

March 21, 2008

The attached 70% draft SWMU assessment reports are referenced in the Upper Sandia investigation work plan and historical investigation report.

Per Paula Bertino, the drafts were prepared by MKM Engineering for Melanee Shurter a few years ago. Each report contains information and data not previously reported to NMED that was collected at the request of NMED to support NFA proposals on specific SWMUs. The information and data in the reports are accurate, but the overall quality and format of the reports were found to be lacking so they were never finalized.



LA-UR-XX-XXXX

October 2005

ER2005-0482

Solid Waste Management Unit (SWMU) Assessment Report for SWMU 03-003(c)



Prepared by the

Environmental Stewardship–Environmental Remediation and Surveillance
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CONTENTS

1.0	INTRODUCTION	1
2.0	SITE DISCRPTION AND OPERATIONAL HISTORY	3
3.0	PREVIOUS INVESTIGATIONS	3
4.0	DATA REVIEW	6
4.1	Inorganic Chemical Comparison to Background Values.....	6
4.2	Radionuclides Comparison with Background Values	6
4.3	Evaluation of Organic Chemicals	6
4.4	Summary of COPCs at SWMU 03-003(c).....	6
5.0	SITE EVALUATION	8
5.1	Site Conceptual Model	8
5.2	Nature and Extent of Contamination	9
5.3	Environmental Fate and Transport of Contaminants of Potential Concern	9
5.3.1	Semi-Volatile Organic Chemicals	9
5.4	Site Assessment.....	9
5.4.1	Human Health Screening Assessment for SWMU 03-003(c)	10
5.4.2	Interpretation of Human Health Screening Assessment Results	11
5.4.3	Ecological Screening Assessment for SWMU 03-003(c).....	11
5.4.4	Surface Water Assessment for SWMU 03-003(c).....	16
6.0	CONCLUSIONS AND RECOMMENDATIONS	16
7.0	REFERENCES	16

FIGURES

Figure 1.0-1.	Location of TA-03 with respect the Laboratory boundary.	2
Figure 2.0-1.	Location of SWMU 03-003(c) with respect to the TA-03 boundary.....	4
Figure 3.0-1.	Sample collection locations at SWMU 03-003(c)	5
Figure 4.3-1.	PCBs detected above detection limit.....	7
Figure 5.1-1.	Conceptual Exposure Model for SWMU 03-003(c)	9

TABLES

Table 4.3-1	Analytical Results for PCBs Exceeding Detection Limits	6
Table 5.4-1	Comparison of Carcinogenic COPCs at SWMU 03-003(c) to SSLs.....	10
Table 5.4-2	HQ Calculations for Terrestrial Receptors at SWMU 03-003(c)	14
Table 5.4-3.	Comparison of EPCs of COPECs with ESLs in Fill at SWMU 03-003(c)	14

ACRONYMS

BV	background value
bgs	below ground surface
COPC	contaminant of potential concern
COPEC	contaminant of potential ecological concern
DOE	U.S. Department of Energy
ENV-ERS	Environmental Stewardship Division–Environmental Remediation & Surveillance Program

EPA	U.S. Environmental Protection Agency
ESL	ecological screening level
HI	hazard index
HQ	hazard quotient
LANL or the Laboratory	Los Alamos National Laboratory
NFA	no further action
NMED	New Mexico Environment Department
NOD	notice of deficiency
PCB	polychlorinated biphenyls
RfD	reference dose
RFI	RCRA facility investigation
RPF	Records Processing Facility
SOP	standard operating procedure
SSL	soil screening level
SVOC	semi-volatile organic compounds
SWMU	solid waste management unit
TA	Technical Area
TAL	target analyte list
TCL	target compound list
T&E	threatened and endangered
UCL	upper confidence level
VOC	volatile organic compounds

1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the Department of Energy (DOE) and managed by the University of California. LANL is located in north-central New Mexico approximately 60 miles northeast of Albuquerque and 20 miles northwest of Santa Fe. The Laboratory covers 40 square miles of the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation between 6200 ft and 7800 ft above sea level (Figure 1.0-1).

LANL's Environmental Stewardship Division (ENV) – Environmental Remediation Services (ERS) is participating in a national effort by the DOE to clean up sites and facilities formerly involved in weapons research and production. The goal of the ERS is to ensure that past operations under the DOE do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, ERS is currently investigating sites potentially contaminated by past Laboratory operations. These sites under investigation are designated as Solid Waste Management Units (SWMUs) or Areas of Concern.

The following sections present the information needed to form the basis of regulatory site decisions, and satisfy the requirements for a SWMU assessment report contained in Section G.3 of Module VIII of the Laboratory's Hazardous Waste Facility Permit (EPA 1994, 44146). Section 2 describes SWMU 03-003(c) and its operational history. A summary of previous investigations conducted at the site is discussed in Section 3. Section 4 provides a comprehensive review of all existing Resource Conservation and Recovery Act (RCRA) analytical chemistry data. Section 5 presents an evaluation of the site based on the RCRA data, and includes a discussion of the site conceptual model, nature and extent of contamination, and environmental fate and transport of site contaminants. Section 5 also presents the formal evaluation of the potential ecological and human health risks posed by site contaminants under current conditions. Section 6 presents conclusions and site recommendations.

This SWMU assessment report presents the current understanding of the nature and extent of contamination and assesses the associated human health and ecological risk at SWMU 03-003(c), site of a former drum and capacitor storage area. The operational history of SWMU 03-003(c) and the results of previous investigations are discussed. A data review presenting nature and extent of contamination as well as data assessments for human health and ecological risk is presented using existing data. The report also presents formal recommendations on the investigatory and regulatory status of the site, based on the existing site data.

Laboratory operational facilities and geographical boundaries are designated by Technical Areas (TAs). SWMU 03-003(c) is located within TA-03. TA-03 houses the main administrative buildings for the Laboratory. SWMU 03-003(c) was proposed for no further action in the Resource Conservation and Recovery Act Facility Investigation Work Plan for Operational Unit 1114 (LANL 1993, 51977; LANL 1993, 57590); however, the New Mexico Environmental Department (NMED) requested further investigation of the site (LANL 1997, 55510).

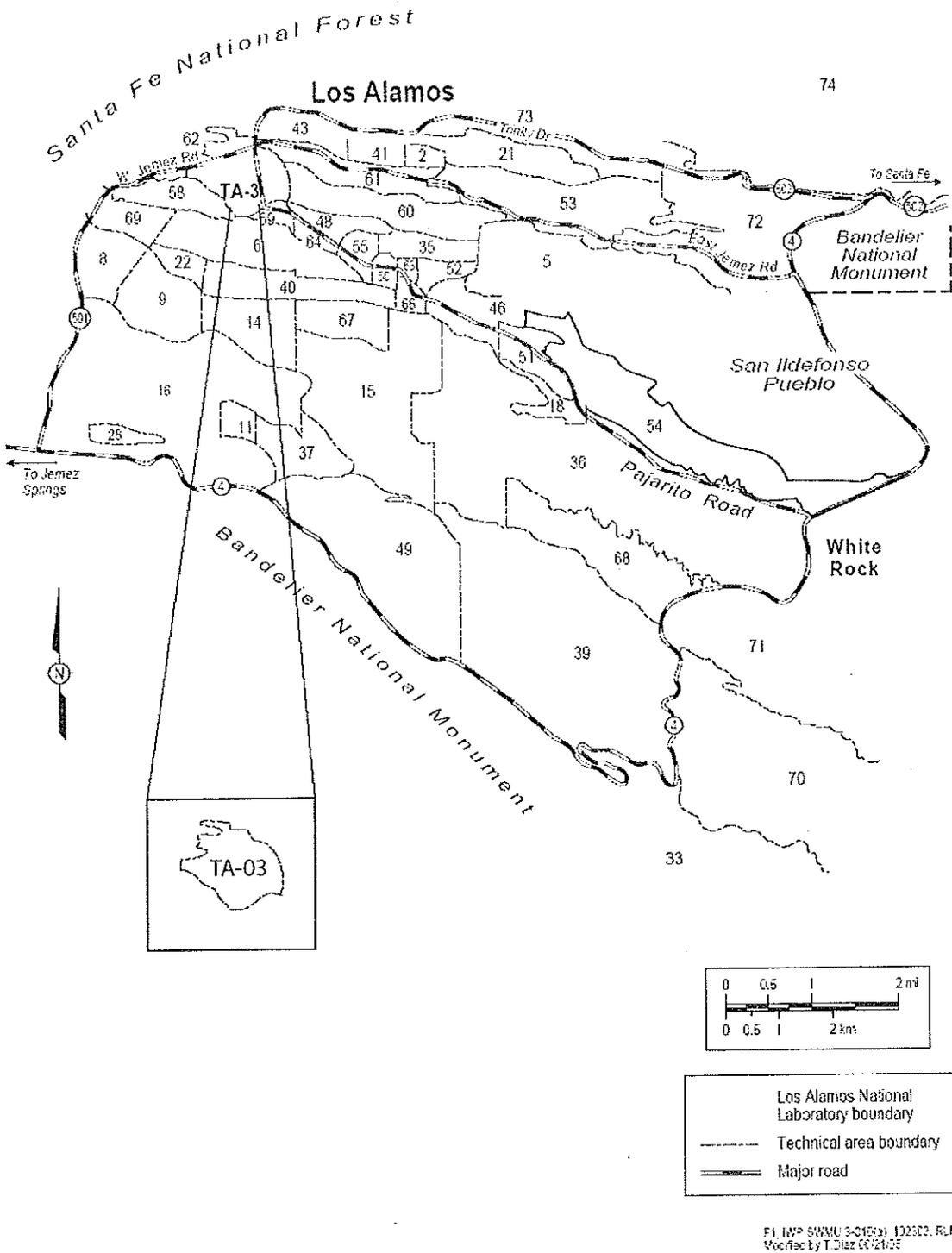


Figure 1.0-1. Location of TA-03 with respect the Laboratory boundary.

2.0 SITE DESCRIPTION AND OPERATIONAL HISTORY

SWMU 03-003(c) is located in a highly developed area that has been backfilled and leveled over the years to facilitate the storage activities. The site is a decommissioned temporary equipment storage area south of Building TA-3-287. Approximately 3,300 non-PCB capacitors were stored temporarily in the area. Oil samples collected from capacitors were analyzed and the results showed less than 50 mg/mg PCBs. Releases of dielectric oils were observed at the site during previous investigations (LANL 1993, 51977 p 6-21). The primary possible site contaminants are Polychlorinated Biphenyl's (PCBs) which are known to have been used in many electrical capacitors and dielectric oils. SWMU 03-003(c) is situated on soil and alluvium overlying cooling unit 4 of the Bandelier Tuff. The location of SWMU 03-003(c) with respect to the TA-03 boundary is shown in Figure 2.0-1.

3.0 PREVIOUS INVESTIGATIONS

No pre-RCRA investigations were conducted at the site. SWMU 03-003(c) was recommended for NFA in the 1993 RFI Work Plan for OU1114 (LANL 1993, 51977; LANL 1993, 57590) based on a review of historical and field information gathered at the site. NMED requested further investigation of SWMU 03-003(c) in the Notice of Deficiency (NOD) Response for OU114, Addendum 1 (LANL 1996, 54088, pg. 10). In response to the NOD, LANL completed a sampling campaign at the site in 2001.

To characterize the levels of contamination at the site, three samples were collected from the surface of SWMU 03-003(c) in 2001 and analyzed for PCBs. The samples were collected at three separate locations at a depth from 0.0 to 0.5 ft below ground surface (bgs). Observations recorded by sampling personnel during sample collection activities indicated no staining or odors. Figure 3.0-1 shows the sample collection locations of the 2001 sampling event. The analytical results for the soil samples collected are discussed in Section 4.0.

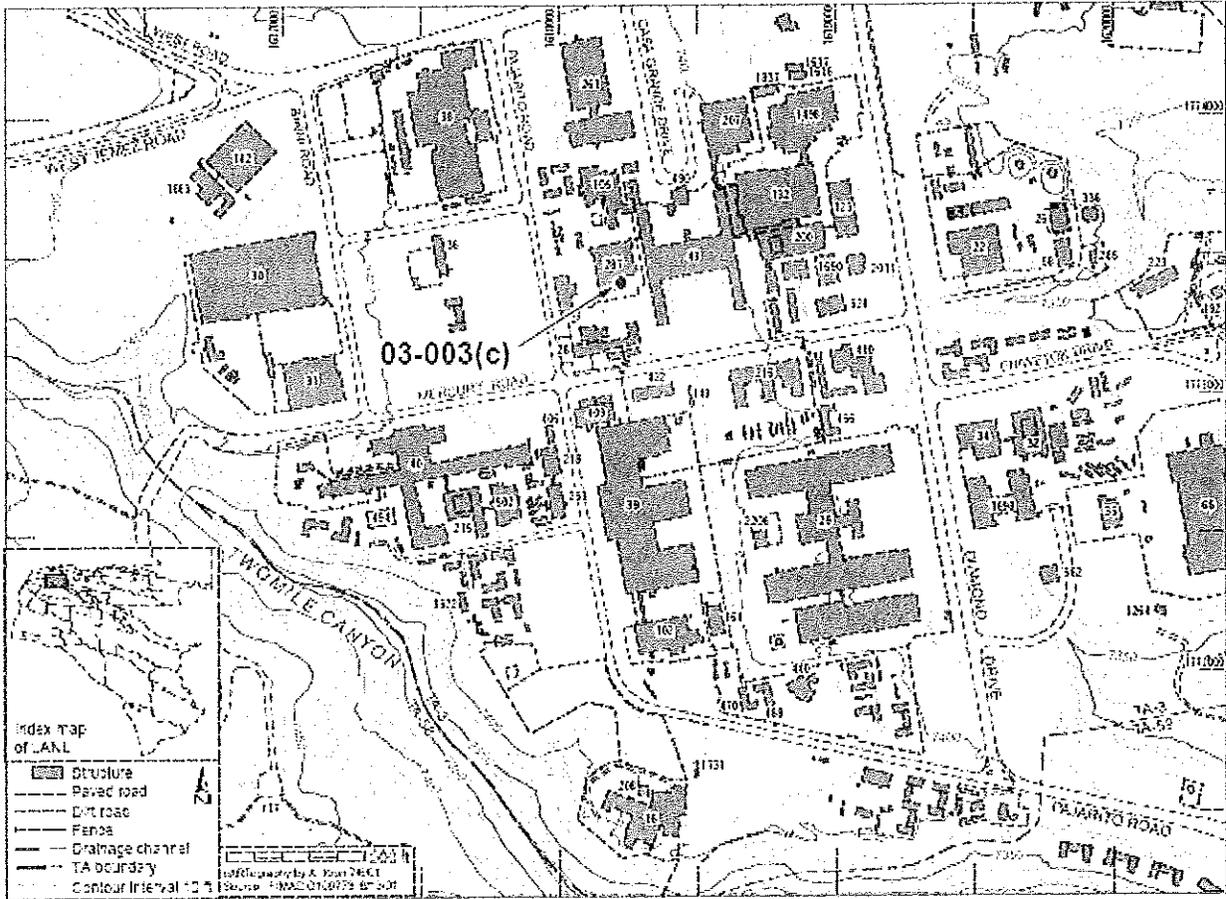


Figure 2.0-1. Location of SWMU 03-003(c) with respect to the TA-03 boundary.

Figure 3.0-1. Sample collection locations at SWMU 03-003(c)

4.0 DATA REVIEW

All of the sample results generated from the 2001 RCRA investigation conducted at SWMU 03-003(c) are reviewed below to identify contaminants of potential concern (COPCs) present at the site. A general overview of the analytical results is also presented.

4.1 Inorganic Chemical Comparison to Background Values

SWMU 03-003(c) was not used for the production or disposal of any materials containing inorganic contaminants and samples were not analyzed for inorganic contaminants.

4.2 Radionuclides Comparison with Background Values

SWMU 03-003(c) was not used for the production or disposal of any radionuclides and samples were not analyzed for radionuclides.

4.3 Evaluation of Organic Chemicals

Organic chemical results exceeding analytical detection limits are used to identify organic COPCs. The samples collected at SWMU 03-003(c) were analyzed for PCBs only. One Aroclor was observed at concentrations exceeding detection limits in samples collected across the site. Table 4.3-1 presents the analytical results for the samples that contained PCBs at concentrations exceeding detection limits. The map locations where samples containing concentrations of PCBs above detection limits were collected and the associated sample concentrations are presented in Figure 4.3-1.

PCBs. One Aroclor was detected in samples collected from SWMU 03-003(c). Aroclor 1254 was detected in two samples at concentrations above detection limits. The maximum concentration of the PCBs detected was 0.054 mg/kg from a sample depth of 0.0 to 0.5 ft bgs.

**Table 4.3-1
Analytical Results for PCBs Exceeding Detection Limits**

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254 (mg/kg)
RC03-01-0015	03-14457	0.33-0.50	Fill	0.054
RC03-01-0016	03-14458	0.33-0.50	Fill	0.043

4.4 Summary of COPCs at SWMU 03-003(c)

The following organic chemicals have been identified as COPCs at SWMU 03-003(c) and are evaluated further in Section 5.0 of this document.

Organic COPCs

Soil – Aroclor 1254.

Figure 4.3-1. PCBs detected above detection limit

5.0 SITE EVALUATION

5.1 Site Conceptual Model

The conceptual site model for SWMU 03-003(c) includes both surface and subsurface sources of contamination. The principal sources of contamination associated with operational activities at the SWMU 03-003(c) are most likely PCBs that were spilled on the ground surface as a result of activities at the site. Possible sources of subsurface contamination may include the absorption of PCBs into the subsurface as a result of leaks or spills from storage containers.

Potential transport mechanisms that may lead to exposure of potential receptors include

- dissolution and/or particulate transport of surface contaminants during rainfall and snow melt runoff events;
- airborne transport of contaminated surface soils;
- continued dissolution and advective/dispersive transport of contaminants contained in subsurface soil and bedrock; and
- biotic perturbation and translocation of contaminants in subsurface waste and contaminated media.

Figure 5.1-1 presents the SWMU 03-003(c) conceptual site model and exposure pathways for human receptors. The potential for downward migration of contaminants in the vadose zone released from SWMU 03-003(c) is low due to the absence of saturated conditions and low hydrostatic pressure at the site. A pathway to the regional aquifer, located approximately 1,000 ft below the site, is unlikely. Therefore, groundwater is not included in the conceptual model as either a potential secondary contaminated medium or contaminant transport and exposure mechanism.

Current potential receptors of surface contamination include site workers at TA-03. Exposure to subsurface materials currently could only occur if materials are excavated and brought to the surface; therefore, potential receptors of subsurface contamination are the same as those listed for surface contamination. In addition, contaminants in soils could also cause exposure through root uptake and by rain splash on plants, with further food web transport of contaminants and subsequent exposure of ecological receptors via plants and/or animals.

In general, COPCs at the SWMU 03-003(c) would be expected to remain vertically within the confines of the site. The COPCs at the site are relatively immobile in soils, and surface water assessment scores are generally low indicating little to no potential for contaminant migration due to the transport and deposition of sediment. Run-off driven contaminant transport could cause the lateral migration of contaminants beyond the boundaries of the SWMU as a result of a significant precipitation event that could drive COPCs down the slope of the canyon.

Figure 5.1-1. Conceptual Exposure Model for SWMU 03-003(c)**5.2 Nature and Extent of Contamination**

The distribution of COPCs at SWMU 03-003(c) were evaluated in the context of the conceptual site model. Aspects of this evaluation included (1) the presence of COPCs in the samples collected from the former storage area; and (2) the distribution of COPCs in areas possibly impacted by the release of contaminants from site sources.

The only COPC detected at SWMU 03-003(c) was Aroclor 1254.

5.3 Environmental Fate and Transport of Contaminants of Potential Concern

The following section briefly describes the chemical and physical properties of SWMU 03-003(c) COPCs that affect their movement in the environment. The properties of organic chemicals that influence their potential movement within the site are solubility, mobility as a function of their organic carbon adsorption coefficient (Koc), their potential rate of volatilization from soils and sediments as measured by Henry's Law Constant, and their potential for aerobic or anaerobic biodegradation depending on soil type and chemical composition. The Koc for Aroclor 1254 is 75600 L/kg (RAIS 2001, 70089), which means it binds readily to organic matter and is not volatile.

5.3.1 Semi-Volatile Organic Chemicals

SVOCs have low to no mobility in soils. In addition, volatilization from moist and dry surfaces is not expected to be an important fate process. In general, SVOCs adsorb readily to soil and sediment. Biodegradation in most cases is also expected to be a relatively slow process taking weeks to many months or years.

5.4 Site Assessment

Human health and ecological screening assessments were conducted for the COPCs identified in the fill layer at SWMU 03-003(c). Risk to human health was evaluated based on an industrial worker scenario using the most current EPA and NMED guidance (EPA 2004, 87478); NMED 2004, 85615), and follows the guidance in "Human Health Risk-Based Screening Methodology, Revision 1," (LANL 2005, 88494). Risk to ecologic receptors and the environment was evaluated using the methodology prescribed in "Screening Level Ecological Risk Assessment Methods, Revision 2" (LANL 2004, 87630).

Risk to human health and the environment from contaminated groundwater was not evaluated in the screening assessment for 03-003(c) because no localized groundwater bodies were identified at or near the site; only the Los Alamos regional aquifer was identified as a potential groundwater source for SWMU 03-003(c). However, as the regional aquifer is located approximately 1,000 ft below SWMU 03-003(c), the possibility that the regional aquifer would be impacted by a release from SWMU 03-003(c) is very unlikely; therefore, the risk to human health and the environment from groundwater at SWMU 03-003(c) is minimal, both as a secondary contaminated medium and as a mechanism for contaminant transport and exposure.

A surface water assessment was performed at SWMU 03-003(c) on June 11, 2001, and is discussed in Section 5.4.3.

The results of the human health and ecological screening assessments for SWMU 03-003(c) are presented below in subsections 5.4.1 and 5.4.2, respectively.

5.4.1 Human Health Screening Assessment for SWMU 03-003(c)

The following subsections include screening evaluations for carcinogenic and noncarcinogenic COPCs, a discussion of uncertainty of the analysis, and an interpretation of the screening evaluations at SWMU 03-003(c).

5.4.1.1 Human Health Screening Evaluation

Only the chemical Aroclor-1254 was identified as a COPC in fill at SWMU 03-003(c) based on the data review presented in Section 4.0. To determine whether this chemical was detected at concentrations that pose a potential concern to human health, this chemical was evaluated further by comparing the exposure point concentration (EPC) (maximum detected concentration in this evaluation) to the applicable industrial soil screening level (SSL).

For SWMU 03-003(c), the NMED SSL for Aroclor-1254 (8.26 mg/kg), based on an excess lifetime carcinogenic risk of 10^{-5} , was used to evaluate the risks posed to human health at the site (NMED 2004, 85615). The results of this evaluation are presented in Table 5.4-1. Fill samples were collected only from the 0.33 to 0.5 ft depth interval. Data evaluation under the residential scenario (NMED 2004, 85615) is also based on this depth and is presented for comparison in Section 5.4.1.3.

Exposure routes considered for the evaluation are as follows: (1) respiratory uptake, (2) dermal contact, and (3) incidental ingestion of soil.

Three samples were collected in fill at SWMU 03-003(c) and analyzed for Aroclors –1016, –1021, –1032, –1042, –1048, –1054, and –1260. Two of the samples showed detections of Aroclor–1254. The EPC for Aroclor –1254 is 0.054 mg/kg, indicating that exposure to this COPC in fill at SWMU 03-003(c) does not present an unacceptable risk to human health for an industrial receptor. The ratio is obtained by dividing the EPC by the SSL. The quotient of 0.0065 translates to an excess cancer risk of $6.5E-08$ (obtained by multiplying the ratio of 0.0065 times the cancer risk of 1×10^{-5}). The calculation is $6.5E-03 \times 1.0E-05 = 6.5E-08$.

**Table 5.4-1
Comparison of Carcinogenic COPCs at SWMU 03-003(c) to SSLs**

Analyte	Location ID	Sample ID	Depth (ft)	Exposure Point Concentration ^a (mg/kg)	SSL Industrial (mg/kg)	Ratio
Aroclor-1254	03-14457	RC03-01-0015	0.33-0.50	0.054	8.26	0.0065
cancer risk						6.5E-08

^a Maximum concentration. Number of samples in fill was not sufficient to calculate an upper confidence limit (UCL)

5.4.1.2 Uncertainty Analysis for Human Health Screening Evaluation

The uncertainty analysis for SWMU 03-003(c) includes a discussion of human health risk toxicity values, current and future land use, and applicable human health receptors.

Toxicity Values

Chemical-specific toxicity values for evaluation of noncarcinogenic endpoints are referred to as reference doses (RfDs). The RfD is a threshold dose, below which adverse noncarcinogenic effects are not likely to be observed. Analogous toxicity values for carcinogens are referred to as slope factors and are based on the concept that no threshold exists below which some excess cancer risk is incurred.

The toxicity values employed in the derivation of SSLs are chosen to be protective of human health; therefore, these values generally introduce a conservative bias to the risk calculations with regard to the general population. For example, RfDs routinely incorporate criteria that account for such uncertainty factors as protection of sensitive individuals and limitations of the studies on which the RfD is based. However, if the target receptor is a sensitive individual rather than an average individual or population, then the conservative bias may, in fact, be appropriate for the receptor.

Human Health Receptor and Current Land Use

The human health screening evaluation at SWMU 03-003(c) is a conservative comparison of the maximum detected concentration, also referred to as the EPC, of Aroclor-1254 with its respective NMED SSL, based on an industrial exposure scenario. The current land use for SWMU 03-003(c) is industrial. Since the site exists within the boundaries of an operational facility and will remain under Laboratory control in the foreseeable future, future land use is anticipated to remain industrial. As an existing operational facility currently and in the future, it is reasonable to assume that on-site workers with authorized access are the primary receptors to the potential contamination at SWMU 03-003(c). Therefore, an industrial worker scenario is the most applicable exposure scenario to assess the potential risks SWMU 03-003(c) poses to human health. Site workers are assumed not to be working below a depth of 0.5 ft bgs.

5.4.2 Interpretation of Human Health Screening Assessment Results

Results of the human health screening evaluation for SWMU 03-003(c) using an industrial exposure scenario show that the Aroclor-1254 concentrations observed in the fill at SWMU 03-003(c) pose no risk to human health. The calculated potential present-day risk of $6.5E-08$ is approximately 2.5 orders of magnitude below the NMED target limit of $1.0E-05$.

The results of the risk screening evaluation using a residential scenario yields a total calculated noncancer hazard quotient of 0.05, below the NMED target limit of 1.0. Note that NMED considers Aroclor-1254 carcinogenic for industrial workers and noncarcinogenic for residential receptors.

5.4.3 Ecological Screening Assessment for SWMU 03-003(c)

The ecological screening assessment for SWMU 03-003(c) is presented in the following subsections and consists of four parts: (1) the scoping evaluation, (2) the screening evaluation, (3) the uncertainty analysis, and (4) interpretation and recommendations (LANL 2004, 87630). The scoping evaluation forms the conceptual basis for the ecological risk assessment by identifying the pathways of contaminant exposure to ecological receptors. The screening evaluation is a numerical comparison of medium-specific ecological screening levels (ESLs) to concentrations of contaminants measured in environmental media. The uncertainty analysis evaluates whether COPECs are added or deleted as a result of information provided in previous sections of this report. The interpretation and recommendations phase provides insight into the relevance of the ecological screening assessment and recommendations for further action, if any.

5.4.3.1 Scoping Evaluation

The primary exposure pathways identified at SWMU 03-003(c) are incidental ingestion of soil that includes grooming and dermal exposure. SWMU 03-003(c) is comprised of compacted soil. The surrounding parking areas are asphalt.

Biotic Associations

The area surrounding SWMU 03-003(c) has been extensively developed as a result of on-going site operations; however, grasses, sage, and some forbs are present outside the immediate operational perimeter of SWMU 03-003(c). Surrounding areas support tree and shrub communities including ponderosa pine, piñon, and Rocky Mountain juniper as well as abundant invertebrates, reptiles, mammals, and birds.

SWMU 03-003(c) is not managed to limit access to on-site ecological receptors. Although the immediate area of SWMU 03-003(c) is barren of vegetation due to ongoing construction activities and therefore not suitable for sustaining ecological receptors, other portions of the mesa top and hillsides surrounding SWMU 03-003(c) differ in community composition and character. These areas have fully intact terrestrial biotic communities and, therefore, the ecological screening assessment for SWMU 03-003(c) includes a full suite of potential terrestrial receptors.

As a conservative measure, Threatened and Endangered (T&E) species will be considered to exist in the vicinity of the former SWMU 03-003(c), as they are present at other parts of the Laboratory. Two species of special interest are the peregrine falcon and the spotted bat, however the US Fish and Wildlife Service delisted the peregrine falcon as a federal T&E species in August 1999 and the spotted bat is listed as threatened by the New Mexico Game and Fish department. Neither of these species has been observed to roost or nest in the area.

Suspected Contaminant and Physical Effects on Biotic Media

To evaluate the impacts of potential contamination from SWMU 03-003(c), efforts were made to distinguish between effects that may be contaminant-related and those that are related to natural physical processes or manmade disturbances such as past or current operational activities. Current staging of heavy equipment, and former activities associated with decontamination and decommissioning (D&D) have rendered the site devoid of vegetation. Sampling took place within the footprint of the former Syllac Building (Building 03-287) where ongoing construction activities are taking place. Therefore, the lack of vegetative cover in this instance is due to manmade disturbance and not contaminant-related.

Data Adequacy

The data are considered adequate for this assessment and representative of the contamination present in the vicinity of SWMU 03-003(c) and are considered adequate for decision-making purposes at this site. The nature and extent of contamination at SWMU 03-003(c) is summarized in Section 5.2. Although presently the site is not capable of sustaining ecological receptors, a screening assessment to evaluate the risk of exposure to future receptors is applicable as restoration of the site to pre-industrial conditions is currently planned.

5.4.3.2 Ecological Screening Evaluation

The results of ecological scoping indicate that eight terrestrial species are appropriate for numerical screening against contaminant concentrations for the SWMU 03-003(c). These receptors cover 11 trophic categories identified for the Pajarito Plateau (LANL 2004, 87630) and include

- a generic 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), and
- the red fox (mammalian carnivore).

The little brown myotis bat – a surrogate for the spotted bat, a T&E species – is not included in this screening evaluation because there are no wetland areas nearby that would be conducive to emerging aquatic insects, a staple of the bat's diet.

The numerical screening evaluation for SWMU 03-003(c) compared medium-specific ESLs for each receptor with the maximum chemical concentration detected in fill at the site. ESLs are derived using the methodology presented in "Screening Level Ecological Risk Assessment Methods, Revision 2" (2004, 87630) and the ECORISK database (LANL 2004, 87386). These sources include all relevant information necessary to calculate HIs and HQs, including concentration equations, dose equations, bioconcentration factors, transfer factors, and toxicity reference values. ESLs for nonradiological chemicals are determined on a toxicological dose basis (LANL 2004, 87630). The ESLs used in the screening evaluation for SWMU 03-003(c) were obtained from the ECORISK database, version 2.1 (LANL 2004, 87386).

For wildlife, toxicological studies were used to determine the maximum contaminant exposure at which no adverse effect was observed (LANL 2004, 87630). This critical exposure level may vary greatly because of population-based variations in individual weight, diet, reproductive status, and phenology. In the case of terrestrial organisms, ESLs were developed to reflect an adverse effect on an average, nongravid, adult individual of a particular species (EPA 1993, 59384). ESLs are designed, therefore, to be protective of specific organisms and may only be used to infer a potential for risk to receptors. The ESL used in the screening evaluation at the SWMU 03-003(c) was obtained from the ECORISK database, version 2.1 (LANL 2004, 87386).

A single COPC was identified at SWMU 03-003(c), Aroclor-1254. The maximum detected concentration of Aroclor-1254 in fill was used for the evaluation because the number of samples collected at SWMU 03-003(c) was insufficient to calculate a representative 95% UCL of the mean. Therefore, the maximum detected concentration is the EPC. The EPC for Aroclor-1254 in fill at SWMU 03-003(c) was determined from all samples collected between 0.33 and 0.5 ft bgs (LANL 2004, 87630).

The ESL for Aroclor-1254 was then compared to the EPC for Aroclor-1254 and the HQ was calculated by dividing the EPC by the ESL. An HQ equal to or greater than 0.3 identifies a chemical of potential ecological concern (COPECs) and determines whether or not the chemical should be evaluated further per LANL guidance (LANL 2004, 87630). Results of the ecological screening evaluation at SWMU 03-003(c) is presented in Table 5.4-2. The HQ calculated for Aroclor-1254 at SWMU 03-003(c) is 1.3, identifying the chemical as a COPEC requiring further evaluation.

Further evaluation of Aroclor-1254 included the calculation of HQs for each COPEC/receptor combination using the maximum detected concentration of Aroclor –1254 observed in fill. An HQ equal to or greater than 1.0 indicates the relative ecological risk is unacceptable for a particular COPEC/receptor combination per LANL guidance (LANL 2004, 87630). Results of this second evaluation are presented in Table 5.4-3.

Table 5.4-2
HQ Calculations for Terrestrial Receptors at SWMU 03-003(c)

Analyte	EPC (mg/kg)	ESL (mg/kg)	Receptor	HQ
Aroclor –1254	0.054	0.041	American Robin (insectivore)	1.3
sum of ratios				1.3

Table 5.4-3.
Comparison of EPCs of COPECs with ESLs in Fill at SWMU 03-003(c)

Analyte	EPC ^a	Generic Plant		Earthworm Invertebrate (soil dwelling)		Deer Mouse (mammalian omnivore)		Montane Shrew (mammalian insectivore)		Desert Cottontail (mammalian herbivore)		Red Fox (mammalian top carnivore)	
		ESL	HQ	ESL	HQ	ESL	HQ	ESL	HQ	ESL	HQ	ESL	HQ
Aroclor –1254	0.054	160	0.0003	na	na	0.88	0.06	0.44	0.12	56	0.001	0.15	0.36
Total for each receptor			0.0003		0.0		0.06		0.12		0.001		0.36

Table 5.4-3 (Continued)

Analyte	EPC	Robin (insectivore)		Robin (omnivore)		Robin (herbivore)		Kestrel (omnivore) (avian intermediate carnivore)		Kestrel (100% meat diet) (avian top carnivore)	
		ESL	HQ	ESL	HQ	ESL	HQ	ESL	HQ	ESL	HQ
Aroclor –1254	0.054	0.041	1.32	0.08	0.675	1.4	0.039	0.17	0.32	0.22	0.245
Total for each receptor			1.3		0.7		0.04		0.3		0.2
Total for all receptors											3.2

^a Units for EPC and ESLs are mg/kg
na = data not available

5.4.3.3 Uncertainty Analysis

Toxicity information is available for all receptors for the identified COPEC with the exception of the earthworm. The available ESLs are considered adequate to determine whether there is a potential for ecological impacts from exposure to Aroclor-1254.

ESLs for vertebrate terrestrial receptors were based on similar species and derived from experimentally determined no-observed adverse effect levels, lowest-observed adverse effect levels, or lethal doses that caused 50% mortality in the population. Receptor-specific data for estimating potential ecological risk are often lacking; therefore, species-specific toxicological effect data from laboratory animals must be extrapolated for wild receptors. Data from laboratory studies are sometimes limited because the studies often evaluate single chemical exposures in isolated and controlled conditions using a single exposure pathway. Additionally, laboratory-controlled toxicological studies are often performed on individuals obtained from artificial and maintained populations. Wild organisms are concomitantly exposed to a variety of stressors and risk-drivers, thereby increasing the potential from synergistic and antagonistic physiological effects. Wild populations are also considered to be more genetically diverse than laboratory animals, making wild populations, as a whole, potentially less sensitive to chemical exposure. The uncertainties associated with these differences may result in an underestimation or overestimation of potential risk.

The assumptions used in the Aroclor-1254 ESL derivation were conservative and not necessarily representative of actual conditions. The assumptions include maximum chemical bioavailability, maximum receptor ingestion rates, minimum body weight, and 100% home-range exposure. This tends to result in conservative estimates of the ESL, which may lead to an overestimation of the potential risk to a receptor.

Toxicological data are typically based on the most toxic and bioavailable chemical species, which are not likely found in the environment. Inorganic chemicals are generally not 100% bioavailable to receptors in the natural environment because of adsorption to matrix surfaces (e.g., soil and sediments) or rapid oxidation or reduction changes that render harmful chemical forms unavailable to receptors. Inorganic chemicals tend to adsorb to soil particles making them less available to receptors. Therefore, the exposure and subsequent toxicity of chemicals to receptors is likely overestimated by the screening assessment.

The screening evaluation was performed using the maximum detected concentration of Aroclor-1254 in fill at SWMU 03-003(c) to a depth of 0.5 ft bgs. A maximum concentration was used because only two data points were available. As a result, when the exposure of individuals within a population was evaluated using this concentration, the maximum concentration was assumed to be constant throughout the exposure area. This results in an overestimation of the potential risk as the concentration of Aroclor-1254 most likely varied across the site.

The following paragraph briefly discusses the single COPEC identified at SWMU 03-003(c).

Aroclor-1254 had a maximum detected concentration of 0.054 mg/kg. Comparison of the maximum detected concentration for Aroclor-1254 to the final ESL (0.041 mg/kg) results in an HQ of 1.3, slightly above the NMED threshold value of 1.0 (LANL 2004, 87630). The final ESL is based on the insectivorous American Robin. For all other ecological receptors HQs were less than 1.0. Therefore, it is most likely that the exceedance of ESL for Aroclor-1254 is the result of the conservative nature of the ESL. Based on this assumption, Aroclor-1254 does not require further evaluation and is eliminated as a COPEC.

5.4.3.4 Interpretation of Ecological Screening Assessment Results for SWMU 03-003(c)

The screening evaluation, which used a conservative ESL for eleven representative receptors, resulted in an HQ of 3.2, above the threshold of 1.0, for Aroclor -1254. However, based on the current site conditions at SWMU 03-003(c) as well as the uncertainties and conservative nature of the ecological screening assessment, it is the conclusion of this evaluation that Aroclor-1254 currently poses no adverse threat to ecological receptors and the environment.

5.4.4 Surface Water Assessment for SWMU 03-003(c)

A Surface Water Site Assessment (SWSA) was conducted at SWMU 03-003(c) on June 11, 2001. The Erosion Matrix Score was 3.6 out of a possible 100 points, reflecting a very low potential for erosion and sediment transport at SWMU 03-003(c); therefore, surface water is not considered further as a viable exposure or transport pathway and poses no significant risk to human health and the environment.

6.0 CONCLUSIONS AND RECOMMENDATIONS

A review of current site data and the results of the human health and ecological screening assessments indicate that Aroclor-1254 concentrations observed in fill at SWMU 03-003(c) pose no unacceptable risk to human health or the environment. Data gathered during the investigation of SWMU 03-003(c) established the nature and extent of contamination in surface media, and indicated that a release of environmental contaminants has not occurred at the site. We conclude that this site is administratively complete without controls and formally recommend approval by NMED of this designation based on Criterion 5 (NMED 1998, 57761). Criterion 5 states that the SWMU has been characterized or remediated in accordance with applicable state or federal regulations and that the available data indicate that chemicals of concern either are not present or are present at concentrations that would pose no potential unacceptable risk under the projected future land use.

7.0 REFERENCES

The following list includes all documents cited in this report. 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 ENV-ERS Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the ENV-ERS Program reference set titled "Reference Set for Material Disposal Areas, Technical Area 21."

Copies of the reference sets are maintained at the NMED Hazardous Waste Bureau; the DOE Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the ENV-ERS Program. 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.

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LA-UR-XX-XXXX

October 2005

ER2005-0485

Solid Waste Management Unit (SWMU) Assessment Report for SWMU 60-002



Prepared by the

Environmental Stewardship--Environmental Remediation and Surveillance
Publications Team

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CONTENTS

1.0	INTRODUCTION.....	1
2.0	SITE DISCRPTION AND OPERATIONAL HISTORY.....	3
3.0	PREVIOUS INVESTIGATIONS	4
4.0	DATA REVIEW	7
4.1	Inorganic Chemical Comparison to Background Values	7
4.2	Radionuclides Comparison with Background Values	12
4.3	Evaluation of Organic Chemicals.....	12
4.4	Summary of COPCs at SWMU 03-003(c).....	16
5.0	SITE EVALUATION.....	17
5.1	Site Conceptual Model.....	17
5.2	Nature and Extent of Contamination.....	18
5.3	Environmental Fate and Transport of Contaminants of Potential Concern.....	18
5.3.1	Inorganic Chemicals.....	19
5.3.2	Volatile Organic Chemicals.....	20
5.3.3	Semi-Volatile Organic Chemicals.....	20
5.4	Site Assessments.....	21
5.4.1	Human Health Screening Assessments.....	21
5.4.2	Ecological Screening.....	25
5.4.3	Surface Water Assessments.....	34
6.0	CONCLUSIONS AND RECOMMENDATIONS	34
7.0	REFERENCES.....	34

FIGURES

Figure 1.0-1.	Location of TA-60 with respect the Laboratory boundary.....	2
Figure 2.0-1.	Location of SWMU 60-002 with respect to the TA-60 boundary.....	4
Figure 3.0-1.	Sample collection locations at SWMU 60-002	6
Figure 4.1-1.	Locations of inorganic chemicals above BV.....	10
Figure 4.3-1.	Location of organic chemicals above detection limits	15
Figure 5.1-1.	Conceptual Exposure Model for SWMU 03-003(c).....	18

TABLES

Table 4.1-1	Inorganic Chemicals with Concentrations Greater Than Los Alamos Background in Soil	8
Table 4.1-2	Inorganic Chemical Detections Greater Than Los Alamos Background in Tuff	9
Table 4.3-1	Organic Chemicals Above Detection Limits in Soil at SWMU 60-002	13
Table 4.3-2	Organic Chemicals Above Detection Limits in Tuff at SWMU 60-002.....	14
Table 5.3-1	Koc and Henry's Law Constant Values for SWMU 60-002 COPCs	19
Table 5.4-1	Comparison of Carcinogenic COPCs at SWMU 60-002 to SSLs.....	22
Table 5.4-2	Comparison of Noncarcinogenic COPCs at SWMU 60-002 to SSLs	23
Table 5.4-3	HQ Calculations for Terrestrial Receptors at SWMU 60-002	28
Table 5.4-4	Comparison of Exposure Point Concentrations of COPECs in Soil with ESLs	29

ACRONYMS

BV	background value
COPC	contaminant of potential concern
COPEC	contaminant of potential ecological concern

DOE	U.S. Department of Energy
DRO	diesel range organics
ENV-ERS	Environmental Stewardship Division–Environmental Remediation & Surveillance Program
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ESL	ecological screening level
FIP	field implementation plan
GRO	gasoline range organics
HI	hazard index
HQ	hazard quotient
LANL or the Laboratory	Los Alamos National Laboratory
NFA	no further action
NMED	New Mexico Environment Department
NOD	notice of deficiency
PAH	potential aromatic hydrocarbons
RfD	reference dose
RFI	RCRA facility investigation
RPF	Records Processing Facility
RRES-RS	Risk Reduction and Environmental Stewardship–Remediation Services
SOP	standard operating procedure
SSL	soil screening level
SVOC	semi-volatile organic compounds
SWMU	solid waste management unit
TA	Technical Area
TAL	target analyte list
TCL	target compound list
TPH	total petroleum hydrocarbons

T&E	threatened and endangered
UCL	upper confidence level
VOC	volatile organic compounds

1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the Department of Energy (DOE) and managed by the University of California. LANL is located in north-central New Mexico approximately 60 miles northeast of Albuquerque and 20 miles northwest of Santa Fe. The Laboratory covers 40 square miles of the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation between 6200 ft and 7800 ft above sea level.

LANL's Environmental Stewardship Division (ENV) – Environmental Remediation Services (ERS) is participating in a national effort by the DOE to clean up sites and facilities formerly involved in weapons research and production. The goal of the ERS is to ensure that past operations under the DOE do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, ERS is currently investigating sites potentially contaminated by past Laboratory operations. These sites under investigation are designated as Solid Waste Management Units (SWMUs) or Areas of Concern.

This Assessment Report presents the operational history of SWMU 60-002; the site of three former construction debris and fill materials storage areas, and discusses the results of previous investigations. A data review presenting nature and extent of contamination as well as data assessments for human health and ecological risk is presented using existing data. Also included are conclusions and recommended actions necessary to meet the no further action (NFA) criterion number 4, which states that the SWMU has been characterized or remediated in accordance with current applicable state or federal regulations, and that available data indicate contaminants of concern are either not present or are present in concentrations that pose an acceptable level of risk to on-site or off-site workers, the general public, or the environment.

SWMU 60-002 is located at the east end of Sigma Mesa within Technical Area (TA) -60 (Figure 1.0-1). TA-60 was created from a portion of TA-3 when the Laboratory redefined its technical areas in 1989. TA-60 lies east of present-day TA-3 on a finger-like mesa between Sandia Canyon to the north and Mortandad Canyon to the south. Most of TA-60 consists of undeveloped mesa top covered with low invasive shrubs and outlined by pines at the edges of the mesa.

SWMU 60-002 was proposed for NFA in the approved Resource Conservation and Recovery Act Facility Investigation Work Plan for Operational Unit 1114 (LANL 1993, 51977; LANL 1995, 57590); however, the New Mexico Environmental Department (NMED) requested further investigation of the site (LANL 1996, 54088, pg 10).

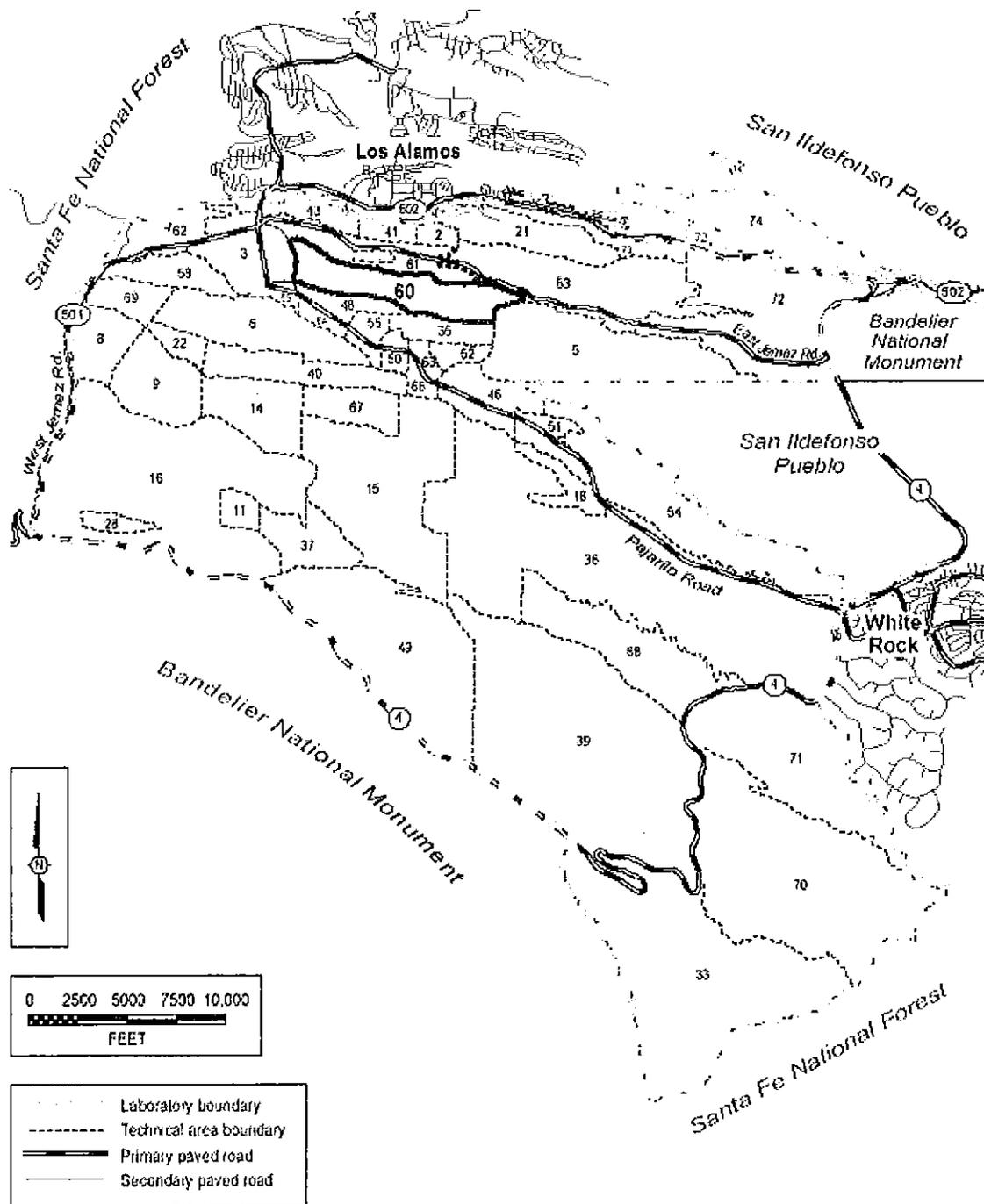


Figure 1.0-1. Location of TA-60 with respect the Laboratory boundary.

2.0 SITE DESCRIPTION AND OPERATIONAL HISTORY

SWMU 60-002 comprises three storage areas that have been used since the 1960's for the storage of construction and fill materials for Laboratory support contractors from the 1960s until the present. One of the storage areas was used to store piles of cured asphalt removed from roadways and parking lots prior to recycling (LANL 85517 Appendix 1). The storage areas are accessible by a single gravel road that is secured by a locked gate at the western end of the mesa, just beyond building TA-60-19 (Figure 2.0-1).

The first storage area is located approximately 900 ft southeast of TA-60-2 and lies on the north side of the access road. This area is a crescent shaped area approximately 200 ft wide X 300 ft long containing primarily construction debris such as concrete chunks, cables, and other similar types of materials. The second storage area is approximately 120 ft northwest of TA-60-29 and is 50 ft in diameter that contained a mound of soil containing rocks, fence posts, pipe, wood, and other similar debris. The third area is on the south side of the access road near the east end of Sigma Mesa. The third storage area was used to stage piles of broken cured asphalt chunks removed from roadways and parking lots throughout the Laboratory prior to recycling. All asphalt materials were removed from the third storage area, although small asphalt debris is visible on the site surface.

The potential contamination of SWMU 60-002 is a result of the accumulation of asphalt chunks associated with normal construction and infrastructure maintenance at the Laboratory.

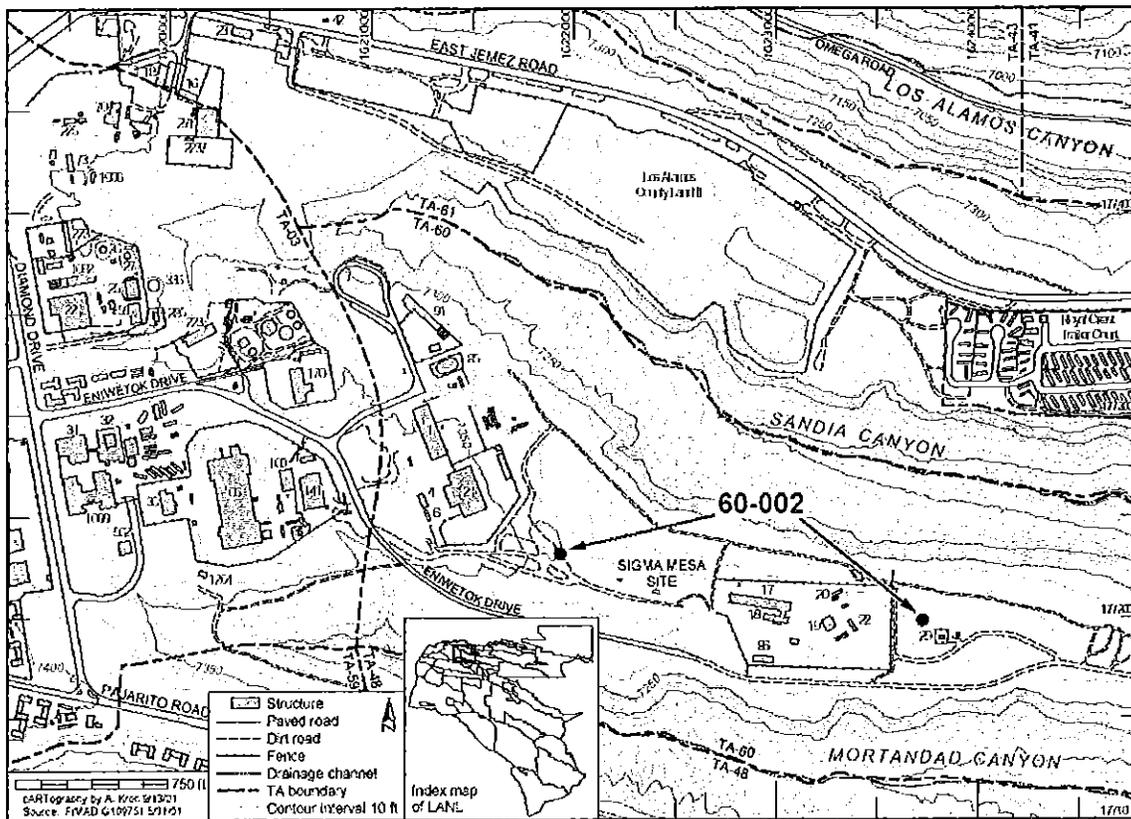


Figure 2.0-1. Location of SWMU 60-002 with respect to the TA-60 boundary.

3.0 PREVIOUS INVESTIGATIONS

In 1993 SWMU 60-002 was proposed for no further action (NFA) in the approved RFI Work Plan for OU 1114 (LANL 1993, 51977; LANL 1995, 57590). The Laboratory developed the recommendation for NFA by applying the four-step evaluation criteria described in Appendix I, Subsection 4.1 of the Installation Work Plan, Revision 2 (LANL 1992, 0768). The recommendations were based on archival information and field investigations. Operational records were used to conclude that no activities at SWMU 60-002 generated target analyte list (TAL), target compound list (TCL), or radioactive wastes (LANL 1993 51977; p. 6-15). Using this rationale, the Laboratory proposed SWMU 60-002 for NFA in accordance with step 4 of the NFA criteria, which states that potential exposure of on-site or off-site workers or the general public to hazardous materials must be far below action levels.

The NFA proposal for SWMU 60-002 was issued a notice of deficiency due to a lack of analytical data supporting the absence of TAL or TCL. Although asphalt is not considered a hazardous contaminant, some of the compounds in asphalt emulsion contain a semi-volatile fraction [potential aromatic hydrocarbons (PAHs)] that can be classified as hazardous (LANL 1996, 54088, p 10).

To properly characterize the nature and extent of possible contamination at SWMU 60-002, the Laboratory developed a Field Implementation Plan (FIP) for Asphalt Batch Plant Solid Waste Management Units and Areas of Concern at Technical Areas 3 and 60 (LANL 2003, 80912) that included a sample collection plan for the site. The FIP objective was to determine if any petroleum contamination was released during the operational activities carried out at the site and define the extent of contamination present (if any). The Laboratory conducted drilling and subsurface sampling to determine if PAHs were present in the soil at SWMU 60-002 in the 2003 investigation. The samples collected at

SWMU 60-002 were analyzed for volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH) – diesel range organics (DRO), TPH- gasoline range organics (GRO), semi-volatile organic compounds (SVOCs) (primarily PAHs), and metals. All samples collected during the 2003 investigation were analyzed in the field for TPH using TPH test kits. The data collected in the field was used to bias the locations of sample collection sites. Three additional locations were sampled in 2004 from the first storage area to characterize the remainder of the storage areas at the site. Figure 3.0-1 shows the sampling locations at SWMU 60-002.

A total of six borehole locations were drilled in addition to the three surface sample locations at SWMU 60-002 to measure the subsurface levels of contaminants of potential concern (COPC). Three borehole locations were drilled to a total depth (TD) of 15.0 ft below ground surface (bgs), two borehole locations were drilled to a TD of 20.0 ft bgs, and one borehole location was drilled to a TD of 17.0 ft bgs; with refusal at 17.0 ft bgs (Figure 3.0-1). The boreholes were continuously sampled using a 3.5-inch continuous core barrel sampler at 5.0 ft intervals, and the recovered core was logged and sampled for TPH contamination. No significant TPH contamination was detected at any of the six borehole locations at SWMU 60-002 using on-site field screening instruments. In addition, no staining or hydrocarbon odors were observed in any of the cores (LANL 85517 pg 26). A total of 19 soil samples were collected from the subsurface of SWMU 60-002 and submitted for laboratory analysis to confirm the field observations. The analytical results for the soil samples collected are presented in Section 4.0.

Figure 3.0-1. Sample collection locations at SWMU 60-002

4.0 DATA REVIEW

The analytical results of the samples collected support the conclusion that the COPC present at SWMU-60-002 are present in concentrations that pose an acceptable level of risk.

All of the sample results generated from the 2003 and 2004 RCRA investigation conducted at the SWMU-60-002 are reviewed below to identify COPCs present at the site. An overview of the analytical results independent of both the associated site risk and an evaluation of the nature and extent of contamination is also presented.

4.1 Inorganic Chemical Comparison to Background Values

Inorganic chemical results are compared to analyte and medium-specific LANL background values (BVs) to identify COPCs; those inorganic chemicals exceeding applicable BVs are retained as COPCs. Most of the published inorganic BVs represent the 95% upper tolerance limit calculated from the range of Laboratory background concentrations determined for a given environmental medium such as soil, sediment, or tuff (LANL 1998, 59730).

Multiple inorganic chemicals were identified at concentrations above BVs at several locations of SWMU 60-002. Analytical results for samples containing inorganic chemicals at concentrations above the applicable BV are displayed in Table 4.1-1 for soil and Table 4.1-2 for tuff. The map locations where samples containing concentrations of inorganic chemicals above the BV were collected and the associated sample concentrations are presented in Figure 4.1-1. Individual inorganic chemicals observed in site samples at concentrations above the BV are discussed below.

Aluminum concentrations above the BV (7,340 mg/kg) were observed in five samples at three locations from the upper member of the Bandelier Tuff (Qbt 4). Sample depths and concentrations varied. One sample from 4.0-4.5 ft bgs contained a concentration of 15,350 mg/kg. One sample and the associated field duplicate from 5.5-6.0 ft bgs contained concentrations of 15,520 mg/kg and 14,650 mg/kg. One sample from 13.5-14.0 ft bgs contained a concentration of 23,720 mg/kg, which was also the highest observed concentration at the site. One sample from 16 to 17 ft bgs contained a concentration of 9,900 mg/kg. No sediment or soil samples contained aluminum at concentrations exceeding their respective BV.

Arsenic concentrations above the BV (2.79 mg/kg) were observed in four Qbt 4 samples. Sample depths and concentrations varied; the highest concentration was 3.97 mg/kg from a sample collected at location 60-22519 from 13.5 to 14.0 ft bgs. One sample from 4.0 to 4.5 ft bgs contained a concentration of 3.52 mg/kg. One sample and the associated field duplicate from 5.5 to 6.0 ft bgs had a concentration of 3.45 mg/kg and 3.56 mg/kg. None of the soil or sediment samples contained arsenic at a concentration above the BV.

Barium was observed at concentrations above the BV (46 mg/kg for Qbt4 and 295 for soil) in four Qbt 4 samples and one soil sample. For the Qbt 4 samples, sample depths and concentrations varied; the highest concentration was 375 mg/kg from a sample collected at location 60-2252 from 5.5-6.0 ft bgs. One sample from 4.0 to 4.5 ft bgs had a concentration of 52.5 mg/kg. The field duplicate for location 60-2252 from 5.5 to 6.0 ft bgs had a concentration of 70.4 mg/kg. One sample from 13.5-14 ft bgs had a concentration of 108 mg/kg. The soil sample had a concentration of 310 mg/kg. None of the sediment samples contained barium at concentrations exceeding the BV.

**Table 4.1-1
Inorganic Chemicals with Concentrations Greater Than Los Alamos Background in Soil**

Sample ID	Location ID	Depth (ft)	Barium	Cadmium	Calcium	Cobalt	Manganese	Nickel	Zinc
Soil Background Value			295	0.4	6120	8.64	671	15.4	48.8
RE60-03-52312	60-22518	4.50-5.00	- ^a	-	-	-	-	-	74.8
RE60-03-52317	60-22519	4.50-5.00	310	0.539 (U) ^b	8050	-	-	-	-
RE60-03-52322	60-22520	3.00-3.50	-	0.55 (U)	8230	10	-	16	-
RE60-03-52327	60-22521	4.00-4.50	-	0.533 (U)	-	-	-	17.1	-
RE60-04-53096	60-22680	1.50-2.00	-	-	-	-	726	-	-

Note: all results are in mg/kg, background values are from (LANL 1998, 59730, p. 44).

^a Results do not exceed BV.

^b The Analyte was analyzed for but not detected; however, the analyte detection limit exceeded BV.

Table 4.1-2
Inorganic Chemical Detections Greater Than Los Alamos Background in Tuff

Sample ID	Location ID	Depth (ft)	Aluminum	Arsenic	Barium	Beryllium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Nickel	Selenium	Vanadium
	Qbt 2,3,4 Background Value		7340	2.79	46	1.21	2200	7.14	3.14	4.66	14500	11.2	1690	482	6.58	0.3	17
RE60-03-52308	60-22517	4.00-4.50	15350	3.52	52.5	^a	2440	8.2	3.83	-	17600	-	2540	-	7.73	0.579	18.4
RE60-03-52307	60-22517	8.50-9.00	-	-	-	-	-	-	-	-	-	-	-	539	-	0.54 (U) ^b	-
RE60-03-52309	60-22517	14.50-15.00	-	-	-	-	-	-	-	-	-	-	-	-	-	0.516 (U)	-
RE60-03-52314	60-22518	14.50-15.00	-	-	-	-	-	-	-	-	-	-	-	-	-	0.48 (U)	-
RE60-03-52320	60-22519	13.50-14.00	23720	3.97	108	1.69	3470	10.1	-	7.99	15200	15	3520	-	13.2	0.583 (U)	20.1
RE60-03-52324	60-22520	14.50-15.00	-	-	-	-	-	-	-	-	-	-	-	-	-	0.489 (U)	-
RE60-03-52332	60-22522	5.50-6.00	15520	3.45	375	-	2720	8.23	-	-	-	-	2390	-	-	0.542 (U)	18.3
RE60-03-52337	60-22522	5.50-6.00	14650	3.56	70.4	-	2990	8.37	3.43	-	14650	11.8	2360	-	-	0.56 (U)	21.2
RE60-03-52334	60-22522	16.00-17.00	9900	-	-	-	-	-	-	-	-	12.4	-	-	8.72	0.565 (U)	-

Note: all results are in mg/kg, background values are from (LANL 1998, 59730, p. 44).

^a Results do not exceed BV.

^b The Analyte was analyzed for but not detected; however, the analyte detection limit exceeded BV

Figure 4.1-1. Locations of inorganic chemicals above BV

Beryllium was observed at concentrations above the BV (1.21 mg/kg) in one Qbt 4 sample. One sample from 13.5 to 14.0 ft bgs had a concentration of 1.69 mg/kg. None of the sediment or soil samples contained beryllium at concentrations exceeding the respective BV.

Cadmium was observed at concentrations above the BV (0.4 mg/kg) in three soil samples. One sample from 3.0 to 3.5 ft bgs had a concentration of 0.55 mg/kg; one sample from 4.0 to 4.5 ft bgs had a concentration of 0.533 mg/kg and one sample from 4.5 to 5.0 ft bgs had a concentration of 0.539 mg/kg. None of the sediment or Qbt 4 samples contained concentrations of cadmium above their respective BV.

Chromium was observed at concentrations above the BV (7.14 mg/kg) in four Qbt 4 samples. Sample depths and concentrations varied; the highest concentration was 10.1 mg/kg from a sample collected at location 60-22520 from 13.5 to 14.0 ft bgs. One sample from 4.0 to 4.5 ft bgs contained a concentration of 8.2 mg/kg. One sample and the associated field duplicate from 5.0 to 6.0 ft bgs had a concentration of 8.23 mg/kg and 8.37 mg/kg. None of the soil or sediment samples contained chromium at a concentration above the BV.

Cobalt was observed at concentrations above the BV (8.64 mg/kg for Qbt 4 and 8.64 for soil) in two Qbt 4 samples and one soil sample. For the Qbt 4 samples, the highest concentration was 3.83 mg/kg from a sample collected at location 60-22517 from 4.0 to 4.5 ft bgs. The remaining sample was collected from 5.0 to 6.0 ft bgs had a concentration of 4.43 mg/kg. The ALLH sample had a concentration of 10 mg/kg and was collected from 3.0 to 3.5 ft bgs. None of the sediment samples contained cobalt at concentrations exceeding the BV.

Copper was observed at concentrations above the BV (4.66 mg/kg) in one Qbt 4 sample. One sample from 13.5 to 14.0 ft bgs had a concentration of 7.99 mg/kg. None of the sediment or soil samples contained copper at concentrations exceeding the respective BV.

Iron was observed at concentrations above the BV (14,500 mg/kg) in three Qbt 4 samples. One sample from 4.0 to 4.5 ft bgs had a concentration of 17,600 mg/kg. One sample from 5.5 to 6.0 ft bgs had a concentration of 14,650 mg/kg. One sample from 13.5 to 14.0 ft bgs had a concentration of 15,200 mg/kg. None of the sediment or soil samples collected contained Iron at concentrations exceeding the BV.

Lead was observed at concentrations above the BV (11.2 mg/kg) in three Qbt 4 samples at two locations. Sample depths and concentrations varied; the highest concentration was 15 mg/kg from a sample collected at location 60-22519 from 13.5 to 14.0 ft bgs. The field duplicate for location 60-2252 from 5.5 to 6.0 ft bgs had a concentration of 12.4 mg/kg and a concentration of 11.8 mg/kg at a depth of 16.0 to 17.0 ft bgs. None of the sediment or soil samples collected contained lead at concentrations exceeding the BV.

Magnesium was observed at a concentration above the BV (1690 mg/kg) in four Qbt 4 samples. Sample depths and concentrations varied; the highest concentration was 3520 mg/kg from a sample collected at location 60-22519 from 13.5 to 14.0 ft bgs. One sample collected from 4.0 to 4.5 ft bgs had a concentration of 2540 mg/kg. The field duplicate for location 60-2252 from 5.5 to 6.0 ft bgs had a concentration of 70.4 mg/kg. One sample from 13.5-14 ft bgs had a concentration of 11.8 mg/kg. None of the sediment or soil samples collected contained magnesium at concentrations exceeding the BV.

Manganese was observed at a concentration above the BV (482 mg/kg) in one Qbt 4 sample. The sample was from 8.5–9.0 ft bgs and had a concentration of 539 mg/kg. One sediment sample contained manganese at concentrations above the BV of 671 mg/kg; the concentrations was 726 mg/kg.

Nickel was observed at concentrations above the BV (6.58 mg/kg for Qbt 4 and 15.4 mg/kg for soil) in three Qbt 4 samples and two soil samples. For Qbt 4 samples, depths and concentrations varied; the

highest concentration was 13.2 mg/kg from a sample collected at location 60-22519 from 13.5 to 14.0 ft bgs. One sample collected from 4.0 to 4.5 ft bgs had a concentration of 7.73 mg/kg and a concentration of 8.72 mg/kg at a depth of 16.0 to 17.0 ft bgs. The soil samples had a concentration of 16 mg/kg at a depth of 3.0 to 3.5 ft bgs and 17.1 mg/kg from at a depth of 4.0 to 4.5 ft bgs. None of the sediment samples contained nickel at concentrations exceeding the BV.

Vanadium was observed at a concentration above the BV (17 mg/kg) in four Qbt 4 samples. Sample depths and concentrations varied; the highest concentration was 21.2 mg/kg from the field duplicate sample collected at location 60-22522 from 5.5 to 6.0 ft bgs. One sample collected from 4.0 to 4.5 ft bgs had a concentration of 18.4 mg/kg. One sample collected from 5.5 to 6.0 ft bgs had a concentration of 18.3 mg/kg. One sample from 13.5-14 ft bgs had a concentration of 20.1 mg/kg. None of the sediment or soil samples collected contained vanadium at concentrations exceeding the BV.

Zinc was observed at concentrations above the BV (48.8 mg/kg) in one soil sample. The sample was from 4.5 to 5.0 ft bgs and had a concentration of 74.8 mg/kg. None of the Qbt 4 or sediment samples concentrations exceeded the BV.

4.2 Radionuclides Comparison with Background Values

SWMU 60-002 was not used for the production or disposal of any radionuclides and samples were not analyzed for radionuclides.

4.3 Evaluation of Organic Chemicals

Organic chemical results exceeding analytical detection limits are used to identify organic COPCs. Multiple organic chemicals, including several VOCs, SVOCs, and PCBs as well as DRO and GRO TPH were observed at concentrations exceeding detection limits in samples collected across the site. Table 4.3-1 presents the analytical results for all samples that contained organic chemicals at concentrations exceeding detection limits in soil and Table 4.3-2 presents the results detected in tuff. The map locations where samples containing concentrations of organic chemicals above detection limits were collected and the associated sample concentrations are presented in Figure 4.3-1.

VOCs. Two VOCs were detected in samples collected at the SWMU 60-002. Acetone and 2-hexanone were detected in six samples, and no samples contained multiple VOCs at concentrations above detection limits. Further, the maximum concentration of the VOCs detected was 0.0118 mg/kg (acetone) observed at location 60-22519 at a depth of 13.5 to 14.0 ft bgs, and all but one analytical results were estimated (J qualified).

SVOCs. Multiple SVOCs, including acenaphthene, benzo(a)anthracene, fluoranthene, fluorene, phenanthrene, and pyrene were detected in three of the samples collected at SWMU 60-002. The highest single sample concentration was of fluoranthene (0.0612 mg/kg) observed in a sample from a depth of 0.0–1.0 ft and three analytical results were estimated.

PCBs. Two Aroclors were detected in samples collected from SWMU 60-002. Aroclors 1254 and 1260 were detected in four samples at concentrations above detection limits. The maximum concentration of the PCBs detected was 0.0202 mg/kg from a sample depth of 0.0 to 1.0 ft bgs and three results were estimated.

TPH. DRO was observed at concentrations above detection limits in 13 of the samples from across the site. The highest sample concentration observed for DRO was 12.9 mg/kg from sample location 60-22518 at a depth of 4.5–5.0 ft. GRO was also detected in two samples collected on site to a depth of two ft with the highest concentrations occurring in soil; all concentrations were less than 1 mg/kg.

**Table 4.3-1
Organic Chemicals Above Detection Limits in Soil at SWMU 60-002**

Sample ID	Location ID	Depth (ft)	Acenaphthene	Aroclor-1254	Aroclor-1260	Benzo(a)anthracene	Fluoranthene	Fluorene	Phenanthrene	Pyrene	TPH/DRO	TPH/GRO
RE60-03-52312	60-22518	4.50-5.00	^a	-	-	-	0.0357 (J)	0.0056 (J)	-	0.0443	12.9	-
RE60-03-52317	60-22519	4.50-5.00	-	-	-	-	-	-	-	-	1.1 (J)	-
RE60-03-52322	60-22520	3.00-3.50	-	-	-	-	-	-	-	-	1.8 (J)	-
RE60-03-52327	60-22521	4.00-4.50	-	-	-	-	-	-	-	-	1.1 (J)	-
RE60-04-53095	60-22680	0.00-1.00	0.0244 (J)	-	-	-	-	-	-	-	-	-
RE60-04-53097	60-22680	0.00-1.00	-	-	0.0039 (J)	0.026 (J)	0.0612	-	0.0372	0.059	-	-
RE60-04-53096	60-22680	1.50-2.00	-	-	0.0042 (J)	-	-	-	-	-	-	-
RE60-04-53099	60-22681	1.50-2.00	-	-	-	-	-	-	-	-	-	0.0344 (J)
RE60-04-53100	60-22682	0.00-1.00	0.0198 (J)	0.0202	0.0162	-	-	-	-	-	-	-
RE60-04-53101	60-22682	1.50-2.00	-	0.0025 (J)	-	-	-	-	-	-	-	0.173

^a Analyte not detected.

^b Value is estimated

Table 4.3-2
Organic Chemicals Above Detection Limits in Tuff at SWMU 60-002

Sample ID	Location ID	Depth (ft)	Acetone	Hexanone[2-]	TPH/DRO
RE60-03-52308	60-22517	4.00-4.50	0.0062 (J) ^a	- ^b	3.9
RE60-03-52307	60-22517	8.50-9.00	0.0044 (J)	-	5.1
RE60-03-52309	60-22517	14.50-15.00	-	-	1.1 (J)
RE60-03-52314	60-22518	14.50-15.00	0.0042 (J)	-	2.2
RE60-03-52320	60-22519	13.50-14.00	0.0118 (J)	0.0088	3
RE60-03-52329	60-22521	14.50-15.00	0.0042 (J)	-	11.3
RE60-03-52332	60-22522	5.50-6.00	-	-	2.6
RE60-03-52337	60-22522	5.50-6.00	-	-	2.3
RE60-03-52334	60-22522	16.00-17.00	-	-	2.6

^a Value is estimated.

^b Analyte not detected

Figure 4.3-1. Location of organic chemicals above detection limits

4.4 Summary of COPCs at SWMU 03-003(c)

The following inorganic and organic chemicals have been identified as COPCs at SWMU 60-002 and are evaluated further in Section 5.0 of this document.

Inorganic COPCs

Soil – barium, cadmium, cobalt, nickel, and zinc

Tuff – aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, and vanadium.

Organic COPCs

Soil – acenaphthene, Aroclor 1254, Aroclor 1260, benzo(a)anthracene, fluoranthene, fluorene, phenanthrene, pyrene, TPH-DRO, and TPH-GRO.

Tuff–acetone, 2-hexanone, and TPH-DRO.

5.0 SITE EVALUATION

5.1 Site Conceptual Model

The conceptual site model for SWMU 60-002 includes both surface and subsurface sources of contamination. The principal sources of contamination associated with operational activities at the SWMU 60-002 are most likely components of cured asphalt that were deposited on the ground surface as a result of storage of recycled asphalt at the site. Possible sources of subsurface contamination may include the introduction of cured asphalt chunks into the subsurface as a result of loading and unloading operations.

Potential transport mechanisms that may lead to exposure of potential receptors include

- dissolution and/or particulate transport of surface contaminants during rainfall and snow melt runoff events;
- airborne transport of contaminated surface soils;
- continued dissolution and advective/dispersive transport of contaminants contained in subsurface soil and bedrock; and
- biotic perturbation and translocation of contaminants in subsurface waste and contaminated media.

Figure 5.1-1 presents the SWMU 60-002 conceptual site model and exposure pathways for human receptors. The potential for downward migration of contaminants in the vadose zone released from SWMU 60-002 is low due to the absence of saturated conditions and low hydrostatic pressure at the site. A pathway to the regional aquifer, located approximately 1,000 ft below the site, is unlikely. Therefore, groundwater is not included in the conceptual model as either a potential secondary contaminated medium or contaminant transport and exposure mechanism.

Current potential receptors of surface contamination include site workers at TA-60. Exposure to subsurface materials currently could only occur if materials are excavated and brought to the surface; therefore, potential receptors of subsurface contamination are the same as those listed for surface contamination. In addition, contaminants in soils could also cause exposure through root uptake and by rain splash on plants, with further food web transport of contaminants and subsequent exposure of ecological receptors via plants and/or animals.

In general, COPCs at the SWMU 60-002 would be expected to remain vertically within the confines of the site. The inorganic and semi-volatile organic site COPCs are relatively immobile in soils, and surface water assessment scores are generally low indicating little to no potential for contaminant migration due to the transport and deposition of sediment. Run-off driven contaminant transport could cause the lateral migration of contaminants beyond the boundaries of the SWMU as a result of a significant precipitation event that could drive COPCs down the slope of the canyon.

Figure 5.1-1. Conceptual Exposure Model for SWMU 03-003(c)

5.2 Nature and Extent of Contamination

The distribution of COPCs at SWMU 60-002 were evaluated in the context of the conceptual site model. Aspects of this evaluation included (1) the presence of COPCs in the samples collected from the former cured asphalt storage area; and (2) the distribution of COPCs in areas possibly impacted by the release of contaminants from site sources. As discussed in Section 2.0, SWMU 60-002 is made up of three separate material storage areas. The first and second storage areas were used to store debris generated from demolition activities while the third storage area was used to accumulate cured asphalt prior to recycling at the former Asphalt Batch Plant.

Most of the inorganic COPCs detected in the samples collected from SWMU 60-002 are present at concentrations slightly above BVs with concentrations ranging up to approximately two times the BVs. Exceptions to this include aluminum and barium, which were observed at a maximum concentration of approximately three times the BV and approximately eight times the BV. For the sample showing the elevated barium results, a duplicate sample containing lower concentrations of barium was observed. This indicates that the nature and extent of most of the inorganic COPCs for the areas sampled at SWMU 60-002 have been effectively defined. However, because no samples were collected from the remaining storage area, the nature and extent of inorganic contamination for SWMU 60-002 has not been adequately defined.

There is no evidence of a release of any volatile COPCs at SWMU 60-002. Only acetone and 2-hexanone were identified at concentrations above detection limits. All of the sample results for acetone were estimated (J qualified). The 2-hexanone detection occurred at one sample location.

The semi-volatile organic COPCs present at SWMU 60-002 are almost exclusively polynuclear aromatic hydrocarbons (PAHs) which are associated with asphalt and petroleum fuels. The site data indicates that the PAHs are primarily present near the operational surface of the areas sampled. These observations are consistent with expectations based on historical practices. Sample data from the locations sampled at SWMU 60-002 suggests that the nature and extent of PAH contamination is adequately defined; however, samples were not collected in the remaining storage area.

Gasoline and diesel range TPH was present at all but one sample locations from SWMU 60-002. The majority of detections for TPH-DRO occurred near the surface of the area sampled. However, concentrations increased with sampling depths at boreholes 60-22519 and 60-22521 from 1.1 mg/kg to 3 mg/kg and 11 mg/kg. All other borehole locations, with the exception of borehole location 60-22522, showed a decrease in TPH-DRO concentrations as the sample depth increased. For borehole 60-22522, TPH-DRO concentrations remained approximately the same at all depths. This indicates that TPH contamination is likely to be fairly confined and does not extend to a great depth.

5.3 Environmental Fate and Transport of Contaminants of Potential Concern

The following two sections briefly describe the chemical and physical properties of SWMU 60-002 COPCs that affect their movement in the environment. With few exceptions, inorganic chemicals are relatively immobile in soils depending on the type of soil and presence of organic matter. Note that most soil types and the tuff at SWMU 60-002 contain little organic material. The properties of organic chemicals that influence their potential movement within the site are solubility, mobility as a function of their organic carbon adsorption coefficient (K_{oc}), their potential rate of volatilization from soils and sediments as measured by Henry's Law Constant, and their potential for aerobic or anaerobic biodegradation

depending on soil type and chemical composition. Table 5.3-1 presents the Koc and Henry's Law Constant for the COPCs at SWMU 60-002. A more thorough discussion of each of the COPCs is presented below.

**Table 5.3-1
Koc and Henry's Law Constant Values for SWMU 60-002 COPCs**

Organic Chemical	Koc (cm ³ /g)	Henry's Law Constant (atm-m ³ /mole) at 25 C°
VOC High Mobility		
acetone	1	3.9×10^{-5}
2-hexanone	134	9.3×10^{-5}
SVOC No Mobility		
benzo(a)anthracene	545,000 – 1,870,000	8.0×10^{-6}
fluoranthene	29,000 – 295,000	9.45×10^{-6}
fluorene	5,000 – 16,500	1.0×10^{-4}
phenanthrene	22,909	na ^a
pyrene	65,300	1.2×10^{-5}
SVOC Very Low Mobility		
acenaphthene	2,065 – 3,230	1.55×10^{-4}

Note. All values are from the Hazardous Substances Databank at <http://toxnet.nlm.nih.gov> except for the Henry's Law Constant for acetone taken from (EPA 2004, 87478).

^a na = not available

5.3.1 Inorganic Chemicals

Most inorganic chemicals at SWMU 60-002, with the exception of barium and certain chemical forms of nickel, are expected to remain relatively immobile in soil. In addition, most of the inorganic chemicals tend to strongly adsorb to suspended solids and sediments in water.

Low to Moderate Mobility in Soils

Arsenic, beryllium, chromium, copper, lead, selenium, and zinc strongly sorb onto sediments as well as clay, loamy, or sandy soils and, therefore, are expected to have low to moderate mobilities in the environment. Aluminum and cobalt are also expected to have low mobilities due to their occurrence as ionic forms and their low volatilities.

Cadmium also tends to adsorb strongly to soils and therefore has a low potential to migrate. Cadmium adsorption increases with pH and the organic content of the soil. Further, cadmium in soil is also expected to convert to more insoluble forms, such as carbonate in aerobic environments and sulfide in anaerobic environments.

Iron is practically insoluble in water and therefore has a low potential mobility in soils.

Manganese in the 3+ and 4+ states is an immobile solid, but may undergo reduction in the presence of organic matter, resulting in the more soluble 2+ form. Organic content of soil at SWMU 60-002 is low; therefore, manganese is expected to be insoluble and immobile.

The mobility of vanadium in soil is strongly influenced by soil pH, with mobility decreasing at lower soil pH. The more soluble pentavalent cation of vanadium may leach; however, clay soils are likely to retain more vanadium than other soils, and vanadium tends to bind strongly to mineral or biogenic surfaces by adsorption or complexing. Adsorption to organic matter as well as to manganese oxide and ferric hydroxide also results in precipitation of dissolved vanadium.

Moderate to High Mobility

Nickel compounds in soil behave differently depending on the particular chemical species. If released to soil, soluble nickel compounds such as nickel chlorides and nickel nitrate will tend to migrate more than insoluble compounds such as nickel oxides and nickel sulfides. Volatilization from moist and dry soil surfaces is not expected to be an important process, based upon the low vapor pressures for most nickel compounds. If released into water, nickel compounds are expected to adsorb to suspended solids and sediment in water. Again, due to their low vapor pressure and ionic form, volatilization from water surfaces is not expected to be an important process affecting the environmental transport of nickel compounds.

Barium compounds, such as soluble barium nitrate, barium cyanide, barium permanganate, and barium chloride, are expected to be mobile in the environment. However, soluble barium can react with sulfates and carbonates forming insoluble barium sulfate and barium carbonate salts.

5.3.2 Volatile Organic Chemicals

Volatile organic chemical mobilities in the environment range from low to very high. Volatilization from moist and dry surfaces varies depending on the Henry's Law Constant and the vapor pressure of the compound. Rates of biodegradation of VOCs also vary considerably from a few days to up to six years. A greater Koc value corresponds to a lower mobility; a smaller Henry's Law Constant value indicates increased volatility. The Koc and Henry's Law Constant for all the volatile organic COPCs discussed below are summarized in Table 5.3-1.

High to Very High Mobility

Acetone, and 2-hexanone are expected to have high mobility in soils based on their Koc values, and if released into water are not expected to adsorb to suspended solids and sediment. Volatilization of 2-hexanone from moist soil surfaces is expected to be an important environmental fate process, based upon their Henry's Law Constants. Significant volatilization of acetone and trichloroethene from dry soil surfaces is also expected, based upon their high vapor pressures. Biodegradation of acetone is expected under aerobic and anaerobic conditions; biodegradation of 2-hexanone chloride in soil is also possible.

5.3.3 Semi-Volatile Organic Chemicals

SVOCs have low to no mobility in soils. In addition, volatilization from moist and dry surfaces is not expected to be an important fate process. In general, SVOCs adsorb readily to soil and sediment. Biodegradation in most cases is also expected to be a relatively slow process taking weeks to many months or years. The Koc and Henry's Law Constant for all the semi-volatile organic COPCs discussed below are summarized in Table 5.3-1.

No Mobility

Benzo(a)anthracene, fluoranthene, fluorine, phenanthrene, and pyrene are expected to be immobile in soils, based on their Koc values. Volatilization from wet and dry soil surfaces is not expected to be an important fate process for these chemicals based on their Henry's Law Constants or vapor pressure

values. Volatilization from moist soil may be possible for benzo(a)anthracene based upon its estimated Henry's Law Constant value, but will be attenuated by soil adsorption. Biodegradation for these compounds is expected to occur slowly, with estimated half-lives ranging from several weeks to years.

Very Low Mobility

The Koc values for acenaphthene indicate this chemical is likely to have very low mobility in soils. Volatilization is not expected to be significant. Based upon its Henry's Law Constant, volatilization from moist soils surfaces is expected but volatilization will be attenuated by soil adsorption.

5.4 Site Assessments

Human health and ecological screening assessments were conducted for the COPCs identified in Section 4.4. A groundwater assessment was not conducted because groundwater has been excluded from the site conceptual model; i.e., there is no complete pathway to the regional aquifer, which is located approximately 1,000 ft below the site. Therefore, impacts to groundwater are unlikely and groundwater is not included in the conceptual model as either a potential secondary contaminated medium or contaminant transport and exposure mechanism. However, monitoring of the groundwater down gradient from TA-03 will continue as part of on-going regional groundwater investigations being conducted in accordance with the hydrogeologic work plan (LANL 1998, 59599) approved by the NMED. A surface water assessment was conducted July 31, 2001 and is discussed in Section 5.4.3.

This section includes a screening level risk assessment for both human health and ecological receptors. The human health screening assessment for SWMU 60-002 is presented in Section 5.4.1 and the ecological screening assessment is presented in Section 5.4.2. The human health screening assessment is based on an industrial scenario as it is most likely that only site workers will be allowed behind the fence for any kind of activities associated with SWMU 60-002. The human health screening assessment follows the Human Health Risk-Based Screening Methodology (LANL 2002, 72639) and current NMED guidance (NMED 2004, 85615). The ecological screening assessment is based on the methodology described in (LANL 2004, 87630).

5.4.1 Human Health Screening Assessments

5.4.1.1 Human Health Screening Evaluation

The COPCs identified in soil and tuff, based upon maximum detected concentrations, were compared with the Laboratory's soil screening levels (SSLs) to determine if the chemicals were detected at concentrations of potential concern to human health. The SSLs used in this evaluation are listed in the most current NMED or EPA Region 6 guidance (NMED 2004, 85615; EPA 2004, 87478). (Exceptions are noted in table footnotes). The parameters used in deriving these SSLs include the most current values available for an industrial receptor as presented in NMED and/or EPA Region 6 guidance. The comparison to SSLs is conducted separately for carcinogens and noncarcinogens. The SSLs for carcinogens are equivalent to a 1×10^{-5} (one in one-hundred thousand) cancer risk and for noncarcinogens are equivalent to a hazard quotient (HQ) of 1.0. Carcinogenic COPCs are evaluated in Table 5.4-1 and noncarcinogenic COPCs in Table 5.4-2. NMED guidance recommends comparison to 0.1 SSL for each noncarcinogen when multiple noncarcinogenic chemicals have been identified and may therefore have an additive effect upon the screening evaluation. Analytical data were considered for screening purposes from the soil surface to a depth of 12.0 ft bgs, corresponding to an approximate depth should any remedial activities take place. This depth was also used to conservatively evaluate the analytical data for the residential scenario (LANL 2002, 72639). The essential nutrients calcium and

magnesium are not evaluated in this screening assessment. Exposure routes considered for human health screening evaluation are:

- respiratory uptake
- dermal contact
- incidental ingestion of soil

**Table 5.4-1
Comparison of Carcinogenic COPCs at SWMU 60-002 to SSLs**

Analyte	Location ID	Sample ID	Depth (ft)	Exposure Point Concentration ^a (mg/kg)	SSL industrial (mg/kg)	Ratio
Total Chromium	60-22522	RE60-03-52337	5.50–6.00	8.37	4500 ^b	0.002
Arsenic	60-22522	RE60-03-52337	5.50–6.00	3.56	17.7	0.20
Aroclor-1254	60-22682	RE60-04-53100	0.00–1.00	0.02	8.26	0.002
Aroclor-1260	60-22682	RE60-04-53100	0.00–1.00	0.016	8.26	0.002
Benzo(a)anthracene	60-22680	RE60-04-53097	0.00–1.00	0.026(J)	23.4	0.001
Sum of ratios						0.207

^a Maximum concentration. Number of samples in soil was not sufficient to calculate a UCL.

^b SSL for total chromium from EPA Region 6 (EPA 2004, 87478). EPA Region 6 SSLs (based on cancer risk of 10⁻⁶) are multiplied by a factor of 10 to be congruent with NMED SSL guidelines based on a cancer risk of 10⁻⁵ (NMED 2004, 85615).

Table 5.4-2
Comparison of Noncarcinogenic COPCs at SWMU 60-002 to SSLs

Analyte	Location ID	Sample ID	Depth (ft)	Exposure Point Concentration ^a (mg/kg)	0.1 SSL industrial ^b (mg/kg)	Ratio
Aluminum	60-22522	RE60-03-52332	5.50–6.00	15,520	10,000	1.55
Barium	60-22522	RE60-03-52332	5.50–6.00	375	7,830	0.05
Cadmium	60-22520	RE60-03-52322	3.00–3.50	0.55(U)	112.8 ^c	0.005
Cobalt	60-22520	RE60-03-52332	3.00–3.50	10.0	2,050	0.005
Iron	60-22517	RE60-03-52308	4.00–4.50	17,600	10,000	1.76
Lead	60-22522	RE60-03-52337	5.50–6.00	11.8	75	0.16
Manganese	60-22680	RE03-04-53096	1.50–2.00	726	2,180	0.33
Nickel	60-22521	RE60-03-52327	4.00–4.50	17.1	2,250	0.008
Selenium	60-22517	RE60-03-52308	4.00–4.50	0.579	568.0	0.001
Vanadium	60-22522	RE60-03-52337	5.50–6.00	21.2	795.0	0.03
Zinc	60-22518	RE60-03-52312	4.50–5.00	74.8	10,000	0.007
Acenaphthene	60-22680	RE60-04-53095	0.00–1.00	0.0244(J)	3,480	0.000007
Acetone	60-22517	RE60-03-52308	4.00–4.50	0.0062(J)	10,000	0.0000006
Fluoranthene	60-22680	RE60-04-53097	0.00–1.00	0.0612	2,440	0.00003
Fluorene	60-22518	RE60-03-52312	4.50–5.00	0.0056(J)	2,940	0.000002
Phenanthrene	60-22680	RE60-04-53097	0.00–1.00	0.0372	2,050	0.00002
Pyrene	60-22680	RE60-04-53097	0.00–1.00	0.059	3,130	0.00002
TPH-DRO	60-22518	RE60-03-52312	4.50–5.00	12.9	^d	—
TPH-GRO	60-22682	RE60-04-53101	1.50–2.00	0.173	^d	—
Sum of ratios						3.9

^a Maximum concentration. Number of samples in soil was not sufficient to calculate a UCL.

^b SSLs for noncarcinogens are multiplied by 0.1 to account for additive effect per NMED guidance.

^c Calculated by LANL according to NMED guidance.

^d Not available.

Total chromium, arsenic, Aroclors-1254 and -1260, and benzo(a)anthracene were detected well below their industrial SSLs. The sum of the ratios of the four carcinogens, 0.207, indicates that exposure to these COPCs does not present an unacceptable risk. The sum of 0.207 is well below an excess cancer risk of 1×10^{-5} (obtained by multiplying the ratio of 0.207 times the cancer risk of 1×10^{-5}). The calculation is $(2.07E-1 \times [1 \times 10^{-5}] = 2 \times 10^{-6})$. The hazard index (HI), obtained by dividing each concentration by the SSL and summing all ratios, for noncarcinogenic COPCs is 3.9, approximately four times NMED's target level of 1.0. However, aluminum and iron make up approximately 85% of the HI, and are not of particular concern for the human health evaluation because both are essential nutrients and have low toxicity.

5.4.1.2 Uncertainty Analysis

Toxicity Values

Chemical-specific toxicity values for evaluation of noncarcinogenic endpoints are referred to as reference doses (RfDs). The RfD has been developed based on the concept that a threshold dose exists below which adverse noncarcinogenic effects are not likely to be observed. Toxicity values for carcinogens are referred to as slope factors and are based on the concept that no threshold exists for incurring some excess cancer risk.

The toxicity values employed in the derivation of SSLs have been derived to be protective of human health and therefore generally introduce a conservative bias to the risk calculations with regard to the general population. For example, RfDs routinely incorporate uncertainty factors that account for such factors as protecting sensitive individuals and limitations of the studies on which the RfD is based. If the target receptor is a sensitive individual rather than an *average* individual or population, then the conservative biases may in fact be appropriate for the receptor.

Human Health Receptor

The human health screening evaluation is a conservative comparison of the exposure point concentration of each COPC at SWMU 60-002 with the respective SSLs, based on an industrial exposure scenario. Because SWMU 60-002 is currently under Laboratory control and is likely to remain so, the most likely exposed individual is a site worker. Therefore, the potential risk for the site worker is appropriately conservative for the screening evaluation. The site worker is not expected to be working below a depth of 10 ft bgs.

5.4.1.3 Interpretation of Human Health Screening Assessment Results for SWMU 60-002

The potential present-day risk to industrial receptors is within acceptable limits. The HI is 3.9, but as noted above, if iron and aluminum were eliminated from the equation the HI would only be approximately 0.6 and considered acceptable by NMED (NMED 2004, 85615). The cancer risk for the industrial receptor is less than 1×10^{-5} . Given the small size of the site, it is unlikely that a worker could receive all his exposure from this site and, therefore, the risk estimates are considered conservative. The potential future risk to residential receptors from contaminants released to the accessible subsurface media is considered to be higher than acceptable limits. The sum of ratios for carcinogenic residential exposure is still only 0.95, equivalent to a cancer risk of 1×10^{-5} equal to NMED's target level. Summing the ratios for noncarcinogens produces a residential HI of 13.8, but again, this is predominantly due to the impact of aluminum and iron. If these two chemicals are taken out of the equation, the HI becomes less than 2.

5.4.2 Ecological Screening

5.4.2.1 Scoping

The scoping evaluation includes the problem formulation, which forms the conceptual basis for exposure and identifies the pathways of contaminant exposure to ecological receptors. The primary exposure pathways at TA-60 in the vicinity of Sigma Mesa are dietary uptake from contaminated surface and near-surface soil and respiratory uptake from wind-blown dust on the mesa top.

Biotic Associations

The top of Sigma Mesa has been extensively developed as a result of site operations. Therefore, the following description applies to areas surrounding SWMU 60-002. There has been some intrusion from grasses and sage. Predominant hillside tree and shrub species include ponderosa pine, piñon, Rocky Mountain juniper, and sage. Predominant hillside ground cover includes various grasses and some forbs. Scoping activities revealed abundant invertebrates, reptiles, mammals, birds, and plant life on the hillsides. The hillside areas have fully intact terrestrial biotic communities and therefore include a full suite of potential terrestrial receptors.

SWMU 60-002 is not managed in a way that limits access to on-site ecological receptors. However, the site is barren of vegetation and therefore not suitable to sustain any ecological receptors. Other portions of the mesa top and hillsides differ in community composition and character and each of the terrestrial functional feeding groups expected on the Pajarito Plateau are likely found around SWMU 60-002.

Potential habitat for Threatened and Endangered (T&E) species is found on the mesa top and/or hillsides of Sigma Mesa for a number of species. However, habitats for two species of special interest (peregrine falcon and the spotted bat) are in the area. Neither of these species has been observed to roost or nest in the area. In addition, the US Fish and Wildlife Service delisted the peregrine falcon as a federal T&E species in August 1999. The spotted bat is listed as threatened by the New Mexico Game and Fish department.

Suspected Contaminant and Physical Effects on Biotic Media

To evaluate the impacts of potential contamination from SWMU 60-002, efforts were made to distinguish between effects that may be contaminant-related and those that are related to natural physical processes or manmade disturbances such as past operational activities. Current staging of debris and large chunks of asphalt and concrete blocks have rendered the site devoid of any vegetation.

Data Adequacy

The data are considered adequate for this assessment and representative of the contamination present in the vicinity of SWMU 60-002 and are considered adequate for decision-making purposes at this site. The nature and extent of contamination at SWMU 60-002 are summarized in Section 5.2. Although presently the site is not capable of sustaining ecological receptors, a screening assessment for these receptors is performed that would be applicable to potential future conditions of the site if it were restored to its pre-industrial condition.

5.4.2.2 Ecological Screening Evaluation

The results of ecological scoping indicate that eight terrestrial species are appropriate for numerical screening against contaminant concentrations at SWMU 60-002. These receptors cover 11 trophic categories identified for the Pajarito Plateau (LANL 2004, 87630) and include

- a generic 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), and
- the gray fox (mammalian carnivore).

In addition to these commonly assessed receptors, the little brown *Myotis* bat is included in this screening evaluation because it is a surrogate for the spotted bat, a T&E species. The spotted bat is an insectivorous mammal, and the little brown *Myotis* bat is a receptor that models the effects of contaminants bioaccumulated from sediments to insects to aerial insectivores. A high fraction of its diet is emergent aquatic insects, as the habitats surrounding water are favorite foraging areas. Although aquatic insects are not present in the vicinity of SWMU 60-002, the drainage leading from this site flows into Sandia Canyon where small wetland areas are present. Contaminants transported by way of surface runoff may be deposited in these wetland areas and result in exposure to the bat.

The numerical screening evaluation compared medium-specific ecological screening levels (ESLs) for each receptor with maximum concentrations of contaminants detected at the site. ESLs are derived based on the approach presented in (LANL 2004, 87630) and the ECORISK database (LANL 2004, 87386). These sources include all relevant information necessary to calculate HIs and HQs, including concentration equations, dose equations, bioconcentration factors, transfer factors, and toxicity reference values. ESLs for nonradiological chemicals are determined on a toxicological dose basis (LANL 1999, 64783). For wildlife, toxicological studies were used to determine the maximum contaminant exposure at which no adverse effect was observed. This critical exposure level may vary greatly because of population-based variations in individual weight, diet, reproductive status, and phenology. In the case of terrestrial organisms, ESLs were developed to reflect an adverse effect on an average, nonpregnant, adult individual of a particular species (EPA 1993, 59384). ESLs are designed, therefore, to be protective of specific organisms and may only be used to infer a potential for risk to receptors. The ESLs used in the screening evaluation at SWMU 60-002 were obtained from the ECORISK database, version 2.1 (LANL 2004, 87386).

COPCs at SWMU 60-002 evaluated by the ecological screening assessment process included the 13 inorganic chemicals and 9 organic chemicals (referenced above in Section 5.4.1.1). The TPHs are not evaluated. The maximum detected concentrations of each COPC in soil were used in the comparison because the number of samples collected was insufficient to calculate a representative 95% UCL of the mean. Exposure point concentrations (EPCs) were determined from samples collected between the ground surface and 5.0 ft bgs (LANL 1999, 64783) for the mesa top.

The minimum ESL for each COPC was compared with the EPC for that contaminant; the HQ was calculated by dividing the concentration by the ESL. An HQ equal to or greater than 0.3 was used as a threshold to identify chemicals of potential ecological concern (COPECs) and determine which chemicals should be evaluated further (LANL 1999, 64783).

Results of this comparison are shown in Table 5.4-3. Based on this initial comparison, ten inorganic chemicals and one organic chemicals in the evaluation are identified as COPECs because the maximum HQs are greater than 0.3. Identified COPECs are evaluated further by calculating HQs for each COPEC/receptor combination using the maximum detected concentration in soil. Table 5.4-4 presents this evaluation.

Table 5.4-3
HQ Calculations for Terrestrial Receptors at SWMU 60-002

Analyte	Exposure Point Concentration (mg/kg)	Final ESL (mg/kg)	Receptor	HQ
Aluminum	15,350	na	Generic plant (Terrestrial autotroph)	na
Arsenic	3.56	0.83	Montane Shrew (mammalian insectivore)	4.29
Barium	310	100	Generic plant (Terrestrial autotroph)	3.10
Cadmium	0.55(U)	0.67	Montane shrew (Mammalian insectivore)	0.82
Total Chromium	8.2	1.4	Earthworm (Invertebrate)	5.86
Cobalt	10.0	0.20	Earthworm (Invertebrate)	50.0
Iron	17,600	na	na	na
Manganese	726	0.05	Earthworm (Invertebrate)	14,520
Nickel	17.1	0.05	Generic plant (Terrestrial autotroph)	342.0
Selenium	0.579	0.04	Little Brown Myotis Bat (aerial insectivore)	14.47
Vanadium	18.4	0.025	Generic plant (Terrestrial autotroph)	736
Zinc	74.8	10	Generic plant (Terrestrial autotroph)	7.48
Acenaphthene	0.0244(J)	0.25	Generic plant (Terrestrial autotroph)	0.1
Acetone	0.0062(J)	3.8	Deer Mouse (mammalian omnivore)	0.002
Aroclor -1254	0.02	0.04	American Robin (avian insectivore)	0.50
Aroclor -1260	0.016	0.14	Red Fox (mammalian carnivore)	0.11
Benzo(a)anthracene	0.026(J)	3.0	Montane Shrew (mammalian insectivore)	0.0087
Fluoranthene	0.0612	26	Montane Shrew (mammalian insectivore)	0.002
Fluorene	0.0056(J)	1.7	Earthworm (Invertebrate)	0.003
Phenanthrene	0.0372	11	Montane Shrew (mammalian insectivore)	0.003
Pyrene	0.059	15	Montane Shrew (mammalian insectivore)	0.004
TPH-DRO	12.9	na	na	na
TPH-GRO	0.173	na	na	na
Sum of Ratios				15,686

^a Maximum concentration. Number of samples in soil was not sufficient to calculate a UCL.

Table 5.4-4
Comparison of Exposure Point Concentrations of COPECs in Soil with ESLs

Analyte	Plant (terrestrial autotroph)		Invertebrate (soil dwelling)		Deer Mouse (mammalian omnivore)		Montane Shrew (mammalian insectivore)		Desert Cottontail (mammalian herbivore)		Red Fox (mammalian top carnivore)	
	ESL	HQ	ESL	HQ	ESL	HQ	ESL	HQ	ESL	HQ	ESL	HQ
Aluminum	na	na	na	na	na	na	na	na	na	na	na	na
Arsenic	10	0.352	6.8	0.518	1.7	2.071	0.83	4.24	21	0.168	97	0.036
Barium	100	3.1	330	0.939	440	0.70	230	1.35	3,300	0.094	41,000	0.008
Cadmium	29	0.019	150	0.004	1.2	0.458	0.67	0.82	22	0.025	570	0.001
Total Chromium	2.4	3.42	1.4	5.85	2,100	0.004	700	0.01	8,000	0.001	18,000	0.0005
Cobalt	13	0.77	na	na	69	0.145	33	0.30	1,800	0.006	3,900	0.003
Iron	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	50	14.5	na	na	720	1.008	520	1.40	1,700	0.427	34,000	0.021
Nickel	20	0.86	100	0.171	2,300	0.007	980	0.02	8,700	0.002	34,000	0.001
Selenium	0.1	5.79	7.7	0.075	1.9	0.305	0.91	0.64	55	0.011	110	0.005
Vanadium	0.025	736	na	na	20	0.920	9.6	1.92	790	0.023	1,500	0.012
Zinc	10	7.48	190	0.394	250	0.299	180	0.42	910	0.082	11,000	0.007
Acenaphthene	0.25	0.10	na	na	260	0.0001	160	0.0002	1100	0.00002	7,800	0.000003
Acetone	na	na	na	na	3.8	0.023	37	0.045	4.3	0.0004	5,100	0.133
Aroclor -1254	160	0.0001	na	na	0.88	0.023	0.44	0.05	56	0.0004	0.15	0.133
Aroclor -1260	na	na	na	na	20	0.001	10	0.002	1,300	0.00001	0.14	0.114
Benzo(a)anthracene	18	0.0014	na	na	4.9	0.005	3.0	0.01	12	0.002	32	0.001
Fluoranthene	na	na	na	na	49	0.001	26	0.002	570	0.0001	430	0.0001
Fluorene	na	na	1.7	0.003	480	0.00001	290	0.00002	2,700	0.000002	10,000	0.000001
Phenanthrene	na	na	na	na	20	0.002	11	0.003	140	0.0003	310	0.0001
Pyrene	na	na	na	na	29	0.002	15	0.004	340	0.0002	260	0.0002
TPH-DRO	na	na	na	na	na	na	na	na	na	na	na	na
TPH-GRO	na	na	na	na	na	na	na	na	na	na	na	na
Total for each receptor		772		8.0		6.0		11.2		0.8		0.5

Table 5.4-4 (continued)

Analyte	Robin (insectivore)		Robin (omnivore)		Robin (herbivore)		Kestrel (omnivore) (avian Intermediate carnivore)		Kestrel (100% meat diet) (avian top carnivore)		Little Brown Myotis Bat (mammalian aerial insectivore)*	
	ESL	HQ	ESL	HQ	ESL	HQ	ESL	HQ	ESL	HQ	ESL	HQ
Aluminum	na	na	na	na	na	na	na	na	na	na	12	1279
Arsenic	19	0.185	32	0.110	100	0.035	140	0.025	2400	0.001	1.1	3.20
Barium	190	1.63	300	1.03	820	0.378	1,400	0.221	36,000	0.009	320	0.969
Cadmium	0.83	0.663	1.5	0.367	10	0.055	5.9	0.093	770	0.001	0.84	0.655
Total Chromium	1,300	0.006	1,500	0.005	1,900	0.004	15,000	0.001	38,000	0.000	2,300	0.004
Cobalt	19	0.526	35	0.286	170	0.059	140	0.071	2,300	0.004	45	0.222
Iron	na	na	na	na	na	na	na	na	na	na	na	na
Manganese	3,900	0.186	4,200	0.173	4,600	0.158	32,000	0.023	290,000	0.003	850	0.854
Nickel	270	0.063	340	0.050	460	0.037	2,700	0.006	10,000	0.002	2,200	0.008
Selenium	1.1	0.526	2	0.290	10	0.058	8.4	0.069	140	0.004	1.2	0.483
Vanadium	2.8	6.57	5.1	3.608	28	0.657	21	0.876	510	0.036	13	1.415
Zinc	30	2.49	42	1.781	67	1.116	200	0.374	1500	0.050	230	0.325
Acenaphthene	na	na	na	na	na	na	na	na	na	na	210	0.0001
Acetone	420	0.00001	42	0.0001	22	0.0003	3,100	0.000002	56,000	0.0000001	50	0.0001
Aroclor -1254	0.041	0.49	0.8	0.025	1.4	0.014	0.17	0.118	0.22	0.091	0.56	0.036
Aroclor -1260	0.88	0.02	1.7	0.009	31	0.001	3.7	0.004	4.6	0.003	12	0.001
Benzo(a)anthracene	na	na	na	na	na	na	na	na	na	na	5.9	0.004
Fluoranthene	na	na	na	na	na	na	na	na	na	na	34	0.002
Fluorene	na	na	na	na	na	na	na	na	na	na	370	0.00002
Phenanthrene	na	na	na	na	na	na	na	na	na	na	14	0.003
Pyrene	na	na	na	na	na	na	na	na	na	na	20	0.003
TPH-DRO	na	na	na	na	na	na	na	na	na	na	na	na
TPH-GRO	na	na	na	na	na	na	na	na	na	na	na	na
Totals for each receptor		13.4		7.7		2.6		1.9		0.2		1287
Total for all receptors												2112

Note: Units for ESLs are mg/kg.

na = Data not available.

* Little brown Myotis bat values based on sediment.

5.4.2.3 Uncertainty Analysis

Toxicity information is available for all receptors for the identified COPECs with the exception of TPH-GRO, TPH-DRO, and iron. ESLs for some receptors are unavailable for certain COPECs; but not for the species associated with the final ESL. The available ESLs are considered adequate to determine whether there is a potential for ecological impacts from exposure to the COPECs.

ESLs for vertebrate terrestrial receptors were based on similar species and derived from experimentally determined no-observed adverse effect levels, lowest-observed adverse effect levels, or lethal doses that caused 50% mortality in the population. Receptor-specific data for estimating potential ecological risk are often lacking; therefore, species-specific toxicological effect data from laboratory animals must be extrapolated for wild receptors. Data from laboratory studies are sometimes limited because the studies often evaluate single chemical exposures in isolated and controlled conditions using a single exposure pathway. Additionally, laboratory-controlled toxicological studies are often performed on individuals obtained from artificial and maintained populations. Wild organisms are concomitantly exposed to a variety of stressors and risk-drivers, thereby, increasing the potential from synergistic and antagonistic physiological effects. Wild populations are also considered to be more genetically diverse than laboratory animals, making wild populations, as a whole, potentially less sensitive to chemical exposure. The uncertainties associated with these differences may result in an underestimation or overestimation of potential risk.

The assumptions used in the ESL derivations were conservative and not necessarily representative of actual conditions. The assumptions include maximum chemical bioavailability, maximum receptor ingestion rates, minimum body weight, 100% home-range exposure, and additive effects of multiple COPECs. This tends to result in conservative estimates of the ESLs, which may lead to an overestimation of the potential risk to a receptor.

The chemical form of the COPEC was not determined as part of this evaluation. This is largely a matter of limitations of 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. Inorganic chemicals are generally not 100% bioavailable to receptors in the natural environment because of adsorption to matrix surfaces (e.g., soil and sediments) or rapid oxidation or reduction changes that render harmful chemical forms unavailable to receptors. Inorganic chemicals tend to adsorb to soil particles making them less available to receptors. Therefore, the exposure and subsequent toxicity of inorganic chemicals to receptors is likely overestimated by the screening assessment.

The screening evaluation was performed using the maximum detected concentration of each COPC at SWMU 60-002 (up to a depth of 5.0 ft bgs). Maximum concentrations were used because only a limited number of data points were available for some media. As a result, when the exposure of individuals within a population was evaluated using these concentrations, the maximum concentrations were assumed to be constant throughout the exposure area. This results in an overestimation of the potential risk because concentrations of COPCs varied across the site.

The following paragraphs briefly discuss each COPEC identified in initial screening. Numbers of detections greater than BV refer to those detected between 0 to 5.0 ft bgs.

Inorganic Chemicals

Aluminum was analyzed for in five samples; however, only one sample above BV was collected at under 5.0 ft bgs. Because DL exceeded BV for Qbt4, the result was included in the analysis. The result for aluminum (15,350 mg/kg) was approximately two times BV (7,340 mg/kg for Qbt4). Aluminum does not

have an ESL for comparison, but it is not toxic to ecological receptors when the soil pH exceeds 5.5 and soil at the site exceeds that value. Aluminum does not require further evaluation and is eliminated as a COPEC.

Analysis of arsenic showed four results at levels greater than BV; however, only one was collected in the 0 to 5.0 ft bgs interval. Comparison of the detected concentration for arsenic (3.52 mg/kg) to the final ESL (0.83 mg/kg) resulted in a ratio of 4.24. Comparison of the final ESL (0.83 mg/kg) to BV (2.79 mg/kg for Qbt4) indicates that exposure of ecological receptors is approximately 3 times background at SWMU 60-002. Ratios from all other receptors were approximately equal to or less than one. Based on the conservative nature of the ESL and because the maximum detection of arsenic only slightly exceeds BV, it is the conclusion of this evaluation that arsenic does not require further evaluation and is eliminated as a COPEC.

Barium was detected in five samples at levels greater than BV, only one of which was collected in soil at 4.00-4.50 ft bgs. The sample concentration for barium (310 mg/kg) compared to the final ESL resulted in a ratio of 3.1. But the EPC is only about 4% of BV (7,830 mg/kg), so the ESL can be considered very conservative. Barium does not require further evaluation and is eliminated as a COPEC.

Cadmium was analyzed for in three samples. While all three samples slightly exceeded the BV of 0.4 mg/kg, all three samples were "U" qualified (non-detects). It is the conclusion of this evaluation that cadmium does not require further evaluation as it was not detected and it is eliminated as a COPEC.

Total chromium was detected in four samples at levels greater than BV, only one of which was collected above 5.0 ft bgs. Comparison of the detected concentration for chromium (8.2 mg/kg) to the final ESL (1.4 mg/kg) resulted in a ratio of 5.85. Ratios from all other receptors, with the exception of plant, were substantially less than one. It is the conclusion of this evaluation that the exceedance of ESL for the earthworm and plant for chromium is the result of the conservative nature of the ESLs. Total chromium does not require further evaluation and is eliminated as a COPEC.

Cobalt was detected in three samples at levels exceeding BV. The highest concentration of cobalt was collected in the soil layer at 3.00-3.50 ft bgs. Comparison of the maximum detected concentration from the soil (10 mg/kg) to the final ESL (13.0 mg/kg) resulted in a ratio of 0.77. Comparison of the maximum concentration to soil BV (8.64 mg/kg) indicates that exposure of ecological receptors is approximately equal to background at SWMU 60-002. Cobalt does not require further evaluation and is eliminated as a COPEC.

Iron was detected in three samples above BV in the Qbt4 layer. The highest concentration (17,600 mg/kg) was found at 4.00-4.50 ft bgs. There is no calculated ESL for iron, but comparison of the maximum detected concentration for iron to BV results in a ratio of 1.76. It is the conclusion of this evaluation that the exceedance of BV for iron is inconsequential. Iron does not require further evaluation and is eliminated as a COPEC.

Manganese was detected in two samples above BV; the highest concentration (726 mg/kg) came from the soil layer at 1.50-2.00 ft bgs. Comparison of the maximum detected concentration for manganese to the final ESL (50 mg/kg) results in a ratio of 14.5. However, comparison of the maximum concentration for manganese to soil BV (671 mg/kg) results in a ratio of only 1.1. Only one other receptor – the montane shrew – exceeded an ESL of slightly above one. It is the conclusion of this evaluation that the exceedance of ESL for the generic plant for manganese is the result of the conservative nature of the ESL. Manganese does not require further evaluation and is eliminated as a COPEC.

Nickel was detected above BV in five samples, only one of which was collected above 5.0 ft bgs. Comparison of the maximum concentration of nickel (17.1 mg/kg) found in the soil layer at 4.00-4.50 ft bgs to the final ESL (20 mg/kg) results in a ratio of 0.86. Ratios for all other receptors are considerably less than one. It is the conclusion of this evaluation that nickel does not require further evaluation and is eliminated as a COPEC.

Selenium was analyzed for in nine samples; however, all but one of the samples was detected at a level greater than BV at 4.00-4.50 ft bgs. Comparison of the maximum detected concentration for selenium (0.579 mg/kg) to the final ESL (0.1 mg/kg) resulted in a ratio of 5.8. However, comparison of the maximum concentration to BV (0.3 mg/kg) indicates that exposure of ecological receptors to background at SWMU 60-002 is only about 2-fold above background. The receptor for the final ESL is a generic plant and there are no plants at the site due to physical disturbance. Plants in surrounding areas show no impacts from the site. There were no other exceedances of ESLs for other receptors. It is the conclusion of this evaluation that the exceedance of ESL for selenium is the result of the conservative nature of the ESL. Selenium does not require further evaluation and is eliminated as a COPEC.

Vanadium was detected in three samples at levels greater than BV. Comparison of the detected value for vanadium (18.4 mg/kg) collected at 4.00-4.50 ft bgs to the final ESL (0.025 mg/kg) resulted in a ratio of 736. However, comparison of the detected concentration to BV (17.0 mg/kg) indicates that exposure of ecological receptors to vanadium at SWMU 60-002 is approximately equivalent to background. It is the conclusion of this evaluation that the exceedances of ESLs for vanadium are the result of the conservative nature of the ESL. Vanadium does not require further evaluation and is eliminated as a COPEC.

Zinc was detected in a single sample at a level greater than BV. Comparison of the maximum detected concentration for zinc (74.8 mg/kg) to the final ESL (10 mg/kg) resulted in a ratio of 7.48. However, comparison of the site concentration to BV (48.8 mg/kg) indicates that exposure of ecological receptors to soils at SWMU 60-002 is only approximately 1.5 times BV. The receptor for the final ESL is plant and there are no plants at the site due to physical disturbance. Plants in surrounding areas show no impacts from the site. It is the conclusion of this evaluation that the exceedance of ESL for zinc is the result of the conservative nature of the ESL. Zinc does not require further evaluation and is eliminated as a COPEC.

Organic Chemicals

There are no background values for organic chemicals, so the maximum value detected is compared only to the final ESL. TPH-DRO and TPH-GRO have no ESLs for comparison. Therefore, the impact of these constituents on ecological receptors at the site cannot be evaluated.

The only organic chemical exceeding the threshold value of 0.3 for COPECs was Aroclor -1254; therefore, all other organic chemicals are eliminated from the discussion. Aroclor -1254 was detected in 2 samples from the soil layer. Comparison of the maximum detected concentration for Aroclor -1254 (0.0202 mg/kg) to the final ESL (0.041 mg/kg) results in a ratio of 0.5. All other receptors have ratios below this value. Aroclor -1254 does not require further evaluation and is eliminated as a COPEC.

5.4.2.4 Interpretation of Screening Assessment Results for SWMU 60-002

The ecological screening assessment of SWMU 60-002 indicates that the COPCs identified by the data review Section 4.4 do not pose a potential for adverse ecological impacts to terrestrial receptors. The screening evaluation, which used conservative ESLs for twelve representative receptors, showed that HQs were above 1.0 for several receptors for each COPEC. However, based on the uncertainties,

conservative nature of the ecological screening assessment, and relatively small size of the site, there is no current potential for adverse impact to ecological receptors at SWMU 60-002.

5.4.3 Surface Water Assessments

A surface water assessment was conducted at SWMU 60-002 on July 31, 2001. The erosion matrix score was 3.6, a very low score indicating little potential for erosion. This score was derived from its location on a mesa top; less than 10% slope, a moderate ground cover in the area and zero points for run-on or run-off potential.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on current site data, there is no unacceptable risk to human health or the environment at SWMU 60-002. However, only two of the three storage areas that make up SWMU 60-002 have been characterized. Although the remaining storage areas were not used as primary storage areas for cured asphalt, a complete assessment is required before the SWMU can be recommended for closure.

In order to complete the characterization of SWMU 60-002, LANL should develop a sampling plan for the remaining storage area and include the results in a final risk assessment.

7.0 REFERENCES

The following list includes all documents cited in this report. 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 RRES-ERS 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 DOE Los Alamos Site Office; US Environmental Protection Agency (EPA), Region 6; and RRES-RS project. The sets were developed to ensure 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.

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