar species and derived from those experimentally determined to have NOAELs, lowest-observed-adverse-effect levels, or doses lethal to 50% of the population. The derivation of ESLs is based on the approach presented in “Screening Level Ecological Risk Assessment Methods, Revision 2” (LANL 2004, 087630). Relevant information necessary to calculate ESLs, including concentration equations, dose equations, bioconcentration factors, transfer factors, and toxicity reference values, are presented in the ECORISK Database, Version 2.2 (LANL 2005, 090032). The ESLs were developed to reflect an adverse effect on an average, nongravid, adult individual of a particular species (EPA 1993, 059384); they are designed to be protective of specific organisms and may only be used to infer a potential risk to receptors. The ESLs used in this screening evaluation (Table E-2.2-1) were obtained from the ECORISK Database, Version 2.2 (LANL 2005, 090032).

The receptors, which represent several trophic levels (LANL 2004, 087630), include the following:

- a plant
- a soil-dwelling invertebrate (represented by the earthworm)
- the American robin (avian insectivore, avian omnivore, and avian herbivore)
- the American kestrel (avian insectivore and carnivore)
- the deer mouse (mammalian omnivore)
- the Montane shrew (mammalian insectivore)
- the desert cottontail (mammalian herbivore)
- the red fox (mammalian carnivore)

The COPCs evaluated against the ESLs included four inorganic chemicals and 23 organic chemicals. The minimum ESL for each COPC was compared with the respective EPC; the HQ was calculated by dividing the EPC by the ESL (Table E-2.2-2). An HQ greater than 0.3 was used to identify chemicals of potential ecological concern (COPECs) and determine which chemicals were evaluated further (LANL 2004, 087630). Based on this comparison, 17 COPCs (four inorganic chemicals and 13 organic chemicals) were retained as COPECs (Table E-2.2-2). Methylphenol[4-], trimethylbenzene[1,2,4-], and trimethylbenzene[1,3,5-] do not have ESLs for terrestrial receptors and were also retained as COPECs and discussed in the uncertainty section.

The COPECs were evaluated further in Table E-2.2-3. The HQs for each COPEC/receptor combination and the HIs for each receptor were calculated. The HI is the sum of HQs for chemicals with common toxicological endpoints for a given receptor. For the purposes of ecological screening, it is assumed that nonradionuclides have common toxicological effects. The HI analysis provides an indication of potential adverse impacts by determining how many receptors may be affected and provides information on T&E species. The HI for each receptor was greater than 1.0, ranging from 2 (red fox) to 96 (plant) (Table E-2.2-3).

E-2.3 Uncertainty Analysis

The uncertainty analysis describes the key sources of uncertainty related to the screening assessment. This analysis can result in either adding or removing chemicals from the list of COPECs for the sites.

The assumptions used in the ESL derivations were conservative and not necessarily representative of actual conditions. These assumptions included maximum chemical bioavailability, maximum receptor ingestion rates, minimum bodyweight, and additive effects of multiple COPECs. Most of these factors tend to result in conservative estimates of the ESLs, which may lead to an overestimation of the potential risk. The effects of a mixture of chemicals generally are unknown, and possible interactions could be synergistic or antagonistic. Therefore, the assumption of additive effects for multiple COPECs may result in an over- or underestimation of the potential risk to receptors.

The chemical form of the individual COPECs was not determined as part of the investigation. This is largely a limitation on analytical quantitation of individual chemical species. Toxicological data are typically based on the most toxic and bioavailable chemical species, which are not likely found in the environment. The inorganic and organic COPECs are generally not 100% bioavailable to receptors in the natural environment because of the adsorption of chemical constituents to matrix surfaces (e.g., soils), or rapid oxidation or reduction changes that render harmful chemical forms unavailable to biotic processes. The ESLs were calculated to ensure a conservative indication of potential risk (LANL 2004, 087630), and the values were biased toward overestimating the potential risk to receptors.

The EPCs used in the calculation of HQs were the 95% UCLs. As a result, the exposure of individuals within a population was evaluated using this specific concentration, which was assumed constant throughout the exposure area. This results in an overestimation of the potential risk because concentrations varied across the site.

A comparison of the EPCs for the inorganic COPECs and their respective background concentrations (LANL 1998, 059730) indicates that the mercury EPC is similar to the background concentration (EPC of 0.11 mg/kg and background concentration of 0.1 mg/kg). Therefore, exposure to mercury across the site is similar to background, and mercury is eliminated as a COPEC.

In addition to the direct comparison of the EPCs with the ESLs, area use factors (AUFs) are used to account for the amount of time that the receptor is likely to spend within the contaminated areas, based on the size of the receptor's home range (HR). The AUFs for individuals were developed by dividing the size of the site (approximately 0.03 hectares [ha]) by the HR for that receptor. The HR for the Mexican spotted owl is 366 ha (EPA 1993, 059384), and the AUF is 0.00008. Based on the application of the AUF for the Mexican spotted owl to the HI (6) for the carnivorous kestrel, which is a surrogate for the owl, there is no potential for ecological risk to the Mexican spotted owl (HI <0.001).

EPA guidance is to manage the ecological risk to populations rather than to individuals, except for T&E species (EPA 1999, 070086). One approach to address the potential effects on a population is to estimate the spatial extent of the area inhabited by the local population that overlaps with the contaminated area. The population area for a receptor is based on the individual receptor HR and its dispersal distance (Bowman et al. 2002, 073475) estimate that the median dispersal distance for mammals is seven times the linear dimension of the HR (i.e., the square root of the HR area). If only the dispersal distances for the mammals with HRs within the range of the screening receptors are used (Bowman et al. 2002, 073475), the median dispersal distance becomes 3.6 times the square root of the HR (R^2=0.91). If it is assumed that the receptors can disperse the same distance in any direction, the population area is circular and the dispersal distance is the radius of the circle. Therefore, the population area can be derived by $\pi(3.6\sqrt{HR})^2$ or approximately 40HR.

The area of SWMU 16-026(r) is approximately 0.03 ha. The population area use factors (PAUFs) are estimated by dividing the area by the population area of each receptor population (Table E-2.3-1). The HIs were recalculated minus mercury, which was eliminated as a COPEC based on similarity to background, and adjusted by the PAUFs (Table E-2.3-2). The HIs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have HRs. Based on the reassessment, the PAUF-adjusted HIs are 0.6 or less for the wildlife receptors (Table E-2.3-2). Therefore, these receptor populations are not adversely affected by the COPECs.

The HI for the plant is primarily driven by an elevated concentration of acenaphthene, naphthalene, selenium, and zinc, while the HI for the earthworm is driven primarily by an elevated concentration of fluoranthene, fluorene, phenanthrene, and pyrene. The concentrations of the PAH COPECs are from one location (location 16-26980) and result in high HQs for the plant and earthworm. In addition, the selenium and zinc HQs for the plant are driven by one elevated sampling result for each inorganic chemical; the value for selenium is a detection limit and not a detected concentration. The EPCs for selenium and zinc without the single elevated sampling results (1.1 mg/kg and 41.8 mg/kg, respectively) are similar to background concentrations (soil background concentrations are 0.1 mg/kg to 1.7 mg/kg for selenium and 14 mg/kg to 75.5 mg/kg for zinc) (LANL 1998, 059730). The HIs are reduced substantially without the single elevated PAH and inorganic COPEC concentrations; the plant HI is approximately 4 and the earthworm HI is approximately 0.7. The results for the PAHs and inorganic chemicals indicate that the elevated concentrations of these COPECs are isolated; the EPCs overestimate the potential exposure and risk and are not likely to adversely affect plant and earthworm populations. Therefore, based on this assessment, the plant and earthworm are not adversely affected by the COPECs. In addition, the PAHs are not from the SWMU but are from the asphalt parking lot and roof drainline.

Methylphenol[4-], trimethylbenzene[1,2,4-], and trimethylbenzene[1,3,5-] were also retained as COPECs but do not have ESLs.

- Methylphenol[4-] was detected in one of 15 samples with a 95% UCL of 0.33 mg/kg. If phenol is used as a surrogate, the minimum ESL is 0.79 mg/kg for the plant. The HQ of 0.4 indicates that methylphenol[4-] is not a COPEC at SWMU 16-026(r).
- Trimethylbenzene[1,2,4-], and trimethylbenzene[1,3,5-] were each detected in one of 15 samples at concentrations of 0.00193 mg/kg and 0.000351 mg/kg, respectively. If trichlorobenzene[1,2,4-] is used as a surrogate, the minimum ESL is 0.27 mg/kg for the Montane shrew. The HQs of 0.007 and 0.001 indicate that trimethylbenzene[1,2,4-] and trimethylbenzene[1,3,5-] are not COPECs at SWMU 16-026(r).

Based on this evaluation, methylphenol[4-], trimethylbenzene[1,2,4-], and trimethylbenzene[1,3,5-] do not pose a potential ecological risk to receptors at SWMU 16-026(r) and are eliminated as COPECs.

E-2.4 Interpretation

Based on the ecological screening assessment for SWMU 16-026(r), several COPECs were identified. The inorganic chemicals and organic chemicals were eliminated as COPECs in the uncertainty analysis by considering a number of factors, including background concentrations, the analysis for potential effects to populations (individuals for T&E species), the area of contamination, and the infrequency of detected concentrations. The ecological screening assessment indicates that contamination at SWMU 16-026(r) does not pose a potential ecological risk to receptors.

E-3.0 CONCLUSIONS AND RECOMMENDATIONS

The human health risk screening results and uncertainty analysis for AOC 16-024(v) indicate that the potential hazard and risk under the construction worker and residential scenarios satisfies NMED's target levels (NMED 2006, 092513). The assumptions under which the risk screening assessments were conducted were protective of both receptors and indicate that no additional corrective action is warranted based on potential risk to human health.

The human health risk screening results for SWMU 16-026(r) indicate that the potential hazard and risk under the industrial and construction worker scenarios do not exceed NMED's target levels (NMED 2006, 092513) under current conditions. The human health risk screening results under the residential scenario exceeded SSLs for PAHs from the roof drain and asphalt parking lot but not from the SWMU, resulting in a total excess cancer risk exceeding NMED's target level. Because SWMU 16-026(r) is not the source of the PAHs, no additional corrective action is warranted based on the potential risk to human health.

Potential ecological risk was not assessed for AOC 16-024(v) because all material to a depth of approximately 8 ft bgs was excavated. As a result, no complete pathways to receptors are present. Potential ecological risk was assessed for SWMU 16-026(r), and the results indicated that contamination does not pose a potential ecological risk to receptor populations. No additional corrective action is warranted at SWMU 16-026(r) based on the potential ecological risk.

E-4.0 REFERENCES

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

Copies of the reference sets are maintained at the NMED Hazardous Waste Bureau; the U.S. Department of Energy-Los Alamos Site Office; the EPA, Region 6; and at the EP Directorate. The sets were developed to ensure that the administrative authority has all material needed to review this document, and they are updated periodically as needed. Documents previously submitted to the administrative authority are not included.

Bowman, J., J.A.G. Jaeger, and L. Fahrig, 2002. "Dispersal Distance of Mammals is Proportional to Home Range Size," Ecology, Vol. 83, No. 7, pp. 2049-2055. (Bowman et al. 2002, 073475)

EPA (U.S. Environmental Protection Agency), December 1993. "Wildlife Exposure Factors Handbook," Vol. I of II, EPA/600/R-93/187a, Office of Research and Development, Washington, D.C. (EPA 1993, 059384)

EPA (U.S. Environmental Protection Agency), June 5, 1997. "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments," Interim Final, Environmental Response Team, Edison, New Jersey. (EPA 1997, 059370)

EPA (U.S. Environmental Protection Agency), July 1997. "Health Effects Assessment Summary Tables," FY 1997 update, EPA-540-R-97-036, Office of Solid Waste and Emergency Response, Washington, D.C. (EPA 1997, 058968)

EPA (U.S. Environmental Protection Agency), April 1998. "Guidelines for Ecological Risk Assessment," EPA/630/R-95/002F, Risk Assessment Forum, Washington, D.C. (EPA 1998, 062809)

EPA (U.S. Environmental Protection Agency), October 7, 1999. "Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites," OSWER Directive 9285.7-28 P, Washington, D.C. (EPA 1999, 070086)

EPA (U.S. Environmental Protection Agency), July 2002. "Calculating Exposure Point Concentrations at Hazardous Waste Sites," draft, OSWER 9285.6-10, Office of Emergency and Remedial Response, Washington, D.C. (EPA 2002, 073593)

EPA (U.S. Environmental Protection Agency), 2002. "Integrated Risk Information System (IRIS)," online database, http://www.epa.gov/iris. (EPA 2002, 076870)

EPA (U.S. Environmental Protection Agency), April 2004. "ProUCL Version 3.0 User Guide," EPA/600/R04/079, Washington, D.C. (EPA 2004, 090033)

EPA (U.S. Environmental Protection Agency), December 2006. "EPA Region 6 Human Health Medium-Specific Screening Levels," Environmental Protection Agency Region 6, Dallas, Texas. (EPA 2006, 094321)

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

LANL (Los Alamos National Laboratory), June 1999. "General Assessment Endpoints for Ecological Risk Assessment at Los Alamos National Laboratory," report prepared for Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1999, 064137)

LANL (Los Alamos National Laboratory), December 2004. "Screening Level Ecological Risk Assessment Methods, Revision 2," Los Alamos National Laboratory document LA-UR-04-8246, Los Alamos, New Mexico. (LANL 2004, 087630)

LANL (Los Alamos National Laboratory), September 2005. "ECORISK Database Release 2.2," Los Alamos National Laboratory document LA-UR-05-7424, Los Alamos, New Mexico. (LANL 2005, 090032)

NMED (New Mexico Environment Department), November 24, 2003. "LANL's Risk Reduction and Environmental Stewardship (RRES) Remediation Services Project Use of Surrogate Chemicals in Risk Assessments, Los Alamos National Laboratory NM0890010515," New Mexico Environment Department letter to D. Gregory (DOE) and G.P. Nanos (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2003, 081172)

NMED (New Mexico Environment Department), June 2006. “Technical Background Document for Development of Soil Screening Levels, Revision 4.0, Volume 1, Tier 1: Soil Screening Guidance Technical Background Document,” New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2006, 092513)

NMED (New Mexico Environment Department), October 2006. “New Mexico Environment Department TPH Screening Guidelines,” Santa Fe, New Mexico. (NMED 2006, 094614)

Table E-1.1-1
EPCs for the Human Health Risk Screening Assessments at AOC 16-024(v)

COPC	Number of Analyses	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	EPC (mg/kg)
Cobalt	4	4.58	14.4	14.4
Perchlorate	4	0.00142	0.00733	0.00733
Acenaphthene	4	0.0362	0.112	0.112
Anthracene	4	0.0362	0.27	0.27
Benzo(a)anthracene	4	0.0234	0.885	0.885
Benzo(a)pyrene	4	0.0368	0.657	0.657
Benzo(b)fluoranthene	4	0.0368	1.14	1.14
Benzo(g,h,i)perylene	4	0.0362	0.519	0.519
Chrysene	4	0.0167	0.976	0.976
Fluoranthene	4	0.0127	1.87	1.87
Fluorene	4	0.0362	1.32	1.32
Indeno(1,2,3-cd)pyrene	4	0.0362	0.44	0.44
2-Methylnaphthalene	4	0.0362	0.0727	0.0727
Naphthalene	4	0.0362	0.0121	0.0121
Phenanthrene	4	0.0154	1.06	1.06
Pyrene	4	0.0294	1.68	1.68

Note: The EPC is the maximum detected concentration.

Table E-1.1-2
EPCs for the Industrial Scenario at SWMU 16-026(r)

COPC	Number of Analyses	Distribution	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Mean Concentration (mg/kg)	Standard Deviation (mg/kg)	EPC (mg/kg)	UCL Method
Lead	6	Gamma	6.41	69.3	23.9	23.9	57.4	Approximate Gamma
Selenium	6	Nonparametric	0.745	8.7	2.15	3.21	7.86	Chebyshev
Acenaphthene	6	Nonparametric	0.0163	0.884	0.21	0.35	0.84	Chebyshev
Anthracene	6	Nonparametric	0.0175	1.48	0.33	0.59	1.37	Chebyshev
Benzo(a)anthracene	6	Nonparametric	0.0175	2.05	0.52	0.84	2.01	Chebyshev
Benzo(a)pyrene	6	Nonparametric	0.0175	1.77	0.41	0.7	1.65	Chebyshev
Benzo(b)fluoranthene	6	Nonparametric	0.0175	2	0.37	0.8	1.79	Chebyshev
Benzo(g,h,i)perylene	6	Nonparametric	0.0174	0.998	0.25	0.4	0.96	Chebyshev
Benzo(k)fluoranthene	6	n/a*	0.0174	1.45	0.42	0.64	1.45	Maximum detected concentration
Chrysene	6	Nonparametric	0.0175	1.9	0.5	0.78	1.88	Chebyshev
Dibenzo(a,h)anthracene	6	Nonparametric	0.0175	0.33	0.07	0.13	0.3	Chebyshev
Dibenzofuran	6	Nonparametric	0.169	0.5	0.18	0.13	0.35	Modified-t
Dichloroethene[1,1-]	6	Normal	0.000279	0.000725	0.000536	0.000146	0.000656	Student's-t
Fluoranthene	6	Nonparametric	0.0175	4.59	1.18	1.89	4.55	Chebyshev
Fluorene	6	Nonparametric	0.0121	0.955	0.22	0.38	0.89	Chebyshev
Indeno(1,2,3-cd)pyrene	6	Nonparametric	0.0175	0.966	0.24	0.39	0.94	Chebyshev
Methylnaphthalene[2-]	6	Nonparametric	0.0175	0.36	0.088	0.14	0.33	Chebyshev
Naphthalene	6	Nonparametric	0.0175	1.11	0.25	0.44	1.02	Chebyshev
Phenanthrene	6	Nonparametric	0.0175	5.53	1/31	2.25	5.31	Chebyshev
Pyrene	6	n/a	0.0175	4.11	1.12	1.73	4.11	Maximum detected concentration
Xylene{1,3+1,4-]	6	Normal	0.000336	0.00119	0.000884	0.000353	0.00118	Student's-t

*n/a = Not applicable.

Table E-1.1-3
EPCs for the Construction Worker and Residential Scenarios and the Ecological Screening Assessment at SWMU 16-026(r)

COPC	Number of Analyses	Distribution	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Mean Concentration (mg/kg)	Standard Deviation (mg/kg)	EPC (mg/kg)	UCL Method
Lead	15	Nonparametric	6.41	69.3	18.6	15.9	36.6	Chebyshev
Mercury	15	Nonparametric	0.005	0.282	0.0312	0.0139	0.11	Chebyshev
Selenium	15	Nonparametric	0.745	8.7	1.52	2	3.77	Chebyshev
Zinc	15	Nonparametric	21.9	242	50.7	52.8	111.3	Chebyshev
Acenaphthene	15	Nonparametric	0.0163	22.1	1.57	5.68	7.97	Chebyshev
Acenaphthylene	15	Nonparametric	0.0174	0.258	0.036	0.062	0.105	Chebyshev
Acetone	15	Nonparametric	0.00261	0.00631	0.00336	0.00115	0.00465	Modified-t
Anthracene	15	Nonparametric	0.0175	27.9	2.01	7.17	10.1	Chebyshev
Benzo(a)anthracene	15	Nonparametric	0.0175	35.8	2.6	9.2	13	Chebyshev
Benzo(a)pyrene	15	Nonparametric	0.0175	29.1	2.13	7.47	10.5	Chebyshev
Benzo(b)fluoranthene	15	Nonparametric	0.0175	36.3	2.6	9.34	13.1	Chebyshev
Benzo(g,h,i)perylene	15	Nonparametric	0.0174	10.8	0.83	2.77	3.95	Chebyshev
Benzo(k)fluoranthene	15	Nonparametric	0.0174	11.9	0.97	3.05	4.41	Chebyshev
Bis(2-ethylhexyl)phthalate	15	Nonparametric	0.087	0.316	0.12	0.058	0.15	Modified-t
Butanone[2-]	15	Nonparametric	0.00261	0.00594	0.0033	0.00298	0.00377	Modified-t
Chrysene	15	Nonparametric	0.0175	37	2.68	9.51	13.4	Chebyshev
Dibenzo(a,h)anthracene	15	Nonparametric	0.0175	0.33	0.043	0.08	0.13	Chebyshev
Dibenzofuran	15	Nonparametric	0.0175	12.3	0.9	3.16	4.45	Chebyshev
Dichloroethene[1,1-]	15	Nonparametric	0.000447	0.00105	0.000611	0.000137	0.000677	Modified-t
Fluoranthene	15	Nonparametric	0.0133	102	7.3	26.2	36.8	Chebyshev
Fluorene	15	Nonparametric	0.0121	20.9	1.5	5.37	7.54	Chebyshev
Indeno(1,2,3-cd)pyrene	15	Nonparametric	0.0175	11.1	0.85	2.85	4.05	Chebyshev
Methylnaphthalene[2-]	15	Nonparametric	0.0153	8.66	0.63	2.22	3.13	Chebyshev
Methylphenol[4-]	15	Nonparametric	0.175	0.888	0.24	0.18	0.33	Modified-t

Table E-1.1-3 (continued)

COPC	Number of Analyses	Distribution	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Mean Concentration (mg/kg)	Standard Deviation (mg/kg)	EPC (mg/kg)	UCL Method
Naphthalene	15	Nonparametric	0.0175	34.5	2.41	8.88	12.4	Chebyshev
Phenanthrene	15	Nonparametric	0.0175	127	9.01	32.6	45.8	Chebyshev
Pyrene	15	Nonparametric	0.0134	97.3	6.96	25.0	35.1	Chebyshev
Trimethylbenzene[1,2,4-]	15	Nonparametric	0.00052	0.00525	0.00102	0.00122	0.0024	Chebyshev
Trmethylbenzene[1,3,5-]	15	Nonparametric	0.000351	0.00525	0.000917	0.00121	0.0023	Chebyshev
Xylene[1,2-]	15	Nonparametric	0.000114	0.00105	0.00057	0.000201	0.000661	Modified-t

Table E-1.1-4
Noncarcinogenic Screening Evaluations for AOC 16-024(v)

COPC	EPC[a] (mg/kg)	Residential SSL[b] (mg/kg)	Residential HQ	Construction Worker SSL[b] (mg/kg	Construction Worker HQ
Cobalt	14.4	1520	0.009	61	0.2
Perchlorate	0.00733	55[c]	0.0001	167[d]	0.00004
Acenaphthene	0.112	3730	0.00003	14100	0.000008
Anthracene	0.27	22000	0.00001	86000	0.000003
Benzo(g,h,i)perylene[e]	0.519	2290	0.0002	9010	0.00006
Fluoranthene	1.87	2290	0.0008	8730	0.0002
Fluorene	1.32	2660	0.0005	10200	0.0001
2-Methylnaphthalene[f]	0.0727	79.5	0.0009	262	0.0003
Naphthalene	0.0121	79.5	0.0002	262	0.00002
Phenanthrene	1.06	1830	0.0006	6990	0.0002
Pyrene	1.68	2290	0.0007	9010	0.0002
		HI	**0.01**	**HI**	**0.2**

[a] Maximum detected concentration used as EPC.

[b] SSLs from NMED (2006, 092513), unless otherwise noted.

[c] SSLs from EPA Region 6 (EPA 2006, 094321).

[d] Construction worker SSL calculated using EPA Region 6 oral reference dose (RfDo) of 0.0007 mg/kg-d (EPA 2006, 094321).

[e] Pyrene is used as surrogate based on structural similarity.

[f] Naphthalene is used as surrogate based on structural similarity.

Table E-1.1-5
Carcinogenic Screening Evaluations for AOC 16-024(v)

COPC	EPC[a] (mg/kg)	Residential SSL[b] (mg/kg)	Residential HQ	Construction Worker SSL[b] (mg/kg)	Construction Worker HQ
Benzo(a)anthracene	0.885	6.21	1×10^{-6}	212	4×10^{-8}
Benzo(a)pyrene	0.657	0.621	1×10^{-5}	21.2	3×10^{-7}
Benzo(b)fluoranthene	1.14	6.21	2×10^{-6}	212	5×10^{-8}
Chrysene	0.976	615	2×10^{-8}	21200	5×10^{-10}
Indeno(1,2,3-cd)pyrene	0.44	6.21	7×10^{-7}	212	2×10^{-8}
		Total Excess Cancer Risk	**1.4×10^{-5}**	**Total Excess Cancer Risk**	**4.1×10^{-7}**

[a] Maximum detected concentration used as the EPC.

[b] SSLs from NMED (2006, 092513).

Table E-1.1-6
Noncarcinogenic Screening Evaluation for the Industrial Scenario at SWMU 16-026(r)

COPC	EPC[a] (mg/kg)	Industrial SSL[b] (mg/kg)	Industrial HQ
Lead	57.4	800	0.07
Selenium	7.86	5680	0.001
Acenaphthene	0.84	33500	0.00003
Anthracene	1.37	100000[c]	0.00001
Benzo(g,h,i)perylene	0.96	30900[d]	0.00003
Dibenzofuran	0.35	1620	0.0002
Dichloroethene[1,1-]	0.000656	777	0.0000008
Fluoranthene	4.55	24400	0.0002
Fluorene	0.89	26500	0.00003
Methylnaphthalene[2-]	0.33	300[e]	0.001
Naphthalene	1.02	300	0.003
Phenanthrene	5.31	20500	0.0003
Pyrene	4.11[f]	30900	0.0001
Xylene[1,3+1,4-]	0.0012	710[g]	0.000002
		HI	**0.08**

[a] 95% UCL used as EPC, unless otherwise noted.

[b] SSLs from NMED (2006, 092513), unless otherwise noted.

[c] Maximum allowable concentration per NMED (2006, 092513) and (EPA Region 6 (EPA 2006, 094321).

[d] Pyrene is used as surrogate based on structural similarity.

[e] Naphthalene is used as surrogate based on structural similarity.

[f] Maximum detected concentration used as the EPC.

[g] Industrial SSL obtained from EPA Region 6 spreadsheet (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screenexpanded.xls).

Table E-1.1-7
Noncarcinogenic Screening Evaluations for the Residential and Construction Worker Scenarios at SWMU 16-026(r)

COPC	EPC[a] (mg/kg)	Residential SSL[b] (mg/kg)	Residential HQ	Construction Worker SSL[b] (mg/kg	Construction Worker HQ
Lead	36.6	400	0.09	800	0.045
Mercury	0.11	23[c]	0.005	927[d]	0.0001
Selenium	3.77	391	0.01	1550	0.002
Zinc	111.3	23500	0.005	92900	0.001
Acenaphthene	7.97	3730	0.002	14100	0.0006
Acenaphthylene[e]	0.105	2290	0.00005	9010	0.00001
Acetone	0.00465	28100	0.0000002	98500	0.00000005
Anthracene	10.1	22000	0.0005	86000	0.0001
Benzo(g,h,i)perylene[e]	3.95	2290	0.002	9010	0.0004
Butanone[2-]	0.00377	31800	0.0000001	100000[f]	0.00000004
Dibenzofuran	4.45	142	0.03	552	0.008
Dichloroethene[1,1-]	0.000677	206	0.000003	678	0.000001
Fluoranthene	36.8	2290	0.02	8730	0.004
Fluorene	7.54	2660	0.003	10200	0.0007
Methylnaphthalene[2-][g]	3.13	79.5	0.04	262	0.01
Methylphenol[4-]	0.33	310[c]	0.001	1170[h]	0.0003
Naphthalene	12.4	79.5	0.2	262	0.05
Phenanthrene	45.8	1830	0.03	6990	0.007
Pyrene	35.1	2290	0.02	9010	0.004
Trimethylbenzene[1,2,4-]	0.0024	58	0.00004	190	0.00001
Trimethylbenzene[1,3,5-]	0.0023	24.8	0.00009	11900[i]	0.0000002
Xylene[1,2-]	0.000661	1600[c]	0.0000004	100000[f]	0.000000007
Xylene{1,3+1,4-]	0.0012	190[c]	0.00001	100000[f]	0.00000002
		HI	**0.5**	**HI**	**0.1**

[a] 95% UCL used as EPC.

[b] SSLs from NMED (2006, 092513), unless otherwise noted.

[c] SSL from EPA Region 6 (EPA 2006, 094321).

[d] Construction worker SSL is for elemental mercury obtained from NMED (2006, 092513).

[e] Pyrene is used as surrogate based on structural similarity.

[f] Maximum allowable concentration per NMED (2006, 092513) and EPA Region 6 (EPA 2006, 094321).

[g] Naphthalene is used as surrogate based on structural similarity.

[h] Construction worker SSL calculated using EPA Region 6 RfDo and inhalation reference dose (RfDi) of 0.005 mg/kg-d (EPA 2006, 094321).

[i] Construction worker SSL calculated using NMED RfDo and RfDi (NMED 2006, 092513).

Table E-1.1-8
Carcinogenic Screening Evaluation for the Industrial Scenario at SWMU 16-026(r)

COPC	EPC[a] (mg/kg)	Industrial SSL[b] (mg/kg)	Industrial Cancer Risk
Benzo(a)anthracene	2.01	23.4	9×10^{-7}
Benzo(a)pyrene	1.65	2.34	7×10^{-6}
Benzo(b)fluoranthene	1.79	23.4	8×10^{-7}
Benzo(k)fluoranthene	1.45c	234	6×10^{-8}
Chrysene	1.88	2310	8×10^{-9}
Dibenzo(a,h)anthracene	0.3	2.34	1×10^{-6}
Indeno(1,2,3-cd)pyrene	0.94	23.4	4×10^{-7}
		Total Excess Cancer Risk	**1.0×10^{-5}**

[a] 95% UCL used as EPC, unless otherwise noted.

[b] SSLs from NMED (2006, 092513).

[c] Maximum detected concentration used as the EPC.

Table E-1.1-9
Carcinogenic Screening Evaluations for the Residential and Construction Worker Scenarios at SWMU 16-026(r)

COPC	EPC[a] (mg/kg)	Residential SSL[b] (mg/kg)	Residential Cancer Risk	Construction Worker SSL[b] (mg/kg	Construction Worker Cancer Risk
Benzo(a)anthracene	13	6.21	2×10^{-5}	212	6×10^{-7}
Benzo(a)pyrene	10.5	0.621	2×10^{-4}	21.2	5×10^{-6}
Benzo(b)fluoranthene	13.1	6.21	2×10^{-5}	212	6×10^{-7}
Benzo(k)fluoranthene	4.41	62.1	7×10^{-7}	2120	2×10^{-8}
Bis(2-ethylhexyl)phthalate	0.15	347	4×10^{-9}	4660	3×10^{-10}
Chrysene	13.4	615	2×10^{-7}	21200	6×10^{-9}
Dibenz(a,h)anthracene	0.13	0.621	2×10^{-6}	21.2	6×10^{-8}
Indeno(1,2,3-cd)pyrene	4.05	6.21	7×10^{-6}	212	2×10^{-7}
		Total Excess Cancer Risk	**2.5×10^{-4}**	**Total Excess Cancer Risk**	**6.5×10^{-6}**

[a] 95% UCL concentration used as the EPC.

[b] SSLs from NMED (2006, 092513).

Table E-1.1-10
Comparison of TPH-DRO Sampling Results with NMED Screening Guidelines

Sample ID	Location ID	Depth (ft)	TPH-DRO Concentrations (mg/kg)
Industrial Screening Guideline*			**1120**
Residential Screening Guideline*			**520**
RE16-06-71163	16-26575	0.5–1	8.72
RE16-06-71165	16-26576	0.5–1	1.3(J)
RE16-06-71168	16-26577	0.5–1	2.19
RE16-06-72962	16-26977	4–4.5	2.26
RE16-06-72963	16-26978	4–4.5	1.48(J)
RE16-06-72967	16-26982	0.5–1	16
RE16-06-72968	16-26983	4–5	5.26
RE16-06-71166	16-27512	0.5–1	11.3
RE16-06-71167	16-27513	0.5–1	7.49

*Screening guidelines obtained from NMED (2006, 094614).

Table E-2.2-1
Ecological Screening Levels for Terrestrial Receptors

Chemical	Kestrel (Intermediate carnivore)	Kestrel (top carnivore)	Robin (herbivore)	Robin (insectivore)	Robin (omnivore)	Deer Mouse	Desert Cottontail	Earthworm	Plant	Montane Shrew	Red Fox
Lead	120	810	21	14	16	120	370	1700	120	72	3700
Mercury	0.082	0.28	0.07	0.013	0.022	3	22	0.05	34	1.7	46
Selenium	8.5	140	1.5	1.1	1.3	1.1	3	7.7	0.1	0.92	110
Zinc	180	1400	200	27	48	290	3000	190	10	160	10,000
Acenaphthene	na[a]	na	na	na	na	160	490	na	0.25	120	6200
Acenaphthylene	na	na	na	na	na	160	500	na	na	120	5200
Acetone	120	30,000	7.5	170	14	1.2	1.4	na	na	15	2900
Anthracene	na	na	na	na	na	310	1100	na	na	210	5800
Benzo(a)anthracene	na	na	na	na	na	3.4	6.2	na	18	3	45
Benzo(a)pyrene	na	na	na	na	na	15	50	na	na	9.6	68
Benzo(b)fluoranthene	na	na	na	na	na	52	130	na	18	38	250
Benzo(g,h,i)perylene	na	na	na	na	na	47	540	na	na	24	94
Benzo(k)fluoranthene	na	na	na	na	na	100	350	na	na	62	400
Bis(2-ethylhexyl)phthalate	0.045	0.033	20	0.02	0.04	1.1	2700	na	na	0.59	1.2
Butanone[2-]	na	na	na	na	na	360	420	na	na	2600	420,000
Chrysene	na	na	na	na	na	3.1	6.5	na	na	2.4	46
Dibenz(a,h)anthracene	na	na	na	na	na	22	95	na	na	12	54
Dibenzofuran	na	na	na	na	na	na	na	na	6.1	na	na
Dichloroethene[1,1-]	na	na	na	na	na	14	40	na	na	11	2900
Fluoranthene	na	na	na	na	na	38	260	38	na	22	360
Fluorene	na	na	na	na	na	340	1100	4.1	na	250	9300
Indeno(1,2,3-cd)pyrene	na	na	na	na	na	110	590	na	na	62	270
Methylnaphthalene[2-]	na	na	na	na	na	3.8	16	na	na	2.5	130
Naphthalene	1100	6300	37	170	61	0.34	0.45	na	1	0.96	42

Table E-2.2-1 (continued)

Chemical	Kestrel (Intermediate carnivore)	Kestrel (top carnivore)	Robin (herbivore)	Robin (insectivore)	Robin (omnivore)	Deer Mouse	Desert Cottontail	Earthworm	Plant	Montane Shrew	Red Fox
Phenanthrene	na	na	na	na	na	15	59	34	na	10	290
Pyrene	na	na	na	na	na	32	110	18	na	22	360
Xylenes[b]	280	3200	90	41	56	2	7	na	100	1.4	130

Notes: Units are mg/kg. ESLs from ECORISK Database, Version 2.2 (LANL 2005, 090032).

[a] na = Not available.

[b] ESLs for xylenes used for xylene[1,2-] and xylene[1,3+1,4-].

Table E-2.2-2
Comparison of COPCs with the Minimum ESLs

COPC	EPC[a] (mg/kg)	Minimum ESL[b] (mg/kg)	Receptor	Hazard Quotient
Lead	35.6	14	Robin(insectivore)	**2.5**
Mercury	0.11	0.013	Robin(insectivore)	**8.5**
Selenium	3.77	0.1	Plant	**37.7**
Zinc	111.3	10	Plant	**11.1**
Acenaphthene	7.97	0.25	Plant	**31.9**
Acenaphthylene	0.105	120	Montane shrew	0.0009
Acetone	0.00465	1.2	Deer mouse	0.004
Anthracene	10.1	210	Montane shrew	0.05
Benzo(a)anthracene	13	3	Montane shrew	**4.3**
Benzo(a)pyrene	10.5	9.6	Montane shrew	**1.1**
Benzo(b)fluoranthene	13.1	18	Plant	**0.7**
Benzo(g,h,i)perylene	3.95	24	Montane shrew	0.2
Benzo(k)fluoranthene	4.41	62	Montane shrew	0.07
Bis(2-ethylhexyl)phthalate	0.15	0.02	Robin(insectivore)	**7.5**
Butanone[2-]	0.00377	360	Deer mouse	0.00001
Chrysene	13.4	2.4	Montane shrew	**5.6**
Dibenz(a,h)anthracene	0.13	12	Montane shrew	0.01
Dibenzofuran	4.45	6.1	Plant	**0.7**
Dichloroethene[1,1-]	0.000677	11	Montane shrew	0.00006
Fluoranthene	36.8	22	Montane shrew	**1.7**
Fluorene	7.54	4.1	Earthworm	**1.8**
Indeno(1,2,3-cd)pyrene	4.05	62	Montane shrew	0.07
Methylnaphthalene[2-]	3.13	2.5	Montane shrew	**1.3**
Naphthalene	12.4	0.34	Deer mouse	**36.5**
Phenanthrene	45.8	10	Montane shrew	**4.6**
Pyrene	35.1	18	Earthworm	**2**
Xylenes[c]	0.0012[d]	1.4	Montane shrew	0.0009

Note: Bolded HQ indicates COPC retained as COPEC.

[a] The EPC is the 95% UCL.

[b] ESLs from ECORISK Database, Version 2.2 (LANL 2005, 090032).

[c] Minimum ESL for xylenes used for xylene[1,2-] and xylene[1,3+1,4-].

[d] EPC for xylene[1,3+1,4-] used in ecological screening (higher of the EPCs for xylene[1,2-] and xylene[1,3+1,4-]).

Table E-2.2-3
Hazard Index Analysis of COPECs at SWMU 16-026(r)

COPEC	EPC (mg/kg)	Plant	Earthworm	Kestrel (Intermediate carnivore)	Kestrel (top carnivore)	Robin (herbivore)	Robin (insectivore)	Robin (omnivore)	Deer Mouse	Montane Shrew	Desert Cottontail	Red Fox
Lead	35.6	0.3	0.02	0.3	0.04	1.7	2.5	2.2	0.3	0.5	0.1	0.01
Mercury	0.11	0.003	2.2	1.3	0.4	1.6	8.5	5	0.04	0.06	0.005	0.002
Selenium	3.77	37.7	0.5	0.4	0.03	2.5	3.4	2.9	3.4	4.1	1.3	0.03
Zinc	111.3	11.1	0.6	0.6	0.08	0.6	4.1	2.3	0.4	0.7	0.04	0.01
Acenaphthene	7.97	31.9	na*	na	na	na	na	na	0.05	0.07	0.02	0.001
Benzo(a)anthracene	13	0.7	na	na	na	na	na	na	3.8	4.3	2.1	0.3
Benzo(a)pyrene	10.5	na	na	na	na	na	na	na	0.7	1.1	0.2	0.2
Benzo(b)fluoranthene	13.1	0.7	na	na	na	na	na	na	0.3	0.3	0.1	0.05
Bis(2-ethylhexyl)phthalate	0.15	na	na	3.8	5.2	0.009	8.5	4.3	0.2	0.3	0.00006	0.1
Chrysene	13.4	na	na	na	na	na	na	na	4.3	5.6	2.1	0.3
Dibenzofuran	4.45	0.7	na	na	na	na	na	na	na	na	na	na
Fluoranthene	36.8	na	0.97	na	na	na	na	na	0.97	1.7	0.1	0.1
Fluorene	7.54	na	1.8	na	na	na	na	na	0.02	0.03	0.007	0.0008
Methylnaphthalene[2-]	3.13	na	na	na	na	na	na	na	0.8	1.3	0.2	0.02
Naphthalene	12.4	12.4	na	0.01	0.002	0.3	0.07	0.2	36.5	12.9	27.6	0.3
Phenanthrene	45.8	na	1.3	na	na	na	na	na	3.1	4.6	0.8	0.2
Pyrene	35.1	na	2	na	na	na	na	na	1.1	1.6	0.3	0.1
	HIs	**96**	**9**	**6**	**6**	**7**	**27**	**17**	**56**	**39**	**35**	**2**

*na = Not available.

Table E-2.3-1
PAUFs for Receptors at SWMU 16-026(r)

Receptor	Home Range[a] (ha)	Population Area (ha)	PAUF[b]
American robin	0.42	16.8	0.002
American kestrel	106	4,240	0.000007
Deer mouse	0.077	3.0	0.01
Desert cottontail	3.1	124	0.0002
Montane shrew	0.39	15.6	0.002
Red fox	1038	41,520	0.0000007

[a] Home ranges from EPA (1993, 059384).

[b] PAUF = population area use factor calculated as the area of the SWMU (0.03 ha) divided by the population area.

Table E-2.3-2
Adjusted Hazard Index Analysis of COPECs at SWMU 16-026(r)

COPEC	EPC (mg/kg)[a]	Plant	Earthworm	Kestrel (Intermediate carnivore)	Kestrel (top carnivore)	Robin (herbivore)	Robin (insectivore)	Robin (omnivore)	Deer Mouse	Montane Shrew	Desert Cottontail	Red Fox
Lead	35.6	0.3[b]	0.02	0.000002	0.0000003	0.003	0.005	0.004	0.003	0.001	0.00002	0.000000007
Selenium	3.77	37.7	0.5	0.000003	0.0000002	0.005	0.02	0.01	0.03	0.008	0.0003	0.00000002
Zinc	111.3	11.1	0.6	0.000004	0.0000006	0.001	0.008	0.005	0.004	0.001	0.000008	0.000000007
Acenaphthene	7.97	31.9	na[c]	na	na	na	na	na	0.0005	0.0001	0.000004	0.0000000007
Benzo(a)anthracene	13	0.7	na	na	na	na	na	na	0.04	0.009	0.0004	0.0000002
Benzo(a)pyrene	10.5	na	na	na	na	na	na	na	0.007	0.002	0.00004	0.0000001
Benzo(b)fluoranthene	13.1	0.7	na	na	na	na	na	na	0.003	0.0006	0.00002	0.00000004
Bis(2-ethylhexyl)phthalate	0.15	na	na	0.00003	0.00004	0.00002	0.02	0.009	0.002	0.0006	0.00000001	0.00000007
Chrysene	13.4	na	na	na	na	na	na	na	0.04	0.01	0.0004	0.0000002
Dibenzofuran	4.45	0.7	na	na	na	na	na	na	na	na	na	na
Fluoranthene	36.8	na	0.97	na	na	na	na	na	0.01	0.003	0.00002	0.00000007
Fluorene	7.54	na	1.8	na	na	na	na	na	0.0002	0.00006	0.000001	0.0000000006
Methylnaphthalene[2-]	3.13	na	na	na	na	na	na	na	0.008	0.003	0.00004	0.00000001
Naphthalene	12.4	12.4	na	0.00000007	0.00000001	0.0006	0.0001	0.0004	0.4	0.03	0.006	0.0000002
Phenanthrene	45.8	na	1.3	na	na	na	na	na	0.03	0.009	0.0002	0.0000001
Pyrene	35.1	na	2	na	na	na	na	na	0.01	0.003	0.00006	0.00000007
PAUF-adjusted HIs		96	7	0.00004	0.00004	0.01	0.05	0.03	0.6	0.08	0.007	0.000001

[a] The EPC is the 95% UCL.

[b] HQs are adjusted by the PAUF.

[c] na = Not available.

Attachment E-1

Ecological Scoping Checklists

E1-1.0 AOC 16-024(v)

E1-1.1 Part A—Scoping Meeting Documentation

Site ID	**AOC 16-024(v)**
Form of site releases (solid, liquid, vapor). Describe all relevant known or suspected mechanisms of release (spills, dumping, material disposal, outfall, explosive testing, etc.) and describe potential areas of release. Reference locations on a map as appropriate.	AOC is a former magazine located outside of the HE exclusion zone at S-Site. It was retired from use as a magazine after 1946 and used by carpenters to store equipment. Potential releases may have occurred within the footprint of the magazine by spills and/or leaching of stored materials.
List of Primary Impacted Media **(Indicate all that apply.)**	**Surface soil –** X **Surface water/sediment –** **Subsurface –** X **Groundwater –** **Other, explain –**
Vegetation class based on GIS vegetation coverage **(Indicate all that apply.)**	**Water** – **Bare Ground/Unvegetated** – X **Spruce/fir/aspen/mixed conifer** – **Ponderosa pine –** **Piñon juniper/juniper savannah** – **Grassland/shrubland** – X **Developed** – **Burned –**
Is T&E Habitat Present? **If applicable, list species known or suspected of using the site for breeding or foraging.**	AOC is within an active technical area (TA-16) and does not have any potential T&E habitat.
Provide list of Neighboring/ Contiguous/Upgradient sites, including a brief summary of COPCs and the form of releases for relevant sites and reference a map as appropriate. **(Use this information to evaluate the need to aggregate sites for screening.)**	Several SWMUs and AOCs are in the general vicinity of AOC 16-024(v), including SWMU 16-025(h2), SWMU 16-031(e), SWMU 16-025(g2), SWMU 16-025(f2), SWMU 16-001(b), SWMU 16-001(c), Consolidated Unit 16-017(i)-99, AOC 16-027(b), AOC 16-033(k), AOC C-16-034, and AOC C-16-035. None of these sites influence AOC 16-024(v).
Surface Water Erosion Potential Information **Summarize information from SOP 2.01, including the total score and the runoff subscore (maximum of 46); terminal point of surface water transport; slope; and surface water run-on sources.**	Erosion matrix score is 3.6, indicating low potential for erosion. This score includes zero for both run-on and runoff. There is no point source and no visible evidence of runoff from the AOC.

E1-1.2 Part B—Site Visit Documentation

Site ID	AOC 16-024(v)
Date of Site Visit	Not applicable
Site Visit Conducted by	

Receptor Information:

Estimate cover	**Relative vegetative cover (high, medium, low, none)** = medium **Relative wetland cover (high, medium, low, none)** = none **Relative structures/asphalt, etc., cover (high, medium, low, none)** = none
Field notes on the GIS vegetation class to assist in verifying the Arcview information	Site is in a grassy area with patches of bare ground.
Are ecological receptors present at the site? **(yes/no/uncertain)** **Describe the general types of receptors present at the site (terrestrial and aquatic), and make notes on the quality of habitat present at the site.**	Yes. Terrestrial receptors in the area. Primarily small rodents and birds as well as plants and insects.

Contaminant Transport Information:

Surface water transport **Field notes on the erosion potential, including a discussion of the terminal point of surface water transport (if applicable).**	Surface water runoff following storms and snowmelt. Erosion potential is low and any runoff occurs as sheetflow.
Are there any off-site transport pathways (surface water, air, or groundwater)? **(yes/no/uncertain)** **Provide explanation**	None.

Ecological Effects Information:

Physical Disturbance **(Provide list of major types of disturbances, including erosion and construction activities, review historical aerial photos where appropriate.)**	Yes. Physical disturbance is present as a result of remediation activities.
Are there obvious ecological effects? **(yes/no/uncertain)** **Provide explanation and apparent cause (e.g., contamination, physical disturbance, other).**	No obvious ecological effects. The site has been revegetated.

No Exposure/Transport Pathways:

If there are no complete exposure pathways to ecological receptors onsite and no transport pathways to off-site receptors, the remainder of the checklist should not be completed. Stop here and provide additional explanation/justification for proposing an ecological No Further Action recommendation (if needed). At a minimum, the potential for future transport should include the likelihood that future construction activities could make contamination more available for exposure or transport.

AOC 16-024(v) has been excavated to a depth of approximately 8 ft. As a result, there are no complete pathways to ecological receptors from residual contamination.

Adequacy of Site Characterization:

Do existing or proposed data provide information on the nature and extent of contamination? **(yes/no/uncertain)** **Provide explanation** **(Consider if the maximum value was captured by existing sample data.)**	Yes. Data collected as a result of this accelerated corrective action provides sufficient information to define the nature and extent of contamination at this AOC.
Do existing or proposed data for the site address potential transport pathways of site contamination? **(yes/no/uncertain)** **Provide explanation** **(Consider if other sites should be aggregated to characterize potential ecological risk.)**	Yes. Area was excavated. No other sites influence or contributed to contamination.

Additional Field Notes:

Provide additional field notes on the site setting and potential ecological receptors.

Not applicable.

E1-1.3 Part C—Ecological Pathways Conceptual Exposure Model

Provide answers to Questions A to V to develop the Ecological Pathways Conceptual Exposure Model

Question A:

Could soil contaminants reach receptors through vapors?

- **Volatility of the hazardous substance (volatile chemicals generally have Henry's Law constant >10^{-5} atm-m^3/mol and molecular weight <200 g/mol).**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No volatile chemicals detected.

Question B:

Could the soil contaminants reach receptors through fugitive dust carried in air?

- **Soil contamination would have to be on the actual surface of the soil to become available for dust.**
- **In the case of dust exposures to burrowing animals, the contamination would have to occur in the depth interval where these burrows occur.**

Answer (likely/unlikely/uncertain): Uncertain

Provide explanation: Some surface contamination present originally; site has been excavated. No burrowing animals present.

Question C:

Can contaminated soil be transported to aquatic ecological communities (use SOP 2.01 runoff score and terminal point of surface water runoff to help answer this question)?

- **If the SOP 2.01 runoff score* for each SWMU and/or AOC included in the site is equal to zero, this suggests that erosion at the site is not a transport pathway. (* note that the runoff score is not the entire erosion potential score, rather it is a subtotal of this score with a maximum value of 46 points).**
- **If erosion is a transport pathway, evaluate the terminal point to see if aquatic receptors could be affected by contamination from this site.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Erosion matrix score is low.

Question D:

Is contaminated groundwater potentially available to biological receptors through seeps or springs or shallow groundwater?

Known or suspected presence of contaminants in groundwater.

- **The potential for contaminants to migrate through groundwater and discharge into habitats and/or surface waters.**
- **Contaminants may be taken up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone.**
- **Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No seeps or springs present.

Question E:

Is infiltration/percolation from contaminated subsurface material a viable transport and exposure pathway?

- **The potential for contaminants to migrate to groundwater.**
- **The potential for contaminants to migrate through groundwater and discharge into habitats and/or surface waters.**
- **Contaminants may be taken up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone.**
- **Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Depth to groundwater is 1000 ft or more. No hydraulic driver present.

Question F:

Might erosion or mass wasting events be a potential release mechanism for contaminants from subsurface materials or perched aquifers to the surface?

- **This question is only applicable to release sites located on or near the mesa edge.**
- **Consider the erodability of surficial material and the geologic processes of canyon/mesa edges.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: AOC is not near the mesa edge. Erosion potential is low.

<u>Question G:</u>

Could airborne contaminants interact with receptors through the respiration of vapors?

- **Contaminants must be present as volatiles in the air.**
- **Consider the importance of the inhalation of vapors for burrowing animals.**
- **Foliar uptake of vapors is typically not a significant exposure pathway**.

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: No volatile chemicals detected. Site has been excavated to 8 ft.

<u>Question H:</u>

Could airborne contaminants interact with plants through the deposition of particulates or with animals through the inhalation of fugitive dust?

- **Contaminants must be present as particulates in the air or as dust for this exposure pathway to be complete.**
- **Exposure through the inhalation of fugitive dust is particularly applicable to ground-dwelling species that would be exposed to dust disturbed by their foraging or burrowing activities or by wind movement**.

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: Site has been excavated to 8 ft.

<u>Question I:</u>

Could contaminants interact with plants through root uptake or rain splash from surficial soils?

- **Contaminants in bulk soil may partition into soil solution, making them available to roots.**
- **Exposure of terrestrial plants to contaminants present in particulates deposited on leaf and stem surfaces by rain striking contaminated soils (i.e., rain splash).**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Provide explanation: Site has been excavated to 8 ft.

Question J:

Could contaminants interact with receptors through food-web transport from surficial soils?

- **The chemicals may bioaccumulate in animals.**
- **Animals may ingest contaminated food items.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: Site has been excavated to 8 ft.

Question K:

Could contaminants interact with receptors through the incidental ingestion of surficial soils?

- **Incidental ingestion of contaminated soil could occur while animals grub for food resident in the soil, feed on plant matter covered with contaminated soil, or while grooming themselves clean of soil.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: Site has been excavated to 8 ft.

Question L:

Could contaminants interact with receptors through dermal contact with surficial soils?

- **Significant exposure through dermal contact would generally be limited to organic contaminants that are lipophilic and can cross epidermal barriers.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: Site has been excavated to 8 ft.

Question M:

Could contaminants interact with plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma-emitting radionuclides.**
- **Burial of contamination attenuates radiological exposure.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: No radionuclides present based on site usage. Site has been excavated to 8 ft.

Question N:

Could contaminants interact with plants through direct uptake from water and sediment or sediment rain splash?

- **Contaminants may be taken up by terrestrial plants whose roots are in contact with surface waters.**
- **Terrestrial plants may be exposed to particulates deposited on leaf and stem surfaces by rain striking contaminated sediments (i.e., rain splash) in an area that is only periodically inundated with water.**
- **Contaminants in sediment may partition into soil solution, making them available to roots.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Provide explanation: No water or sediment present.

Question O:

Could contaminants interact with receptors through food-web transport from water and sediment?

- **The chemicals may bioconcentrate in food items.**
- **Animals may ingest contaminated food items.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: No water or sediment present.

Question P:

Could contaminants interact with receptors through the ingestion of water and suspended sediments?

- **If sediments are present in an area that is only periodically inundated with water, terrestrial receptors may incidentally ingest sediments.**
- **Terrestrial receptors may ingest water-borne contaminants if contaminated surface waters are used as a drinking water source.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: No water or sediment present.

Question Q:

Could contaminants interact with receptors through dermal contact with water and sediment?

- **If sediments are present in an area that is only periodically inundated with water, terrestrial species may be dermally exposed during dry periods.**
- **Terrestrial organisms may be dermally exposed to water-borne contaminants as a result of wading or swimming in contaminated waters.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: No water or sediment present.

Question R:

Could suspended or sediment-based contaminants interact with plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma-emitting radionuclides.**
- **Burial of contamination attenuates radiological exposure.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: No water or sediment present.

Question S:

Could contaminants bioconcentrate in free-floating aquatic, attached aquatic plants, or emergent vegetation?

- **Aquatic plants are in direct contact with water.**
- **Contaminants in sediment may partition into pore water, making them available to submerged roots.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Plants/Emergent Vegetation: 0

Provide explanation: No aquatic habitat present.

Question T:

Could contaminants bioconcentrate in sedimentary or water-column organisms?

- **Aquatic receptors may actively or incidentally ingest sediment while foraging.**
- **Aquatic receptors may be directly exposed to contaminated sediments or may be exposed to contaminants through osmotic exchange, respiration, or ventilation of sediment pore waters.**
- **Aquatic receptors may be exposed through osmotic exchange, respiration, or ventilation of surface waters.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Animals: 0

Provide explanation: No aquatic habitat present.

Question U:

Could contaminants bioaccumulate in sedimentary or water column organisms?

- **Lipophilic organic contaminants and some metals may concentrate in an organism's tissues.**
- **Ingestion of contaminated food items may result in contaminant bioaccumulation through the food web.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Animals: 0

Provide explanation: No aquatic habitat present.

Question V:

Could contaminants interact with aquatic plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma-emitting radionuclides.**
- **The water column acts to absorb radiation; therefore, external irradiation is typically more important for sediment dwelling organisms.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

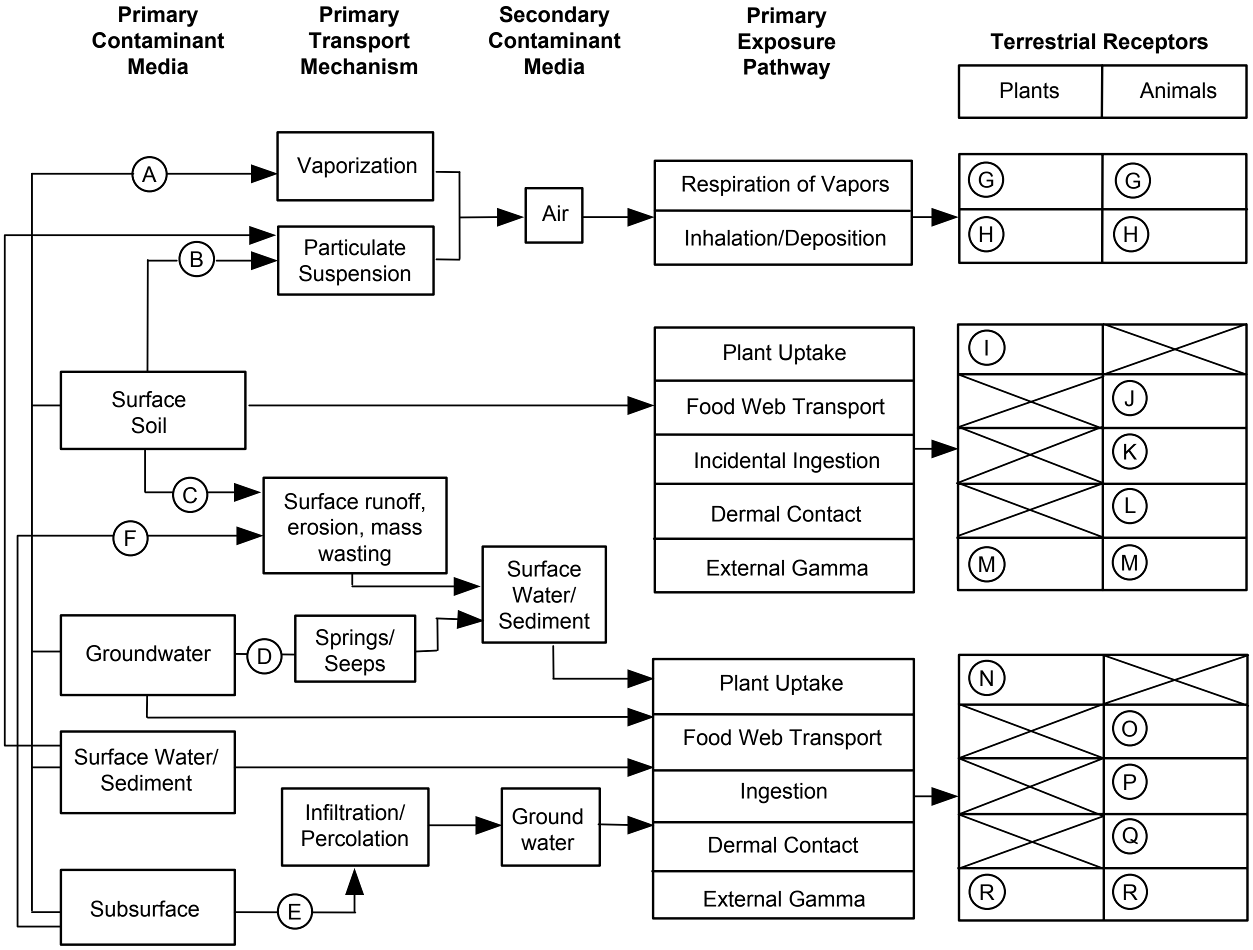
Aquatic Plants: 0

Aquatic Animals: 0

Provide explanation: No aquatic habitat present.

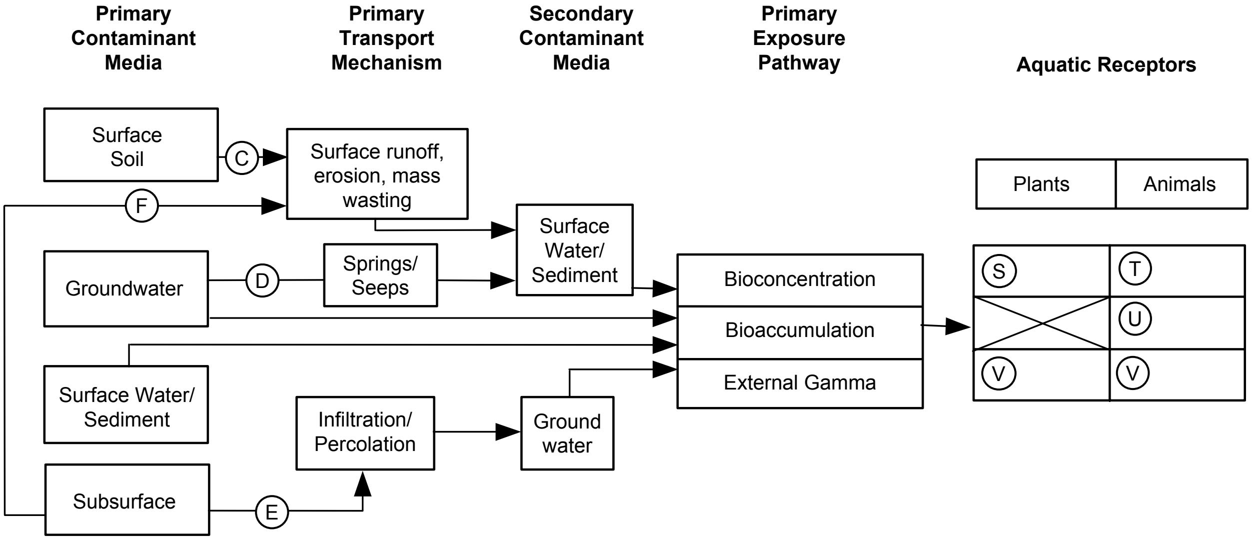
Ecological Scoping Checklist
Terrestrial Receptors
Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the Scoping Checklist



Ecological Scoping Checklist
Aquatic Receptors
Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the Scoping Checklist



Signatures and certifications:

Checklist completed by (provide name, organization and phone number):

Name (printed): Richard Mirenda
Name (signature): Richard Mirenda
Organization: EP-ERSS
Phone number: (505) 665-6953
Date completed: 2/5/07

Verification by another party (provide name, organization and phone number):

Name (printed): Bill Eisele
Name (signature): William F. Eisele
Organization: EP-ERSS
Phone number: (505) 667-0295

E1-2.0 SWMU 16-026(r)

E1-2.1 Part A—Scoping Meeting Documentation

Site ID	**SWMU 16-026(r)**
Form of site releases (solid, liquid, vapor). Describe all relevant known or suspected mechanisms of release (spills, dumping, material disposal, outfall, explosive testing, etc.) and describe potential areas of release. Reference locations on a map as appropriate.	SWMU 16-026(r) is potential soil contamination from oil overflow lines associated with the oil-water separator at Fire Station #5 (Building 16-180) at TA-16. The oil-water separator is located in the middle of the southern wall of the building and received discharge from six floor drains. The oil-water separator remains in place but is no longer used. The oil separator consists of a 3-ft^3 cement pit below floor level in a wastewater line that receives only oily wastewater. The pit removed oil from the water to protect the sewer system from being overloaded with large volumes of oil. Oil was separated from water: the oil layer, which floated to the top of the pit, flowed to an oil overflow drainline, a 2-in. cast-iron pipe, located at the top of the pit. The water sank to the bottom of the pit and flowed out of a drain at the pit bottom. The oil overflow line is believed to daylight approximately 70 ft south of the building, but the pipe is not visible. The water in the bottom of the oil-water separator drained into a field south of Building 16-180.
List of Primary Impacted Media **(Indicate all that apply.)**	**Surface soil –** **Surface water/sediment –** **Subsurface –** X **Groundwater –** **Other, explain –**
Vegetation class based on GIS vegetation coverage **(Indicate all that apply.)**	**Water** – **Bare Ground/Unvegetated** – **Spruce/fir/aspen/mixed conifer** – **Ponderosa pine –** **Piñon juniper/juniper savannah** – **Grassland/shrubland** – **Developed** – X **Burned –**
Is T&E Habitat Present? **If applicable, list species known or suspected of using the site for breeding or foraging.**	SWMU is within an active technical area (TA-16) and does not have any potential T&E habitat.
Provide list of Neighboring/ Contiguous/Upgradient sites, including a brief summary of COPCs and the form of releases for relevant sites and reference a map as appropriate. **(Use this information to evaluate the need to aggregate sites for screening.)**	Several SWMUs and AOCs are in the general vicinity of SWMU 16-026(r), including SWMU 16-025(h2), SWMU 16-031(e), SWMU 16-025(g2), SWMU 16-025(f2), SWMU 16-001(b), SWMU 16-001(c), Consolidated Unit 16-017(i)-99, AOC 16-027(b), AOC 16-033(k), AOC C-16-034, and AOC C-16-035. None of these sites influence SWMU 16-026(r).
Surface Water Erosion Potential Information **Summarize information from SOP 2.01, including the total score and the run-off subscore (maximum of 46); terminal point of surface water transport; slope; and surface water run-on sources.**	Erosion matrix score is 3.6, indicating low potential for erosion. This score includes zero for both run-on and run-off. There is no point source and no visible evidence of runoff from the SWMU.

E1-2.2 Part B—Site Visit Documentation

Site ID	SWMU 16-026(r)
Date of Site Visit	Not applicable
Site Visit Conducted by	

Receptor Information:

Estimate cover	**Relative vegetative cover (high, medium, low, none)** = low **Relative wetland cover (high, medium, low, none)** = none **Relative structures/asphalt, etc., cover (high, medium, low, none)** = high
Field notes on the GIS vegetation class to assist in verifying the Arcview information	Site is within a developed area of TA-16. Area is paved with asphalt, with patches of bare ground and grass.
Are ecological receptors present at the site? **(yes/no/uncertain)** **Describe the general types of receptors present at the site (terrestrial and aquatic), and make notes on the quality of habitat present at the site.**	Yes. Terrestrial receptors in the area. Primarily small rodents and birds as well as plants and insects.

Contaminant Transport Information:

Surface water transport **Field notes on the erosion potential, including a discussion of the terminal point of surface water transport (if applicable).**	Surface water runoff following storms and snowmelt. Erosion potential is low and any runoff occurs as sheet flow. The outfall from the drainlines does not daylight.
Are there any off-site transport pathways (surface water, air, or groundwater)? **(yes/no/uncertain)** **Provide explanation**	None.

Ecological Effects Information:

Physical Disturbance **(Provide list of major types of disturbances, including erosion and construction activities, review historical aerial photos where appropriate.)**	Yes. Physical disturbance is present as a result of remediation activities.
Are there obvious ecological effects? **(yes/no/uncertain)** **Provide explanation and apparent cause (e.g., contamination, physical disturbance, other).**	No obvious ecological effects.

No Exposure/Transport Pathways:

If there are no complete exposure pathways to ecological receptors onsite and no transport pathways to off-site receptors, the remainder of the checklist should not be completed. Stop here and provide additional explanation/justification for proposing an ecological No Further Action recommendation (if needed). At a minimum, the potential for future transport should include the likelihood that future construction activities could make contamination more available for exposure or transport. Not applicable.

Adequacy of Site Characterization:

Do existing or proposed data provide information on the nature and extent of contamination? **(yes/no/uncertain)** **Provide explanation** **(Consider if the maximum value was captured by existing sample data.)**	No. Data collected as a result of this accelerated corrective action does not provide sufficient information to define the nature and extent of contamination beneath the drainline or at the outfall.
Do existing or proposed data for the site address potential transport pathways of site contamination? **(yes/no/uncertain)** **Provide explanation** **(Consider if other sites should be aggregated to characterize potential ecological risk.)**	No. Outfall area is not adequately characterized.

Additional Field Notes:

Provide additional field notes on the site setting and potential ecological receptors. Not applicable.

E1-2.3 Part C—Ecological Pathways Conceptual Exposure Model

Provide answers to Questions A to V to develop the Ecological Pathways Conceptual Exposure Model

Question A:

Could soil contaminants reach receptors through vapors?

- **Volatility of the hazardous substance (volatile chemicals generally have Henry's Law constant >10^{-5} atm-m^3/mol and molecular weight <200 g/mol).**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Volatile chemicals detected infrequently and at concentrations less than the estimated quantitation limits.

Question B:

Could the soil contaminants reach receptors through fugitive dust carried in air?

- **Soil contamination would have to be on the actual surface of the soil to become available for dust.**
- **In the case of dust exposures to burrowing animals, the contamination would have to occur in the depth interval where these burrows occur.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Drainline and outfall are subsurface, with no surface expression.

Question C:

Can contaminated soil be transported to aquatic ecological communities (use SOP 2.01 run-off score and terminal point of surface water runoff to help answer this question)?

- **If the SOP 2.01 run-off score* for each SWMU and/or AOC included in the site is equal to zero, this suggests that erosion at the site is not a transport pathway. (* note that the runoff score is not the entire erosion potential score, rather it is a subtotal of this score with a maximum value of 46 points).**
- **If erosion is a transport pathway, evaluate the terminal point to see if aquatic receptors could be affected by contamination from this site.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Erosion potential is low. Drainline and outfall are subsurface, with no surface expression.

Question D:

Is contaminated groundwater potentially available to biological receptors through seeps or springs or shallow groundwater?

Known or suspected presence of contaminants in groundwater.

- **The potential for contaminants to migrate through groundwater and discharge into habitats and/or surface waters.**
- **Contaminants may be taken up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone.**
- **Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: No seeps or springs present. Drainline and outfall are subsurface, with no surface expression.

Question E:

Is infiltration/percolation from contaminated subsurface material a viable transport and exposure pathway?

- **The potential for contaminants to migrate to groundwater.**
- **The potential for contaminants to migrate through groundwater and discharge into habitats and/or surface waters.**
- **Contaminants may be taken up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone.**
- **Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: Depth to groundwater is 1000 ft or more; no hydraulic driver present.

Question F:

Might erosion or mass wasting events be a potential release mechanism for contaminants from subsurface materials or perched aquifers to the surface?

- **This question is only applicable to release sites located on or near the mesa edge.**
- **Consider the erodability of surficial material and the geologic processes of canyon/mesa edges.**

Answer (likely/unlikely/uncertain): Unlikely

Provide explanation: SWMU not located near mesa edge. Erosion potential is low.

<u>**Question G:**</u>

Could airborne contaminants interact with receptors through the respiration of vapors?

- **Contaminants must be present as volatiles in the air.**
- **Consider the importance of the inhalation of vapors for burrowing animals.**
- **Foliar uptake of vapors is typically not a significant exposure pathway**.

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 1

Terrestrial Animals: 1

Provide explanation: Volatile chemicals detected infrequently and at concentrations less than the estimated quantitation limits.

<u>**Question H:**</u>

Could airborne contaminants interact with plants through the deposition of particulates or with animals through the inhalation of fugitive dust?

- **Contaminants must be present as particulates in the air or as dust for this exposure pathway to be complete.**
- **Exposure through the inhalation of fugitive dust is particularly applicable to ground-dwelling species that would be exposed to dust disturbed by their foraging or burrowing activities or by wind movement**.

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 1

Terrestrial Animals: 2

Provide explanation: Drainline and outfall are subsurface, with no surface expression. Burrowing animals may be exposed.

<u>**Question I:**</u>

Could contaminants interact with plants through root uptake or rain splash from surficial soils?

- **Contaminants in bulk soil may partition into soil solution, making them available to roots.**
- **Exposure of terrestrial plants to contaminants present in particulates deposited on leaf and stem surfaces by rain striking contaminated soils (i.e., rain splash).**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 2

Provide explanation: Drainline and outfall are subsurface, so root uptake is possible.

Question J:

Could contaminants interact with receptors through food-web transport from surficial soils?

- **The chemicals may bioaccumulate in animals.**
- **Animals may ingest contaminated food items.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 2

Provide explanation: Drainline and outfall are subsurface, with no surface expression.

Question K:

Could contaminants interact with receptors through the incidental ingestion of surficial soils?

- **Incidental ingestion of contaminated soil could occur while animals grub for food resident in the soil, feed on plant matter covered with contaminated soil, or while grooming themselves clean of soil.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 1

Provide explanation: Drainline and outfall are subsurface, with no surface expression.

Question L:

Could contaminants interact with receptors through dermal contact with surficial soils?

- **Significant exposure through dermal contact would generally be limited to organic contaminants that are lipophilic and can cross epidermal barriers.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 1

Provide explanation: Drainline and outfall are subsurface, with no surface expression.

Question M:

Could contaminants interact with plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma-emitting radionuclides.**
- **Burial of contamination attenuates radiological exposure.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: No radionuclides present based on process knowledge.

<u>Question N:</u>

Could contaminants interact with plants through direct uptake from water and sediment or sediment rain splash?

- **Contaminants may be taken up by terrestrial plants whose roots are in contact with surface waters.**
- **Terrestrial plants may be exposed to particulates deposited on leaf and stem surfaces by rain striking contaminated sediments (i.e., rain splash) in an area that is only periodically inundated with water.**
- **Contaminants in sediment may partition into soil solution, making them available to roots.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Provide explanation: No water or sediment is present.

<u>Question O:</u>

Could contaminants interact with receptors through food-web transport from water and sediment?

- **The chemicals may bioconcentrate in food items.**
- **Animals may ingest contaminated food items.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: No water or sediment is present.

<u>Question P:</u>

Could contaminants interact with receptors through the ingestion of water and suspended sediments?

- **If sediments are present in an area that is only periodically inundated with water, terrestrial receptors may incidentally ingest sediments.**
- **Terrestrial receptors may ingest water-borne contaminants if contaminated surface waters are used as a drinking water source.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: No water or sediment is present.

Question Q:

Could contaminants interact with receptors through dermal contact with water and sediment?

- **If sediments are present in an area that is only periodically inundated with water, terrestrial species may be dermally exposed during dry periods.**
- **Terrestrial organisms may be dermally exposed to water-borne contaminants as a result of wading or swimming in contaminated waters.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Animals: 0

Provide explanation: No water or sediment is present.

Question R:

Could suspended or sediment-based contaminants interact with plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma-emitting radionuclides.**
- **Burial of contamination attenuates radiological exposure.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Terrestrial Plants: 0

Terrestrial Animals: 0

Provide explanation: No water or sediment is present.

Question S:

Could contaminants bioconcentrate in free-floating aquatic, attached aquatic plants, or emergent vegetation?

- **Aquatic plants are in direct contact with water.**
- **Contaminants in sediment may partition into pore water, making them available to submerged roots.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Plants/Emergent Vegetation: 0

Provide explanation: No aquatic habitat is present.

Question T:

Could contaminants bioconcentrate in sedimentary or water-column organisms?

- **Aquatic receptors may actively or incidentally ingest sediment while foraging.**
- **Aquatic receptors may be directly exposed to contaminated sediments or may be exposed to contaminants through osmotic exchange, respiration, or ventilation of sediment pore waters.**
- **Aquatic receptors may be exposed through osmotic exchange, respiration, or ventilation of surface waters.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Animals: 0

Provide explanation: No aquatic habitat is present.

Question U:

Could contaminants bioaccumulate in sedimentary or water column organisms?

- **Lipophilic organic contaminants and some metals may concentrate in an organism's tissues.**
- **Ingestion of contaminated food items may result in contaminant bioaccumulation through the food web.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

Aquatic Animals: 0

Provide explanation: No aquatic habitat is present.

Question V:

Could contaminants interact with aquatic plants or animals through external irradiation?

- **External irradiation effects are most relevant for gamma-emitting radionuclides.**
- **The water column acts to absorb radiation; therefore, external irradiation is typically more important for sediment dwelling organisms.**

Provide quantification of exposure pathway (0=no pathway, 1=unlikely pathway, 2=minor pathway, 3=major pathway):

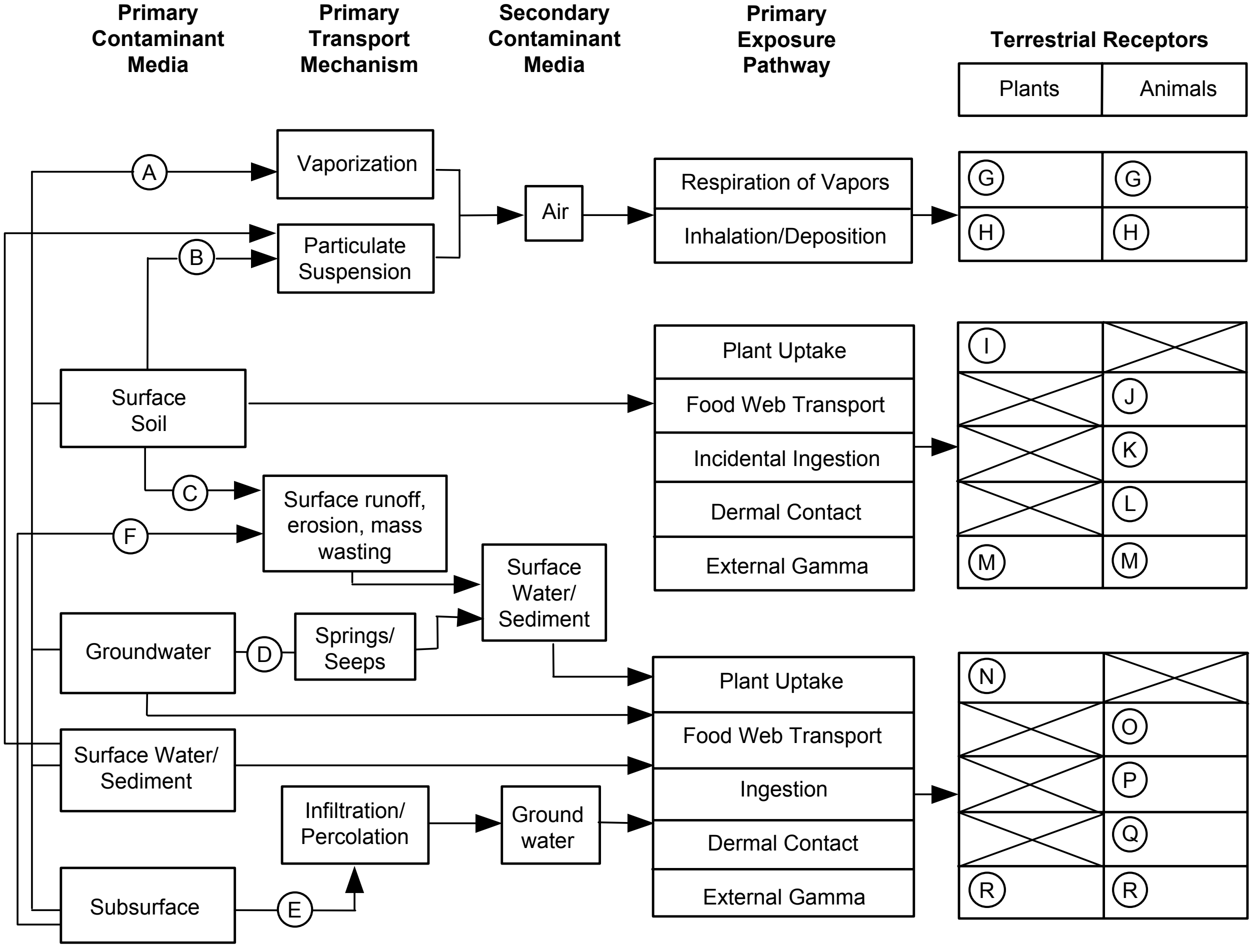
Aquatic Plants: 0

Aquatic Animals: 0

Provide explanation: No aquatic habitat is present.

Ecological Scoping Checklist
Terrestrial Receptors
Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the Scoping Checklist

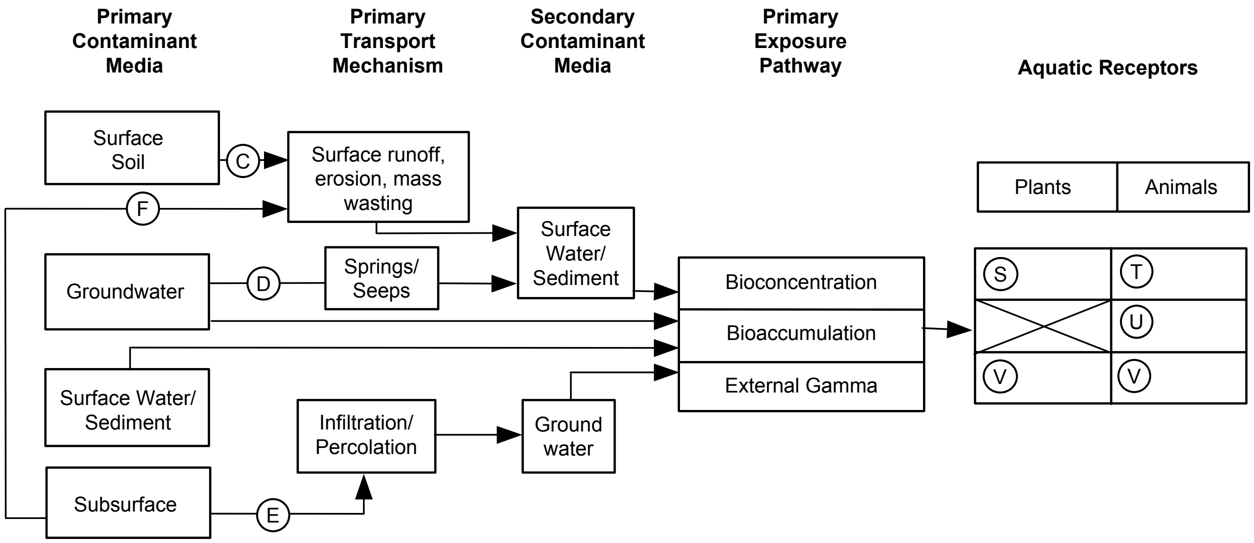


Ecological Scoping Checklist

Aquatic Receptors

Ecological Pathways Conceptual Exposure Model

NOTE:
Letters in circles refer to questions on the Scoping Checklist



Signatures and certifications:

Checklist completed by (provide name, organization and phone number):

Name (printed): Richard Mirenda

Name (signature): Richard Mirenda

Organization: EP-ERSS

Phone number: (505) 665-6953

Date completed: 2/5/07

Verification by another party (provide name, organization and phone number):

Name (printed): Bill Eisele

Name (signature): William F. Eisele

Organization: EP-ERSS

Phone number: (505) 667-0295

Appendix F

Waste Management Data

Appendix F consists of waste documentation generated during the 2006 ACA investigation at AOC 16-024(v) and SWMU 16-026(r) and includes the following attachments:

- Attachment F-1. 2006 Investigation-Derived Waste Summary at AOC 16-024(v) and SWMU 16-026(r)
    - ❖ Table F1-1. Summary of Waste Volumes Derived during the 2006 ACA of AOC 16-024(v) and SWMU 16-026(r)
    - ❖ Table F1-2. Summary of Waste Characterization Samples Collected and Analyses Performed during the 2006 ACA of AOC 16-024(v) and SWMU 16-026(r)
- Attachment F-2. Waste Characterization Strategy Form from the 2006 ACA at AOC 16-024(v) and SWMU 16-026(r)
- Attachment F-3. Waste Profile Forms from the 2006 ACA at AOC 16-024(v) and SWMU 16-026(r)
- Attachment F-4. CWDRs for Waste from the 2006 ACA at AOC 16-024(v) and SWMU 16-026(r)
- Attachment F-5. Waste Manifests for Waste from the 2006 ACA at AOC 16-024(v) and SWMU 16-026(r)
- Attachment F-6. Waste Characterization Data from the 2006 ACA at AOC 16-024(v) and SWMU 16-026(r) (on CD included with this document)

Attachment F-1

2006 Investigation-Derived Waste Summary at
AOC 16-024(v) and SWMU 16-026(r)

Table F1-1
Summary of Waste Volumes
Derived during the 2006 ACA of AOC 16-024(v) and SWMU 16-026(r)

LANL Container ID	Item ID	NTS ID	Waste	Shipment Date	Shipment Number	Volume (m^3)	Manifest #	Waste Profile #	Disposal Facility
n/a*	n/a	n/a	Asphalt from near SWMU 16-026(r)	8/22/06	n/a	5	n/a	n/a	Materials Recycling Facility (MRF)
n/a	n/a	n/a	Asphalt from near SWMU 16-026(r)	8/22/06	n/a	5	n/a	n/a	MRF
	10033704		Nonhaz Soil from SWMU16-026(r)			7.6		39893	Waste Management, Rio Rancho
	10033705		Nonhaz soil from SWMU 16-026(r)			8.4		39893	Waste Management, Rio Rancho
	10033706		Nonhaz soil from AOC 16-024(v)			7.6		39893	Waste Management, Rio Rancho
	10033707		Nonhaz soil from SWMU 16-026(r)			7.6		39893	Waste Management, Rio Rancho
	10033708		Non Haz soil from AOC 16-024(v)			8.4		39893	Waste Management. Rio Rancho
	10033709		Nonhaz soil from AOC 16-024(v)			7.6		39893	Waste Management, Rio Rancho

Note: Empty cells denote pending information.

*n/a = Not applicable.

Table F1-2
Summary of Waste Characterization Samples Collected and Analyses Performed during the ACA of AOC 16-024(v) and SWMU 16-026(r)

Date Collected	Location ID	Sample ID	Depth (ft)	Sample Type	Media	Excavated during 2006 Field Activities	Analytical Suites Requested (by Request Number)					
							VOCs[a]	Explosive Compounds	TAL[b] Metals	Perchlorate	MTBE[c]	SVOCs[d]
8/24/06	AOC 16-024(v)	RE16-06-71181	n/a[e]	WST[f]	Soil	Yes	5937s	5937s	5938s	5937s	5937s	5937s
8/24/06	AOC 16-024(v)	RE16-06-71182	n/a	WST	Soil	Yes	5937s	5937s	5938s	5937s	5937s	5937s
8/24/06	AOC 16-024(v)	RE16-06-71183	n/a	WST	Soil	Yes	5937s	5937s	5938s	5937s	5937s	5937s
6/26/06	SWMU 16-026(r)	RE16-06-71191	n/a	WST	Soil	Yes	5532s	5532s	5532s	5532s	5532s	5532s
6/26/06	SWMU 16-026(r)	RE16-06-71192	n/a	WST	Soil	Yes	5532s	5532s	5532s	5532s	5532s	5532s

[a] VOC = Volatile organic compound

[b] TAL = Target Analyte List.

[c] MTBE = Methyl tertiary butyl ether.

[d] SVOC = Semivolatile organic compound.

[e] n/a = Not applicable.

[f] WST = Waste characterization sample.

Attachment F-2

Waste Characterization Strategy Form from the
2006 ACA at AOC 16-024(v) and SWMU 16-026(r)

Waste Characterization Strategy Form

Project Title	**Accelerated Corrective Action Work Plan for Area of Concern 16-024(v) and Solid Waste Management Unit 16-026(r)**
Solid Waste Management Unit or Area of Concern #	**AOC 16-024(v), SWMU 16-026(r)**
Activity Type	**Soil sampling and possible removal of contaminated soil**
Field Team Leader	**Billy Warren, MKM Engineers Inc.**
Field Waste Management Coordinator	**Vickie Maranville, MKM Engineers Inc.**
Completed by	**Shannon Smith**
Date	**3/27/06**

Description of Activity:

AOC 16-024(v)

Conduct geodetic surveys of AOC 16-024(v), complete utility locates and identify the location of former Building 16-62 and the AOC 16-024(v) boundary.

Collect 8 subsurface soil samples at 4 locations in the area of AOC 16-024(v) that will be impacted by construction activities. The four sample locations will correspond to the footprint of former Building 16-62.The collection of these samples will be used to characterize soil contamination in only a small portion of the AOC (areas impacted by excavation for planned tie-in location of new gas line to the end of existing gas line). AOC 16-024(v) will be impacted by the proposed construction activities and is shown on the attached Figure 1. Samples will be collected using a backhoe. Field screening will be conducted for volatile organic compounds (VOCs) using a photo ionization detector (PID) and high explosives (HE) using a Detech ® Immunoassay test kit. If field screening does not indicate the presence of VOC or HE contamination, excess sample material removed from each sample location will be returned to the area from which it originated, per approval e-mail from D. McInroy, provided as Attachment 1. Excavated material that exceeds acceptable field screening levels (25 ppm VOCs and 5 ppm HE) will not be returned to the excavation and will be stored and managed as waste as described in the characterization strategy. All analytical samples will be submitted to an approved off-site laboratory and analyzed for VOCs, semivolatile organic compounds (SVOCs), target analyte list (TAL) metals, HE and perchlorate.

Samples will be submitted to the analytical laboratory on a standard 30-day turn-around-time frame. If field screening results indicate that chemical of potential concern (COPC) concentrations are above NMED Industrial SSLs, an excavation of some soils (<100 cubic yards) may be required. All excavated material will be stored in a roll-off container and will be sampled and analyzed at an off-site laboratory pending final waste characterization.

SWMU 16-026(r)

Conduct geodetic surveys of SWMU 16-026(r), complete utility locates and identify the SWMU boundary.

Collect 8 subsurface soil samples at 4 locations along the oil-water separator overflow line and outfall area. The collection of these samples will be used to characteize soil contamination prior to the installation of a new water line. SWMU 16-026(r) will be impacted by the proposed construction activities and is shown on the attached Figure 2. Samples will be collected using a backhoe. Field screening will be conducted for volatile organic compounds (VOCs) using a photo ionization detector (PID). Samples will be collected using a backhoe. If field screening does not indicate the presence of VOC contamination excess sample material removed will be returned to the area from which it originated, per approval e-mail from D. McInroy, provided as Attachment 1. Excavated material that exceeds acceptable field screening levels (25 ppm VOCs) will not be returned to the excavation and will be stored and managed as waste as described in the characterization strategy. All analytical samples will be submitted to an approved off-site laboratory and analyzed for VOCs, semivolatile organic compounds (SVOCs), target analyte list (TAL) metals, total petroleum hydrocarbons (TPH)-gasoline range organics (GRO) and diesel range organics (DRO).

Samples will be submitted to the analytical laboratory on a standard 30-day turn-around-time frame. If field screening results indicate that chemical of potential concern (COPC) concentrations are above NMED Industrial SSLs, an excavation of some soils (<100 cubic yards) may be required. All excavated material will be stored in a roll-off container and will be sampled and analyzed at an off-site laboratory pending final waste characterization.

Site restoration activities will be conducted after construction activities are complete.

Site History and Description:

AOC 16-024(v) is the former location of a high explosive (HE) storage magazine (former Building 16-62), constructed in 1944 outside of the S-Site exclusion zone. The location of the AOC is shown in Figure 1. It is located approximately 100 ft east of the footprint of the former steam plant (Building 16-540). The magazine was 6 ft by 6 ft by 7 ft tall. The building was constructed of wood and concrete and had a concrete floor with soil piled against three sides of the building, but not over the top. The structure was used as an HE magazine until 1946 and was then used for general storage until it was removed in 1968. The location remains undeveloped and unpaved.

As part of the TA-16 Weapons Campus Infrastructure Upgrade project, a new natural gas line will be tied into the existing gas line at the approximate location of this AOC. The installation of these new utility lines have prompted the proposed accelerated corrective action activities.

SWMU 16-026(r) is an inactive drainline and outfall from the oil-water separator at fire station Number 5 (Building 16-180) at TA-16. The location of the SWMU is shown in Figure 2. The oil-water separator was used to skim oil from water discharged to floor drains in the fire house. The fire station was constructed in 1952 and remains in use. The outfall area where the oil overflow line reportedly discharged is an unpaved area approximately 70 ft south of the fire station. Oil stains have never been observed on surface soils at the reported outfall location. Currently, the oil-water separator and discharge line are inactive, and the floor drains in the building were rerouted to discharge into the sanitary sewer.

As part of the TA-16 Weapons Campus Infrastructure Upgrade project, a new potable water line will be tied into the existing water line at the approximate location of this SWMU. These proposed structures will be located within the SWMU boundary and have prompted these accelerated corrective action activities.

Characterization Strategy:

Waste #1: IDW

Waste Type: Investigation-derived (contact) waste - used PPE, contaminated disposable sampling supplies (e.g. paper towels, nitrile gloves, plastic sampling spoons, plastic sheeting)

Anticipated Regulatory Status: non hazardous, non radioactive solid waste

Characterization Approach: contact waste will be characterized based on acceptable knowledge from site characterization data (analytical results from sampling activity). No significant or regulated levels of contaminants from contact with the soils are anticipated. Contact waste will be segregated from excavated soils.

Storage and Disposal Method: The contact waste will be accumulated in appropriate containers and staged at the site. The contact waste will be appropriately managed in a <90 Day storage area according to LANL LIRs and LIGs. Pending final waste characterization and approval of a LANL WPF, the contact waste will be disposed of at an appropriate authorized waste disposal facility.

Waste #2: Contaminated Soil (potential)

Waste Type: Excavated soil

Anticipated Regulatory Status: New Mexico Special Waste (a petroleum-contaminated soil [PCS]) or potential listed and/or characteristic hazardous waste. Suspected contaminants are primarily TPH (16-026[r]) and HE (16-024[v]). VOCs, SVOCs and metals are also possible contaminants.

Characterization Approach: Waste will be characterized based on acceptable knowledge and site characterization and direct sampling of roll off containers. Samples of containerized waste will be collected and submitted for laboratory analysis for explosive compounds (EPA Method 8321), SVOCs (Method 8270C), VOCs (Method 8260B), TPH (GRO and DRO[Method 8015M]), and TAL metals (Methods 6010B, 6020 and 7471A) . Waste characterization data will be reviewed to make final waste determinations with respect to NMSW and hazardous waste regulations.

Storage and Disposal Method: AOC 16-024(v) and SWMU 16-026(r) excavated soil will be loaded directly into a staged rolloff container. Only temporary onsite storage of excavated material is anticipated pending waste analysis. The excavated soil will be appropriately managed and handled per LANL LIRs and LIGs. Once the final waste determination for this waste stream is made, a WPF, CWDR and shipping manifests will be submitted for LANL review/approval. Upon approval of waste documentation, the containers will be transported, and disposed of at an appropriate authorized waste disposal facility. All waste will be stored in a NMSW, (limits on volume) or <90 Day storage area.

Waste Characterization Strategy Form (continued)

CHARACTERIZATION TABLE

Waste Description	16-024(v) Waste # 1 - IDW	16-024(v) Waste # 2 Contaminated Soil	16-026(r) Waste # 1 IDW	16-026(r) Waste # 2 Contaminated Soil
Volume	**<110 Gallons**	**<100 yds^3**	**<110 Gallons**	**<100 yds^3**
Packaging	**Drum liner in *55 gal. drums***	**Roll off**	**Drum liner in *55 gal.* drums**	**Roll off**
Regulatory classification:				
Radioactive				
Solid	x	x	x	x
Hazardous	x	x		
Mixed (hazardous and radioactive)				
Toxic Substances Control Act (TSCA)				
New Mexico Special Waste			x	x
Industrial	x		x	
Characterization Method				
Acceptable knowledge (AK): Existing Data/Documentation	X	X		
AK: Site Characterization	X	X	x	x
Direct Sampling of Containerized Waste		x		x
Analytical Testing				
Volatile Organic Compounds (EPA 8260-B)		x		x
Semivolatile Organic Compounds (EPA 8270-C)		x		x
Organic Pesticides (EPA 8081-A)				
Organic Herbicides (EPA 8151-A)				
PCBs (EPA 8082)				
Total Metals (EPA 6010-B/7471-A)		x		x
Total Cyanide (EPA 9012-A)				
High Explosives Constituents (EPA 8330/8321-A)		x		
Asbestos				
Total petroleum hydrocarbon (TPH)-GRO (EPA 8015-M)				x
TPH-DRO (EPA 8015-M)				x
Toxicity characteristic leaching procedure (TCLP) Metals (EPA 1311/6010-B)		x		x
TCLP Organics (EPA 1311/8260-B & 1311/8270-C)		x		x
TCLP Pest. & Herb. (EPA 1311/8081-A/1311/8151-A)				
Gross Alpha (alpha counting) (EPA 900)				
Gross Beta (beta counting) (EPA 900)				
Tritium (liquid scintillation) (EPA 906.0)				
Gamma spectroscopy (EPA 901.1)				
Isotopic plutonium (chem. separation/alpha spec.) (HASL-300)				
Isotopic uranium (chem. separation/alpha spec.) (HASL-300)				

Waste Description	16-024(v) Waste # 1 - IDW	16-024(v) Waste # 2 Contaminated Soil	16-026(r) Waste # 1 IDW	16-026(r) Waste # 2 Contaminated Soil
Total uranium (6020 inductively coupled plasma mass spectroscopy [ICPMS])				
Strontium-90 (EPA 905)				
Americium-241 (chem. separation/alpha spec.) (HASL-300)				
Waste Profile Form #	**TBD**	**TBD**	**TBD**	**TBD**

Waste Characterization Strategy Form (continued)

SIGNATURES	**DATE**
Project Leader (Print name and then sign below.) Melanee Shurter Melanee M Shurter	5/15/06
ERS-ECR Waste Management Coordinator (Print name and then sign below.) Leonard Trujillo Leonard	5/15/06
SWRC Representative (Print name and then sign below.) John Tymkowych John M. Tymkowych	5/16/06
NWIS-SWO Representative (Print name and then sign below.) Andy U. Elicio	5/15/06

SOP-01.10, R2	**Los Alamos National Laboratory** **ENV-ECR**

Figure 1

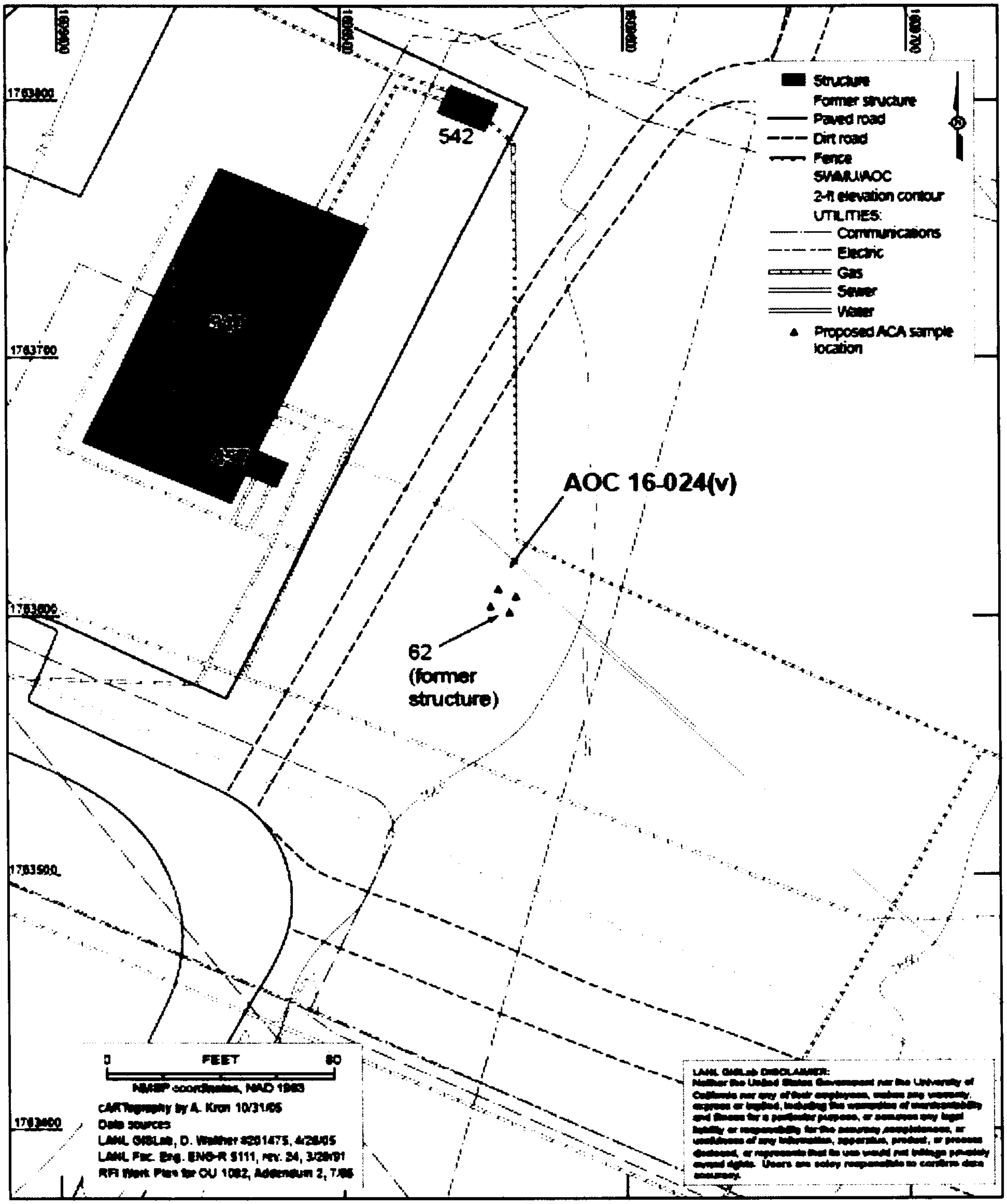
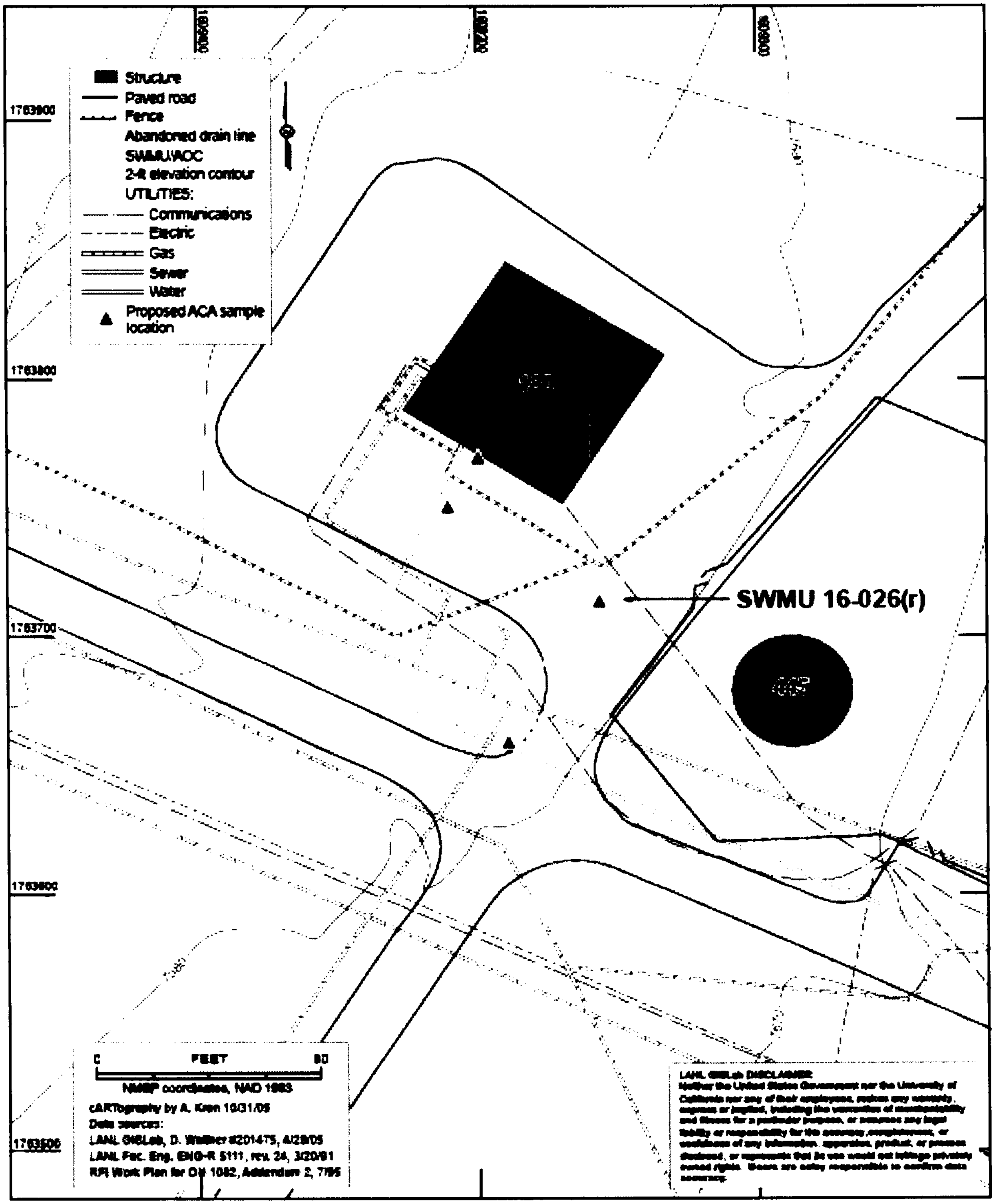

1763800
1763700
1763600
1763500
1763400
542
AOC 16-024(v)
62
(former
structure)
Structure
Former structure
Paved road
Dirt road
Fence
SWMU/AOC
2-ft elevation contour
UTILITIES:
Communications
Electric
Gas
Sewer
Water
Proposed ACA sample location
0 FEET 80
NMSP coordinates, NAD 1983
cARTography by A. Kron 10/31/05
Data sources
LANL GISLab, D. Walther #201475, 4/28/05
LANL Fac. Eng. ENG-R 5111, rev. 24, 3/28/91
RFI Work Plan for OU 1082, Addendum 2, 7/95
LANL GISLab DISCLAIMER:
Neither the United States Government nor the University of California nor any of their employees, makes any warranty, express or implied, including the warranties of merchantability and fitness for a particular purpose, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Users are solely responsible to confirm data accuracy.

Figure 2


1629600
1629700
1629800
1763900
1763800
1763700
1763600
1763500
Structure
Paved road
Fence
Abandoned drain line
SWMU/AOC
2-ft elevation contour
UTILITIES:
Communications
Electric
Gas
Sewer
Water
Proposed ACA sample location
SWMU 16-026(r)
0
FEET
80
NMSP coordinates, NAD 1983
cARTography by A. Kron 10/31/05
Data sources:
LANL GISLab, D. Walker #201475, 4/28/05
LANL Fac. Eng. ENG-R 5111, rev. 24, 3/20/91
RFI Work Plan for OU 1082, Addendum 2, 7/95
LANL GISLab DISCLAIMER

Attachment 1

```
Just for your information.

>X-Sieve: CMU Sieve 2.2
>X-Sender: u091351@norris-mail.lanl.gov
>X-Mailer: QUALCOMM Windows Eudora Version 6.1.2.0
>Date: Wed, 24 Aug 2005 14:20:12 -0600
>To: royb@lanl.gov
>From: Dave McInroy <mcinroy@lanl.gov>
>Subject: Requirements for Backfilling Sample Sites
>Cc: "Gabriela Lopez Escobedo" <gabriela@lanl.gov>, bcriswell@lanl.gov,
>         kmv@lanl.gov, Bob McInroy <bmcinroy@lanl.gov>
>X-PMX-Version: 4.7.1.128075
>
>Roy,
>In regard to the sampling activities at TA-16, since you are excavating
>the sample site with a backhoe rather than creating a bore hole, the
>spoils may be returned to the excavation.  We believe that the Order
>requirement associated with not returning cuttings to the bore hole are
>related to the potential for bridging effects of backfilling and not
>being able to compact the excavated area well enough to ensure that we
>don't create a pathway for contaminant migration.  This being stated,
>please ensure that when the spoils are returned to sample locations
>that were accessed by using a backhoe, they are replaced in the order
>in which they were removed from the hole (as possible), as well as
>compacted the site to at least the same density as the undisturbed,
>surrounding soils.  These locations should then be documented.
>
>If these steps are followed, they will ensure minimal disturbance of
>any contamination which might be associated with the area as well as
>avoiding the creation of any potential fast path for contaminant
>migration.  By maintaining a record of the locations, they can be
>avoided or targeted during any future sampling campaign.
>Thanks,
>Dave
>
>
>
>David McInroy
>Deputy Program Director
>Environmental Restoration & Surveillance Environmental Stewardship
>Division Los Alamos National Laboratory
>(505) 667-0819
>Fax 665-4747
>Cell 699-1183
```

Jeff Sanders

From: Saundra Martinez [saundra@lanl.gov]
Sent: Thursday, April 27, 2006 10:07 AM
To: sander@lanl.gov
Subject: Emailing: DocEditPrint_wconcur.htm

Hi Jeff
Please obtain signatures on this form when you are getting signatures on the final WCSF.
Include this form with the final document in the record package submittal to RPF.
Thank you.
Saundra

ENV-Environmental Characterization & Remediation Document Signature Form

Document Catalog Number: ER2006-0414
(Please prefix the name of all electronic versions of this document with this number.)

Document Title /Subject: Accelerated Corrective Action Work Plan for Area of Concern 16-024(v) and Solid Waste Management Unit 16-026(r)

PRSs: None **Privileged Information: Y / N**

Associated Document Catalog Number(s): None

Author: Sanders, Jeffery S 606-0872 jeffsanders@adelanteconsulting.com

Author Organization: Remedial Actions

Document Team: None

Document Type: Waste Characterization Strategy Form (WCSF) or WCSF Amendment **Former OU:** N/A

Date Due: Unknown **Date Final Complete:** Unknown
Date Sent to DOE: Unknown **Date Sent to NMED:** Unknown
Date Sent to RPF: Unknown **Received Per RPF:** Unknown

LA-UR Number: **RPF ER ID Number:** **Performance Measure:** No
AA Deliverable: No **Certification Required:** No **Force Peer Review:** No
Distribution TO: **Distribution FROM:**
Distribution COPY: **Distribution THRU:**
Attachment Notes:
Status/Comments:

Reviewer Signatures: (By signing below, the reviewer indicates that he/she **reviewed** and **approv** the document. Conditional approval may be indicated by checking the COMMENTS ATTACHED bo

Reviewer **(Print reviewer's name under title)**	**Signature**	**Date**	**Comment Attached**
Author Shannon Smith		5/23/06	
Technical Reviewer LEONARD J. TRUJILLO	Leonard	5/16/06	
Technical Reviewer (#2)			
Solid Waste Regulatory Compliance (SWRC) John Tymkowych	John M.	5/16/06	
Project Leader Melanie Shurter	Melanie M Shurter	5/25/06	

Document Catalog Number ER2006-0414

Attachment F-3

Waste Profile Forms for the 2006 ACA at
AOC 16-024(v) and SWMU 16-026(r)

LOS ALAMOS NATIONAL LABORATORY
WASTE PROFILE SYSTEM

WPF #: 39893

29-Jan-2007 02:06 PM **(Version: 1)**

Generator	:	**SHURTER, MELANEE**	MS	:	**M992**	PH	:	**6677369**	Z#:	**097894**
WMC	:	**STYERS, KAREN**	MS	:	**M992**	PH	:	**5056674700**	Z#:	**183203**
Contact	:									
RCRA Rev	:	**Elicio Andy U**	MS	:	**J595**	PH	:	**5056676956**	Z#:	**118692**
Status	:	**ACTIVE**	Activation Date	:	**01/29/2007**	Expiration Date:				**01/29/2008**
Group	:	**ERSS-RS**	TA	:	**16**	Bldg	:	**000000**	Room :	**OUTSIDE**

You are required to keep a copy of the WPF(s) in your files for at least three years. This WPF(s) is valid for one year or as long as the composition of the waste you have characterized remains the same. Should your waste change, please submit a new WPF to NWIS-SWO Customer Service.

Waste Accumu : **None of the Above Site ID#**
ER Waste PRS# 16-026(R)

Method of Char : Chemical/Physical Analysis Number: SEE PG 3 FOR FULL LISTING

Acceptable Knowledge Documentation Number: ER2006-0414

Waste Prevention/Minimization

Can hazard segregation, elimination, or material substitution be used?	N
Can any of the materials in the waste stream be recycled or reused?	N
Has waste minimization been incorporated into procedures or other process controls>	Y
Can this waste be generated outside a RCA?	NA

Waste Type : **Process Waste/Spent Chemical/Other**

Waste Classes: RCA Waste - **Not RCA Waste**
RAD Waste - **Non-rad**

Waste Category: **Inorganic**
Other

Waste Sources : **Investigative Derived**

Waste Matrix : **Solid**

Matrix Type : **Homogeneous**

Process Desc :
THIS SOLID WASTE WAS GENERATED FROM SITE FIELD INVESTIGATION ACTIVITIES AT SWMU 16-026(R).

Waste Desc : THIS WASTE STREAM CONSISTS OF EXCAVATED SOIL THAT IS CONTAINERIZED IN ROLL-OFF BINS.

Ignitability : **Not ignitable**

Corrosivity : **Non-aqueous**

Reactivity : **Non-reactive**

Boiling Point : **Not applicable**

Toxicity Characteristic Metals:

Contaminant	Method	Limit	Min	Max	Unit
ARSENIC	**TOTA**		**1.83**	**6.36**	**PPM**
BARIUM	**TOTA**		**50.5**	**229**	**PPM**

CADMIUM	**TOTA**		**0**	**0.371**	**PPM**
CHROMIUM	**TOTA**		**4.17**	**14.3**	**PPM**
LEAD	**TOTA**		**6.41**	**69.3**	**PPM**
MERCURY	**TOTA**		**0.005**	**0.282**	**PPM**
SELENIUM	**TOTA**		**0**	**1.63**	**PPM**
SILVER	**TOTA**		**0**	**0.102**	**PPM**

Toxicity Characteristic Organic Compounds:

Contaminant	Method	Limit	Min	Max	Unit
P-CRESOL	**TOTA**		**0**	**0.888**	**PPM**
CRESOL - MIXED	**TOTA**		**0**	**0.888**	**PPM**
1,1-DICHLOROETHYLENE	**TOTA**		**0**	**0.000557**	**PPM**
METHYL ETHYL KETONE	**TOTA**		**0**	**0.00594**	**PPM**

Additional Chemical Constituents and Contaminants:

CAS NO	Constituent	MIN	MAX	UOM
	EXCAVATED SOIL	**95**	**99**	**%**
	ACENAPHTHENE	**0**	**0.00222**	**%**
	ACENAPHTHYLENE	**0**	**0.0000258**	**%**
	ACETONE	**0**	**0.00000452**	**%**
	ALUMINUM	**0.762**	**2.71**	**%**
	ANTHRACENE	**0**	**0.00279**	**%**
	BENZO(A)ANTHRACENE	**0**	**0.00358**	**%**
	BENZP(A)PYRENE	**0**	**0.00291**	**%**
	BENZO(B)FLUORANTHENE	**0**	**0.00363**	**%**
	BENZO(G,H,I)PERYLENE	**0**	**0.00149**	**%**
	BENZO(K)FLUORANTHENE	**0**	**0.00123**	**%**
	BERYLLIUM	**0.0000389**	**0.000664**	**%**
	BIS(2-ETHYLHEXYL)PHTHALATE	**0**	**0.0000167**	**%**
	CALCIUM	**0.0764**	**1.36**	**%**
	CHRYSENE	**0**	**0.0037**	**%**
	COBALT	**0.000216**	**0.000725**	**%**
	COPPER	**0.000288**	**0.00114**	**%**
	DIBENZ(A,H)ANTHRACENE	**0**	**0.000033**	**%**
	DIBENZOFURAN	**0**	**0.00126**	**%**
	FLUORANTHENE	**0**	**0.0102**	**%**
	FLUORENE	**0**	**0.00217**	**%**
	INDENO(1,2,3-CD)PYRENE	**0**	**0.00147**	**%**
	IRON	**0.778**	**2.22**	**%**
	MAGNESIUM	**0.0876**	**0.307**	**%**
	MANGANESE	**0.0219**	**0.0541**	**%**
	METHYLNAPHTHALENE[2-]	**0**	**0.000943**	**%**
	NAPHTHALENE	**0**	**0.00345**	**%**
	NICKEL	**0.000279**	**0.0048**	**%**
	PHENANTHRENE	**0**	**0.0127**	**%**
	POTASSIUM	**0.086**	**0.26**	**%**
	PYRENE	**0**	**0.00973**	**%**
	SODIUM	**0.0151**	**0.063**	**%**
	THALLIUM	**0**	**0.0000291**	**%**
	TPH DRO	**0**	**0.00284**	**%**

TPH GRO	**0**	**0.00000371**	%
TRIMETHYLBENZENE[1,2,4-]	**0**	**0.000000193**	%
TRIMETHYLBENZENE[1,3,5-]	**0**	**0.0000000351**	%
VANADIUM	**0.00112**	**0.00289**	%
XYLENE[1,2-]	**0**	**0.0000000279**	%
XYLENE[1,3 AND 1,4]	**0**	**0.0000000597**	%
ZINC	**0.00219**	**0.0242**	%

Additional Information: REFERENCING WCSF: ACCELERATED CORRECTIVE ACTION WORK PLAN FOR 16-024(V) AND SWMU 16-026(R) [ER2006-0414]. THIS IS WASTE #2 IN THE WCSF. NO KNOWN USE OF SOLVENTS AT THIS SITE. ANALYTICAL RESULTS ARE FROM SITE CHARACTERIZATION WHICH IS THE SAME MATERIAL AS THE EXCAVATED SOIL. SAMPLE IDS FOR CHEMICAL ANALYSIS: RE16-06-71163, RE16-06-71165 TO 69, RE16-06-71172, RE16-06-71174 TO 76.

Work Control Documentation:

Do the procedures for this process cover how to manage this waste?	Y
Do the procedures for this process cover controls to prevent changes to waste constituents and concentrations or addition or removal of waste?	Y

Waste Certification Statements:

Waste appears to meet WAC chapter for: NON-HAZARDOUS WASTE (CHAPTER 17.0)

WASTE CHARACTERIZATION INFORMATION

Radioactivity Category : **NON-RAD**

RCRA Category : **NON HAZARDOUS**

Secondary Info : N/A

Waste Classification : **SOLID WASTE**

Waste Acceptances :

EPA Hazardous Waste Code : N/A

Attachment F-4

CWDRs for AOC 16-024(v) and SWMU 16-026(r)

Los Alamos
National Laboratory

Chemical Waste Disposal Request

Waste Services Use Only

This form is used to request disposal of chemical and low-level radioactive wastes. Fill out electronically, then print and sign. Mail completed form to Waste Services at **MS J595.**

Account Information 6A000A-MR0R-05FC-6B00	**Z Number** 135015	**Name (Print)** Michael Le Scouarnec	**Telephone** 667-7112	**Date** 02-07-07

Waste Pick-up Location and Storage Type:	**TA** 16	**Building**	**Room**	☐ **Security Area**	☐ **Direct Off-Site Shipment**

☐ **< 90 Day Accumulation Area**
☐ **Universal Waste Area**
☐ **TSDF**
(Start Date:)

☐ **Satellite Accumulation Area** (Approx. vol:)
☐ **PCB Waste** (Start Date:)
☐ **NM Special Waste** (<90 days) (Start Date:)

☐ **Rad Staging Area** (<90 days)
☐ **Rad Storage Area** (<1 year)
(Start Date:)

☐ **Rad Dumpster** (No:)

☐ **Other** (describe in description)

Item Id	**Waste Profile Number**	**Shipping Container Information**					**Waste Information**				*S=Solid L=Liquid G=Gas P=Powder	**Description**
		Type	Volume	Unit	Tare Weight	Unit	Volume	Unit	Weight	Unit		
10033704	39893	01	9.2	M	2600	P	7.6	M	30000	P	S	Non-Haz Soil,SWMU 16-026 (r)
10033705	39893	01	9.2	M	2600	P	8.4	M	33000	P	S	Non-Haz Soil,SWMU 16-026 (r)
10033706	39893	01	15.3	M	4200	P	7.6	M	30000	P	S	Non-Haz Soil, AOC 16-024 (v)
10033707	39893	01	9.2	M	2600	P	7.6	M	30000	P	S	Non-Haz Soil,SWMU 16-026 (r)
10033708	39893	01	9.2	M	2600	P	8.4	M	33000	P	S	Non-Haz Soil, AOC 16-024 (v)
10033709	39893	01	9.2	M	2600	P	7.6	M	30000	P	S	Non-Haz Soil, AOC 16-024 (v)

Container Types
01-Bulk (Unpackaged)
02-Metal Drum
03-Fiber or Plastic Drum
04-Plastic Bottle or Container
05-Glass Bottle or Container
06-Plastic Bag
07-Fiber or Plastic Box
08-Wooden Box
09-Metal Box
10-Portable Tank
11-Cylinder
12-Shield Cask
13-Other (**specify in description**)
14-Compactor Box
15-Aerosol Can

Units for Volume
G-Gallon
L-Liters
F-Cubic Feet
Q-Quart
M-Cubic Meters
O-Fluid Ounce
P-Pint

Units for Weight
P-Pound
K-Kilograms
G-Grams
O-Ounce
T-Tons

CERTIFICATION STATEMENT: To the best of my knowledge, I certify that the information on this form is correct. I understand that this information will be made available to regulatory agencies and that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Printed Name Michael Le Scouarnec	**Signature**	**Z Number** 135015	**Date** 02-07-07

*For new and unused chemicals

Low- level Radiological Information

Item ID	S/V/B[1]	C/NC[2]	Health Physics Container/Package Information				Radionuclide	Amount (Double Click +/- column to activate selection box)				Unit	Uncertainty			
			Container Surface (mrem/hr)	1 Meter Dose (mrem/hr)	Package Surface Contamination (DPM/100 sq. cm)											
					Alpha	Beta-Gamma										
									E					E		
									E					E		
									E					E		
									E					E		
									E					E		
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									E					E		
									E					E		

[1] S = Surface, V = Volume, B = Both Surface and Volume

[2] C = Compactible, NC = Non-compactible

Units for Activity **C** – curies **M** – grams **L** - curies/liter

Attachment F-5

Waste Manifests for Waste from the 2006 ACA at AOC 16-024(v) and SWMU 16-026(r)

Southwest Abatement Inc.

4609 Kinney ST SE Albuquerque, NM 87105

Daily Trip Log

Time 5:30pm
[illegible] -3
[illegible] 7.75

Danielle Skiver	Daily Inspection	Milage Stop:	9213
# 177-0601	Log In 6:22am	Milage Start:	8887
8-22-06	Log Out 5:12pm	Total Miles:	326

Customers Address	Code *	Drop	Dispose	Can # Dropped	Can # Pulled	Landfill	Container # left at	Dump Ticket	Maintenance Time {Fuel}
[illegible] on truck	—	✓	!	[illegible]			[illegible]		
Stagecoach	2√	1	1	0137.40	0536.40	WM	Site	378827	Dropped @ WM, picked up 9805.12 @ WM to move
San Mateo	2√	1	1	0206.40	0137.40	Recycle	Site	27961	So loader could clean up sludge, picked 40 back up
TA-16	3√	1	1		0531.12	MRF	TA-16	NA	
TA-16	3√	1	/		0526.12	MRF	TA-16	NA	
		4	5						
Incentive Total									

14 60 + 13 50 = 28 00

④

#1 MCO - #3
R. #2 P.U.N.R. #4

Comments: 15 mins @ Recycle getting drop/estimate info, 15 mins @ TA-16 waiting Billy, 2.5 hours to move cans due to placement,

.25 .25 2.5

Attachment F-6

Waste Characterization Data from the 2006 ACA at
AOC 16-024(v) and SWMU 16-026(r)
(on CD included with this document)