Nevada
Environmental
Restoration
Project

DOE/NV--926

National Nuclear Security Administration

Surface Corrective Action Investigation Report for the Gnome-Coach Site, New Mexico

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May 2004

Environmental Restoration
Division

U.S. Department of Energy
National Nuclear Security Administration
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SURFACE CORRECTIVE ACTION INVESTIGATION REPORT FOR THE GNOME-COACH SITE, NEW MEXICO

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office
Las Vegas, Nevada

Controlled Copy No.: ___

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May 2004

SURFACE CORRECTIVE ACTION INVESTIGATION REPORT
FOR THE GNOME-COACH SITE, NEW MEXICO

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List of Acronyms and Abbreviations

AEC	U.S. Atomic Energy Commission
ALARA	As-low-as-reasonably-achievable
Am-241	Americium-241
AOC	Area of concern
ATV	All-terrain vehicle
Ba-133	Barium-133
bgs	Below ground surface
Bq/g	Becquerel per gram
BLM	U.S. Department of the Interior, Bureau of Land Management
CADD	Corrective Action Decision Document
CAIR	Corrective Action Investigation Report
CFR	*Code of Federal Regulations*
CLP	Contract Laboratory Program
cm	Centimeter
Co-60	Cobalt-60
COC	Contaminant of concern
COPC	Contaminant of potential concern
cps	Counts per second
cps/(pCi/cm^2)	Counts per second per picocuries per square centimeter
CPT	Cone penetrometer truck
Cs-137	Cesium-137
CWD	Contaminated Waste Dump
DCGL	Derived concentration guide levels
DLAPS	Dual, large-area, plastic scintillator
DOE	U.S. Department of Energy

List of Acronyms and Abbreviations *(Continued)*

DRO	Diesel-range organics
DQI	Data Quality Indicator
DQO	Data Quality Objective
EEG	Environmental Evaluation Group
EI	Electrical imaging
EM	Electromagnetic
EPA	U.S. Environmental Protection Agency
fCi/g	Femtocuries per gram
ft	Foot (feet)
ft^2	Square foot (feet)
ft^3	Cubic foot (feet)
g	Gram
GC	Gas chromatography
g/cm^3	Grams per cubic centimeter
GPS	Global Positioning System
GRO	Gasoline-range organics
HPGe	High-purity germanium
hr	Hours
HWB	Hazardous Waste Bureau
I-131	Iodine-131
ICP	Inductively coupled plasma
ICRP	International Commission on Radiological Protection
IDW	Investigation-derived waste
ILCR	Incremental lifetime cancer risk
in.	Inches
INEEL	Idaho National Engineering and Environmental Laboratory

List of Acronyms and Abbreviations *(Continued)*

keV	Kiloelectron volt
lbs	Pounds
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
m	Meters
MDC	Minimum detectable concentration
m^2	Square meter
mg/cm^2	Milligram per square centimeter
mg/kg	Milligram per kilogram
mm	Millimeter
mL	Milliliter
mrem	Millirem
mrem/yr	Millirem per year
MS	Matrix spike
MSD	Matrix spike duplicate
Na-22	Sodium-22
NAD	North American Datum
NaI	Sodium iodide
NCP	National Contingency Plan
NIST	National Institute of Standards and Technology
NMED	New Mexico Environment Department
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NRC	U.S. Nuclear Regulatory Commission
NW	Northwest
PAL	Preliminary action levels

List of Acronyms and Abbreviations *(Continued)*

Pb	Preparation blanks
pCi/cm^3	Picocuries per cubic meter
pCi/g	Picocurie per gram
PID	Photoionization detector
ppm	Part per million
PRG	Preliminary remediation goal
Pu-239/240	Plutonium-239/240
QA	Quality assurance
QAPP	Quality assurance project plan
QC	Quality control
RCRA	*Resource Conservation and Recovery Act*
RESRAD	Residual Radiation
RME	Reasonable maximum exposure
RPD	Relative percent difference
SDG	Sample delivery group
SE	Standard Error
SGZ	Surface ground zero
Sr-90	Strontium-90
SVOC	Semivolatile organic compounds
TCLP	Toxicity characteristic leaching procedure
TPH	Total petroleum hydrocarbons
Tl	Thallium
UCL	Upper confidence level
UST	Underground storage tank
UTM	Universal Trans Mercator
VOC	Volatile organic compounds

List of Acronyms and Abbreviations (Continued)

VRP	Voluntary Remediation Program
WIPP	Waste Isolation Pilot Plant
y^3	Cubic yards
^oC	Degree Celsius
μCi	Microcurie
μCi/g	Microcurie per gram
%R	Percent recovery

Executive Summary

This Corrective Action Investigation Report presents a summary of the surface investigation activities conducted at the Gnome-Coach Site by the U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office (NNSA/NSO). The Gnome-Coach Site is located approximately 25 miles east of Carlsbad, New Mexico, in Eddy County. Gnome was the first nuclear experiment conducted under the Plowshare Program under the direction of the U.S. Atomic Energy Commission, predecessor to the DOE. Gnome, a 3-kiloton nuclear explosive, was detonated on December 10, 1961, at a depth of 1,184 feet below ground surface in a thick, bedded salt deposit within the Salado Formation. Immediately following the detonation, close-in stemming failed and cavity gases vented from the emplacement hole into the atmosphere. The gases were carried downwind in a northwest direction from the site (AEC, 1962). Coach, an experiment to be located near Gnome also within the Salado Formation, was initially scheduled for 1963. Construction and rehabilitation were completed for Coach, but the test was canceled and never executed.

The Gnome-Coach Site surface investigation focused on sixteen operational areas and 21 drill pads where the DOE conducted drilling and other surface support activities. For the purposes of this report, the Gnome-Coach Site surface is defined as the surface and shallow subsurface soils that may have been impacted as a result of surface activities conducted during the Gnome-Coach project or surface and shallow subsurface soils that may have impacted as a result of a release from the deep subsurface (i.e., venting). This definition intentionally excludes contamination in the deep subsurface resulting from the Gnome nuclear detonation.

The purpose of this report is to present and interpret the data collected during the corrective action investigation. The Gnome-Coach Site surface includes the surface and shallow subsurface soils to a depth of approximately 20 feet below ground surface. Shallow groundwater is not present at the Gnome-Coach Site. Based on the results of the surface investigation, the NNSA/NSO intends to issue a recommendation of no further action for closure under the New Mexico Voluntary Remediation Program. Justification for no further action is provided through a review of current surface and shallow subsurface conditions, including the presence, absence, and extent of contamination.

A corrective action investigation was performed from February to June 2002, with supplemental activities performed in May 2003. Soil samples were analyzed for total *Resource Conservation and Recovery Act* metals, volatile organic compounds, semivolatile organic compounds, total petroleum hydrocarbons (TPH) diesel-range organics (DRO) and gasoline-range organics, gamma spectroscopy, isotopic plutonium, strontium-90, and tritium. Soil sample analytical results for arsenic and TPH-DRO indicated these compounds were present above screening levels in one or more samples.

Levels of cesium-137, the primary radiological contaminant of potential concern, were identified in concentrations distinguishable from background. However, as established through the risk assessment, the levels of cesium-137 in surface and shallow subsurface soils are compliant with the unrestricted release dose limit of 25 millirem per year.

Arsenic results were determined to be representative of background concentrations found throughout the state of New Mexico; therefore, they pose no increased risk to human health and the environment.

Concentrations of TPH-DRO were found to exceed the State of New Mexico cleanup levels. During the supplemental field activities performed in May 2003 to define the extent of TPH-DRO contamination, those soils which exceeded the cleanup levels were excavated and removed from the site.

It is the intention of NNSA/NSO to close the site surface with no further action under the New Mexico Voluntary Remediation Program.

1.0 Introduction

This Corrective Action Investigation Report (CAIR) presents a summary of the surface and shallow subsurface soil investigation activities conducted at the Gnome-Coach Site, New Mexico, by the U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office (NNSA/NSO). For the purposes of this document, the Gnome-Coach Site surface is defined as the surface soils and shallow subsurface soils that may have been impacted as a result of surface activities conducted during the Gnome-Coach project or surface and shallow subsurface soil that may have been impacted as a result of a release from the deep subsurface (i.e., venting). This definition intentionally excludes contamination in the deep subsurface resulting from the Gnome nuclear detonation.

Gnome was the first nuclear experiment conducted under the Plowshare Program under the direction of the U.S. Atomic Energy Commission (AEC), predecessor to the DOE. The Plowshare Program focused on developing nuclear devices exclusively for peaceful purposes. Gnome, a 3-kiloton nuclear explosive, was detonated on December 10, 1961, at a depth of 1,184 feet (ft) below ground surface (bgs) in a thick, bedded salt deposit within the Salado Formation approximately 25 miles east of Carlsbad, New Mexico, in Eddy County (Figure 1-1). Immediately following the detonation, close-in stemming failed and cavity gases vented from the emplacement hole into the atmosphere. The gases were carried downwind in a northwest direction from the site (AEC, 1962). Coach, an experiment to be located near Gnome also within the Salado Formation, was initially scheduled for 1963. Construction and rehabilitation were completed for Coach, but the test was canceled and never executed.

Major site restoration activities were conducted in 1968 to 1969 and 1977 to 1979. The results of the final phase of the 1977 to 1979 restoration effort showed the average radionuclide concentration over any area of 0.25 hectare did not exceed the established radiological release criteria (DOE/NV, 1981). Although restoration activities were performed for surface and shallow subsurface radiological contamination, radiologically elevated locations had been identified on the surface during recent survey and sampling events conducted by the U.S. Environmental Protection Agency (EPA) (1994) and the Environmental Evaluation Group (EEG) (1995). The data collected during these two efforts is too limited to adequately assess the surface conditions using current standards. Reviews of

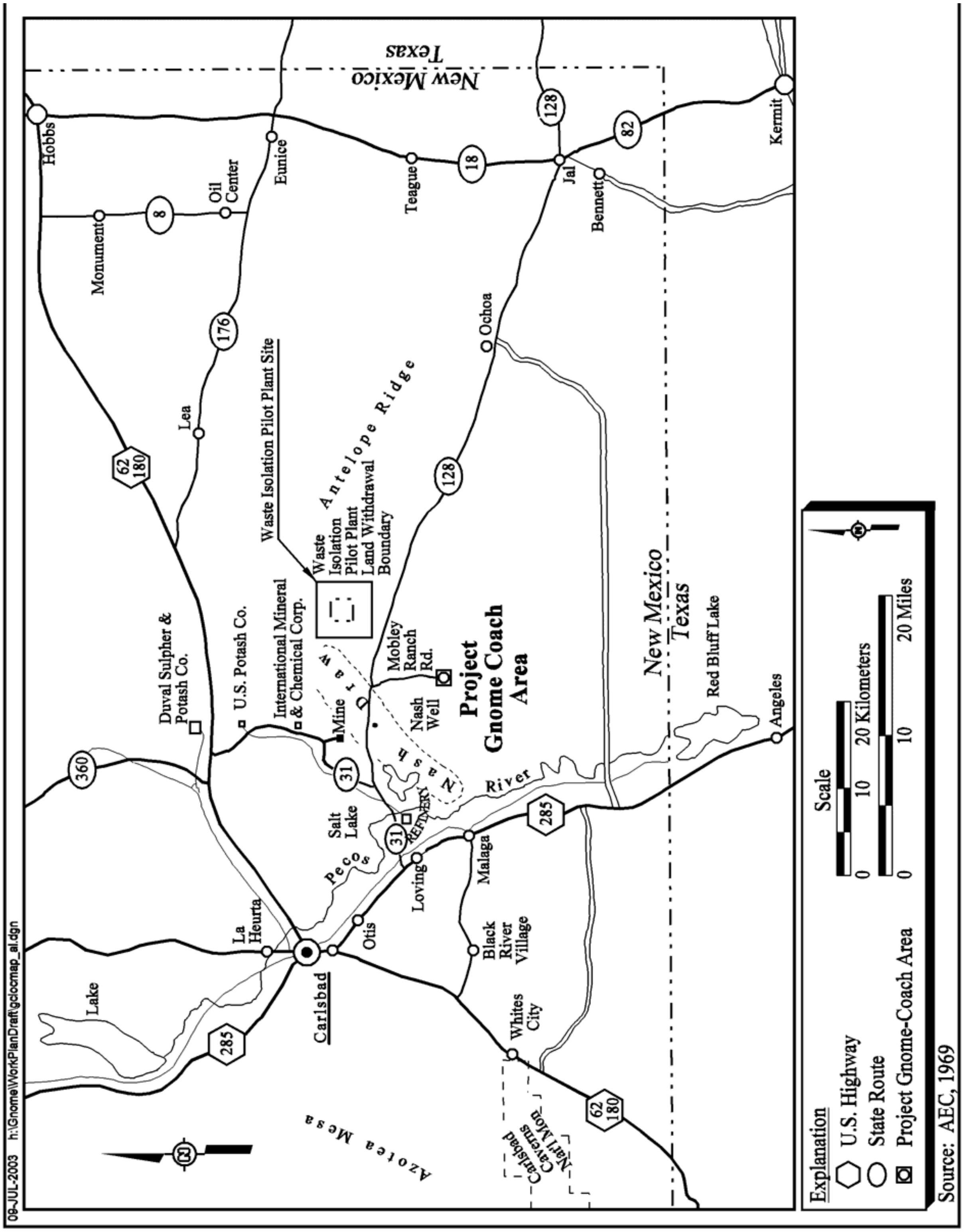


Figure 1-1
Location of the Project Gnome-Coach Area

historical radiological data also identified data gaps for shallow subsurface soils at several operational areas. Additionally, historical restoration efforts had not adequately defined the potential for, and extent of, chemical contamination for the surface and shallow subsurface.

1.1 Purpose

The purpose of this report is to present an overview of site investigation activities and document the nature and extent of contamination in surface and shallow subsurface soils at the Gnome-Coach Site. Characterization of the surface and shallow subsurface of the Gnome-Coach Site was conducted in accordance with the *Site Characterization Work Plan for the Gnome-Coach Site, New Mexico* (NNSA/NV, 2002). Site investigation activities were conducted from February 25 to June 15, 2002. These activities consisted of mobilization/demobilization, radiological *in situ* surveys, geophysical surveys, vegetation sampling, and soil sampling. Supplemental field activities consisting of soil removal were conducted from May 19 to 23, 2003.

1.2 Scope of Work

The scope of this report is to provide the information and data resulting from the characterization investigation that supports the selection and recommendation of no further action at the Gnome-Coach Site surface. The investigation results presented in this report are used in a human health risk assessment to support risk-based decisions on the need to perform corrective actions for the surface of the Gnome-Coach Site.

1.3 Report Organization

This report has been organized as follows:

- Section 1.0 provides information on the investigation background, purpose, scope of work, and the report contents.
- Section 2.0 provides a summary of the investigation and the methods used.
- Section 3.0 provides a summary of the radiological driveover survey.
- Section 4.0 provides a summary of the geophysical investigation.
- Section 5.0 provides a summary of the soil investigation.

- Section 6.0 provides the details of the vegetation sampling.
- Section 7.0 provides details of the contaminated waste dump and salvage yard investigation.
- Section 8.0 provides details of the surface ground zero investigation.
- Section 9.0 provides details of the shaft area investigation.
- Section 10.0 provides details of the fallout plume investigation.
- Section 11.0 provides details of the investigation of the drill pads.
- Section 12.0 provides a summary of waste management activities.
- Section 13.0 provides a summary of survey and demobilization activities.
- Section 14.0 provides conclusions.
- Section 15.0 provides recommendations.
- Section 16.0 provides a list of references.

Appendix A - Analysis of Radiological Constituents in the Surface Soil, Shallow Subsurface Soil, and Vegetation at the Gnome-Coach Site, Eddy County, New Mexico

Appendix B - Human Health Risk Assessment

Appendix C - Quality Control Summary for the Gnome-Coach Site, New Mexico

Appendix D - Geophysical Survey Figures

Appendix E - Analytical Results

To make this report a concise summary, the complete field documentation and laboratory data (e.g., Field Activity Daily Logs, Sample Collection Logs, Analysis Request/Chain of Custody forms, Visual Classification of Soils Forms, Laboratory Certificates of Analyses, calibration records, and analytical results) are not contained in this report. These documents are retained in project files as both hard copy and electronic media, where appropriate.

2.0 Summary of Investigation

This section provides an overview of the primary investigation activities conducted at the Gnome-Coach Site between February 25 and June 15, 2002, and the supplemental field activities conducted May 19 to 23, 2003.

2.1 Project Data Quality Objectives

In order to complete the scope of work for the site characterization investigation, the Data Quality Objectives (DQOs) for the surface, as outlined in the Work Plan (NNSA/NV, 2002), were met by using available historical data in combination with newly collected data from the characterization investigation. The following sequential DQOs were achieved by collecting data of sufficient quality and quantity to:

- Determine the nature and extent of potential contamination at the surface and shallow subsurface
- Support a risk-based decision on the need to perform corrective actions for the surface
- Support a corrective action alternative analysis for the surface, if required

In order to determine if there is a potential for adverse impacts to possible receptors, contaminants detected in soil were compared to appropriate preliminary action levels (PALs). Positive detects greater than the PAL are discussed in regard to the corresponding operational area in Sections 7.0 through 11.0. A Quality Control Summary Report is provided in Appendix C. Analytical results are provided in Appendix E.

Chemical PALs

In accordance with the Work Plan, the PALs for chemical chemicals of potential concern (COPCs) are based on the preliminary remediation goals (PRGs) for industrial exposures provided in the EPA *Region 9 Risk-Based Concentration Table* (EPA, 1999). These PRGs are developed based on protection of human health assuming different exposure scenarios. Industrial PRGs assume exposure through incidental soil ingestion as well as inhalation of airborne dust. These PRGs reflect cancer risks of 1×10^{-6} (i.e., one in a million) or noncancer hazard quotients of 0.1. These values were used for screening purposes to flag chemical COPCs potentially requiring further evaluation by a risk assessment.

One change was made to the PALs as described in Section 3.2.2 of the Work Plan. Initially, total petroleum hydrocarbons (TPH)-diesel range organics (DRO) results were to be compared to levels identified in a New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB) Position Paper (NMED, 2000). However, based on an agreement reached by the representatives of NNSA/NSO, NMED HWB, and NMED Voluntary Remediation Program (VRP) during a meeting in Santa Fe, New Mexico on January 30, 2003 (Wycoff, 2003), the PAL for diesel was changed to the value provided in the latest draft (August 30, 2002) of the *New Mexico Environment Department Hazardous Waste Bureau TPH Cleanup Guideline* (NMED, 2002). This document proposes a TPH-DRO cleanup level of 2,200 milligrams per kilogram (mg/kg).

The following PALs were used for the purpose of determining if additional consideration needed to be given to COPCs identified in soil samples:

- Chemical COPCs - Industrial risk-based PRGs provided in EPA Region 9 Risk-Based Concentration Table (EPA, 1999)
- TPH-DRO - 2,200 mg/kg (NMED, 2002; and Wycoff, 2003)
- TPH-gasoline range organics (GRO) - No PAL based on GRO detection only. The individual constituents (e.g., benzene, ethylbenzene) were compared to the Region 9 PRGs.

Radiological PALs

The PALs for Cesium-137 (Cs-137) were initially determined through the "Radiological Screening Evaluation for the Gnome-Coach Site," presented in Appendic C of the Work Plan (NNSA/NV, 2002). Appendix B of this report again presents the regulatory guidelines and methodology for determining the PALs for Cs-137 (the primary radiological COPC).

For the Gnome-Coach Site, the PAL is defined based on dose criteria guidelines from DOE 5400.5 (DOE, 1993) and 10 CFR 20 (CFR, 2000). According to 10 CFR 20, a site will be considered acceptable for unrestricted use if the residual radioactivity concentrations that are distinguishable from background radiation results in a total effective dose equivalent to a future hypothetical land user that does not exceed 25 millirem per year (mrem/yr). The Cs-137 PAL for the Gnome-Coach

Site is based on the most limiting or restrictive hypothetical land use scenario, which is the rancher scenario based on the meat ingestion pathway. A PAL is defined for both large areas of radiological-contaminated surface soil, on the order of 100 square meters (m^2), and for small areas that have contamination that is significantly elevated in comparison to the surrounding area (i.e., hot spots).

The most limiting (or minimum) PAL for Cs-137 was determined to be 167 picocuries per gram (pCi/g) for areas greater than 20,000 m^2. To be conservative, this PAL is initially used for comparison to all areas of concern (AOCs) regardless of size. The dose to a receptor will be proportionately lower for the smaller AOCs. Refer to Section B.3.3 (Appendix B) of this report for a more details regarding the derivation of PALs.

2.1.1 Selected Analytical Methods and Contaminants of Potential Concern

Contaminants of potential concern for the Gnome-Coach Site surface investigation are listed in Section 3.2.1 of the Work Plan (NNSA/NV, 2002). The list was determined based on an evaluation of site-specific historical documentation regarding site operations, previous sampling efforts performed at Gnome-Coach, drilling methods, process knowledge from other underground nuclear test areas, and State of New Mexico regulatory guidelines. The COPCs and their corresponding method of analyses for the soil investigation are:

- TPH-DRO and -GRO - EPA Method 8015B (EPA, 1996)
- Volatile organic compounds (VOC) - EPA Method 8260B (EPA, 1996)
- Semivolatile organic compounds (SVOCs) - EPA Method 8270C (EPA, 1996)
- Total *Resource Conservation and Recovery Act* (RCRA) metals - EPA Methods 6010B/7471A (EPA, 1996)
- Radionuclides/Fission products (primarily Cs-137) - Gamma spectroscopy, isotopic plutonium, strontium-90, and tritium

To support waste disposal profiles some samples were analyzed for VOCs, SVOCs, and/or metals using the toxicity characteristic leaching procedure (TCLP), EPA Method 1311 (EPA, 1996).

A master sample log is provided in Appendix E. This log contains sampling information such as sample identification number and analyses performed for each sample. The analyses were conducted off site by Paragon Analytics, Inc. or on site using a high-purity germanium (HPGe) detector.

2.2 Investigation Activities

Sixteen identified operational areas and 21 drill pads of the Gnome-Coach Site were investigated using one or more investigation techniques (e.g., geophysical survey and soil sampling). The operational areas investigated included drill pads associated with numerous well locations, the contaminated waste dump, salvage yard, laundry/lab facilities, various storage areas, surface ground zero, decontamination pad, evaporation pond/waste tank, fallout plume, and the shaft area. Detailed descriptions of the separate operational areas are provided in the Work Plan (NNSA/NV, 2002). Plate 1 shows these areas based on locations of sample data and historical drawings. Table 2-1 presents the actions taken to complete the field investigation and their associated dates.

Table 2-1
Summary of Site Characterization

Activity	Dates of Activity
Mobilization and Site Set Up	Feb. 25 - March 7, 2002
Radiological Driveover Survey and Related Soil Sampling	March 4 - 20, 2002
Geophysical Surveys	March 18 - May 1, 2002
Vegetation Sampling	March 31 - April 10, 2002
In Situ Radiological Survey with Cone penetrometer technology (CPT)	May 13 - May 22, 2002
Soil Sampling	May 20 - June 12, 2002
Demobilization and Site Cleanup	June 12 - June 15, 2002
Waste Management	July 1, 2002
Supplemental Closure Activities	May 19 - May 23, 2003

Table 2-2 identifies the types of investigation activities conducted at each AOC as part of the characterization. Table 2-2 correlates to Table 4-1 of the Work Plan which outlined the initial types of investigations to be conducted. Based on field conditions encountered, several AOCs were subject to additional activities than initially planned (e.g., geophysical survey area encompassed several AOCs not initially proposed).

Table 2-2
Summary of Investigation Activities Conducted at Various AOCs
(Page 1 of 2)

Area of Concern	AOC-Specific Investigation Details	Investigation Activity Conducted				
		Driveover Radiological Survey	Geophysical Survey	CPT *In Situ* Survey	Direct-Push	Excavation
Salvage Yard	Section 7.0	T	T	T		T
Contaminated Waste Dump		T	T	T		
Road		T	T	T		
Gnome Ground Zero	Section 8.0	T	T		T	
Evaporation Pond/waste Tank		T	T			T
Area 57		T	T	T		
Old Laundry/Lab		T	T			
Decontamination Pad		T	T	T	T	T
Warehouse Pad		T	T		T	T
Crusher Plant	N/A[a]	T	T			
Gnome-Coach Shaft	Section 9.0	T	T	T	T	T
Salt Muckpile		T	T	T		
New Laundry/Lab		T	T	T	T	T
Equipment Storage Area		T	T	T		
Fallout Plume	Section 10.0	T	T	T		
Drum Storage Area		T	T		T	T
Generator Pad			T		T	
LRL-1 Drill Pad	Section 11.0	T	T		T	
LRL-2 Drill Pad		T	T		T	
Coach/LRL-7 Drill Pad		T	T			T
LRL-8 Drill Pad		T	T		T	
USGS-1 Drill Pad			T		T	
USGS-2 Drill Pad			T		T	
USGS-4 and USGS-8 Drill Pad		T	T	T	T	
USGS-5 Drill Pad			T		T	
USGS-7 drill pad			T		T	T

Table 2-2
Summary of Investigation Activities Conducted at Various AOCs
(Page 2 of 2)

Area of Concern	AOC-Specific Investigation Details	Investigation Activity Conducted				
		Driveover Radiological Survey	Geophysical Survey	CPT *In Situ* Survey	Direct-Push	Excavation
Sandia No. 1 Drill Pad	Section 11.0		T		T	
Sandia No. 3 Drill Pad			T		T	T
SRI-1 Drill Pad			T		T	T
SRI-2 Drill Pad			T		T	
SRI-3 Drill Pad			T		T	
SRI-4 Drill Pad			T			
SRI-5 Drill Pad			T		T	
SRI-6 Drill Pad			T		T	
SRI-7 Drill Pad			T		T	
SRI-8 Drill Pad			T		T	T
SRI-9 Drill Pad			T		T	T
SRI-10 Drill Pad			T		T	

N/A = Not Applicable

[a]The Crusher Plant is discussed as part of the general area around surface ground zero and was not treated as an AOC for the investigation.

2.2.1 Radiological Surface Surveys

In situ surface radiological surveys were completed using a dual, large-area, plastic scintillator (DLAPS) mounted on the back of a four-wheel drive vehicle. Approximately 80 acres were surveyed prior to all other investigation activities to gather information on current radiological surface conditions. The driveover surveys were started during the week of mobilization and were completed by March 14, 2002. All AOCs initially proposed for the driveover survey were completed. Many of these areas were expanded to ensure complete coverage and that background measurements were encountered. Additional details are provided in Section 3.0.

2.2.2 Geophysical Surveys

Geophysical surveys were conducted in two phases between March 18 and May 1, 2002. Over 30 AOCs were surveyed, including several AOCs not initially proposed in the Work Plan. The objectives of the geophysical investigation, as proposed in the Gnome-Coach Work Plan, were met. These objectives included more accurately locating and delineating targeted areas of potential contamination, locating other suspect areas, and detecting residual buried debris. The areas investigated were expanded or contracted depending on field conditions and preliminary results of geophysical data. Additional details of the geophysical investigation are provided in Section 4.0 of this report.

2.2.3 Vegetation Sampling

Thirty-six vegetation samples were collected and processed between April 1 and 10, 2002, to provide ecological risk data on important range species for grazing cattle within the site boundaries. Three areas were identified and selected based on the availability of sufficient biomass of black grama grass (*Bouteloua eriopoda*) and sand dropseed (*Sporobolus cryptandrus*) species. The sampled areas included one area in each the downwind and upwind directions of the fallout plume, and one control area. The downwind area of the fallout plume was biased towards the areas of elevated gamma measurements identified during the surface radiological driveover survey. The samples were processed (dried and milled) on site and sent to an off-site laboratory for gamma spectroscopy analysis. Additional details are provided in Section 6.0.

2.2.4 Surface and Shallow Subsurface Soil Investigation

There were 7 historical operational areas and 17 mud pits investigated during the shallow subsurface investigation. The investigation consisted of *in situ* shallow subsurface radiological surveys and soil sample collection at the initially proposed AOCs as well as anomalies detected by surface driveover radiological surveys and geophysical surveys. Over 230 soil samples were collected for radiological and/or chemical analyses. Health Physics personnel, using an HPGe detector, operated an on-site laboratory for gamma spectroscopy analysis.

2.2.4.1 Background Soil Sampling

Twenty-four background soil samples were collected and analyzed off site for gamma spectroscopy, isotopic plutonium, strontium-90 (Sr-90), and RCRA metals. The samples were collected at various depth intervals representing potential and/or expected depths of contamination at identified AOCs. Additional details are provided in Section 5.1.

2.2.4.2 Surface Soil Sampling

Based on results of the surface radiological survey, 22 surface samples were collected and analyzed for gamma spectroscopy using the HPGe detector located on site. The sample locations were biased towards the highest gamma counts detected by the DLAPS survey. Additional details are provided in Section 5.2.2.

2.2.4.3 In Situ Radiological Survey Using Cone Penetrometer Technology

In situ shallow subsurface radiological surveys using a 25-ton cone penetrometer truck (CPT) equipped with a spectral gamma probe were performed between May 13 and May 21, 2002. Eighty-two borings were pushed to measure gross gamma counts during depth-integrated CPT pushes at selected AOCs. Initially, four AOCs were proposed for CPT investigation; however, based on surface radiological surveys, eight additional areas were investigated. Over 20 soil samples were collected using the CPT based on gross gamma counts. These samples were analyzed for gamma spectroscopy using the HPGe detector located on site. Additional details are provided in Section 5.2.3.

2.2.4.4 Direct-Push Soil Collection

Direct-push activities were conducted between May 20 and June 12, 2002. This portion of the investigation included 16 drill pads and 7 former operational areas were investigated with over 200 borings pushed and soil samples collected for radiological and/or chemical analyses. Additional soil samples were collected using direct-push methods at approximately six anomalies identified by either radiological and/or geophysical survey results. Additional details are provided in Section 5.2.4.

2.2.4.5 Excavation

Exploratory excavations were conducted using a backhoe at 10 anomalies of unknown origin detected through geophysical surveys. Approximately 22 excavations were conducted and included limited soil sampling at anomalies inaccessible to the direct-push rig. Additional excavation activities were conducted during the week of May 19 to 23, 2003, to remove and dispose of approximately 18 cubic yards of diesel-contaminated soil and collect confirmation soil samples. Additional details are provided in Section 5.2.5.

3.0 Radiological Driveover Survey Summary

Driveover radiological surveys at the Gnome-Coach Site were conducted to identify the nature and extent of radiological contamination in surface soil at concentrations statistically greater than undisturbed background soil. The DLAPS surveys were successful in providing information on current site conditions for over 40 acres of the Gnome-Coach Site with regard to the distribution and concentration of residual radioactivity in the surface soils of previously cleaned areas. The surveys aided in verifying the boundaries of AOCs and identified hot spots which required further characterization. All radiological anomalies identified during the surface driveover survey were verified for concentrations and types of radioactivity and lateral extent by several methods including portable handheld instruments, CPT shallow subsurface *in situ* surveys, and/or soil sampling.

A brief, general description of the radiological driveover methods and results is presented in this section with site-specific results provided in Sections 7.0 through 11.0. Appendix A of this report addresses, in more detail, the investigation of radiological constituents in surface soils using the DLAPS detector system, a discussion of the DLAPS detector system calibration and control, and the statistical analysis of the survey results. The information and data provided in Appendix A demonstrate that a sufficient quantity and quality of *in situ* measurements, samples, and analysis were performed to define current site conditions and identify and evaluate that no further action is required for closure of the Gnome-Coach Site surface.

The driveover radiological surveys were performed using the DLAPS detector mounted on a four-wheel drive truck which systematically traversed each designated AOC. The distance between each traverse or pass was sufficient for nearly 100 percent coverage of the land surface identified in the Work Plan. Over 150,000 radiological measurements (in counts per second [cps]), along with three-dimensional survey location coordinates, were recorded and stored in a combined file.

Plate 1 (which is discussed in Appendix A) displays the results of the DLAPS driveover survey. The gamma count rates varied from a minimum of 121 cps at the USGS-4 drill pad to a maximum of 794 cps at the salvage yard hot spot SAYA0001. The mean count rate in the background area was 174 cps. The nature and extent of the radiological contamination (specifically Cs-137) are represented in Plate 1. No surface soil at Gnome-Coach exceeded the minimum area-specific PAL of

167 pCi/g for Cs-137. In addition to the driveover results, Plate 1 identifies the 1979 site restoration sample locations and the location and Cs-137 concentration in surface soil samples collected from 20 hot spots identified during the DLAPS driveover surveys.

4.0 Geophysical Investigation

The geophysical investigation began once each known AOC and all suspected locations were demarcated. Geophysical surveys were conducted so as not to interfere with the initial driveover radiological survey or the vegetation sampling. A global positioning system was used to provide measurement of positional data. The geophysical investigation was conducted to accomplish the following target-area specific objectives:

- Investigate all drill pads and suspect areas to identify potential backfilled drilling mud pits, and, if identified, map their dimensions.
- Delineate the contaminated waste dump (CWD) boundaries and identify any remaining buried metallic debris.
- Delineate the salvage yard boundaries and identify any remaining buried metallic debris.
- Locate and delineate boundaries of the buried, uncontaminated salt trench at the old laundry/lab area.
- Investigate the general area near and between the shaft and Gnome ground zero to detect a concrete-lined grease pit near the shaft, any unknown burial sites, and unknown underground storage tanks (USTs) or septic tanks.
- Verify there are no USTs at the generator pad.
- Verify all buried debris was excavated from the warehouse area.
- Map out identified buried water, phone, or cable lines.

Initial estimates of the survey area were approximately 82 acres (3,575,000 square feet [ft^2]). The actual areas investigated were determined in the field by project personnel. The areas investigated were expanded or contracted depending on results of the geophysical survey. The areas of concern that were included in the investigation are listed in Table 2-2.

Phase 1 of the investigation (March 18 to April 10, 2002) focused on collecting initial in-phase and conductivity data. Phase 2 (April 19 to May 1, 2002) focused on refining Phase 1 data using additional geophysical methods. The most appropriate geophysical method(s) used at each designated AOC were determined in the field based on site conditions. The following sections describe the areas investigated and the geophysical methodologies used.

4.1 Geophysical Methodology

The surface geophysical investigation was conducted in accordance with the contractor's geophysical procedures, which are provided in detail in the final geophysical report (*Gnome-Coach Geophysical Survey Report, Carlsbad, New Mexico* [SAIC, 2002]).

A description of the purpose, theoretical background, limitations, field procedures, and data processing procedures for the following geophysical methods used at the Gnome-Coach Site are included in the final geophysics report (SAIC, 2002):

- Frequency Domain Electromagnetic Terrain Conductivity Methods
- Digital Global Positioning Methods
- Time Domain Electromagnetic Terrain Conductivity Methods
- Electrical Imaging Methods
- Ground-Penetrating Radar Methods

Data was digitally recorded and periodically downloaded to a field computer to provide preliminary interpretations and real-time data. Maps of each area surveyed were produced prior to leaving the field as the collected data were used to more accurately define the boundaries of each suspect area for the shallow subsurface investigation. Additionally, the geophysics personnel staked all potential mud pits and subsurface anomalies identified prior to the shallow subsurface investigation.

The most appropriate geophysical methods were used at each designated AOC. The methods were determined in the field based on site conditions, with one or more methods being employed to meet the objectives for each AOC. Emphasis was placed on electromagnetic (EM) conductivity data for identifying drilling mud pits and backfilled trenches, and resistivity data was used in determining their thickness and dimensions. Former burial pits (such as the CWD), with the potential of remaining buried metallic objects/debris were identified using EM conductivity data, and delineated using a high-resolution metal detector. Areas with the potential for buried structures (such as storage tanks) were surveyed with EM to identify anomalies.

4.2 Results of Geophysical Surveys

For descriptions of the geophysical results, see Sections 7.0 through 11.0 where investigation results are discussed for individual areas. The geophysical figures referenced in the text are provided in Appendix D.

5.0 Soil Investigation Summary

There were 15 historical operational areas and 17 mud pits investigated during the surface/shallow subsurface investigation. The investigation consisted of *in situ* shallow subsurface radiological surveys and soil sample collection at initially proposed AOCs, as well as anomalies detected by surface driveover radiological surveys and geophysical surveys. Over 230 soil samples were collected for radiological and/or chemical analyses. Health Physics personnel used an HPGe detector in an on-site laboratory to perform gamma spectroscopy analysis.

5.1 Background Soil Sampling

Soil samples were collected from unaffected areas near the Gnome-Coach Site to establish baseline levels for inorganic COPCs (i.e., radionuclides and metals). Twenty-four background soil samples were collected at various depth intervals and analyzed to meet requirements outlined in Section 4.6 of the Work Plan (NNSA/NV, 2002). The depth intervals represented the potential and/or expected depths of contamination at the AOCs. The background locations were selected upwind of the fallout plume in areas representing local soil conditions. These locations were similar to the 1979 background sampling areas. If a borehole met refusal above a required depth interval, a new borehole location was selected to complete the collection process. Therefore, instead of the minimum 8 original boreholes proposed, a total number of 15 boreholes were pushed to complete sample collection. The samples were analyzed at an off-site laboratory for gamma spectroscopy, isotopic plutonium, Sr-90, and RCRA metals. Table 5-1 lists the borehole number, sample number, depth, and analysis performed. All RCRA metal and radiological soil results above detection limits are listed in Appendix E (Tables E.1-3 and E.1-4, respectively).

Background detections of Cs-137 are consistent with historical background samples and samples from undisturbed background locations in New Mexico (McArthur and Miller, 1989). The background results for Sr-90 and plutonium-239/240 (Pu-239/240) were nondetects.

A statistical analysis was performed on the background RCRA metal data for the Gnome-Coach Site with the results listed in Table 5-2. The table shows the mean, standard deviation, relative percent error at the 90 percent confidence level, and the screening value (e.g., Region 9 PRGs) for each metal.

Table 5-1
Background Samples, Types, and Analyses

Borehole Number	Site Feature	Sample Number	Sample Matrix	Analyses
BKGA	Background Area near east section line	BKGA0001	Soil	Metals, GS, Pu, Sr-90
		BKGA0101	Duplicate of BKGA0001	Metals, GS, Pu, Sr-90
		BKGA0102	Soil	GS, Pu, Sr-90
		BKGA0304	Soil/Full Lab QC	GS, Pu, Sr-90
BKGB		BKGB0001	Soil	Metals, GS, Pu, Sr-90
		BKGB0102	Soil	GS, Pu, Sr-90
		BKGB0304	Soil	Metals, GS, Pu, Sr-90
BKGC		BKGC0001	Soil	Metals, GS, Pu, Sr-90
		BKGC0102	Soil	GS, Pu, Sr-90
		BKGC0304	Soil	Metals, GS, Pu, Sr-90
		BKGC0708	Soil	Metals
BKGD		BKGD0001	Soil/Full Lab QC	Metals, GS, Pu, Sr-90
		BKGD0101	Duplicate of BKGD0001	Metals, GS, Pu, Sr-90
		BKGD0102	Soil	GS, Pu, Sr-90
		BKGD0304	Soil	Metals, GS, Pu, Sr-90
BKGE		BKGE0001	Soil	Metals, GS, Pu, Sr-90
		BKGE0102	Soil	GS, Pu, Sr-90
		BKGE0304	Soil	Metals, GS, Pu, Sr-90
		BKGE0708	Soil	Metals
BKGF		BKGF0001	Soil	Metals, GS, Pu, Sr-90
		BKGF0102	Soil	GS, Pu, Sr-90
		BKGF0304	Soil	Metals, GS, Pu, Sr-90
BKGG		BKGG0001	Soil	GS, Pu, Sr-90
		BKGG0102	Soil	GS, Pu, Sr-90
		BKGG0304	Soil	GS, Pu, Sr-90
BKGH		BKGH0001	Soil	GS, Pu, Sr-90
		BKGH0102	Soil	GS, Pu, Sr-90
		BKGH0304	Soil	GS, Pu, Sr-90
BKGI	Background Area near south section line	BKGI0708	Soil	Metals
		BKGI1112	Soil	Metals
BKGJ		BKGJ0708	Soil	Metals
		BKGJ1112	Soil	Metals
BKGK		BKGK0708	Soil	Metals
		BKGK1112	Soil	Metals
BKGL		BKGL0708	Soil	Metals
BKGM		BKGM1112	Soil	Metals
BKGN		BKGN1112	Soil	Metals
BKGO		BKGO1112	Soil	Metals

GS = gamma spectroscopy analysis
Metals = Total RCRA metals plus mercury
Pu = Isotopic plutonium analysis
Sr-90 = Strontium-90 analysis

Table 5-2
Background RCRA Metal Soil Concentrations for the Gnome-Coach Site

Statistical Parameter	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Mean	1.73	202.69	0.097	3.82	3.38	0.004	0.47	1.01
Std. Deviation	0.77	323.78	0.11	0.93	1.44	0.002	0.09	0.03
% error at 90% confidence level	11.45	41.24	29.37	6.28	10.98	9.21	4.83	0.70
Screening Value	2.7[a]	100,000[a]	810[a]	450[a]	1,000[a]	610[1]	10,000[1]	10,000[1]

[a]Screening value used is EPA Region 9 Preliminary Remediation Goals (EPA,1999)

Typically, a relative error of plus or minus 10 to 20 percent from the true mean at a confidence level of 90 percent is considered acceptable for planned removal and remedial response studies (EPA, 1989). This target was met for all metals except barium and cadmium. The high variability results of these metals suggest that additional samples should be taken. However, it is felt that since the mean is considerably lower than the PRG and none of the environmental samples exceeded the PRG, further sampling for barium and cadmium is unnecessary.

5.2 Site Characterization of Surface and Shallow Subsurface Soils

Surface and shallow subsurface soils were characterized at the Gnome-Coach Site using a variety of techniques which included shallow subsurface *in situ* gamma surveys using a CPT and soil sample collection using hand sampling, direct push, and excavation. A brief description of the soil characterization techniques are provided in the following sections. Sections 4.2 and 4.7 of the Work Plan (NNSA/NV, 2002) provides detailed descriptions of the technologies and sample design utilized for characterizing surface and shallow subsurface soils (e.g., CPT and direct push). Each investigation technique was used in the manner described in these sections. Details of characterization results pertaining to specific AOCs are provided in Sections 7.0 to 11.0. Table E.1-1 in Appendix E lists all the characterization samples collected from the Gnome-Coach Site with the associated borehole number, site feature, sample matrix, and type of analyses performed.

5.2.1 Soil Field Screening

Field screening was conducted on soils for the purpose of aiding the selection of the most appropriate soil sample for laboratory analysis as well as for health and safety and waste management decisions.

All direct push soil cores and excavated soil were visually inspected and initially screened for VOCs using a photoionization detector (PID) and radiation using a portable alpha and beta/gamma survey instrument and recorded, as appropriate. When deemed necessary, a sample aliquot was taken for additional radiological screening using the HPGe detector. Based on field conditions, it was not necessary to run any headspace screening or use TPH field-screening kits.

Radiation field-screening levels for the portable instruments measuring alpha and beta/gamma were defined as the mean background activity level measured from 20 background locations plus two times the standard deviation of the mean background activity level. This field-screening level was used during soil collection activities for chemical COPCs and should not be confused with the downhole *in situ* gamma-screening levels used for the shallow subsurface radiological characterization or the background levels established for the driveover radiological survey.

5.2.2 Surface Soil Sampling

Based on results of the surface radiological survey, 22 surface samples were collected between March 13 and March 28, 2002. The samples were collected by hand using a disposable plastic scoop and analyzed by gamma spectroscopy using the on-site HPGe. The sample locations were biased towards the highest gamma counts detected during the DLAPS driveover survey. These sample results provided correlation data for the DLAPS driveover data, as well as fulfilling the requirement of limited confirmation sampling that the primary COPC is Cs-137 at certain AOCs as designated in the Work Plan. The first 22 samples listed on Table E.1-1 provide relevant sample information. Additional data specific to an AOC is provided in Sections 7.0 through 11.0; additionally, Appendix A provides further discussion of the surface soil results in relation to the driveover survey results.

5.2.3 CPT In Situ Radiological Survey and Sampling

Shallow subsurface *in situ* radiological surveys were completed May 13 to 21, 2002, using a 25-ton CPT equipped with a spectral gamma probe. Eighty-two borings were pushed at the Gnome-Coach Site to measure gross gamma counts during depth-integrated CPT pushes at selected AOCs to determine the nature and extent of potential contamination. Shallow subsurface *in situ* radiological surveys were the primary investigation tool used in determining the vertical extent of radiological contamination at hot spot locations identified by the radiological driveover survey. Initially, four AOCs were proposed for CPT investigation:

- Decontamination pad
- New laundry/lab
- Salt muckpile
- USGS-4 and -8

However, based on surface radiological surveys, hot spots identified within the following six additional AOCs were investigated with the CPT:

- Salvage yard
- CWD
- Road between CWD and salvage yard
- Fallout plume
- Equipment storage area
- Shaft (2 separate areas)

Table 5-3 provides general information regarding CPT borings. At each CPT push location (except where noted), continuous gamma count-rate measurements were acquired from the ground surface to the noted depth. The depth given in the table reflects the maximum depth of the probe tip, while actual gamma measurements are generally about 2 ft shallower due to the position of the gamma detector within the probe sleeve. When applicable, radiological CPT data has been converted from gross counts to pCi/g allowing direct comparison to gamma spectroscopy soil sample results (refer to Appendix A for details). Radiological CPT data specific to an AOC investigation are provided in Sections 7.0 to 11.0. Detailed discussions of the CPT quality control and general survey results are included in Appendix A.

Twenty-three soil samples were collected using the CPT. Sample location selection was based on gross gamma counts and analyzed for gamma spectroscopy using the on-site HPGe detector. Table 5-3 indicates which borings had samples collected; however, refer to samples with the prefix “CPT” in Table E.1-1 (master sample log) for details such as the analyses. An 18-inch (in.) brass sleeve was used to collect soil. The soil was removed from the sleeve, homogenized, and placed into appropriate containers for analysis. The radiological data acquired by this technology, combined with confirmation sample analytical results, are of sufficient quality and quantity to establish current

Table 5-3
Summary of CPT Pushes

Site Feature	Boring Number	Total Depth Pushed	Sample Collected
Salvage Yard	CPTBA0000	7.4	T
	CPTBB0000	7.6	T
	CPTBC0000	11.6	T
	CPTBD0000	11.7	T
	CPTBE0000	10.0	T
	CPTBF0000	13.75	T
	CPTBG0000	5.7	T
	CPTBH0000	6.9	T
	CPTBI0000	9.6	T
	CPTBJ0000	10.1	T
	CPTBK0000	4.3	T
	CPTBL0000	5.0	N/A
	CPTBM0000	6.1	N/A
	CPTBN0000	6.1	N/A
	CPTBO0000	6.0	N/A
	CPTBP0000	6.2	N/A
New Laundry/Lab	CPTEA0000	6.2	N/A
	CPTEB0000	6.1	N/A
	CPTEC0000	6.3	T
	CPTED0000	6.1	N/A
	CPTEE0000	8.1	T
	CPTEF0000	6.1	N/A
	CPTEG0000	6.0	N/A
	CPTEH0000	6.0	N/A
	CPTEI0000	6.1	T
	CPTEJ0000	6.1	T
Salt Muckpile	CPTFA0000	6.1	N/A
	CPTFB0000	6.1	N/A
	CPTFC0000	6.0	N/A
	CPTFD0000	6.1	N/A
	CPTFE0000	12.1	T
	CPTFF0000	3.0	N/A
	CPTFG0000	10.1	T
	CPTFH0000	4.1	N/A
	CPTFI0000	10.1	N/A
	CPTFJ0000	7.0	T
	CPTFK0000	7.0	T
	CPTFL0000	12.1	N/A
	CPTFM0000	12.4	N/A
SHFB Location	CPTGA0000	6.0	N/A
	CPTGB0000	6.1	N/A
	CPTGC0000	6.1	N/A
	CPTGD0000	6.0	N/A
SHFC Location	CPTCA0000	6.0	N/A
	CPTCB0000	6.1	N/A
	CPTCC0000	6.1	N/A
	CPTCD0000	6.0	N/A
	CPTCE0000	6.0	N/A
Decontamination Pad	CPTDA0000	6.1	N/A
	CPTDB0000	6.0	N/A
	CPTDC0000	6.6	N/A
	CPTDD0000	6.0	N/A
	CPTDE0000	6.1	N/A
	CPTDF0000	6.9	N/A
	CPTDG0000	6.1	N/A
	CPTDH0000	6.1	N/A
	CPTDI0000	6.1	N/A
	CPTDJ0000	6.7	N/A
USGS-4 and -8	CPTHA0000	7.0	N/A
	CPTHB0000	6.1	N/A
	CPTHC0000	6.1	N/A
	CPTHD0000	6.1	N/A
	CPTHE0000	6.0	N/A
	CPTHF0000	6.1	N/A
	CPTHG0000	6.0	N/A
	CPTHH0000	6.2	N/A
	CPTHI0000	6.0	N/A
	CPTHJ0000	6.1	N/A
Contaminated Waste Dump	CPTIA0000	6.0	N/A
	CPTIB0000	6.0	N/A
	CPTIC0000	6.0	T
	CPTID0000	6.0	T
Road	CPTJA0000	6.0	N/A
Area 57	CPTKA0000	5.9	N/A
	CPTKB0000	6.0	N/A
Equipment Storage Area	CPTLA0000	7.0	N/A
	CPTLB0000	7.0	N/A
Fallout Plume	CPTMA0000	5.0	N/A
	CPTMB0000	6.0	N/A
	CPTMC0000	0.0	T
	CPTMD000	6.0	T

radiological site conditions. The salvage yard was the only AOC in which the CPT was used to collect soil for analyses other than radioanalysis (i.e., RCRA metals).

5.2.4 Direct-Push Soil Sampling

Direct-push activities were conducted between May 20 and June 12, 2002. This portion of the investigation included 16 drill pads and seven former operational areas were investigated with over 200 borings pushed and soil samples collected for radiological and/or chemical analyses. Additional soil samples were collected using direct-push methods at approximately six anomalies detected by either radiological and/or geophysical survey results. All borehole numbers with soil samples listed in Table E.1-1 (the master sample log) are direct push sample locations, with the exception of those beginning with the prefix "CPT" and those at the LRL-7 drill pad which were excavations.

The direct-push method of soil sample collection involves the use of a truck-mounted, direct push drill rig. Soil core was collected continuously from surface to total depth in clear, acetate sleeves located within the core sampler. The core sampler used was 4 ft in length with an inside diameter of 1.75 in. Upon removal of the sampler from the boring, the acetate sleeve was extracted and transferred from the driller to the sample collection team, where it was opened. Once opened, the core was screened for radioactivity using alpha and beta/gamma survey instruments and for VOCs using a PID. The contents of all sampling sleeves were inspected, and the physical features of the soil were described and logged. Depending on the results of the field screening and visual observations of the soils, a 1-ft interval was selected and sampled for the appropriate analyses.

A combination of biased and systematic sampling strategies were used based on field conditions and results of previous investigation results (e.g., geophysics survey). Section 4.7.4 of the Work Plan (NNSA/NV, 2002) describes the sampling strategies in more detail. The minimum number of sample intervals from each boring location was dependant on the results of the field screening and visual observations. If there was no indication of potential contamination, only one interval was selected for a confirmatory sample at the depth most likely to have been contaminated based on historical information. If soil conditions indicated potential contamination, a minimum of two samples were collected; one sample in the "contaminated" interval and one sample in a clean interval below the contaminated interval. Details regarding direct-push results are located in AOC-specific sections (Sections 7.0 through 11.0).

5.2.5 Excavation Activities and Sampling

Excavations were conducted intermittently during CPT and direct push activities. A backhoe was used to excavate areas to provide information on shallow subsurface anomalies identified by the geophysical investigation or sample locations inaccessible to the direct push rig. Ten anomalies detected by geophysical surveys were excavated. Excavations with soil sampling were conducted at the LRL-7/Coach drill pad because the anomaly locations were inaccessible to the direct-push rig. The backhoe was used to uncover sampling locations at the decontamination pad anomaly "C" to better locate and delineate the hydrocarbon contamination associated with a buried cement pad. The hydrocarbon contaminated soil was later removed by excavation and disposed of off site during May 2003. Details regarding excavation results are located in AOC-specific sections (Sections 7.0 through 11.0).

6.0 Vegetation Sampling

Thirty-six vegetation samples were collected and processed between April 1 and April 10, 2002. The objectives were to (1) characterize radionuclides (specifically Cs-137) in important range species for grazing cattle within site boundaries, and (2) provide information for estimation of radionuclide ingestion by range cattle as constituents of any ingestion pathway analysis. The samples were processed (dried and milled) on site and sent to an off-site laboratory for gamma spectroscopy analysis. The following sections describe the vegetation sampling effort and results.

6.1 Biological Setting

Vegetation of the Gnome Site is classified as Desert Grassland (Dick-Peddie, 1993). Range grasses, predominantly black grama (*Bouteloua eriopoda),* blue grama (*B.* gracilis), sand dropseed (*Sporobolus cryptandrus)*, and three-awn (*Aristada* spp.) are most important from the standpoint of livestock range, although the last species is the least palatable. These are mixed with shrubs such as honey mesquite (*Prosopis glandulosa)*, banana yucca (*Yucca baccata*), four-winged saltbush (*Atriplex canescens*), shinnery oak (*Quercus turbinella*), and various prickly pear cacti (*Opuntia spp.*).

Several small mammals are resident in the site environs, although no effort was made to sample them. Representative genera are small mice (*Peromyscus spp.*, *Onychomys sp.*), kangaroo rats (*Dipodomys spp.*), and woodrats (*Neotoma spp*.). Black-tailed jackrabbits (*Lepus californicus*) were common during sampling activities, and signs of cottontail rabbits (*Sylvilagus auduboni*) were observed. Tracks of mule deer (*Odocoileus hemionus*) and perhaps pronghorn (*Antilocapra americana*) were encountered in sample plots. Domestic range cattle (*Bos* spp.) are common residents within the site during grazing periods established by the U.S. Department of the Interior, Bureau of Land Management (BLM) based upon forage conditions. The grazing has a significant impact upon the vegetative communities. BLM records indicate that quantity of livestock on Gnome pasture (640 acres) has varied from 15 to 35 animals. These animals usually grazed for periods of two weeks to six months under BLM recommendations (Daly, 2002). Desert bird communities were only encountered incidentally and not sampled. Species noted were mourning dove (*Zenaidura macroura*) and scaled quail (*Callipepla squamata*), both of which were previously sampled in 1972 by the EPA

(Smith and Giles, 1973). The roadrunner (*Geococcyx californianus*) was also noted but not sampled. No effort was made to record incidental observations. Reptile observations were restricted to unidentified lizards that were common throughout the area but not collected as part of the study.

6.2 Review of Historical Studies

Two sets of bioenvironmental sampling programs were conducted at the Gnome-Coach Site and were summarized in Appendix D of the Work Plan (NNSA/NV, 2002).

6.3 Reconnaissance of Site to Define Sampling Areas

Initial reconnaissance of the Gnome-Coach Site for purposes of initially designating vegetation sampling locations was conducted on December 18, 2000. The relative abundance of suitable vegetation was determined in relation to site features, especially the reported fallout plume trajectory (315°) (Allen, 1962) and control areas. Sampling areas were tentatively designated downwind on the Gnome test plume trajectory and two control areas were located upwind to the south and southeast of the Gnome shaft at distances of about 400 meters (m). Prime consideration was given to include sufficient stands of black grama (*B. eriopoda*) and sand dropseed (*S. cryptandrus*) grasses to assure sufficient biomass for gamma analysis. Those sample types were based upon communications with BLM personnel who have conducted livestock grazing studies on the Gnome Site since 1982 (Arnold, 2000).

6.4 Sampling Locations

The originally designated sampling areas within the Gnome fallout plume were relocated from an angle of 315° to an angle of 330° relative to the Gnome shaft following results of the March 25, 2002, driveover survey and associated soil sampling for Cs-137. Size and shape of sampling quadrats were dependent upon the presence and density of black grama (*B. eriopoda*) and sand dropseed (*S. cryptandrus*) grasses in sufficient stands to provide the required biomass for analysis and archiving (in the event of needed duplicate analyses). Due to the open, scattered nature of grass plants and impacts of cattle grazing, survey (general area) sampling methods were employed rather than inventory (biomass per m^2) sampling procedures.

6.4.1 Fallout Plume

Six quadrats were located along the centerline of the Gnome fallout plume beginning at 207 m from the Gnome shaft and extending out to 382 m from the shaft (Figure 6-1). Soil sampling associated with the driveover survey found six locations appreciably above a driveover background of approximately 175 cps at which Cs-137 concentrations in soils ranged from 5.3 pCi/g about 33 m from the shaft to 67.5 pCi/g at 395 m on a nearly straight line of 330°. Four vegetation sampling quadrats, designated VSA-1 through VSA-4, straddled that line, beginning 207 m from the shaft and proceeded out to 382 m, about 13 m from the highest value. Two additional quadrats, VSA-5 and VSA-6, were located adjacent to, and on each side, of the VSA-4 quadrat to form a T-shaped sampling scheme to ensure detection of variable Cs-137 deposition over the area.

6.4.2 Control Areas

Six quadrats were located in two separate locations upwind from the December 10, 1961, Gnome plume (Figure 6-2). The primary control area consisted of three quadrats (VBA-1 through VBA-3) located 330 m from the shaft at a bearing of 125°. The secondary control area (also of three quadrats [VBA-4 through VBA-6]) was located 330 m from the shaft, at a bearing of 160°.

6.5 Sample Collection

Quadrats were selected within representative stands of *B. eriopoda, S. cryptandrus,* or mixed stands of both species and outlined with plastic traffic pylons, the areas of size and shape dependent on plant densities necessary to provide sufficient biomass. Size and shape of the polygons from which the samples were taken varied, due to effects of cattle grazing and the natural habitat responses of the grasses. Polygon areas varied from 1,150 to 1,660 m^2. Locations of quadrat corners were mapped using global positioning system (GPS) technology. Primary control quadrats were located and sampled first, followed by secondary control quadrats, and finally the plume (or study) quadrats. Two persons independently used pruning shears to clip selected plants about 2 in. above the ground surface to avoid including inordinate amounts of soil in the samples. Clipped vegetation was placed in 2-gallon plastic bags until 2.0-3.3 pounds (lbs) of standing vegetation were obtained. This method yielded two independent groups of three samples each from each quadrat. Upon the completion of sampling at each quadrat, samples were weighed by spring scale and returned to the field laboratory

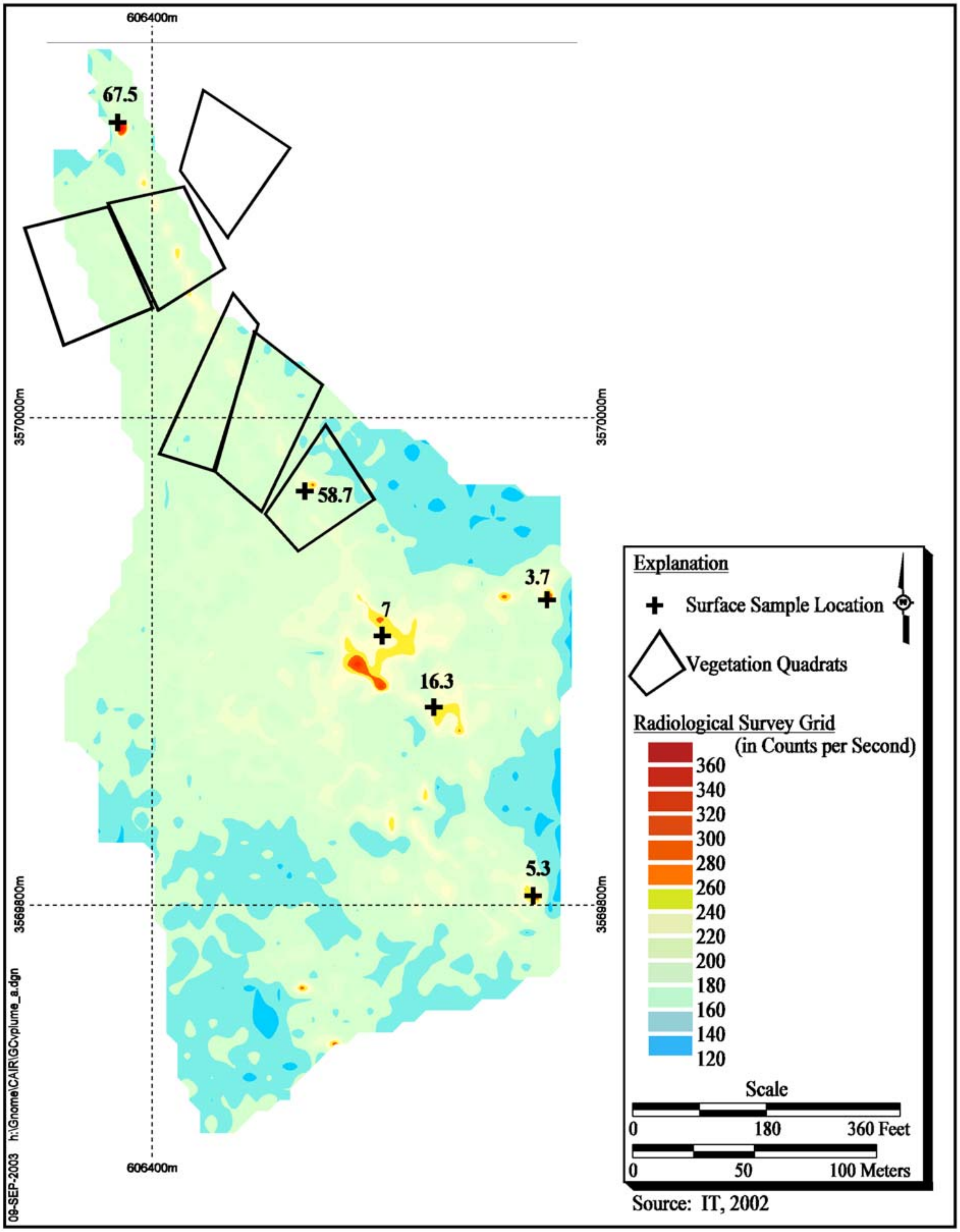


Figure 6-1
Vegetation Plume Quadrats at Gnome-Coach Site

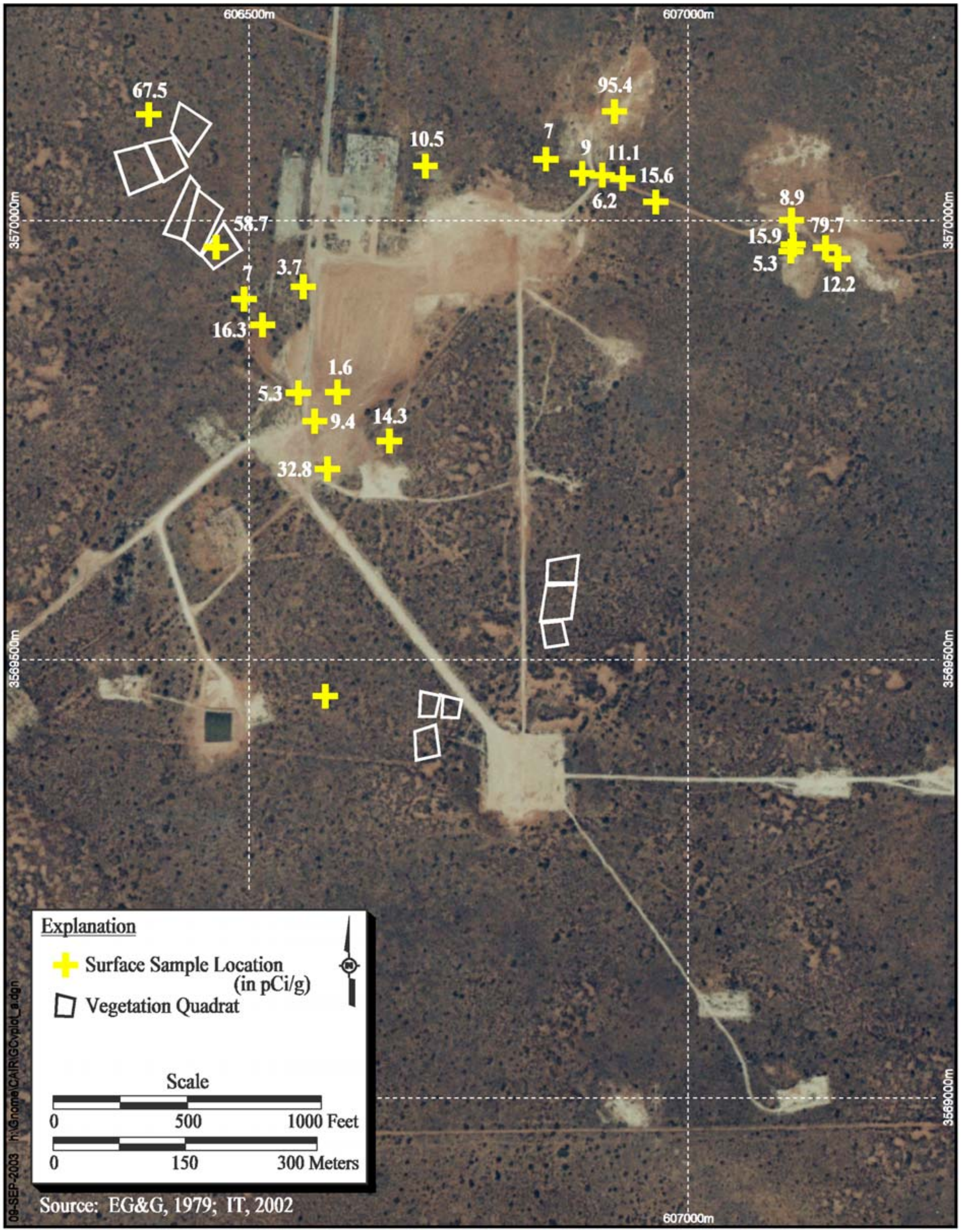


Figure 6-2
Vegetation Plots at Gnome-Coach Site

at appropriate times. Samples were weighed again, labeled, and placed in secure storage until processed. Samples VBA1A-C and VBA5A through VBA6C were collected from *S. cryptandrus* stands; VBA2A through VBA4C were mixed *S. cryptandrus/B. eriopoda*; and VSA1A through VSA6C (all plume quadrats) were *B. eriopoda*. Essentially pure samples of *S. cryptandrus* (n = 9) weighed 515 ± 72 grams (g) (1.1 ± 0.16 lb); *B. eriopoda* samples (n = 18) weighed 425 ± 66 g (0.94 ± 0.15 lb); and samples of combined species (n = 8) weighed 546 ± 79 g (1.2 ± 0.17 lb) before being dried.

6.6 Sample Preparation

Drying of the vegetation samples was accomplished by placing them in a thermostatically-controlled drying oven at 100 degrees Celsius (ºC) for periods of either 7 to 8 hours (hr) or 15 to 19 hrs, depending on the field schedule. Moisture loss was essentially independent of drying time or plant species, and was consistently 13 to 14 percent of sample wet weight. This indicated that samples were of past season's growth and contained little or no fresh vegetation. Three dried independent samples from each quadrat were randomly selected and milled (with a Wiley mill) to pass a 2 millimeter (mm) screen; the other three samples were archived until all analytical procedures were completed and satisfactory. Milled samples were compacted into tared 500 milliliter (mL) Marinelli beakers, weighed, all pertinent sampling data were recorded, and the beakers were sealed with custody tape. Plume quadrats (VSA1 to VSA6) samples (n = 18) (essentially pure *B. eriopoda*) weighed 194.2 ± 2.8 (standard error [SE]) grams (g) (0.43 ± 0.006 lb); control quadrats samples VBA1 and VBA5 and VBA6 (n = 9) were essentially pure *S. cryptandrus* and weighed 140.8 ± 7.6 (SE) g (0.31 ± 0.02lb), compared to 155.7 ± 9.5 (SE) g (0.34 ± 0.02lb) for a mixture of *S. cryptandrus* and *B. eriopoda* in quadrats VBA2 to VBA4. This difference is significant ($P<0.001$) and resulted in samples of *B. eriopoda* being more easily compacted. Five duplicate samples (14 percent of total samples) were randomly included in the analyses. Excess milled material was archived along with the unprocessed second independent sample until final analytical results were received, reviewed, and accepted.

6.6.1 Radiochemical Analyses

Vegetation samples were analyzed for Cs-137 by Paragon Analytics Laboratory in Fort Collins, Colorado, using conventional hyperpure germanium coaxial detectors to perform gamma-ray analyses, consistent with DOE-EML 300 procedures. Samples were counted for 300 to 1,000 minutes, corrected for background, and Cs-137 concentrations were calculated on the dried biomass. Detection limit was 36 ± 1 femtocuries per gram (fCi/g). Duplicate counts were performed on 5 of the 36 samples (14 percent) and two blanks were counted after all vegetation analyses were completed.

6.7 Results

A summary table listing the vegetation sample numbers, locations, and analytical results is provided in Table 6-1.

6.7.1 Control Areas

Primary control area (VBA1A to VBA3C) and secondary control area (VBA4A to VBA6C) samples (n = 18) were consistently below the detection limits of 33 ± 1.0 and 26 ± 2.0 (mean ± SE) fCi/g obtained for the two areas. These results indicate that the control areas were properly located out of the plume trajectory of contamination.

6.7.2 Fallout Plume Areas

Vegetation samples from quadrats in the downwind trajectory of Gnome contamination (Figure 6-1) were greater in Cs-137 content than any of those from control locations. No consistent trend with distance from the Gnome shaft was found, suggesting that Cs-137 was randomly deposited over the landscape during the surges of escaping gases noted by observers of the test. Cesium-137 concentrations in samples (all *B. eriopoda*) from the various quadrats are shown in Table 6-2.

These results demonstrate the variable Cs-137 concentrations in vegetation within the Gnome plume due to meteorological influences. Arranging the 18 individual values in ascending numerical order provides a means of determining the median value, which is a robust measure of central tendency often used in evaluating variable data. In this case, there are nine values above and nine below the median and indicate the grouping of values in the lower strata.

Table 6-1
Vegetation Sample Locations, Types, and Analyses

Sample Number	Site Feature	Sample Matrix	Analyses	Result (pCi/g)
VBA1A	Secondary Control Area	Vegetation	Cs-137	ND
VBA1B		Vegetation	Cs-137	ND
VBA1C		Vegetation	Cs-137	ND
VBA2A		Vegetation	Cs-137	ND
VBA2B		Vegetation	Cs-137	ND
VBA2C		Vegetation	Cs-137	ND
VBA3A		Vegetation	Cs-137	ND
VBA3B		Vegetation	Cs-137	ND
VBA3C		Vegetation	Cs-137	ND
VBA4A	Primary Control Area	Vegetation	Cs-137	ND
VBA4B		Vegetation	Cs-137	ND
VBA4C		Vegetation	Cs-137	ND
VBA5A		Vegetation	Cs-137	ND
VBA5B		Vegetation	Cs-137	ND
VBA5C		Vegetation	Cs-137	ND
VBA6A		Vegetation	Cs-137	ND
VBA6B		Vegetation	Cs-137	ND
VBA6C		Vegetation	Cs-137	ND
VSA1A	Fallout Plume Area	Vegetation	Cs-137	0.114 ± 0.035
VSA1B		Vegetation	Cs-137	0.084 ± 0.026
VSA1C		Vegetation	Cs-137	0.534 ± 0.1
VSA2A		Vegetation	Cs-137	0.215 ± 0.05
VSA2B		Vegetation	Cs-137	0.116 ± 0.035
VSA2C		Vegetation	Cs-137	0.12 ± 0.04
VSA3A		Vegetation	Cs-137	0.115 ± 0.042
VSA3B		Vegetation	Cs-137	0.273 ± 0.059
VSA3C		Vegetation	Cs-137	0.57 ± 0.11
VSA4A		Vegetation	Cs-137	0.222 ± 0.052
VSA4B		Vegetation	Cs-137	0.096 ± 0.033
VSA4C		Vegetation	Cs-137	0.13 ± 0.039
VSA5A		Vegetation	Cs-137	0.092 ± 0.034
VSA5B	Fallout Plume Area	Vegetation	Cs-137	0.082 ± 0.03
VSA5C		Vegetation	Cs-137	0.1 ± 0.037
VSA6A		Vegetation	Cs-137	0.306 ± 0.065
VSA6B		Vegetation	Cs-137	0.263 ± 0.064
VSA6C		Vegetation	Cs-137	0.15 ± 0.043
VBA7A*	Fallout Plume Area	Vegetation	Cs-137	0.119 ± 0.033

Notes:
* These samples are field duplicates.
ND = Not detected above minimum detectable concentrations.
Cs-137 = Gamma spectroscopy performed with only Cs-137 reported.

Table 6-2
Cs-137 Mean Concentrations for Plume Quadrats

Quadrat	No.	Cs-137 fCi/g Mean ± SE
VSA-1	3	244 ± 145
VSA-2	3	150 ± 32
VSA-3	3	320 ± 133
VSA-4	3	149 ± 38
VSA-5	3	91 ± 5.2
VSA-6	3	240 ± 47
Total Number of Samples	18	
Median		130 fCi/g

Cesium-137 concentrations in Gnome plume vegetation samples in quadrats located at various distances from the base of the T-shaped sampling scheme. Quadrat VSA-1 was at the base of the T and about 207 m from the Gnome shaft; other quadrats were irregularly spaced out to 382 m on a 330° bearing from the shaft (plume origin).

6.8 Discussion

These results provide the only systematic collection of data on Cs-137 concentrations in range vegetation of the Gnome-Coach Site since the release of contamination from the 1961 test. Previous measurements of radionuclides in plant samples of the area were much broader in scope, as in the 1978 sampling (DOE/NV, 1978) of a wide variety of vegetative types with very limited replication, or the inconclusive results from the EPA study (Smith and Giles, 1973) in which sampling and counting methods provided no Cs-137 values, apparently because of small sample sizes and incomplete sample preparation. Similarly, the results from the 1999 rangeland vegetation sampling at the Waste Isolation Pilot Plant (WIPP) Site (DOE, 2000) were all less than the minimum detectable concentration (MDC), presumably because of the sample preparation methods that used coarse (2.5 to 5-centimeter [cm] segments), air-dried at room temperature, aliquots for analysis. Our procedure of drying samples at 100°C for 7 to 18 hr and milling to 2 mm provided more compact and uniform samples for analyses that yielded consistent, positive results. Converting the 1999 WIPP site Cs-137 values in vegetation [mean (4) = 6.8225 x 10^{-3} Becquerel (Bq/g) wet wt = 180 fCi/g wet wt, or 209 fCi/g dry wt] and corrected for radioactive decay ($e^{-\lambda t}$ = 0.93), a mean value of 195 fCi/g dry weight during 2002 is indicated and compares well with our values for vegetation samples from the plume quadrats. Whether this agreement of values is due to our more sensitive analytical method or deposition of Cs-137 on WIPP environs by passage of the airborne plume vented from the Gnome test is conjectural. The WIPP area is within the envelope of estimated contamination during the first 24 hours following the test (Allen, 1962).

A major objective of the Gnome vegetation sampling exercise was to obtain current, accurate values of Cs-137 in forage for range cattle and for subsequent modeling of Cs-137 transport through the Gnome ecosystem to man. Information from BLM (Daly, 2002) indicates 3,500 lbs of *B. eriopoda*; 13,700 lbs of *S. cryptandrus* and other dropseed species; and 69,850 lbs of grass species are produced annually within the Gnome site. Based on an allowable 45 percent utilization, these values yield 1,575 lbs of *B. eriopoda*; 6,165 lbs of *S. cryptandrus* and other dropseed species; and 31,432 lbs of grass are annually available to cattle. These numbers are subject to change due to environmental factors, particularly grazing pressure and seasonal precipitation. An applicable model (PATHWAY) for the current Gnome-Coach effort (Kirchner and Whicker 1984; Whicker et al., 1990) assumes 37.4 lbs per day ingestion rate of dry vegetation for grazing animals and provides values for other essential parameters. The BLM assumes 18.3 lbs forage (grass only) consumption per day; they consider the PATHWAY estimate to be applicable if cattle on the Gnome Site are eating grasses, shrubs (especially mesquite *Prosopis glandulosa*, four-winged saltbush *Atriplex canescens*, some shinnery oak *Quercus harvardii*), and herbaceous plants (forbs) in their diet. The shrubs and forbs were not sampled in this effort but are expected to contribute negligible amounts of Cs-137 to the diet, so that a dietary intake based on our measurements of Cs-137 in *B. eriopoda* and *S. cryptandrus* would be a conservative estimate of exposure.

6.9 Conclusions

The vegetation sampling program verified the northwest (NW) (330°) trajectory of the plume of contamination that resulted from venting of the Gnome test and variable deposition of Cs-137 on surrounding environs, as indicated by the driveover radiological survey conducted just prior to the vegetation sampling program. The Cs-137 concentrations in important range forage grasses *Bouteloua* e*riopoda* and *Sporobolus cryptandrus* were below analytical detectable limits (36 ± 9 fCi/g dry weight) in 18 control samples collected in six quadrats in two areas sited 1,006 ft from the shaft upwind (south and southeast) of the Gnome shaft. Detectable Cs-137 concentrations were found in 18 study samples collected in six quadrats in a T-shape in the downwind track of the Gnome plume. Values (mean ± SE) ranged from 91 ± 5.2 to 320 ± 133 fCi/g dry weight, with a median value of 130 fCi/g, illustrating the variable deposition of Cs-137 during the several surges of contamination observed immediately after the Gnome test.

7.0 Waste Dump and Salvage Yard Investigation

This section describes the field investigation activities associated with the CWD and salvage yard present at the Gnome-Coach Site. The road connecting these two former operational areas (ROAD) is also included in this section because of its geographic proximity. Primary objectives of the field investigation were to verify historical radiological results for the surface, provide information on remaining buried debris, and determine if any potentially hazardous waste is present at the salvage yard.

Table 7-1 is a summary of the results and types of investigation techniques conducted for the CWD and salvage yard investigation. Results for each field technique are described in further detail in the following sections.

7.1 Radiological Driveover Results

The CWD, salvage yard, and the ROAD are combined into one area for the purposes of discussing radiological driveover results. Results show gamma levels at or near background with the exceptions of several small, isolated elevated areas referred to as "hot spots." These isolated areas are concentrated mostly along the edges of the CWD access road and the ROAD between the CWD and the salvage yard (referred to as the salvage yard road in Appendix A). The contamination is consistent with historical information that trucks and/or conveyors hauled contaminated debris along the road and subsequently material spilled over the edges onto the ground. There are two additional isolated locations with elevated gamma measurements located downgradient of the ROAD, and are interpreted as possible migration of contaminants along a drainage that lies at the edge of the LRL-2 drill pad.

The highest elevated gamma measurement identified by the driveover survey is located within the historical footprint of the salvage yard and referred to as the "Salvage Yard Hot Spot-SAY0001" (Table A.2-2). The defined area for this "hot spot" is approximately 530 m^2 with a maximum count rate of 749 cps (background levels are around 175 cps for the Gnome Site). For comparison to soil cleanup guidelines, conversion of driveover data from cps to pCi/g for this area results in a mean Cs-137 concentration of approximately 5.82 pCi/g and a maximum concentration of 93.85 pCi/g.

Table 7-1
Summary of Field Investigation for Salvage Yard and Contaminated Waste Dump

Unique Identifier	How Feature was identified	Summary of Geophysical Results	Summary of Borehole Observations	Summary of Radiological Driveover	Summary of CPT *In Situ* Results	Summary of Excavation Results	Summary of Analytical Results
Contaminated Waste Dump	Historical data and geophysics	EM-31 shows 2 lobes of increased conductivity interpreted as main areas of CWD; EM-31/-61 data indicate metallic material randomly distributed within area of CWD	NA	Small, isolated areas of elevated readings mostly along road access	Survey indicates elevated driveover readings confined to the surface	NA	Cs-137 not above PAL[a]
Salvage Yard	Historical data and geophysics	EM-31 shows area of conductivity which corresponds to EM-31/-61 magnetic anomaly interpreted to represent organized buried material	NA	One isolated surface area with highest elevated readings found on site	Survey indicates shallow subsurface elevated gamma present west of buried material to depth of 3 to 4 ft bgs; elevated driveover readings at SAYA0001 location confined to the surface	Nonhazardous debris and metal scrap identified to depth of ~3 ft	Cs-137 not above PAL Arsenic above PAL but not statistically different than background
Road	Historical data and current site conditions	See CWD and salvage yard summaries	NA	Several elevated areas along both lengths of road	Survey indicates elevated driveover readings confined to the surface	NA	Cs-137 not above PAL

[a]The PAL/soil guideline is risk-based concentration based on HHRA

NA = Not applicable

Gamma spectroscopy analysis on a soil sample confirms this area has the highest Cs-137 concentration for the Gnome-Coach surface at 95.4 pCi/g. This "hot spot" is located south of the debris identified by geophysics. The larger area encompassing the salvage yard and CWD that is defined for the risk assessment has an area of approximately 60,000 m^2. This area has a mean Cs-137 concentration of 1.24 pCi/g and a maximum Cs-137 concentration of 93.85 pCi/g based on converted driveover data.

Eleven surface soil samples were collected within the footprints of the salvage yard, CWD, and the ROAD immediately following the driveover survey. The sample locations were selected with a bias towards the highest DLAPS counts. All hot spots indicate scattered radionuclides within the soil rather than discrete, easily removable material. Although only two samples were required by the Work Plan, the additional samples were collected to provide correlation data with the radiological driveover results. See Appendix A for additional details regarding statistical analysis of radiological data for the salvage yard, ROAD footprints, and associated "hot spots."

7.2 Geophysical Results

The purpose of the geophysical investigation was to delineate boundaries and identify any remaining buried metallic debris. Figures 15, 16, and 17 in Appendix D depict the results of the EM-31 conductivity, EM-31 inphase, and EM-61-MK2 respectively for the salvage yard. The salvage yard geophysics identified an anomaly interpreted as representing shallow buried debris/material in a rectangular form. The EM-31 quadrature phase data identified a conductivity anomaly just north of the LRL-2 drill pad area. The EM-31 inphase data indicates several disjoint anomalous magnetic susceptibility areas in the same area. An EM-61-MK2 survey was also conducted to detail the anomalies with elevated magnetic susceptibility. The data indicates significant responses in the area with the smaller features measuring about 2 m wide by 3 m long. The EM-61-MK2 data indicates that the material is near surface and the blocky nature of the features suggest well-organized buried material.

Figures 18, 19, and 20 in Appendix D depict the results of the EM-31 conductivity, EM-31 inphase, and EM-61-MK2 respectively for the CWD. The EM-31 quadrature data indicate two lobes of increased conductivity where the lobe with the highest conductivities is interpreted to represent the most significant area of the CWD. Randomly distributed metallic materials are interpreted to exist within the near surface waste materials with the bulk of the metallic materials deeper based on the EM-31 inphase data. An EM-61-MK2 survey was conducted to detail the magnetic anomalies. This data indicates an irregular pattern of metallic materials randomly distributed within the landfill area.

7.3 CPT In Situ Investigation Results

The CPT *in situ* technology was used to investigate the salvage yard and isolated locations at the CWD and the ROAD between the CWD and salvage yard. At the salvage yard, the CPT rig was used to conduct *in situ* gamma surveys to investigate potential radiological levels prior to sending in the backhoe for excavation of the in-phase anomaly. At the same time, the CPT was also utilized to collect soil samples for both gamma and metals analysis. A systematic grid pattern was overlain on the geophysical anomaly footprint with eight initial push locations marked. These locations were followed as closely as feasible based on field conditions. Some locations were adjusted to avoid setting on the slope of the caliche ridge located on the eastern edge of the anomaly. When possible, the CPT rig pushed to 12 ft bgs. Push designations CPTBA through CPTBI represent the initial pushes within the grid pattern. Elevated gamma readings were encountered in two general areas of the Salvage Yard. The southwest corner of the geophysical anomaly (CPTBE) showed elevated gamma counts of about 350 cps around 1.0 ft bgs. An excavation through this area indicates little to no buried debris. Step-outs CPTBJ to L were pushed to bound the elevated gamma. Surveys along the eastern length of the caliche ridge near an open pit (CPTBG, H, and I) indicate elevated gamma of about 300 to 400 cps at depths ranging from 2.5 to 4.5 ft bgs. Stepouts CPTBM to P were pushed to bound the subsurface elevated gamma on the caliche ridge. Based on CPT, data it appears that lateral extent of elevated subsurface gamma contamination coincides with the approximate boundary of disturbed ground as identified through geophysical survey data. The vertical extent of elevated gamma is confined to within 5.0 ft bgs. These depths are consistent with the approximate depths of buried material still remaining at the site and data from previous sampling efforts during the 1979 restoration effort. The depths of soil collection for gamma and metals analyses were biased based on field conditions (e.g., elevated field screening levels or depth of refusal).

In situ subsurface surveys with the CPT were conducted at the road access to the CWD and between the CWD and the salvage yard for the purpose of determining vertical extent of the surface contamination detected by the driveover survey. Push CPTJA0000 was pushed along the east side of the road and is considered representative of the other isolated, elevated surface gamma measurements that exist along both sides of the road. Pushes CPTIA to D were pushed around the road access to the CWD at areas with elevated surface gamma measurements as detected by the driveover surveys. The CPT results at all these locations indicate elevated gamma measurements are confined to the surface (< 6 in.). It was observed that the tip of the gamma probe would spike prior to entering the ground surface but results within the shallow subsurface soil (> 6 in.) would drop immediately to background. Because of this phenomenon, elevated gamma counts could not be collected and recorded at the surface. Two confirmatory shallow subsurface samples were also collected in the CWD area as required by the Work Plan (CPTIC0305 and CPTID0608) biased towards subsurface CPT gamma readings at background levels.

7.4 Direct-Push Results

Direct-push technology was not utilized at these sites. Soil samples were collected with the CPT (see Section 7.3).

7.5 Excavation Results

Trenches were excavated at the salvage yard centered on EM-31/-61 geophysical anomalies (see Figures 16 and 17 in Appendix D). One trench was excavated at the northwest EM-31 anomalies. A second trench was excavated to investigate the southwestern anomaly. Trench depths averaged about 3 to 4 ft bgs. Results of the northern excavation confirmed scrap metal and debris remains buried at the salvage yard. The southern trench did not encounter metal debris. Since the presence of buried debris correlates with the EM-31and EM-61 geophysical footprint, two trenches were deemed adequate in defining the anomaly. Visual observations indicate possible burned organic material within the burial area; however, no soil staining was visible. There were no elevated radiological field screening results on the soil or debris within the excavations. This is consistent with the data from CPT pushes conducted in the same area. Figure 7-1 is a photo depicting typical debris found in the salvage yard.

There were no excavations conducted at the CWD or ROAD.

Figure 7-1
Excavation at the Salvage Yard (Photos taken May 2, 2002)

7.6 Summary of Radiological Analytical Results

A total of 11 surface samples and 18 shallow subsurface samples were collected between the salvage yard, the CWD and the ROAD. Sixteen of the 18 shallow subsurface samples were collected from the salvage yard. The samples were analyzed on site for gamma spectroscopy. All positive detections for Cs-137 and other isotopes associated with gamma spectroscopy analysis (but not considered COPCs) are provided in Appendix E (Tables E.1-2 and E.1-3) (e.g., potassium-40). None of the analytical results are above the established risk-based soil cleanup guideline of 167 pCi/g for Cs-137 (maximum concentration is 95.4 pCi/g at SAYA0001). Results of on-site gamma spectroscopy analysis on the two subsurface soil samples from the CWD were both nondetects for Cs-137.

One surface sample, SAYB0001, was submitted to an off-site laboratory for confirmatory isotopic plutonium analysis. Pu-239 was detected at 0.028 pCi/g which is consistent with background levels.

7.7 Summary of Chemical Analytical Results

A total of 10 shallow subsurface soil samples were collected and analyzed for Total RCRA metals analysis at the salvage yard as required by the Work Plan. Results in Table 7-2 show several samples with concentrations of arsenic above Region 9 PRGs. However, these concentrations are not statistically different than background in the state of New Mexico.

Table 7-2
Soil Above PALs

Sample Identification Number	Depth (ft bgs)	Contaminants of Potential Concern
		Arsenic
Preliminary Action Levels		**2.7 mg/kg**[a]
CPTBA0708	7 - 8	4
CPTBB0608	6 - 8	4
CPTBG0507	5 - 7	10
CPTBH0608	6 - 8	3.1
CPTBI0811	8 - 11	3.4
CPTBI0101	Duplicate of CPTBI0811	4.1

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 1999)

8.0 Surface Ground Zero Investigation

This section describes the field investigation activities associated with the following AOCs:

- Surface ground zero (SGZ)
- Evaporation pond/tank
- Area 57
- Salt muckpile
- Old laundry/lab
- Decontamination pad
- Warehouse Area

These areas are discussed together in this section because of geographic proximity and/or they were operationally linked to SGZ. Primary objectives of the field investigation were to verify historical radiological results for the surface and shallow subsurface (where necessary), provide general geophysical data, and determine if any potentially radioactive and/or hazardous waste is present.

Table 8-1 is a summary of the results and types of investigation techniques conducted for the SGZ and vicinity. Results for each field technique are described in further detail in the following sections.

8.1 Radiological Driveover Results

The historical AOCs of SGZ, evaporation pond/tank, and Area 57 were combined for the purpose of calculating a surface radiological concentration for Cs-137. The old laundry/lab and decontamination pad were combined with the salt muckpile. The warehouse pad remains as a separate area for the purpose of calculating radiological driveover results. Plate 1 shows that gamma measurements of these specific areas are at or near background levels with the exception of a hot spot location (about 663 m^2 in size) at the Area 57 historical sampling area. Gamma spectroscopy analysis on a soil sample confirmed Cs-137 concentrations around 11 pCi/g for the surface; the maximum concentration based on conversion of driveover results is 14.4 pCi/g. This hot spot is located in a relatively low, flat area where no historical subsurface activities were known to have occurred; however, the contamination may be a result of runoff during historical operations. The hot spot indicates scattered radionuclides within the soil rather than discrete, easily removable material. The 1979 historical AOC referred to as the crusher plant was in the general vicinity of SGZ,

Table 8-1
Summary of Field Investigation for Surface Ground Zero and Vicinity
(Page 1 of 2)

Unique Identifier	How Feature was Identified	Summary of Geophysical Results	Summary of Borehole Observation	Summary of Radiological Driveover	Summary of CPT *In Situ* Results	Summary of Excavation Results	Summary of Analytical Results
Surface Ground Zero	Historical data and current site conditions (i.e., monument and Well DD-1)	EM-31 increased conductivity and magnetic susceptibility at monument and historical area of abandoned well casing Conductivity anomaly "Unknown D" with scattered metallic materials possibly related to surface ground zero operations	No biasing factors identified in soil	Survey shows gamma at or near background levels	NA	NA	Arsenic above PAL but not statistically different than background
Evaporation Pond/Tank	Historical data and geophysics	EM-31 conductivity data identified two anomalies interpreted to represent the historic areas of the pond and waste tank EM-61 data indicates possible buried metallic material in "Pond A" anomaly	NA	Survey shows gamma at or near background levels	NA	Backfilled soil encountered, no metallic debris	NA
Area 57	Historical data and radiological driveover survey	No geophysical anomaly identified	NA	Few spots with elevated gamma measurements	Survey indicates elevated gamma confined to surface	NA	Cs-137 not above PAL
Warehouse Pad	Historical data and geophysics	EM-31 data mapped visible, reinforced concrete pad EM-31 data shows two additional anomalies with possible buried materials, the northern anomaly "2" interpreted as historically excavated scrap metal location	No biasing factors identified in soil	Survey shows gamma at or near background levels	NA	Anomaly "1" excavated and found small metal debris on surface	Arsenic above PAL but not statistically different than background

Table 8-1
Summary of Field Investigation for Surface Ground Zero and Vicinity
(Page 2 of 2)

Unique Identifier	How Feature was Identified	Summary of Geophysical Results	Summary of Borehole Observation	Summary of Radiological Driveover	Summary of CPT *In Situ* Results	Summary of Excavation Results	Summary of Analytical Results
Salt Muckpile	Historical data and geophysics	Historical footprint of muckpile visible with strong magnetic and conductivity signatures Two electrical imaging (EI) traverses data show low resistivities in subsurface of muckpile footprint	NA	Survey shows gamma at or near background levels	Survey indicates presence of subsurface elevated gamma	NA	Cs-137 not above PAL
Decontamination pad	Historical data and geophysics	EM-31 conductivity data shows 4 anomalies in the general area of decon pad with only the fourth anomaly (Unknown C) having increased magnetic susceptibility Closest anomaly to SGZ interpreted as decon pad Anomalies "Unknown A and B" represent unknown site activities Anomaly "Unknown C" EM-31/-61 data indicates 3 distinct areas of buried material	No biasing factors identified in soil for the interpreted decon pad or Unknown "A" and "B" Unknown "C" has hydrocarbon staining and odors associated with buried concrete pad	Survey shows gamma at or near background levels	Survey indicates no subsurface elevated gamma at the decon pad	Unknown "C" has three distinct features with the largest identified as a cement pad with hydrocarbon contamination, the other two features are buried metal debris	Diesel above cleanup level of 2,200 parts per million (ppm) Arsenic above PAL but not statistically different than background
Old Laundry/Lab	Historical data and geophysics	EM-31 data and EI data confirmed presence and approximate dimension/configuration of buried salt trench	NA	Survey shows gamma at or near background levels	NA	NA	NA

NA = Not applicable

decontamination pad, and old laundry/lab where driveover results confirm that surface cleanup of radiological contamination was successful during the 1977 to 1979 restoration effort.

8.2 Geophysical Results

The geophysical survey was conducted to accomplish the following target-area specific objectives:

- Locate and delineate boundaries of the buried, uncontaminated salt trench at the old laundry/lab area
- Investigate the general area near SGZ to detect any unknown burial sites and unknown USTs or septic tanks.
- Map out identified buried utilities.

Figures 3, 4, and 5 in Appendix D depict the results of the EM-31 conductivity, EM-31 magnetic susceptibility, and EM-61-MK2, respectively, for SGZ and vicinity. The land area referred to as Area 57, located northwest of the former evaporation waste tank, was not originally scheduled for geophysical surveys. However, due to the proximity of Area 57 to other AOCs this area was surveyed. Results indicate no elevated conductivity or magnetic anomalies were detected. The following paragraphs summarize the geophysical results for the major areas of concern discussed in this section.

Surface Ground Zero

Several conductivity and magnetic anomalies were identified at and near SGZ. Unknown A, B, and C anomalies are discussed under the decontamination pad summary. A large area of elevated conductivity and magnetic susceptibility is present where the SGZ monument and Well DD-1 are present and may be attributed to the presence of below-ground casing of several abandoned wells. Southeast of SGZ is anomaly referred to Unknown D with elevated conductivity and magnetic susceptibility. An EM-61-MK2 survey conducted at Unknown D indicates large, deeper metallic materials in the vicinity of SGZ, with scattered smaller metallic materials elsewhere. Another conductivity anomaly is present due east of SGZ and is interpreted to be associated with LRL-1; therefore, it is discussed in Section 11.0.

Evaporation Pond/Waste Tank

Two areas of elevated conductivity are interpreted to represent the historically excavated and sampled areas of the evaporation pond and waste tank. Evaporation pond 'A' located west of SGZ represents the former area of the pond, while evaporation pond 'B' located northwest of SGZ represents the former area of the aboveground waste tank. Magnetic susceptibility surveys of both anomalies suggest metallic materials may be present within the elevated conductivity anomalies. EM-61-MK2 data at anomaly A identifies discrete (less than 2-meters across), buried metallic materials at the east end. Geophysical data do not show evidence of interpreted underground storage tanks or piping.

Decontamination Pad

A large elevated conductivity anomaly in the general area southwest of SGZ is interpreted to represent the decontamination pad. EM-31 inphase data in this same area shows no metallic material present. Further southwest beyond the interpreted decontamination pad are two conductivity anomalies (Unknown A and B). These anomalies are interpreted to represent unknown site activities which may have been used in conjunction with the decontamination pad, or for entirely different activities. There is no evidence of buried metallic materials at these locations. Just southeast of the interpreted decontamination pad, is another anomaly identified as Unknown C with both elevated conductivities and magnetic susceptibility. The EM-61-MK2 data at Unknown C indicate three distinct areas of deep subsurface metallic material estimated to range from 1 to 3 m in depth.

Old Laundry/Lab Facility

The buried, uncontaminated salt trench has been interpreted as present; however, the dimensions are different than historically reported based on EM-31 conductivity and magnetic susceptibility data. However, the overall volume of salt in the salt trench (10,300 cubic meters) identified through geophysical means is consistent with the trench volume (12,000 cubic meters) reported in historical documents (DOE/NV, 1981). The EM-31 inphase data show an increased response which interferes with identifying any discrete features that may be related to the old laundry/lab facility. In addition to the EM-31 surveys, two electrical imaging (EI) surveys were conducted on the salt trench anomaly. Figures 6 and 7 in Appendix D show the locations and results of the two EI surveys. The north/south line (EI-1) shows a lens of material with relatively consistent resistivities and is interpreted to be the salt trench with a width of about 59 ft and 9.8 ft thick. Another EI line was run east/west (EI-2) across the salt trench "extension" and results show the increased resistivity of the interpreted salt trench is absent. Therefore, the salt trench "extension" identified with the EM-31 data is anomalous and is interpreted not to be associated with the buried salt trench.

Salt Muckpile

The salt muckpile was not originally proposed as requiring geophysics based on historical process knowledge; however, it is discussed here because the strong responses identified during the surveys have an influence on interpretations of the shaft area. A large area where the former muckpile was historically located shows elevated conductivities and strong magnetic susceptibility (EM-31 data). The muckpile anomaly extends from north of the shaft through the old laundry/lab area (previously discussed in Section 8.3) and is approximately 578 ft in length, which is greater than historically reported lengths of about 450 ft. The width of this feature (east-west) is about 394 ft and is consistent with historical information. To evaluate the subsurface vertical characteristics of this feature, two electrical imaging traverses (EI-3 and EI-4) were acquired. Both traverses identified low resistivities in the subsurface in the area of the muckpile. The low resistivities of the muckpile are interpreted to be related to the presence of salts penetrating the subsurface sand formations. Traverse EI-4 encountered higher resistivities at the western end of the traverse. The depth of influence of low resistivity is interpreted to be 100 ft.

Warehouse Pad

The purpose of the geophysical investigation was to verify that all buried debris was removed. The reinforced concrete floor of the warehouse pad was mapped and accounts for the large conductivity and inphase anomaly. The EM-31 inphase data identified two discrete anomalous areas south and north of the pad (WAR1 and WAR2, respectively). These are interpreted to represent buried metallic debris. The EM-61-MK2 survey data indicate both anomalies may be buried at least 3 ft bgs. Warehouse anomaly 2 located north of the warehouse pad is interpreted as the area of historically excavated scrap metal and is consistent with areas of historical soil sampling.

8.3 CPT In Situ Investigation Results

CPT pushes were conducted at Area 57, the decontamination pad, and the salt muckpile. CPT *in situ* technology at the decontamination pad was originally proposed in the Work Plan to characterize the shallow subsurface for potential migration of radioactive decontamination fluids from the surface. The CPT boring locations for the pad were based on a systematic grid overlain on the EM-31 conductivity boundaries. Eight borings were pushed within the grid. An additional two pushes were located in a southwest direction leading towards conductivity Anomalies A and B (Figure 3 in Appendix D for locations of geophysical anomalies) to provide information on shallow subsurface soils between anomalous areas. *In situ* subsurface gamma measurements are at background; therefore, step-out borings were not required. Soil samples for gamma spectroscopy analysis were required at a minimum of four borings and were collected using direct push technology rather than the CPT. Details regarding these four samples are discussed in Section 8.4.

Area 57 was not initially proposed for CPT investigation but was added after the radiological driveover survey results confirmed elevated surface gamma measurements are present. Two CPT boring locations were biased within the footprint of the elevated gamma measurements. *In situ* data collected to depths of 6.0 ft showed that elevated gamma is confined to the surface (< 6 in.) at Area 57.

CPT *in situ* technology at the salt muckpile was proposed in the Work Plan to provide supplemental radiological data for the shallow subsurface based on a review of historical data. A minimum of eight pushes were conducted at the salt muckpile (CPTFA to M) as proposed in the Work Plan; additionally, step-out pushes were conducted within this area. Subsurface soil samples were collected at four locations at the salt muckpile to meet the requirements of the Work Plan. The sample locations were biased towards the two highest surface gamma measurements and two lower surface measurements.

8.4 Direct-Push Investigation Results

Direct-push technology was utilized at SGZ (anomaly unknown D), warehouse pad (anomaly 2), and the decontamination pad to collect shallow subsurface soil samples.

Warehouse Pad

Direct push was utilized to investigate the potential for radiological and/or hazardous waste contamination at the warehouse pad. Direct-push boring locations were based on a systematic grid pattern setup within boundaries established on historical sampling areas and geophysical survey results (e.g., EM-31 anomaly warehouse 2). A total of eight borings were pushed within the grid. Field observations indicate no chemical or radiological contamination so only one confirmatory sample was collected from each boring at depths where contamination would be most likely (i.e., 5 ft bgs). All the soil samples collected were analyzed for gamma spectroscopy and RCRA metals analyses.

Decontamination Pad

Direct push was utilized to investigate the potential for chemical contamination at the decon pad. The initial direct push boring locations for the decontamination pad were based on a systematic grid overlain on the geophysics EM-31 conductivity boundary. These locations coincided with the CPT borings conducted prior to direct push. Like the CPT, eight borings were pushed within the grid and samples collected for radiological and chemical analyses. Field observations indicate no chemical or radiological contamination; therefore, only one confirmatory sample was collected from each boring at a depth representative of expected contamination (i.e., 4 ft bgs).

Anomalies Unknown A and Unknown B southwest of the decontamination pad (Figure 3 in Appendix D) are not associated with any known historical operations; therefore, two additional borings were pushed at each anomaly to provide data on the potential for hazardous or radiological contamination. Field screening and observations indicate native soil with no evidence of contamination; therefore, one confirmatory sample was collected from each boring. Based on disturbed surface conditions, a test boring was selected to collect geological data. This boring was located just east of the boundary of Unknown A. Field observations indicate subsurface soil conditions similar to the rest of the boring locations. A sample was not collected at this location.

To characterize the hydrocarbon contamination associated with the buried concrete pad at Unknown C, the investigation consisted of two separate direct-push events, each of which followed an episode of excavation at this feature. Section 8.5 describes the excavation results conducted at this feature. The first direct-push event attempted to intercept the hydrocarbon contamination discovered during the first excavation event. After several unsuccessful pushes, one subsurface soil sample was collected near the assumed western end of the pad, below excavation depth. The decision was made to re-excavate the concrete pad prior to conducting additional borings. Once the excavation had determined the exact location of the pad and subsurface hydrocarbon contamination, the direct-push rig was brought in to bound the contamination both vertically and laterally. A total of five additional borings were conducted to bound contamination.

Surface Ground Zero

The SGZ location was investigated due to the Unknown D conductivity anomaly identified during geophysics. The anomaly investigation was treated similar to the investigation for potential mud pits; therefore, was limited to four test borings to identify if subsurface conditions warranted an extended investigation. The four boring locations were biased towards locations with increased magnetic susceptibility. Because the anomaly could have been a result of unknown historical subsurface activities, boring depths ranged from 16 to 20 ft bgs to ensure adequate investigation of the subsurface conditions. Boring logs indicate similar soil conditions encountered throughout the Gnome Site. Field observations at all four borings did not indicate potential contamination; therefore, one confirmatory subsurface soil sample was collected from each boring and submitted for full-suite analyses. The samples were collected at the 3- to 4-ft bgs interval. This depth is considered a reasonable interval based on process knowledge for the potential contamination from surface activities associated with ground zero activities.

8.5 Excavation Results

Trenches were excavated within the geophysical anomalies identified at the warehouse pad, evaporation pond/tank, and the anomaly Unknown C near the decon pad. One pothole trench was conducted at the warehouse anomaly 1 and found only small metallic debris and soil. The Site Supervisor decided not to excavate at warehouse anomaly 2 since the anomaly was being investigated with direct push, and metallic debris was anticipated for this area.

One trench was excavated at each of the anomalies identified at the evaporation pond/tank. Results indicate only soils at depth; therefore, no further investigation was conducted at the evaporation pond/tank locations.

Unknown anomaly C had three distinct features which were all excavated to identify the source of metallic readings (Figure 3 in Appendix D). The two smaller features were scrap metal debris found just below the surface with no indications of contamination (e.g., radiological field screening). An initial excavation on the westernmost feature encountered a concrete pad with associated hydrocarbon staining and odor. The excavation was halted at that time to bring in the direct push rig to bound contamination. However, direct push was unable to accurately locate the pad and soil; therefore, a second excavation was conducted to find the pad again and determine more exact direct push locations to bound contamination. The second excavation found the pad at about 18 in. bgs with approximate dimensions of 12 in. thick, 4 ft wide, and approximately 10 ft long. Elevated PID readings were encountered with hydrocarbon staining and odor. TPH field screening was not utilized at this location as field observations (e.g., odor, staining) were adequate in determining sample locations and intervals. One soil sample (DECQ0102) was collected within the excavation in the worst-case soil. The direct-push rig was utilized to bound contamination away from the concrete pad.

Two exploratory trenches were excavated within the area of the conductivity and magnetic anomaly associated with the salt muckpile. The objectives were to document shallow subsurface conditions and possibly determine the source of the strong anomalous geophysical responses. One trench was located in proximity to EI-3. Results indicated relatively undisturbed soil below 2 to 3 ft with light to moderate amounts of cementation.

8.6 Summary of Radiological Analytical Results

A total of 1 surface soil sample and 21 shallow subsurface soil samples were collected for radiological analysis. On-site gamma spectroscopy was conducted on the 21 shallow subsurface soil samples collected between SGZ, warehouse pad, decontamination pad, and the salt muckpile. Cs-137, the primary COC, was below detection limits for all 21 samples analyzed. All other positive detections for isotopes associated with gamma spectrometry analysis (but not considered COPCs) are provided in Appendix E (Tables E.1-2 and E.1-3) (e.g., potassium-40).

Surface sample A57A0001 was collected in the historical area referred to as Area 57 and analyzed on site by gamma spectroscopy to confirm driveover concentrations of Cs-137, the primary COPC. The Cs-137 result of 10.5 pCi/g is above background but below the soil cleanup guideline of 167 pCi/g for Cs-137. This sample was also sent to an off-site laboratory for isotopic plutonium analysis with a result of 0.06 pCi/g Pu-239, which is consistent with background levels at the Gnome-Coach Site.

8.7 Summary of Chemical Analytical Results

A total of 38 shallow subsurface samples were analyzed for a variety of chemical constituents between the warehouses pad, SGZ, and the decontamination pad. Only arsenic and TPH-DRO were detected above PALs and are listed in Table 8-2. The highest concentration of TPH-DRO

(DECQ0102) is associated with the buried concrete pad at anomaly Unknown C. This level is above the NMED soil cleanup guideline of 2,200 milligrams per kilogram (mg/kg) TPH-DRO (NMED, 2002). The hydrocarbon contamination was bounded vertically with sample DECQ0708, and laterally with samples DECR0708, DECS0708, and DECT0708 in which TPH-diesel was undetected.

Metals analysis show some arsenic concentrations above PALs at all three sampled AOCs; however, statistics show the levels of arsenic are not statistically different than background in the state of New Mexico. There were no detections of VOCs, SVOCs, or TPH-GRO above PALs within the sampled areas discussed in this section.

Table 8-2
Soil Above PALs

Sample Identification Number	Depth (ft bgs)	Contaminants of Potential Concern	
		Arsenic (mg/kg)	DRO (mg/kg)
Preliminary Action Levels		**2.7**[a]	**2,200**[b]
WARH0506	5 - 6	2.9	ND
WARG0506	5 - 6	2.7	ND
WARF0506	5 - 6	2.7	ND
WARE0506	5 - 6	3.1	ND
SGZC0304	3 - 4	2.7	ND
SGZB0304	3 - 4	3	ND
DECJ0304	3 - 4	2.7	ND
DECF0304	3 - 4	2.7	ND
DECA0304	3 - 4	2.7	ND
DECQ0102	1 - 2	2.9	12,000

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 1999)
[b]Based on agreement with New Mexico Environment Department (Wycoff, 2003)

mg/kg = Milligrams per kilogram
ND = Not detected above minimum reporting limits

8.8 Supplemental Field Activities

Based on sample diesel results of DECQ0102, remobilization occurred May 19 through 23, 2003, to conduct supplemental field activities consisting of excavation and soil removal at the decontamination pad anomaly C. Soil contaminated with diesel above the 2,200 mg/kg NMED cleanup level found during initial investigation activities was removed, containerized, and shipped off site as nonhazardous solid waste. Confirmation soil samples (DECU to DECZ) were collected from the four sidewalls and floor of the excavation and submitted to Paragon Analytics Laboratory for TPH-DRO analysis. All sample results confirmed that soil remaining at the site is below 2,200 mg/kg. Approximately 18 cubic yards of soil were removed. The excavation was backfilled with native soil and recontoured to the surrounding land surface Figures 8-1 and 8-2 depict the excavation and the subsequent backfilling and recontouring of the surface.

Figure 8-1
Open Excavation After Removal of
Diesel-Contaminated Soil, Decontamination Pad
(Photo taken May 21, 2003)

Figure 8-2
Recontoured Surface at Decontamination Pad
Following Excavation and Removal Activities
(Photo taken May 23, 2003)

9.0 Shaft Area Investigation

This section describes the field investigation activities associated with the following AOCs:

- Shaft
- New laundry/lab
- Equipment storage area

These areas are discussed together in this section because of geographic proximity. Primary objectives of the field investigation was to verify historical radiological results for the surface and shallow subsurface (where necessary), provide general geophysical data, and determine if any potentially radioactive and/or hazardous waste is present. The LRL-8 drill pad is located within the geographic boundaries of the shaft area and may be referred to during the shaft discussion; however, details regarding the LRL-8 investigation are discussed in Section 11.0.

Table 9-1 is a summary of the results and types of investigation techniques conducted for the shaft Area investigation. Results for each field technique are described in further detail in the following sections.

9.1 Radiological Driveover Results

The driveover survey areas of the region between the shaft and SGZ are divided into two sections for the purpose of calculating Cs-137 concentrations. The shaft Area (Plate 1) includes the shaft, equipment storage area, new laundry/lab, and the LRL-8 drill pad. Results of the entire area show surface gamma measurements at or near background with the exceptions of a few small hot spot areas. Two of these areas are located to the north and south of the shaft with a third area at the shaft concrete plug. A fourth hot spot location is in the vicinity of the equipment storage area and has the largest footprint of all hot spots identified at the site (792 m^2). All hot spots indicate scattered radionuclides within the soil rather than discrete, easily removable material.

The highest gamma measurement for the shaft region of the driveover survey is located within the footprint of the equipment storage area. Based on converted DLAPS data, the 95 percent upper confidence level (UCL) in the mean Cs-137 concentration is the highest at 2.85 pCi/g with a DLAPS maximum concentration of 23.2 pCi/g. These concentrations are about 3 percent of the area-specific

Table 9-1
Summary of Field Investigation for the Shaft and Vicinity
(Page 1 of 2)

Unique Identifier	How Feature was Identified	Summary of Geophysical Results	Summary of Borehole Observation	Summary of Radiological Driveover	Summary of CPT *In Situ* Results	Summary of Excavation Results	Summary of Analytical Results
Shaft	Historical data and current site conditions (e.g., concrete plug)	Shaft anomaly C (conductivity only) may represent disturbance associated with historic trailer park Shaft anomaly D (conductivity only) may represent activities associated with the equipment storage area and/or LRL-8 drill pad Shaft anomaly A is a linear feature identified by EM-31 inphase data and interpreted as utility line or cables EM-31 in-phase data identified shaft anomaly B as containing metallic materials Two metallic features identified northeast of shaft and interpreted as related to grease pit and new laundry/lab EI-5 traverse across Shaft anomaly C and LRL-8 “mud pit” show low resistivity zones with depth of influence to 9 m	No biasing factors identified in soil to indicate subsurface contamination	Three small, isolated areas of elevated readings, none of which exceed PALs	Survey indicates elevated gamma confined to near surface (<1 ft)	Grease pit area: rebar footings identified and not a grease pit Shaft anomaly A: bundle of cables identified not related to lab Shaft anomaly B: 55-gal drum filled w/concrete	Cs-137 not above PAL No chemical analytes above PALs

Table 9-1
Summary of Field Investigation for the Shaft and Vicinity
(Page 2 of 2)

Unique Identifier	How Feature was Identified	Summary of Geophysical Results	Summary of Borehole Observation	Summary of Radiological Driveover	Summary of CPT *In Situ* Results	Summary of Excavation Results	Summary of Analytical Results
New Laundry/Lab	Historical data	Footprint of historical excavation of sump not identified EM-31/-61 identified one faint metallic anomaly near the historic location of the laundry/lab facility	No biasing factors identified in soil	Survey shows gamma at or near background levels	Survey indicates no subsurface elevated gamma	Buried copper tubing identified at the EM-31/-61 metallic anomaly	Cs-137 not above PAL
Equipment Storage Area	Historical data and driveover rad survey	Shaft anomaly D may represent disturbed surface for equipment storage area activities	NA	An area about 782 m^2 has elevated gamma levels	Survey indicates elevated gamma confined to near surface (<1 ft)	NA	Cs-137 not above PAL

NA = Not applicable

PAL of 745 pCi/g (refer to Appendix A). The new laundry/lab facility is located within this driveover region and the measurements are at background indicating the historical sample of 28,000 pCi/g was removed during the 1977 to 1979 cleanup (refer to Section A.3.4.1 in the Work Plan [NNSA/NV, 2002]).

9.2 Geophysical Results

The geophysical survey was conducted to accomplish the following target area-specific objectives:

- Investigate the general area between the shaft and SGZ to detect a concrete-lined grease pit near the shaft and any unknown burial sites; unknown USTs or septic tanks.
- Map out identified buried utility lines, if present.

Figures 8, 9, and 10 in Appendix D depict the results of the EM-31 conductivity, EM-31 magnetic susceptibility, and EM-61-MK2, respectively for the shaft area. Figures 11, 12, and 13 in Appendix D depict the results of EI survey lines conducted over parts of the salt muckpile and shaft areas. The following paragraphs summarize the geophysical results for the major areas of concern discussed in this section. Anomalies not associated with the shaft are identified on Figures 8 and 9 in Appendix D but are discussed in other sections. These include anomalies at the drum storage area to the west of the shaft (Section 10.3), Sandia-3 drill pad southwest of the shaft (Section 11.3), and LRL-8 drill pad (Section 11.3).

Shaft Area

The shaft area mapping is dominated by a large area of elevated conductivity and magnetic susceptibility (EM-31 data) representing the salt muckpile. This muckpile feature obscures effective mapping of the grease pit and new laundry/lab features of interest. A number of anomalies have been identified and delineated south of the large muckpile anomaly. Shaft Anomalies C and D are two distinct areas of increased EM-31 conductivity evident south-southeast of the shaft. EM-31 in-phase data at these two anomalies show no metallic materials present except for where they overlap other anomalies. Anomaly D is consistent with the historical location of the equipment storage area and therefore, is discussed below. Additionally, anomaly D is contiguous with a conductivity area interpreted to represent the LRL-8 mud pit area, which is discussed in Section 11.0. Southeast of the shaft, EM-31 in-phase data identified a linear anomaly running in a southwest to northeast direction and it has been identified as shaft anomaly A. The appearance of this metallic feature suggests utilities, wires, cables, or piping. Although it is not marked, this linear feature seems to extend southwest adjacent to the Sandia-3 drill pad. Shaft anomaly B contains metallic materials and is located on the western edge of the conductivity shaft anomaly C. Two other metallic features identified by the EM-31 in-phase data are isolated features northeast of the shaft located in the vicinities of the former grease pit and new laundry/lab.

An EM-61-MK2 survey was conducted to detail the anomalies with elevated magnetic susceptibility. In the grease pit area, considerable subsurface metals are interpreted to be present. The new laundry/lab feature indicates no subsurface metals present. Shaft anomaly A, the linear feature, appears as a discontinuous feature.

An EI traverse (EI-5) was collected across the conductive shaft anomaly C and LRL-8 mud pit anomaly and is shown in Figure 11 of Appendix D. High-resistivity soils exist on the extreme eastern and western portions of the traverse. Low-resistivity zones are present at both conductive anomalies, with shaft anomaly C having an interpreted depth of influence of about 15 ft. The LRL-8 mud pit anomaly has an interpreted depth of influence of about 27 ft.

New Laundry/Lab

The objectives of the geophysical surveys were to delineate the boundaries of previously excavated areas at the new laundry/lab facility and verify all structures were removed. While anomalous measurements of conductivity and magnetic susceptibility are present at the historically mapped location of the new laundry/lab facility, the geophysical evidence is weak. The anomaly related to the salt muckpile is interpreted to mask the potentially subtle presence of any structures or previously excavated areas of interest. One small, isolated magnetic susceptibility feature was identified near the suspected area of the new laundry/lab. An EM-61-MK2 survey was conducted at this small anomaly and no subsurface metals were identified. See Section 9.5 for details regarding an excavation at this small magnetic anomaly.

Equipment Storage Area

This area was mapped because of its proximity to the shaft and was not originally proposed for geophysics. Shaft anomaly D is a distinct area of increased conductivity and may be consistent with the location of the equipment storage area and possibly reflect surface-disturbing activities. Shaft anomaly D is contiguous with an area that has been interpreted to represent the LRL-8 mud pit due to its proximity to the drill pad.

9.3 CPT In Situ Results

CPT pushes were conducted at the new laundry/lab facility as originally proposed in the Work Plan. Additional areas were added based on driveover radiological survey results (i.e., hot spots) and include the equipment storage area (CPTLA and B) and an isolated area south (CPTCA to E) and north (CPTGA to D) of the shaft concrete pad. These areas coincide with the collected surface samples ESA0001, SHFB0001, and SHFC0001, respectively. Plate 2 shows the areas of CPT investigation. A minimum of eight pushes were conducted at the new laundry/lab (CPTEA to J) as proposed in the Work Plan; additional pushes were conducted near the shallow subsurface metallic anomaly. Subsurface soil samples were collected at four locations at the new laundry/lab areas to meet the requirements of the Work Plan. The sample locations were biased towards the two highest surface gamma measurements and the two lowest surface measurements. The CPT results at the isolated driveover hot spots indicate elevated gamma measurements are confined to the surface at the three locations. It was observed that the tip of the gamma probe would spike prior to entering ground surface but the results within shallow subsurface soil (> 6 in.) were at background.

The collection methodology for *in situ* locations followed a systematic grid pattern based on the anomaly footprint identified by historical sampling areas and/or geophysics. Some locations within the grid pattern may have been altered based on field conditions (e.g., slope of sand dune). The depths of soil collection were biased based on field conditions (e.g., elevated field-screening levels or depth of refusal).

9.4 Direct-Push Results

Direct-push technology was used at the new laundry/lab and at anomalies associated with the shaft area. In addition to the CPT *in situ* investigation, the new laundry/lab was investigated using direct push for the purposes of investigating the presence of chemical COPCs and to collect additional radiological samples. A systematic grid was set up in the approximate area of the new laundry/lab based on historical sample location coordinates. Some of the locations were slightly altered because of field conditions (e.g., inaccessible slope). As required in the Work Plan, a minimum of eight borings were pushed, most of them in close proximity to CPT boring locations. Field screening and visual observations did not indicate the presence of potential contamination; therefore, no step-out borings were conducted for this AOC. Confirmatory samples were collected at depths of 7 to 8 ft bgs where potential contamination would be expected based on process knowledge.

As required by the Work Plan, the minimum eight borings were pushed plus two additional borings for the shaft area. Due to the large area of interest for the shaft, biased locations were chosen instead of a systematic grid. The locations for soil sampling were biased at anomalies identified by both geophysics and process knowledge. These locations included borings within the footprints of shaft anomaly A, B, C, and D. The biasing was also based on results of the EI-5 traverse where resistivities suggested shallow subsurface anomalies. Step-out borings were not required at any of the shaft investigation areas based on field-screening and visual observations. The three borings at LRL-8 are discussed in Section 11.0 although they are identified in the shaft area.

9.5 Excavation Results

Two trenches were excavated perpendicular to the shaft anomaly A signature and confirmed the presence of buried cables along the entire length of the anomaly. One excavation at shaft anomaly B uncovered a buried metal drum filled with concrete. Excavation results at the grease pit anomaly revealed 1.5-in. diameter rebar, most likely footings used for the shaft head frame. The new lab anomaly excavation revealed buried copper wires. None of the uncovered material at these anomalies indicated elevated field-screening results, thus not requiring additional investigation.

9.6 Summary of Radiological Analytical Results

A total of 4 surface and 23 shallow subsurface samples were collected for radiological analysis. On-site gamma spectroscopy was conducted on the 23 shallow subsurface soil samples collected at the shaft area and the new laundry/lab. The primary COPC, Cs-137, was below detection limits for 24 of the 27 samples analyzed. Three of the subsurface samples had detections of Cs-137 but are below PALs. Three shallow subsurface samples, collected within the shaft area, were submitted for isotopic plutonium analysis. Analytical results were nondetect. All other positive detections for isotopes associated with gamma spectroscopy analysis (but not considered COPCs) are provided in Appendix E (Tables E.1-2 and E.1-3) (e.g., potassium-40).

Three of the four surface samples collected were located within the shaft area (SHFA0001, SHFB0001, and SHFC0001) and analyzed for gamma spectroscopy. Although concentrations were above background, none exceeded the PAL of 167 pCi/g for Cs-137. The equipment storage area had one surface sample collected and analyzed for gamma spectroscopy and isotopic plutonium (ESAA0001). The Cs-137 was above background but below the PAL of 167 pCi/g. The Pu-238 and Pu-239/240 concentrations of 0.339 pCi/g and 2.22 pCi/g, respectively, exceeded undisturbed background levels in New Mexico (McArthur and Miller, 1989). These concentrations are less than the screening level of 8.65 pCi/g and 7.84 pCi/g, respectively, for the sparsely vegetated rural land use established by the National Council on Radiation Protection and Measurements (NCRP, 1999) (refer to discussion in Appendix A).

9.6.1 Summary of Chemical Analytical Results

A total of 19 shallow subsurface samples were collected and submitted for various chemical constituents at the shaft area and new laundry/lab. There were no chemical analytes reported above PALs at these two AOCs.

10.0 Fallout Plume Investigation

This section describes the field investigation activities associated with the fallout plume, drum storage area, and generator pad. These areas are discussed together in this section because of geographic proximity and organization of this report. The drum storage area lies geographically near and within the fallout plume; therefore, it is included in this section. For the sake of organization, the generator pad is included in this section, but it is not operationally linked with either the shaft or SGZ. The primary objectives of this field investigation were to verify historical radiological results for the surface, provide information on remaining buried debris, and determine if any potentially radioactive and/or hazardous waste is present.

Table 10-1 is a summary of the results and types of investigation techniques conducted for the fallout plume, drum storage area, and generator pad investigation. Results for each field technique are described in further detail in the following sections.

10.1 Radiological Driveover Results

The fallout plume and drum storage area are combined into one area for the purposes of discussing radiological driveover results. The generator pad was not investigated for radiological constituents; therefore, a driveover survey was not conducted at this AOC. The driveover survey area was extended further south-southwest than originally planned to capture historical surface storage areas. The driveover survey in the primary venting direction (northwest) for the fallout plume was not as extensive as originally proposed in the Work Plan because background results were encountered within an 1,800-ft radius of the venting source. Results of the entire area show gamma levels at or near background with the exceptions of small hot spot areas. These isolated areas form a nearly linear feature that originates near the shaft and extends in a northwest direction.

The highest gamma measurement for the driveover survey in this area are located at the farthest northwest areas of the linear feature. Converted DLAPS data indicate maximum Cs-137 concentrations up to 76.0 pCi/g for the surface (hot spot FALA0001). Geophysics confirmed no buried cable or pipes in this region. All hot spots indicate scattered radionuclides within the soil rather than discrete, easily removable material.

Table 10-1
Summary of Field Investigation for the Fallout Plume and Vicinity

Unique Identifier	How Feature was Identified	Summary of Geophysical Results[a]	Summary of Borehole Observation	Summary of Radiological Driveover	Summary of CPT *In Situ* Results	Summary of Excavation Results	Summary of Analytical Results
Fallout Plume	Historical data and driveover rad survey	No evidence of buried cable/pipe in vicinity of linear radiological anomaly	NA	Linear fingerprint with smaller, isolated areas of readings above background	Survey indicates elevated gamma confined to the surface	NA	Cs-137 not above PAL
Drum Storage Area	Historical data and Geophysics	EM-31 identified 4 distinct magnetic susceptibility anomalies Anomaly A is interpreted as possible underground storage tank Anomaly B is a large but weak magnetic anomaly in the general vicinity of the historical storage area Anomaly C is a linear feature with strong response and is interpreted as a large, buried metallic object Anomaly D is considered interference from an aboveground culvert pipe present at the time of the survey	No biasing factors identified in soils investigated at Anomaly B, C, and D	One isolated area of elevated readings, included with fallout plume	NA	Anomaly A is a concrete vault structure with no indication of contamination Anomaly B and C have buried metal scrap and debris/trash with no indication of contamination	Arsenic above PAL but not statistically different than background
Generator Pad	Historical data and current site features	No evidence of buried tanks or disturbed subsurface soils	No biasing factors identified in soil	NA	NA	NA	No analytes above PALs

NA = Not applicable

10.2 Geophysical Results

The fallout plume and drum storage area were not originally proposed for geophysics; however, field conditions at both AOCs warranted the addition of geophysics of varying scope. The generator pad was surveyed alone for the purpose of verifying no USTs were located at the site.

Figures 8, 9, and 10 in Appendix D depict the results of the EM-31 conductivity, EM-31 magnetic susceptibility, and EM-61-MK2, respectively, for the drum storage area. Figures 21 and 22 in Appendix D show the EM-31 conductivity and magnetic susceptibility results for the generator pad. The following paragraphs summarize the geophysical results for the major areas of concern discussed in this section.

Fallout Plume

In order to investigate the linear fingerprint of elevated gamma measurements identified during the driveover survey, an EM-61-MK2 survey was conducted to investigate the presence and continuity of potential cabling or piping in this area. A random walk-over survey was conducted along the axis of the elevated gamma measurements. The survey did not indicate the presence of metallic material along this axis.

Drum Storage Area

The drum storage area was initially surveyed as an extension of the anomalies identified in the shaft area. Upon the start of the survey, it became apparent that additional areas of interest required a more extensive survey at the drum storage area. Four anomalous areas were identified with EM-31 data. Anomaly A is an isolated anomaly approximately 40 m north of the actual area of concern, but it was included in the drum storage area for convenience. Elevated conductivity and magnetic susceptibility signatures led to an interpretation that an underground storage tank may be represented. Anomalies B and C are indistinguishable within a large conductivity anomaly that extends westward from the shaft area. The EM-31 in-phase data show a separation into distinct areas for anomalies B, C, and D. Anomaly B is the largest magnetic susceptibility anomaly but it has weak responses. Anomaly C shows a small linear feature with a stronger response. The EM-61-MK2 data provided details to the in-phase data and indicates anomaly B to be small, randomly distributed pieces of buried metal; whereas, anomaly C is significant in size and was interpreted to represent a large metallic object but not a tank. Anomaly D is not considered to be a concern but rather interference from culvert pipe present on the surface; however, small, near-surface metallic, debris may be present in the same area.

Generator Pad

The EM-31 survey indicated no conductivities or in-phase data that would suggest a shallow subsurface disturbance or underground structures (e.g., tank). No further geophysics were conducted.

10.3 CPT In Situ Results

The CPT technology was utilized at the fallout plume only. Surface radiological data did not indicate the need for additional *in situ* data collection at the drum storage area. Radiological contaminants were not a concern at the generator pad; therefore, CPT technology was not used.

The collection of *in situ* gamma data at the fallout plume was attempted at three hot spot locations within the linear footprint identified by the driveover survey; however, technical problems with the gamma probe allowed only one gamma spectra to be collected at the previously collected FALA0001 surface sample location (CPTMA0000). As expected, results indicate elevated measurements are confined to the surface at the CPTMA0000 location. It was observed that the tip of the gamma probe would spike prior to entering ground surface but results within shallow subsurface soil (> 6 in.) were at background. While attempting to collect *in situ* data at the other two hot spot locations, the gamma probe started functioning incorrectly; therefore, it was decided to collect soil samples instead with the CPT. Gamma spectroscopy was performed on these samples to provide Cs-137 data on soils within the plume. The two additional locations (CPTMC and CPTMD) chosen for sample collection were biased towards elevated driveover measurements located within the southern part of the plume fingerprint.

10.4 Direct-Push Results

Direct-push technology was not utilized at the fallout plume. Direct push was utilized for soil sample collection at the drum storage area and generator pad. Plate 2 shows the locations of the direct push soil sample borings for the two AOCs. A systematic grid with eight sample locations was established within the physical boundaries of the generator pad. The direct-push rig could not access one location due to a large tree; therefore, the sample was moved to a biased location downstream from the pad to capture potential migration of contaminants of concern (COCs) (GENH). All holes were pushed to the minimum depth of 4 ft bgs, the expected depth of potential contamination. Two borings (GEND and GENF) were pushed to a depth of 8 ft bgs to confirm that contamination was not present at deeper depths. Visual observations and field screening at all borings did not indicate potential contamination; therefore, step-out borings were not conducted.

The drum storage area sample locations were based on a combination of a systematic grid pattern and biasing. The initial grid pattern was set up within a boundary that encompassed the three drum storage anomalies B, C, and D. Eight borings were located based on the grid; however, one of those borings was moved from an anomaly B location to within the geophysical boundary of anomaly C. In addition, another biased location was sampled within anomaly C to capture any potential contamination associated with the buried debris and trash found by earlier excavation activities. The systematic grid was followed as closely as field conditions would allow (e.g., rig access). Field screening and visual observations did not indicate potential contamination; therefore, step-out borings were not conducted.

10.5 Excavation Results

Excavations were conducted only at the drum storage area within the geophysical anomalies A, B, and C to identify the source of increased magnetic susceptibility. The excavation at anomaly A uncovered a concrete-filled underground structure, similar in size and shape to a tank. There are no historical references to this structure and field conditions did not indicate contamination in the surrounding soil. No additional investigation was conducted. Figure 10-1 is a photo of the partially uncovered structure. Results at the anomaly B indicate small, scattered metallic debris. Results at the anomaly C trench indicate scrap metal and debris remains buried and correlates well with the EM-61 geophysical footprint. None of the uncovered material had elevated field-screening results.

10.6 Summary of Radiological Analytical Results

A total of 7 surface soil samples and 11 shallow subsurface soil samples were collected for radiological analysis between the fallout plume and the drum storage area. On-site gamma spectroscopy was conducted on 10 samples, while 7 drum storage area samples were sent off site for gamma spectroscopy analysis due to time constraints in the field. All of the surface samples collected

Figure 10-1
Excavation at Drum Storage Area Anomaly A
(Photo taken May 2, 2002)

at the fallout plume had concentrations above background for Cs-137. Only two of the subsurface samples collected within the drum storage area had Cs-137 concentrations above background levels. However, none of the surface or shallow subsurface samples exceed the established soil cleanup guideline of 167 pCi/g Cs-137. All other positive detections for isotopes associated with gamma spectroscopy analysis (but not considered COPCs) are provided in Appendix E (Tables E.1-2 and E.1-3) (e.g., potassium-40).

10.7 Summary of Chemical Analytical Results

A total of 18 shallow subsurface soil samples were collected and analyzed for various chemical constituents between the drum storage area and the generator pad. Total RCRA metals analysis show some arsenic concentrations above PALs at the drum storage area (Table 10-2); however, levels are not statistically different than established background concentrations in the state of New Mexico.

One sample (GENA0304) collected from the generator pad had an elevated TPH-DRO concentration of 1,200 parts per million (ppm) at a depth of 3 to 4 ft bgs. Since the original soil boring did not indicate the potential for TPH contamination by field screening or visual/odor observations, step-out borings were not conducted. Therefore, this “hit” is not bounded vertically. Laterally, the contamination is bounded by other borings located within several feet and which had clean samples at similar depths. The TPH-DRO concentration within sample GENA0304 does not exceed NMED cleanup levels of 2,200 mg/kg.

Table 10-2
Soil Above PALs

Sample Identification Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)
		Arsenic
Preliminary Action Levels[a]		**2.7**
DSAC0101	Duplicate of DSAE0405	2.7
DSAD0405	4 - 5	3.6
DSAF0405	4 - 5	2.8
DSAH0405	4 - 5	3.1
DSAI0405	4 - 5	3.4

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 1999)

11.0 Drill Pads Investigation

This section describes the field investigation activities associated with the 21 drill pads present at the Gnome-Coach Site. The primary objectives of the drill pad field investigation were to determine the presence of mud pits associated with well drilling and whether potentially hazardous and/or radioactive waste was present at an identified mud pit.

Table 11-1 is a summary of the results and types of investigation techniques conducted for the drill pad investigation. Neither mud nor mud pits were identified at any of anomalies identified by geophysics.

11.1 Radiological Driveover Survey Results

The following drill pads were included within the radiological driveover survey: LRL-1, LRL-2, LRL-7, and LRL-8. Drill pad LRL-7/Coach was specifically identified as requiring the survey as it had associated historical radiological operations during the 1968 and 1979 restoration efforts. The other three areas were included under a larger survey footprint and were located near operational areas associated with historical radiological contamination.

LRL-2 was the only drill pad in which gamma measurements above background were recorded. Based on field conditions and results of the driveover survey, it appears that the contamination may be associated with runoff from other contaminated areas along the access road to the salvage yard and CWD. One surface sample, SAYB0001, was collected near the edge of the LRL-2 drill pad for radiological analyses to confirm driveover results. Note that the sample nomenclature for the salvage yard (SAYB0001) was used even though the locality is more appropriately LRL-2.

11.2 Geophysical Results

The geophysical survey was conducted to accomplish the following objectives:

- Primary objective was to identify and delineate potential mud pits.
- A secondary objective was to identify areas of potential buried metallic material.

Table 11-1
Summary of Results and Field Techniques for Drill Pads
(Page 1 of 5)

Unique Identifier	How Feature was Identified	Summary of Geophysical Results	Summary of Borehole Observations	Summary of Radiological Driveover	Summary of CPT *In Situ* Results	Summary of Excavation Results	Summary of Analytical Results
LRL-1 Drill Pad	Historical data and geophysics	EM-31 conductivity anomaly northeast of SGZ interpreted as potential mud pit Figure 3 in SAIC, 2002	No evidence of mud pit	Survey shows gamma at or near background levels	NA	NA	No results above PALs
LRL-2 Drill Pad	Historical data and current site features	EM-31 data indicate two areas of conductivity: south area interpreted as well location and north area as potential mud pit Figures 15 and 16 in SAIC, 2002	No evidence of mud pit	Small, isolated locations with elevated gamma above background on southern edge of drill pad	NA	NA	Arsenic above PAL but not statistically different than background
LRL-7/Coach Drill Pad	Historical data and current site features	EM-31 data indicated 4 separate anomalies with potential for representing mud pits EM-31 data identified wellheads for LRL6 and LRL7 Figures 24 and 25 in SAIC, 2002	NA	Survey shows gamma at or near background levels	NA	Separate excavations at each of the four conductivity anomalies found no evidence of mud pits	No results above PALs
LRL-8 Drill Pad	Historical data and current site features	EM-31 conductivity anomaly north of drill pad interpreted as mud pit with possible metallic materials metallic anomaly present south of drill pad EI-5 traverse shows depth of low resistivity to 9 meters at interpreted mud pit anomaly Figures 8, 9, 10,11, and 26 in SAIC, 2002	No evidence of mud pit	Survey shows gamma at or near background levels	NA	NA	No results above PALs
Sandia No. 1 Drill Pad	Historical data and current site features	EM-31 shows large conductivity anomaly in which eastern part of anomaly interpreted as mud pit; western part due to presence of water trough Figures 27 and 28 in SAIC, 2002	No evidence of mud pit	NA	NA	NA	Arsenic above PAL but not statistically different than background

Table 11-1
Summary of Results and Field Techniques for Drill Pads
(Page 2 of 5)

Unique Identifier	How Feature was Identified	Summary of Geophysical Results	Summary of Borehole Observations	Summary of Radiological Driveover	Summary of CPT *In Situ* Results	Summary of Excavation Results	Summary of Analytical Results
Sandia No. 3 Drill Pad	Historical data and current site features	EM-31 conductivity anomaly west of drill pad interpreted mud pit Second conductivity anomaly identified in roadway EM-61 identified linear metallic feature south of drill pad Figures 29, 30, and 31 in SAIC, 2002	No evidence of mud pit	NA	NA	The EM-61 anomaly was a 6 to 8-ft diameter metal ring buried near surface	No results above PALs
SRI-1 Drill Pad	Historical data and current site features	A weak EM-31 conductivity anomaly is interpreted as a mud pit EM-61 indicates large, buried metallic feature west of conductive anomaly Figures 32, 33, and 34 in SAIC, 2002	No evidence of mud pit	NA	NA	The EM-61 anomaly was a concrete pad present just inches below surface	Arsenic above PAL but not statistically different than background
SRI-2 Drill Pad	Historical data and current site features	EM-31 conductivity data shows 3 anomalies, 2 are coincident with surface concrete structures, third anomaly located east of structures is interpreted as a mud pit Figures 35 and 36 in SAIC, 2002	No evidence of mud pit	NA	NA	NA	Arsenic above PAL but not statistically different than background
SRI-3 Drill Pad	Historical data and current site features	EM-31 conductivity data shows 3 anomalies, one is coincident with concrete foundation; second area is adjacent to concrete; and the third, east of concrete, is the interpreted mud pit Figures 37, 38, and 39 in SAIC, 2002	No evidence of mud pit	NA	NA	NA	Arsenic above PAL but not statistically different than background
SRI-4 Drill Pad	Historical data	No evidence of well location or mud pit based on EM-31 data Figures 40 and 41 in SAIC, 2002	NA	NA	NA	NA	NA

Table 11-1
Summary of Results and Field Techniques for Drill Pads
(Page 3 of 5)

Unique Identifier	How Feature was Identified	Summary of Geophysical Results	Summary of Borehole Observations	Summary of Radiological Driveover	Summary of CPT *In Situ* Results	Summary of Excavation Results	Summary of Analytical Results
SRI-5 Drill Pad	Historical data and current site features	EM-31 conductivity anomaly north of drill pad interpreted as a mud pit EM-31/-61 identified metallic anomaly along eastern side of potential mud pit Well casing identified Figures 42, 43, and 44 in SAIC, 2002	No evidence of mud pit	NA	NA	EM-61 anomaly was identified as metal cable inches below surface by hand digging; therefore, backhoe excavation not conducted	No results above PALs
SRI-6 Drill Pad	Historical data and current site features	EM-31 conductivity anomaly north of drill pad interpreted as a mud pit Well casing identified Figures 45 and 46 in SAIC, 2002	No evidence of mud pit	NA	NA	NA	No results above PALs
SRI-7 Drill Pad	Historical data and current site features	EM-31 conductivity anomaly north of drill pad interpreted as a mud pit Observed wellhead on surface confirmed by EM-31 in-phase data Figures 47 and 48 in SAIC, 2002	No evidence of mud pit	NA	NA	NA	No results above PALs
SRI-8 Drill Pad	Historical data and current site features	EM-31 conductivity anomaly north of drill pad interpreted as a mud pit EM-31/-61 identified metallic anomaly along eastern side of potential mud pit Figures 49, 50, and 51 in SAIC, 2002	No evidence of mud pit	NA	NA	EM-61 metallic anomaly identified as conductor casing; no mud identified within 3 separate exploratory trenches, all of which encountered a 3-ft thick caliche horizon about 3.5 to 4.0 ft bgs	Arsenic above PAL but not statistically different than background

Table 11-1
Summary of Results and Field Techniques for Drill Pads
(Page 4 of 5)

Unique Identifier	How Feature was Identified	Summary of Geophysical Results	Summary of Borehole Observations	Summary of Radiological Driveover	Summary of CPT *In Situ* Results	Summary of Excavation Results	Summary of Analytical Results
SRI-9 Drill Pad	Historical data and current site features	EM-31 conductivity anomaly identified south of USGS-1 tank and interpreted as a mud pit EM-31 inphase identified two metallic anomalies - one located on drill pad interpreted to represent well location EM-61 data shows second metallic anomaly to be deep feature with 3 discrete, separate features Figures 52, 53, and 54 in SAIC, 2002	No evidence of mud pit	NA	NA	Only soil encountered at both magnetic anomalies down to depth of 5 ft bgs	Arsenic above PAL but not statistically different than background
SRI-10 Drill Pad	Historical data and current site features	No evidence of potential mud pit or other anomaly separate from fence Figures 55 and 56 in SAIC, 2002	No evidence of mud pit	NA	NA	NA	No results above PALs
USGS-1 Drill Pad	Historical data and current site features	See SRI-9 summary	Hydrocarbon staining and odor present at concrete pad	NA	NA	NA	No results above PALs
USGS-2 Drill Pad	Historical data and current site features	EM-31 conductivity anomaly south of observed wellhead EM-31 in-phase anomaly at observed wellhead Figures 57 and 58 in SAIC, 2002	No evidence of mud pit	NA	NA	NA	No results above PALs
USGS-4 and 8 Drill Pad	Historical data and current site features	One larger EM-31 conductivity anomaly can be separated into two parts, suggesting two potential mud pit locations east of observed wellheads EM-31 in-phase anomalies at observed wellheads Figures 59 and 60 in SAIC, 2002	No evidence of mud pit	Survey shows gamma at or near background levels	Survey indicates no shallow subsurface elevated gamma	NA	No results above PALs

Table 11-1
Summary of Results and Field Techniques for Drill Pads
(Page 5 of 5)

Unique Identifier	How Feature was Identified	Summary of Geophysical Results	Summary of Borehole Observations	Summary of Radiological Driveover	Summary of CPT *In Situ* Results	Summary of Excavation Results	Summary of Analytical Results
USGS-5 Drill Pad	Historical data and current site features	EM-31 conductivity anomaly along western edge of drill pad interpreted as a mud pit EM-31 in-phase anomaly at observed wellhead Figures 61 and 62 in SAIC, 2002	No evidence of mud pit	NA	NA	NA	No results above PALs
USGS-7 Drill Pad	Historical data and current site features	EM-31 conductivity anomaly along southern edge of drill pad interpreted as a mud pit EM-31 in-phase shows increased magnetic susceptibility in center of interpreted mud pit EM-61 data shows only scattered surface features Figures 63, 64, and 65 in SAIC, 2002	No evidence of mud pit	NA	NA	Surface metal debris; subsurface only soil	No results above PALs

NA = Not applicable

The EM-31 was used at every historical drill pad location to aid in identifying potential mud pits. EM-61/MK-2 was used at USG-7, LRL-8, SAN-3, SRN-1, SRN-3, SRN-5, SRN-8, and SRN-9 to provide details of EM-31 magnetic results. Electrical imaging was used in the vicinity of the LRL-8 interpreted mud pit (specifically EI-5). All but two of the listed drill pads had, at a minimum, a conductivity anomaly that was initially assumed to represent a potential mud pit. These drill pads were investigated further via direct push or excavation. SRI-4 and SRI-10 were the only two drill pads without an anomaly that could be interpreted as a potential mud pit. SRI-4 was not investigated further; however, one test push was conducted at SRI-10 for confirmation purposes. The geophysical results for the drill pads are mostly redundant. Therefore, results are provided in summary form within Column 3 of Table 11-1 instead of discussing at length in paragraph form.

Figures 47 and 48 in Appendix D are representative examples of conductivity and in-phase anomalies, respectively, that were typically identified by the EM-31 technology. The various figures providing geophysical results for all the drill pad areas are too numerous to list individually; therefore, the applicable figure number(s) has been included in Column 3 of Table 11-1. These drill pad figures are available in the final geophysics report generated for the Gnome-Coach Site (SAIC, 2002).

11.3 CPT In Situ Results

The CPT *in situ* technology was utilized at the USGS-4/8 drill. A systematic grid for CPT pushes was established around the USGS-4 and USGS-8 wellheads where process knowledge suggests there would be the highest potential for radiological contamination related to the tracer test reinjection activities. A total of 10 borings (8 initial grid locations plus 2 additional) were pushed at this drill pad prior to soil sampling with the direct push rig to investigate the potential presence of gamma-emitting radionuclides (primarily Cs-137). The CPT pushed to a minimum depth of 6 ft bgs or refusal. The *in situ* surveys indicate all gamma measurements at background levels. One boring appears to have elevated readings but the jump in counts resulted from excessive vibration of the probe in the subsurface, causing an anomalous reading. No soil samples were collected during the *in situ* surveys.

11.4 Direct-Push Results

Direct push was utilized at 19 of the identified drill pad locations for the purpose of detecting the presence of potential mud pits and to determine if radiological or hazardous wastes are present at identified anomalies. Direct push was not used at the LRL-7 drill pad due to access restrictions of the Geoprobe truck; instead, four excavations were conducted with a backhoe (see Section 11.5 for details). For those drill pads where a potential mud pit was interpreted to exist, a minimum of three test pushes were typically performed at each anomaly. The three biased test pushes were located within boundaries based on geophysical data, with biasing towards the highest conductive responses. At the conclusion of pushing at designated drill pads, no evidence of mud or mud pits was identified at any of the anomalies. Therefore, a full investigation (i.e., eight borings in a systematic grid) as described in the Work Plan was not conducted at any drill pad, with the exception of the USGS-4/8 drill pad.

At each test push, the soil core was field screened visually and monitored for VOCs and radioactivity upon bringing it to the surface. As outlined in the Work Plan, if there was no evidence of a mud pit or contamination, then one confirmatory sample was collected at a depth interval where contamination could have been expected. The interval between 9 to 12 ft bgs was typically chosen based on process knowledge from other Offsite Project locations. Every drill pad investigation, except for two, showed no evidence or biasing factors within the soil cores to suggest the need for more than one confirmatory sample per push. The exceptions were Sandia-1 (SAN-1) and the concrete pad at USGS-1.

Because the USGS-4/8 drill pad had been previously selected as requiring additional shallow subsurface data due to the tracer test activities, a full investigation was initiated and completed with a total of 12 borings being pushed and sampled. Four borings were biased at former CPT locations to collect samples for radiological analyses. Eight additional borings were split between the two identified geophysical anomalies. The anomaly south of the USGS-8 wellhead had four borings pushed at biased locations based on anomaly data and surface field conditions. The other four borings were biased towards a suspect area to the northeast that has metal debris and apparent soil cuttings. This area was nearly contiguous with the second geophysical anomaly. There was no evidence of a mud pit at either anomaly. None of the soil borings indicated potential contamination based on field screening and soil observations.

The Sandia-1 investigation found an anomalous, elevated alpha and beta/gamma field-screening result within one boring at a depth around 14 ft bgs. A gamma spectroscopy analysis of the field-screening sample was performed on site. Gamma spectroscopy results indicated the Electra instrument reading was anomalous. However, a complete suite of analytes, including isotopic plutonium, was conducted on a soil sample collected from the potentially contaminated interval, and a second soil sample was collected at a clean interval about 2 ft below this sample in order to bound the potential contamination vertically. Additionally, 2 step-out borings were conducted to ensure if there was any type of radiological contamination it was bound laterally. Analytical results are discussed below in Section 11.6.

The concrete pad at the USGS-1 drill pad was previously identified through historical photos and was proposed in the Work Plan. One boring was biased in the center of historical staining. The soil core had hydrocarbon staining and odors; therefore, one sample was collected near the surface and another at depth to bound the vertical extent of contamination. Three step-out borings were pushed in a roughly triangular pattern around the initial boring. The presence of the wellhead, concrete pad, and wellpump precluded any borings on the north side of the stained area. The soil cores in the step-out borings had no indication of hydrocarbon contamination.

11.5 Excavation Results

Separate excavations were conducted at the four conductivity anomalies identified at the LRL-7 drill pad area to determine if any mud pits are present. Trenches were excavated to depths of about 9 ft bgs, with no indication of mud pits or potential contamination. Confirmatory samples were collected directly from the backhoe bucket at three of the trenches which were considered the most suspect based on field conditions. Fresh soil was excavated from the bottom of the trench so that depths of samples reflect the bottom depth of the trench.

An excavation was conducted at the USGS-7 drill pad to investigate the source of the magnetic susceptibility anomaly. The excavation encountered native soils to a depth of 6 ft bgs, with a caliche horizon identified about 1.0 ft bgs. Some metal debris was identified on the surface and could account for part of the anomaly. As no indications of contamination were observed, no further investigation was conducted beyond the planned direct push boreholes.

An excavation was conducted at the Sandia No. 3 drill pad to investigate the source of the magnetic susceptibility anomaly on the east end of the pad. A 6 to 8 ft diameter metal ring is buried near the surface. As no indications of contamination were observed, no further investigation was conducted beyond the planned direct-push boreholes.

An excavation was conducted at the SRI-1 drill pad to investigate the source of magnetic susceptibility anomaly. A concrete pad was identified only inches beneath the surface. As no indications of contamination were observed, no further investigation was conducted beyond the planned direct push boreholes.

Hand digging with a shovel was conducted at the SRI-5 drill pad to investigate the source of magnetic susceptibility anomaly. Buried metal cable was found a few inches below the surface. As no indications of contamination were observed, no further investigation was conducted.

An excavation was conducted at the SRI-8 drill pad to investigate the source of magnetic susceptibility anomaly. Conductor casing was identified as the source. As no indications of contamination were observed, no further investigation was conducted beyond the planned direct-push boreholes. Three separate exploratory trenches/potholes were excavated to provide information on the shallow subsurface soil horizons in an attempt to identify the cause of increased conductivity readings. All three areas encountered a 3-ft caliche (calcium carbonate) horizon at a depth of 3.5 to 4.0 ft bgs.

Two magnetic susceptibility anomalies were investigated at the SRI-9 drill pad and nearby. Both excavations encountered only soil to a depth of 5 ft bgs. As no indications of contamination were observed, no further investigation was conducted beyond the planned direct-push boreholes at the conductivity anomaly.

11.6 Summary of Radiological Analytical Results

One surface sample and 18 shallow subsurface soil samples were collected for radiological analyses. The one surface sample, SAYB0001, was collected and analyzed to confirm driveover results. The analytical result of 7.0 pCi/g Cs-137 is above background but well below the PAL of 167 pCi/g. This sample was also submitted to an off-site laboratory for isotopic plutonium analysis to fulfill the Work

Plan requirement that a certain percentage of elevated Cs-137 samples be submitted. This sample had nondetect results.

The 18 shallow subsurface soil samples were collected between the following drill pads:
Sandia No. 1, LRL-1, LRL-8, and USGS-4/8. With the exception of Sandia No. 1, these soil samples were analyzed for gamma spectroscopy because the drill pads are located within former operational areas associated with radiological contamination; results were at background or non-detect. Eight samples were also analyzed for Sr-90 and tritium at USGS-4/8 to meet Work Plan requirements with all results at background concentrations or nondetects. Isotopic plutonium and gamma spectroscopy analysis were added to the list of COPCs at the Sandia No. 1 drill pad due to an anomalous, elevated, radiological field-screening result at depth; results for both these analyses were nondetects.

Positive detections for other nuclides associated with gamma spectroscopy analysis (but not considered COPCs) are provided in Appendix E (Tables E.1-4 and E.1-5) (e.g., potassium-40).

11.7 Summary of Chemical Analytical Results

A total of 70 shallow subsurface soil samples were collected and analyzed for variety of chemical constituents at the various drill pad investigations. With the exception of several arsenic results listed in Table 11-2, all analytical results for chemical analysis were either non-detects or below PALs. One boring at the USGS-4/8 drill pad had a detection of TPH-diesel of 720 mg/kg. This concentration does not exceed the NMED cleanup level of 2,200 mg/kg. This boring was located within the geophysical anomaly footprint south of the USGS-8 wellhead. Initial soil core logging did not indicate hydrocarbon staining or odor; therefore, step-out borings were not conducted. However, three borings pushed in a triangular pattern around boring USG4I0910 can be used for lateral bounding of TPH contamination. The confirmation samples collected at depths of 9 to 12 ft bgs at borings USG4J, K, and L all show TPH below detection limits which indicates the contamination is localized.

Although arsenic is present above the EPA Region 9 PRGs (1999), the concentrations are not considered to be statistically different than background in the state of New Mexico.

Table 11-2
Soil Above PALs

Sample Identification Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)
		Arsenic
Preliminary Action Levels		**2.7**[a]
SRN9A1112	11 - 12	4.9
SRN8C1213	12 - 13	3.3
SRN3D0506	5 - 6	2.8
SRN3B0506	5 - 6	3.9
SRN3A0304	3 - 4	3.1
SRN2B0809	8 - 9	3.7
SRN1C0910	9 - 10	3
SRN1A1011	10 - 11	3.8
SAN1B1415	14 - 15	3.1
SAN1A1011	10 - 11	3.8
LRL2B1112	11 - 12	3.6

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 1999)

12.0 Waste Management Activities

Waste generated during the Gnome-Coach investigation included sanitary waste, hydrocarbon waste, and decontamination rinsate. Analytical data for the IDW associated with waste management samples was reviewed to determine the regulatory status of the IDW.

Analytical data from the waste management samples, listed in Table 12-1, indicated that there were no hazardous or radioactive waste constituents above regulatory levels in the soil or water. Therefore, all IDW was characterized as nonregulated waste and disposed of as sanitary waste. On July 1, 2002, the following waste was shipped to the Safety-Kleen landfill in Westmoreland, California:

- Six 55-gallon drums of non-regulated decontamination rinsate
- One 55-gallon drum of non-regulated solid waste

Following supplemental field activities during the week of May 19, 2003, approximately 18 cubic yards of diesel-contaminated soil waste was generated. The waste was contained in 20 cubic yard (yd^3) roll-off containers. On May 23, 2003, the two roll-off containers were shipped to the Clean Harbors (formerly Safety Kleen) landfill at Grassy Mountain, Utah.

Table 12-1
Waste Management Samples

Borehole Number	Site Feature (soil samples) or Sample Type	Sample Number	Sample Matrix	Analyses
USG1	Waste Management for Soils Generated at USGS-1	USG1E0108	Soil	TCLP VOCs, TCLP SVOCs, TCLP Metals
USG1/DECQ	Waste Management for Soils Disposed from Decon Trough	GNMH009	Soil	TCLP VOCs, TCLP SVOCs, TCLP Metals, GS
NA	Waste Management	GNMA002	Water	VOCs, SVOCs, Metals, GS
NA	Waste Management	GNMB003	Water	VOCs, SVOCs, Metals, GS
NA	Waste Management	GNMC004	Water	VOCs, SVOCs, Metals, GS, Pu
NA	Waste Management	GNMD007	Water	VOCs, SVOCs, Metals, GS
NA	Waste Management	GNME008	Water	VOCs, SVOCs, Metals, GS
NA	Waste Management	GNMF011	Water	VOCs, SVOCs, Metals, GS
NA	Field Blank	GNMB0101	Water	VOCs, SVOCs, Metals, GS, Pu
NA	Duplicate of GNMF011	GNMC0101	Water	VOCs, SVOCs, Metals, GS

GS = Gamma spectroscopy
Pu = Isotopic plutonium
VOCs = Volatile organic compounds
SVOCs = Semivolatile organic compounds
TCLP = Toxicity Characteristic Leaching Procedure
Metals = RCRA metals with mercury

13.0 Demobilization Activities

Demobilization activities for the primary field investigation were completed between June 12 and 15, 2002. Power was disconnected from the site trailers on June 14. The two office trailers, trash roll-off dumpster, and two transportainers were removed from the site by July 2002. All IDW was transported off site for disposal on July 1, 2002.

The staging areas used to set up site trailers and equipment were previously cleared and stabilized during original testing operations and, therefore, did not require revegetation or reseeding after demobilization. Any metal t-posts and signs installed during the characterization activities were removed from the site.

All investigation-related locations associated with excavation, direct-push sampling, and CPT borings were surveyed with a Trimble Global Positioning System and the Pathfinder software. Because of the lack of mud pits and other types of features that would require potential corrective action, topographic surveying was not conducted at the Gnome-Coach Site. Roads and a few surface features (e.g., former benchmark for historical sampling grid) were surveyed with the Trimble unit to provide better positional data.

A second demobilization was completed on May 23, 2003, after the removal of diesel-contaminated soil was completed. Two roll-off containers, the supply transportainer, and all equipment were transported off site. Sample locations associated with the TPH-soil removal were surveyed with a Trimble Global Positioning System and the Pathfinder software.

14.0 Conclusions

This section provides a summary of the conclusions made on the environmental conditions at the Gnome-Coach Site based on observations made during the field investigation, analytical data results for soil samples, and the risk assessment.

14.1 Conclusions

The following conclusions are based on site observations, soil analytical results, and the risk assessment.

14.1.1 Conclusions from the Radiological Driveover Survey

Several hot spots exist throughout the site, but none of the Cs-137 concentrations exceed the established PALs.

14.1.2 Conclusions from the Geophysical Investigation

Anomalies interpreted as potential mud pits were identified at 20 of 21 drill pads. The location and presence of the buried salt trench was confirmed. The boundaries of several AOCs with former burial trenches were confirmed (i.e., salvage yard, CWD). Several shallow subsurface anomalies were identified, requiring further investigation (e.g., drum storage area, decontamination pad).

14.1.3 Conclusions from the Soil Investigation

In situ CPT borings identified residual shallow subsurface radioactivity at the salvage yard and shaft area, but the risk assessment indicates the concentrations of Cs-137 do not pose a threat to human health and/or the environment. Surface and shallow subsurface sample results confirm that radiological COPCs were either below action levels or consistent with natural background. Mud pits were not identified at any of the drill pads through direct push and excavation. Excavation activities identified several locations with buried sanitary debris/trash. Surface and shallow subsurface sample results for chemical COPCs indicate only TPH-DRO concentrations above cleanup levels at the decontamination pad. Arsenic concentrations in several samples are above PALs, but are not statistically different than background in the state of New Mexico. The diesel-contaminated soil above the 2,200 mg/kg cleanup level has been removed.

14.1.4 Summary

Recommendations on additional actions at the Gnome-Coach Site surface and shallow subsurface are based on the following findings of the corrective action investigation and risk assessment:

- Chemical COPCs identified in the soil are below action levels or consistent with natural background (i.e., arsenic).
- Levels of Cs-137 in the soil are compliant with the unrestricted release dose limit (25 mrem/yr) as established through the risk assessment (Appendix B).
- Two samples, ESAA0001 and A57A0001, had detectable plutonium concentrations. Sample ESAA0001 plutonium concentration exceeds New Mexico background, but is only 17.5 percent of the preliminary action level of 12.7 pCi/g.
- None of the samples analyzed were positive for Sr-90 or tritium.

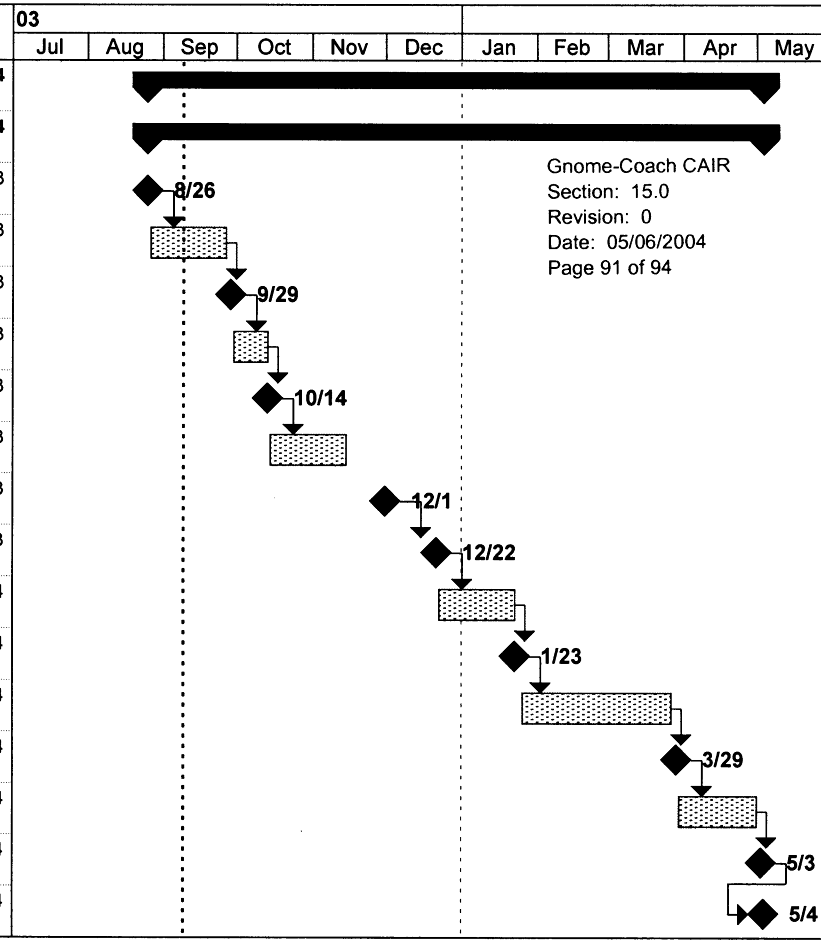
15.0 Recommendations

Based on the conclusions of the corrective action investigation as stated in Section 14.0, and the goal of NNSA/NSO to clean close the Gnome-Coach Site surface in accordance with the New Mexico VRP (NMED, 1999), the following recommendations are made:

- NNSA/NSO will complete the application process for admission of the site into the New Mexico VRP.
- Once accepted into the VRP, NNSA/NSO will work with the New Mexico VRP to complete all required public participation activities.
- Based on the conclusions in Section 14.0, NNSA/NSO recommends no further corrective actions be required for the site and no Corrective Action Plan/Closure Report be required.
- Based on the conclusions in Section 14.0, NNSA/NSO recommends that no use restrictions be placed on the surface for the Gnome-Coach Site.
- Once all NMED comments on this report are addressed and all VRP-required documentation filed, NNSA/NSO will request a certificate of completion for the Gnome-Coach Site surface.

Figure 15-1 is provided as an estimated schedule of project activities.

ID	Task Name	Duration	Start	Finish
1	**Gnome Surface Site Closure Schedule**	**180d**	**Tue 8/26/03**	**Mon 5/3/04**
2	**Prepare VRP Application and CAIR**	**180d**	**Tue 8/26/03**	**Mon 5/3/04**
3	Submit VRP Application and Deliver CAIR to NMED (Rev	1d	Tue 8/26/03	Tue 8/26/03
4	NMED Review and Comment	23d	Wed 8/27/03	Fri 9/26/03
5	Receive Conditional Approval into VRP from NMED	1d	Mon 9/29/03	Mon 9/29/03
6	Prepare Draft VRA	10d	Tue 9/30/03	Mon 10/13/03
7	Notify Public and Make Documents Available for Public R	1d	Tue 10/14/03	Tue 10/14/03
8	30-Day Public Comment Period	23d	Wed 10/15/03	Fri 11/14/03
9	Public Meeting (if necessary)	1d	Mon 12/1/03	Mon 12/1/03
10	NMED Provides NNSA/NSO with NMED comments	1d	Mon 12/22/03	Mon 12/22/03
11	Address NMED and Public Comments to VRA	23d	Tue 12/23/03	Thu 1/22/04
12	Finalize VRA with NMED	1d	Fri 1/23/04	Fri 1/23/04
13	Incorporate Comments and Revise CAIR (Rev.1)	45d	Mon 1/26/04	Fri 3/26/04
14	Deliver CAIR to NMED (Rev.1)	1d	Mon 3/29/04	Mon 3/29/04
15	NMED Review of CAIR (Rev.1)	24d	Tue 3/30/04	Fri 4/30/04
16	Receive NMED Approval on CAIR (Rev.1)	1d	Mon 5/3/04	Mon 5/3/04
17	Receive VRP Certificate of Completion from NMED	1d	Tue 5/4/04	Tue 5/4/04



Project: Figure 15-1.MPP
Date: Tue 9/9/03

Task | Summary | Rolled Up Progress
Progress | Rolled Up Task
Milestone | Rolled Up Milestone

Figure 15-1
Schedule of Project Activities

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Appendix A

Analysis of Radiological Constituents

A.1.0 Introduction

This appendix addresses the investigation of radiological constituents in the surface soil, subsurface soil, and vegetation at the Gnome-Coach Site. Included is the scope of work, technical approach, and analytical results, and comparison of the analytical results to the PAL concentrations. The information and data provided in this Appendix will demonstrate that a sufficient quantity and quality of *in situ* measurements, samples, and analysis have been performed to define current site conditions and identify and evaluate if further action is required for permanent closure of the site. The following sections of this appendix provide details on the activities performed for each phase of the radiological assessment. These phases include *in situ* driveover radiological surveys of the surface soil, CPT-based *in situ* radiological surveys of the shallow subsurface soil, and the collection and analysis of soil and vegetation samples.

A.2.0 In Situ Radiological Surveys

This section describes the *in situ* radiological data and addresses the data collection and analysis. Two different *in situ* radiological survey techniques were used during this investigation. The first technology is driveover radiological surveys utilizing a DLAPS detector system to measure counts from beta/gamma-emitting radionuclides in the surface soil. The second technique utilizes a CPT equipped with a sodium-iodine detector to collect count rates and gamma spectrometry data from gamma-emitting radionuclides in the shallow subsurface soil. The *in situ* radiological data collection accomplished the following site investigation objectives:

- Provided information on current site conditions regarding the distribution and concentration of residual radiological contamination in the surface soils of previously cleaned areas.
- Defined the nature and extent of the residual radionuclides in the surface and near-surface soil.
- Identified areas of elevated radionuclide concentrations (hot spots) remaining in surface soils.
- Gathered shallow subsurface data that can be used to fill data gaps that were identified for previous site investigations (i.e., new laundry/lab, decontamination pad) on the nature and extent of potential radiological contamination.

The two technologies utilized for *in situ* radiological characterization in this investigation are described in the following sections.

A.2.1 Driveover Radiological Surveys

Driveover radiological surveys identify the nature and extent of radiological contamination in surface soil at concentrations statistically greater than surface soil from undisturbed background locations. The driveover radiological surveys provide information on current site conditions regarding the distribution and concentration of residual radioactivity in the surface soils of previously cleaned areas, aid in verifying the boundaries of AOC, and identify hot spots which may require further characterization or removal.

A.2.1.1 Description of the DLAPS System

The driveover radiological surveys were performed utilizing a DLAPS system. The DLAPS system consists of two large-area plastic scintillators, a differential GPS, a data acquisition system, and a laptop computer. The detector consists of two Model VRM-3 plastic scintillators that are 3.8 cm thick by 1.02 cm wide by 66 cm long, wrapped in 70 milligrams per square centimeter (mg/cm^2) of light-blocking plastic and aluminum foil. The detector has a metal screen window designed to detect >300 kiloelectron volts (keV) beta particles and >40 keV gamma photons. The detector has upper- and lower-level discriminator controls that are adjusted to optimize detection of a specified energy range (e.g., 500 to 800 keV for detection of Cs-137 661.5 keV photon). A Trimble Pathfinder Pro XRS™ GPS receiver with a TSC1™ datalogger is used to determine positional information. The GPS automatically measures and records the positional data with each count-rate measurement collected in the surveyed area. The GPS antenna is mounted on top and in the center of the two DLAPS detectors to facilitate position accuracy. A digital controller, Model SC-755, supports data display and output to either a laptop computer or other data-logging equipment. The controller has been designed to transmit data every second for operation with a GPS.

A.2.1.2 Calibration of the DLAPS

The DLAPS system was calibrated at the Idaho National Engineering and Environmental Laboratory (INEEL) utilizing ten large-area, thin plate radionuclide sources. Analytics, Incorporated of Atlanta, Georgia, built the sources in accordance with National Institute of Standards and Technology (NIST) requirements for traceability. Five of the sources used consist of Cs-137 and five of the sources were americium-241 (Am-241). Each set of five sources consisted of one source with an active area of 91 × 91 mm (approximately 13 square inches) and four sources with an active area of 590 × 590 mm (approximately four square feet). Table A.2-1 lists the manufacturer's source identification number, calibration date, the INEEL identification number, source radionuclide, and source activity and uncertainty.

The field of view of the DLAPS system was determined by suspending the detectors above the calibration sources at heights of 15.2 cm, 30.5 cm, and 50.8 cm. These heights were selected because they are the detector heights commonly used during the conduct of driveover surveys. At each height, field checks were made to establish the detector response about two axes; the X-axis drawn

Table A.2-1
DLAPS Calibration Source Data

Manufacture Source ID	Calibrations Date	INEEL Source ID	Source Nuclide	Source Activity and Uncertainty Disintegrations per Second (dps) / Microcuries (µCi)
54474-370	August 28, 1997 12:00 EST	Cs-137 B	Cs-137	6.69 ± 0.33E+4 dps /1.81 ± 0.09 µCi
54475-370	August 28, 1997 12:00 EST	Cs-137 D	Cs-137	6.65 ± 0.33E+4 dps/1.80 ± 0.09 µCi
54476-370	August 28, 1997 12:00 EST	Cs-137 A	Cs-137	6.66 ± 0.33E+4 dps/1.80 ± 0.09 µCi
54477-370	August 28, 1997 12:00 EST	Cs-137 C	Cs-137	6.76 ± 0.34E+4 dps/1.83 ± 0.09 µCi
54478-370	August 28, 1997 12:00 EST	Cs-137 E	Cs-137	3.61 ± 0.18E+4 dps/0.976 ± 0.05 µCi
55818-370	June 2, 1998 12:00 EST	Am-241 A	Am-241	5.58 ± 0.28E+5 dps/15.09 ± 0.75 µCi
55819-370	June 2, 1998 12:00 EST	Am-241 B	Am-241	5.56 ± 0.28E+5 dps/15.04 ± 0.75 µCi
55821-370	June 2, 1998 12:00 EST	Am-241 E	Am-241	3.69 ± 0.18E+5 dps/9.96 ± 0.50 µCi
55822-370	June 2, 1998 12:00 EST	Am-241 D	Am-241	5.55 ± 0.28E+5 dps/15.0 ± 0.75 µCi
55823-370	June 2, 1998 12:00 EST	Am-241 C	Am-241	5.46 ± 0.27E+5 dps/14.76 ±0.74 µCi

dps = Disintegrations per second
µCi = Microcuries

through the long dimension (length) of the detector and the Y-axis drawn through the narrow dimension (width) of the detector. The DLAPS system was found to have symmetrical responses about the X- and Y-axis. Background count rates were established for each detector at each height. At each height, the field of view was established by moving the smaller sources away from the detector and measuring the detector count rate. The field of view was defined as the area where the detector count rate was statistically greater than background (e.g., the count rate exceeded the mean background count rate plus two standard deviations of the mean background count rate). Once the field of view was established, the large-area calibration sources were placed in a matrix over the ground surface in order to cover and extend slightly beyond the field of view. This required multiple source movements in order to cover the entire field of view. A surface source calibration factor was then calculated by dividing the net count rate for the total field of view by the surface activity concentration, resulting in the calibration factor having units of counts per second/picocurie per square centimeter (cps/[pCi/cm^2]). Using an iterative process, Microshield™ software was used to calculate the energy fluence rate and the activity concentration in pCi/cubic centimeter (pCi/cm^3) of different uniform contamination distributions of a volume source that yielded an energy fluence rate equal to the surface energy fluence rate. The activity concentration was converted from activity per unit volume to activity per unit mass by dividing by a soil density of 1.5 grams per cubic centimeter (g/cm^3). The fluence rate due to the collided gamma rays (e.g., buildup in the shielding soil is included) were used for each modeled scenario. The volumetric calibration factors were then calculated by dividing the surface calibration factor determined for each height by the activity per unit mass that gave the same energy fluence rate (same count rate) as the measured large-area surface calibration sources.

The calibration factors were then used to convert the DLAPS data in cps to Cs-137 concentration in pCi/g using the following equation:

$$Cs^{137}(pCi/g) = 2.3 \times 10^{-4}(cps)^2 - 5.072 \times 10^{-2}(cps) + 0.134767 \qquad (A-1)$$

The MDC of radiological contamination on the surface soil for the DLAPS system is defined as a function of vehicle speed, gamma-ray energy, and detector height. Tests were performed on the relationship between these three variables for gamma energies ranging between 275 keV and 1,275 keV. Radiological point sources with activities varying from 432 to 8,590 pCi were used. With the range of gamma energies and activities tested, the MDC of the DLAPS system as a function of vehicle speed and the detector height above the ground surface falls within a predictable range. For performing driveover radiological surveys of large areas, a detector height of 50.8 cm and a vehicle speed of 2.5 to 5.6 miles per hour will ensure an MDC of less than 5 to 10 pCi/g respectively while optimizing the amount of area covered per unit time (Follette et al., 1998).

A.2.1.3 Quality Assurance

The driveover radiological surveys were conducted in accordance with ITLV-FA-010, "Radiological Land Area Surveys" (IT, 2001a) and Section 4.2.1 of the Gnome-Coach Work Plan (NNSA/NV, 2002). Radiological detection equipment used in the Gnome-Coach driveover surveys were performance-checked daily to known radiological sources as described in Standard Quality Practice ITLV-0460, "Daily Source and Background Check" (IT, 2001a), and Detailed Operating Procedure ITLV-FA-010, "Radiological Land Area Surveys" (IT, 2001b). To ensure positional accuracy, the GPS system was programmed according to the operational manual to achieve a submeter accuracy and performance, and checked in accordance with Standard Quality Practice ITLV-0453, "Field Mapping with a Global Positioning System" (IT, 2000). The DLAPS system response during the daily background and performance checks met the criteria established in ITLV-0460 and ITLV-FA-010.

A background area survey with the DLAPS system was conducted at the beginning of each day prior to performing driveover radiological surveys. This background area survey is used to establish the background range for the land-area survey to be performed that day and identify ambient background fluctuations.

The driveover radiological surveys are performed at a speed that will ensure a MDC of less than 5 pCi/g of Cs-137. This concentration is 3 percent of the infinite area preliminary action level for Cs-137 in surface soil established in Appendix B of the Work Plan (NNSA/NV, 2002). Comparison of gamma spectroscopy analysis of surface soil samples collected from Gnome-Coach to driveover radiological surveys performed at the same locations demonstrates that the MDC of the DLAPS system was significantly less than 5 pCi/g. The DLAPS system is able to detect hot spots at concentrations exceeding 1.6 pCi/g. This concentration is slightly less than the 99^{th} percentile Cs-137 concentration (1.63 pCi/g) reported in New Mexico surface soil samples collected from undisturbed background locations when decayed to 2002 (McArthur and Miller, 1989). In addition, this concentration is less than 1 percent of the minimum Cs-137 surface soil PAL.

A.2.1.4 Data Acquisition

A four-wheel drive truck, with the mounted DLAPS detector, was used to systematically traverse each designated AOC. The distance between each traverse (or detector pass) was dependent upon the detector height and the required coverage of the survey. The detector height determines the detector field of view. For example, with the detector approximately 1.67 feet above the ground surface the field of view is an oval 6.6 ft long by 3 ft wide.

The radiological measurements (in units of counts per second) and the three-dimensional survey location coordinates, in Universal Trans Mercator (UTM), 13 North American Datum (NAD) 1927 (CONUS), in meters, were recorded on a TSC1 data logger and stored in a combined file. Each measurement is an integrated one-second count and represents approximately 2.25 m^2 of land surface surveyed. The number of counts acquired during one second is recorded with a date and time stamp and the three-dimensional GPS coordinates. The combined file in the TSC1 data logger is downloaded to a laptop and the GPS measurements were exported using Trimble's Pathfinder Office™ software. Each GPS measurement was positionally corrected by collecting real-time satellite differential signals. The data was then exported as a standard comma delimited ASCII file.

The exported ASCII files are then imported into Microsoft Access™ 2000 tables and a non-parametric test developed by Hollander and Wolfe (1973) was performed on the count-rate data. The non-parametric test calculated the following confidence limits for each background-corrected data set: 68 percent, 95.4 percent, 99.7 percent, and 99.9 percent. If the survey counts per second data did not exceed the background counts per second data, then the confidence limits of 68 percent, 95.4 percent, 99.7 percent, and 99.9 percent were derived from the background data set.

The confidence limits are representative of the percent reliability that the counts per second exceed the mean background for the survey area. The ASCII data for each survey area was then imported into SURFER™, a commercial software package for graphical presentation. Using a Krigging gridding method, SURFER™ creates a color-coded contour plot for each of the survey areas. The color-coded contour plots identify gamma radiation emission rates from low to high based on the following color scheme: dark purple, dark blue, light blue, green, light green, yellow, orange, red, and pink. Plate 1 is a color-coded plot of the DLAPS system driveover radiological surveys of the Gnome-Coach site. Plate 1 represents more than 150,000 driveover radiological survey measurements. In addition, Plate 1 shows the outline of each AOC and the significant site features within each AOC. For example, the salt muckpile AOC includes the decontamination pad, salt muckpile, and the old laboratory.

The colors in Plate 1 represent the confidence level that the Cs-137 concentration in the surface soil exceeds its concentration in the background area. The DLAPS measurements exceeding 369 cps have a greater than 95 percent confidence level that the Cs-137 concentration in the surface soil exceeds that in the background area.

A.2.1.5 Analysis of the Driveover Radiological Data

The driveover radiological data was exported to Excel 97™ worksheets for initial data analysis. The worksheet for each AOC lists the northing and easting coordinate, elevation, date, and time of the measurement, and the counts per second for both DLAPS detectors. The weighted average counts per second for both detectors and the fitted Cs-137 concentration, based upon Equation A-1, were calculated and recorded in the spreadsheets. The same information is derived for each hot spot by defining the boundaries of the elevated count rate.

The background radiation rate is lower at the Gnome-Coach Site than the background radiation rate at the INEEL where the DLAPS system was calibrated. Therefore, when applying Equation A-1 the Cs-137 concentration is negative if the weighted average count rate is less than 218 cps. For example, all of the calculated Cs-137 concentrations in the Gnome-Coach background area were negative. To ensure the reported Cs-137 concentration is positive and conservatively calculated, the Cs-137 concentration in each data set is adjusted upward by adding to it the minimum Cs-137 concentration in the data set. For example, for the SGZ the minimum calculated Cs-137 concentration based on Equation A-1 is -2.646 pCi/g. Therefore, 2.646 pCi/g was added to all 21,059 calculated Cs-137 concentration values in the SGZ dataset.

The Cs-137 concentration data was exported to MINITAB™ statistical software (Minitab, 2000). The MINITAB™ software was used to calculate the descriptive statistics for the Cs-137 concentration data, the goodness of fit of the Cs-137 concentration data to normal and log normal distributions, and the 95 percent lower and upper confidence levels of the Cs-137 concentration for percentiles ranging from 0.00 to > 99.9 percent. The descriptive statistics include the following analysis for all DLAPS measurements associated with each AOC and hot spot and the natural logarithm of each measurement.

- Number of measurements acquired in the driveover survey of the AOC or hot spot
- The mean, median, trimmed mean, standard deviation, standard error of the mean, minimum, maximum, 1st quadrant, and 3rd quadrant of the Cs-137 concentration for each AOC and hot spot.
- A probability plot of the Cs-137 concentration and a plot of the upper and lower 95 percent confidence level of the Cs-137 concentration for each AOC and hot spot
- The Ryan-Joiner test (Ryan, Joiner, and Ryan, 1982), similar to Shapiro-Wilk (Shapiro and Wilk, 1965), is used to calculate a coefficient of determination between the Cs-137 concentration and a fitted normal or log normal distribution to the Cs-137 concentration

The descriptive statistics, distribution function analysis, probability plots, and 95 percent confidence level plots for Cs-137 concentrations in surface soil, based upon the DLAPS measurements, associated with each AOC and hot spot are located in Attachment 1, Exhibits 1 through 10. The Excel™ and MINITAB™ worksheets with the raw data and calculated values are voluminous, approximately 6,200 pages, and are not included in this report. Electronic copies of this data is kept in project files.

The number of Cs-137 concentration measurements varied from a minimum of 20 for fallout plume hot spot FALA0001 to a maximum of 45,669 for the fallout plume AOC. The coefficient of determination between the Cs-137 concentration and the fitted distribution function can hypothetically vary from a minimum of -1.00 for a perfect inverse correlation, through a value of 0.00 for a random correlation, to a maximum of 1.00 for a perfect fit. For the 17 AOCs and hot spots analyzed, the coefficient of determination varied from a minimum of 0.9440 for shaft hot spot SHFC0001 to values exceeding 0.99 for the equipment storage yard hot spot ESAA0001, shaft hot spot SHFB0001, shaft AOC, warehouse pad AOC, fallout plume AOC, fallout plume hot spot FALA0001, and salvage yard ROAD hot spot area. These coefficients of determinations represent excellent fits between the calculated Cs-137 concentration in surface samples and the equations fitted to their distributions. It is instructive to discuss the meaning of the correlation of determinations being very close to 1.0. The correlation of determinations demonstrate a nearly perfect fit between the measured Cs-137 concentration measured in the surface soil and the log normal probability distributions fitted to the measurements. Hence, if many times *n* surface soil samples are collected at random from these AOCs, there is a 94.4 to 99.9 percent confidence level that the calculated mean Cs-137 concentration from the population of *n* samples would not differ significantly, be within the two sigma total measurement uncertainty, of the true mean Cs-137 concentration.

A.2.1.6 Driveover Radiological Survey Results

Plate 1 displays the results of the DLAPS driveover radiological surveys. The DLAPS detector count rates varied from a minimum of 121 cps at the USGS drill pad AOC to a maximum of 794 cps in the salvage yard hot spot SAYA0001. The mean count rate in the background area was 174 cps. In addition, Plate 1 identifies the 1979 site restoration sample locations and the location and Cs-137 concentration in surface soil samples collected from 20 hot spots identified during the DLAPS driveover radiological surveys.

The calculated Cs-137 concentration in surface soils for eight Gnome-Coach AOCs and nine hot spots, based upon the DLAPS driveover radiological surveys, is summarized in Table A.2-2. This table lists the following information for each AOC and hot spot:

- Minimum Cs-137 concentration (pCi/g)
- Median Cs-137 concentration (pCi/g)
- 95 percent UCL in the mean Cs-137 concentration (pCi/g)
- Maximum Cs-137 concentration (pCi/g)
- Area-specific Cs-137 PAL (pCi/g)
- Comparison of the 95 percent UCL and maximum Cs-137 concentration to the PAL

The 95 percent UCL of the mean Cs-137 concentration and the maximum Cs-137 concentration was less than the area-specific PALs for all Gnome-Coach AOCs and hot spots. The Cs-137 concentration data listed in Table A.2-2 demonstrates the following.

- The maximum 95 percent UCL in the mean Cs-137 concentration, 7.67 pCi/g for hot spot FALB0001 in the Fallout Plume, is only 0.89 percent of the area-specific PAL.

- The 95 percent UCL in the mean Cs-137 concentration for the Salvage Yard is 1.08 percent of the area-specific PAL. This is the maximum percentage of the area-specific PAL for all Gnome-Coach AOCs and hot spots.

- The maximum Cs-137 concentration associated with a DLAPS measurement, an area of approximately 2.25 m^2, is 93.8 pCi/g. This concentration is less than 3 percent of the PAL for an area of 3 m^2 and 56.2 percent of the minimum Cs-137 surface soil PAL of 167 pCi/g (i.e., if Cs-137 is distributed in the surface soil over an area $2,000 m^2).

A comparison was made between the maximum calculated Cs-137 concentration at nine hot spots, based upon the DLAPS measurements, with the Cs-137 concentration in surface soil samples collected at the same hot spot location. The DLAPS-based data is based upon the average Cs-137 concentration over 2.25 m^2 of surface soil while the latter data set is based upon the mean Cs-137 concentration in a 500 mL soil sample collected from the ground surface to a depth of six inches. Although this comparison is being made between two different sets of data, the comparison is useful in determining how accurately and precisely the DLAPS measurements can predict the Cs-137 concentration in soil that has a Cs-137 concentration greater than background. The data is listed in

Table A.2-2
Cesium-137 Concentration in Gnome-Coach Surface Soil: Radiological

Gnome-Coach Area of Concern	Area (m^2)	Minimum Cs-137 Concentration (pCi/g)	Mean Cs-137 Concentration (pCi/g)	Median Cs-137 Concentration (pCi/g)	95% UCL Mean Cs-137 Concentration (pCi/g)	Maximum Cs-137 Concentration (pCi/g)	Area-Specific Cs-137 Preliminary ActionLevel(PAL) (pCi/g)[a]	Are the Mean, Median, 95% UCL Mean, and Maximum < PAL
FalloutPlume Hot Spot FALA0001	35	0.1400	2.46	2.71	4.70	44.1	971	Yes
Fallout Plume Hot Spot FALB0001	70	0.6400	6.51	5.440	7.67	76.0	893	Yes
Shaft Hot Spot SHFB0001	138	0.0100	0.57	0.484	0.76	24.1	832	Yes
Shaft Hot Spot SHFC0001	153	0.5390	1.75	1.567	1.89	24.5	825	Yes
Shaft Hot Spot SHFA0001	447	0.0190	1.35	1.723	1.50	15.9	763	Yes
Salvage Yard Hot Spot SAYA0001	531	0.3400	5.82	4.090	6.49	93.8	752	Yes
Area 57 Hot Spot A57A0001	663	0.1190	1.91	1.790	1.99	14.4	738	Yes
Equipment Storage Area Hot Spot ESA0001	792	0.5850	2.74	2.613	2.85	23.2	745	Yes
USGS Drill Pad	2,904	0.0000	0.45	0.476	0.46	2.7	693	Yes
LRL-7	8,151	0.0001	0.45	0.485	1.67	2.4	351	Yes
Warehouse Pad	14,261	0.0001	0.70	0.714	0.71	8.2	217	Yes
Salvage Yard Road Hot Spots Area	16,398	0.0190	2.08	1.944	2.11	64.3	195	Yes
Shaft	19,659	0.0063	0.92	0.898	0.93	24.5	170	Yes
Surface Ground Zero	29,455	0.0086	0.69	0.723	0.70	17.2	167	Yes
Saltmuckpile	31,790	0.0001	0.65	0.707	0.66	24.1	167	Yes
Fallout Plume	54,511	0.0001	0.88	0.905	0.88	76.0	167	Yes
Salvage Yard	60,076	0.0086	1.24	1.259	1.26	93.8	167	Yes

Gnome-Coach median Cs-137 concentration = 1.00 (Percent of PAL = 0.60)
Gnome-Coach 95% UCL Cs-137 concentration = 1.01 (Percent of PAL = 0.61)
Number of driveover rad measurements = 154,921
Total area surveyed in square meters = 240,033
[a]Appendix B (Section B.3.3) defines area-specific PALs

Table A.2-3. For one hot spot, SHFB0001, the two sets of measurements are significantly different. The Cs-137 concentration derived from the DLAPS measurements is 24.1 pCi/g, and the Cs-137 concentration measured utilizing gamma spectroscopy is 1.56 pCi/g. The surface soil sample collected from hot spot SHFB0001 may not have been the location with the highest Cs-137 concentration. Nevertheless, the Cs-137 concentration for eight of the nine hot spots analyzed are not different at the 95 percent confidence level.

Table A.2-3
Comparison of DLAPS and Gamma Spectrometry Measurements of Cs-137 Concentration in Hot Spot Surface Soil

Hot Spot Location	DLAPS Maximum Cs-137 Concentration ± 2F (pCi/g)	Gamma Spectrometry Cs-137 Concentration ± 2F (pCi/g)	DLAPS Cs-137 Concentration and Gamma Spectrometry Cs-137 Concentration within 2F
FALA0001	44.1 ± 13.3	67.5 ± 10.2	Yes
FALB0001	76 ± 17.4	58.7 ± 9	Yes
SHFA0001	15.9 ± 8	9.4 ± 1.9	Yes
SHFB0001	24.1 ± 9.8	1.56 ± 0.54	No
SHFC0001	24.5 ± 9.9	32.8 ± 5.04	Yes
SAYA0001	93.8 ± 19.4	95.4 ± 14.3	Yes
A57A0001	14.4 ± 7.6	10.5 ± 2	Yes
ESAA0001	23.2 ± 9.6	14.3 ± 2.5	Yes
Salvage Yard Road	64.3 ± 16	79.7 ± 38.4	Yes

The driveover radiological surveys were performed over 100 percent of the seven AOCs identified in the Work Plan (NNSA/NV, 2002). The nature and extent of the radiological contamination are represented in Plate 1. In addition, Plate 1 displays the Cs-137 concentrations in 20 areas with elevated concentrations. Table A.2-2 summarizes the Cs-137 concentrations in the seven AOCs and nine hot spots and compares them to the area-specific PALs. No surface soil at Gnome-Coach exceeded the minimum area-specific PAL of 167 pCi/g.

The 95 percent UCL of the mean Cs-137 concentration with the highest percentage of the area-specific PAL is the salvage yard ROAD hot spots area. The 95 percent UCL mean Cs-137 concentration in this area is 2.11 pCi/g, which is equal to 1.08 percent of the area-specific PAL. The

95 percent UCL mean Cs-137 concentration at all other Gnome-Coach locations is less than 1.00 percent of the area-specific PAL.

A.2.2 Cone Penetrometer

This section provides details on the shallow subsurface *in situ* radiological survey investigation utilizing a CPT equipped with a sodium iodine (NaI) gamma spectrometer detector. A subsurface *in situ* radiological survey is the primary investigation tool used in determining the vertical extent of radiological contamination at hot spot locations identified during the radiological driveover surveys. In addition, the CPT was used in determining the nature and vertical extent of radiological contamination at selected AOCs identified in the Work Plan (NNSA/NV, 2002).

Gamma rays emitted from Cs-137 located within a foot of the probe tip should have sufficient energy to penetrate the soil, probe, and NaI detector, resulting in recorded counts and gamma spectra. The CPT system is designed to continuously measure the count rate in the detector as the probe is pushed through the subsurface soils. A gamma spectra can also be acquired at any time when the probe is stationary.

A.2.2.1 CPT System Description

The tip of the CPT is equipped with a probe containing a 1- × 2-in. cylindrical NaI detector that can be used to acquire both counts and gamma spectra. The probe is driven into the ground using hydraulic pressure balanced against the weight of the 25- to 40-ton truck-mounted platform. The CPT connects rods to the probe and uses a hydraulic system to advance the rods and the probe through the subsurface soils. In addition to the NaI detector, the tip of the probe contains a preamplifier, temperature sensor, sleeve stress sensor, and tip stress sensor. The data acquisition and analysis systems are located in the CPT.

A.2.2.2 CPT System Calibration

The CPT probe with the NaI detector was tested for energy linearity over a gamma energy range from 583 to 2,614 keV using three check sources: 1 microcurie (µCi) Cs-137, 1 µCi cobalt-60 (Co-60), and 0.1 µCi thallium-208 (Tl-208). The full-energy peak was linear over the energy range tested (ARA, 1998). The Cs-137 peak resolution was calculated to be 7.5 percent (ARA, 1998). The

Cs-137 resolution as a function of count rate was determined using a sodium-22 (Na-22) check source and a 10 µCi barium-133 (Ba-133) source in addition to the check sources listed above. As the count rate from the NaI detector was increased from 3,500 to 20,000 cps, the loss in the Cs-137 full-energy peak resolution was less than 0.2 percent as the detector dead time increased from 7 to 54 percent (ARA, 1998). When in the CPT probe, the efficiency of the NaI detector for Cs-137 was measured using the first three check sources listed above plus a 10 µCi Cs-137 source placed at a distance of 25.4 cm from the probe. For the different combination of sources, the efficiency for Cs-137 varied from 3.00 to 3.5 cps/µCi.

A quantitative calibration is difficult to perform for the CPT probe NaI gamma spectroscopy system in the shallow subsurface soil environment. The concentration of gamma emitters in an environmental sample can be quantified using gamma detector spectroscopy systems by specifying and controlling each of the following 10 variables:

- Density and atomic number fraction for each element in the sample
- Density and atomic number fraction for all media surrounding the sample
- Density and atomic number fraction for all media between the sample and the detector
- Size and shape of the sample
- Distance and the direction from the sample to the detector

A calibration factor, expressed in units of (pCi/g)/cps is valid if, and only if, each of these 10 variables is known and controlled within very narrow defined limits. The detector calibration factor must also be defined experimentally as a function of the environmental variables such as temperature, humidity, and background radiation that cannot be accurately and precisely controlled.

Few of the 10 variables listed above can be known or controlled during CPT gamma spectroscopy. Therefore, the accuracy and precision in the calculated concentration of Cs-137 in soil obtained from CPT gamma spectroscopy analysis will be less than that for a soil sample analyzed in a qualified radioanalytical laboratory.

Due to effects of Compton scatter, achieving a quantitative calibration of a CPT gamma spectroscopy system is made even more difficult because the detector is operating in soil instead of air. Compton scatter is the predominant interaction mechanism for 661.65 keV gamma-ray photon emitted from the Cs-137 decay product, Ba-137 m. The Compton scattering takes place between the gamma-ray photon and the electrons in the soil, probe, and NaI detector. The Compton scattering of the gamma-ray photon by the soil is significantly greater than Compton scattering in air. The increase is due to the higher average atomic number and higher density of soil in comparison to air. During Compton scattering, the gamma-ray photon is deflected with respect to its original direction and transfers a portion of its energy to an electron. The angular distribution of the scattered Cs-137 photons has a strong tendency for forward scatter. Subsequently, each of the Compton-scattered photons may then undergo additional Compton interaction, transferring more of its energy to electrons and distributing less of its angular scatter in the direction of the original incident photon. The multiple Compton scatter interactions in soil results in a gamma spectrum with a much broader and lower energy peak in comparison to a Cs-137 spectrum acquired under typical laboratory conditions (i.e., a point source in air). For typical laboratory conditions, gamma-ray photon spectra peaks are distinct, narrow, and most of the counts from Cs-137 are under the easily identified full-energy peak present at the 661.65 keV energy line. However, the CPT gamma-ray spectrum acquired in Cs-137-contaminated soil has a broad flat peak from 90 to 110 keV. Only a very small fraction of the total counts are located in a region near the 661.65 keV full-energy line, and there is no discernable peak. Mathematical modeling of the acquired CPT spectra is required to identify the number of counts associated with the Cs-137 peak. CPT gamma spectroscopy can only provide a semi-quantitative analysis of the Cs-137 concentration in soil. Therefore, soil samples are collected from the shallow subsurface and analyzed using laboratory gamma spectroscopy to confirm the nature and extent of radionuclide contamination identified by the CPT.

A calibration was performed on the CPT gamma spectroscopy system. CPT gamma spectra were acquired for Cs-137-contaminated sand with concentrations varying from 4.8 to 34,824 pCi/g. The Cs-137-contaminated sand geometry consisted of a right-circular cylinder with a depth of 15.24 cm and a diameter of 30.48 cm. The contaminated sand was surrounded by 40 cm of clean sand. The CPT probe with a NaI detector was passed through the center of the clean and contaminated sand. The calibration factor established for this geometry is:

$$Cs^{137}(\text{pCi/g}) = (C_{ROI} + 13{,}643)/29.4 \qquad \text{(A-2)}$$

where:

C_{ROI} = equals the number of counts in the 600 keV to 800 keV region of interest

The Pearson coefficient of fit of Equation A-2 is 0.999 with a P-value of 0.0002 for sand with known Cs-137 concentrations ranging from 300 to 50,000 pCi/g.

A.2.2.2.1 Temperature Calibration

Heat is produced from the friction of pushing the probe through the subsurface. The heat is transmitted to the NaI detector and causes changes in the density and gamma response of the crystal. This results in a gain shift in the acquired gamma spectra. Detector calibration tests were performed by the CPT system operator at 10.1, 28.7, and 44.9 ºC, and an algorithm was developed to correct the gain shift as a function of temperature (ARA, 1998). Changes in the probe temperature are detected by a probe sensor and transmitted to the CPT data acquisition system. Corrections are made by the data acquisition system to the gamma spectra to correct for thermal changes in the detector based upon the temperature calibration.

A.2.2.3 CPT Operations

The CPT system is designed to continuously measure the count rate in the NaI detector as the probe is pushed through the subsurface soil. A gamma spectra can be acquired at any time when the probe is stationary.

The data collected from the sleeve and tip stress sensors are used to determine if the rods are being bent beyond their design limits, provide information on the nature of the material through which the probes are being pushed, and if the pressure on the probe indicates refusal in the subsurface material. The CPT system is operated as follows:

- Temperature and gamma count rates are digitized on two channels of the data acquisition system. The results are viewed with a temperature correction display program on the local area network within the truck.
- The gross gamma count-rate data as a function of probe depth is provided continuously in real time by the rate meter on the multichannel analyzer.
- Raw spectra data can be viewed in real time while the push is in progress.
- When the probe is stationary, the system software collects gamma spectrometry data over a user-selected time interval, corrects the data for temperature, and makes the data available for viewing in quasi-real time.

- All acquired data are stored and available as hard copies and electronic copies.

A.2.2.3.1 CPT Quality Control

Before and after each CPT push, the NaI response to a 1.0 µCi Cs-137 check source is performed. In addition, a 300-second background spectrum was acquired. The resolution and gain shifts in the Cs-137 full-energy peak gain are evaluated to ensure the loss in resolution is less than 5 percent, and ensure the energy of the Cs-137 peak had not shifted more than 0.2 percent. If these two criteria had not been achieved, no CPT radiological surveys are performed until the CPT detector system performance is restored.

A.2.2.4 CPT Radiological Survey Results

The results of the CPT radiological survey are listed in Table A.2-4. This table lists the boring number in which the gamma spectrum was collected, the AOC, the depth below the ground surface, the estimated Cs-137 concentration, and comparison of the estimated Cs-137 concentration to the maximum concentration of Cs-137 in background and the minimum area-specific PAL.

Table A.2-4
CPT Estimated Cs-137 Concentration in Subsurface and Surface Soil

Boring Number	AOC	Depth (ft)	Estimated Cs-137 (pCi/g)	Exceed Maximum Background in Surface Soil	Exceed Minimum Area-Specific Surface Soil PAL (167 pCi/g)
CPTBE0000	Salvage Yard	0.5	75.25	Yes	No
CPTBG0000	Salvage Yard	2.3	15.4	Yes	No
CPTBH0000	Salvage Yard	3.3	85.32	Yes	No
CPTBI0000	Salvage Yard	2.8	16.42	Yes	No
CPTBK0000	Salvage Yard	0.3[a]	184.82	Yes	Yes
CPTCA0000	Shaft	0.1[b]	20.18	Yes	No

[a]Sample CPTBK0000, the CTP was pushed to a depth of 6 ft, maximum count rate is at 0.3 ft bgs
[b]Sample CPTCA0000, the CTP was pushed to a depth of 4.3 ft, maximum count rate is at 0.1 ft bgs

A.3.0 Soil Sampling

Soil samples were collected during the Gnome-Coach site investigation and submitted for gamma spectrometry and isotopic plutonium analysis. The soil sample locations were selected to validate driveover and CPT *in situ* radiological surveys.

Soil samples were collected when a hot spot was detected during a driveover radiological survey. At that time, the vehicle would be stopped and one of the survey team members would flag the location based upon a handheld instrument survey. Handheld surveys were performed using a small plastic scintillation detector, TSA Model PRM-470B, with the 470B elevated as specified by the team leader, typically at 14 to 20 inches above the ground surface. The 470B surveys were performed at a speed of less than 2 feet of detector movement per second with the speaker on. When increased count rates were detected, the surveyor reduced the survey speed (~ 2 to 3 in. of detector movement per second) and determined the size of the affected area by moving the detector in a pattern that allows for finding the boundary (i.e., the area where the count rate returns to background). A survey team member then records the location and radiation instrument count rate electronically utilizing a Trimble Pathfinder Pro XRS GPS receiver with a TSC1 data logger.

CPT soil samples were collected from locations where the CPT NaI detector count rate indicated elevated Cs-137 concentrations in the subsurface soil. The depth of the subsurface soil sample was selected to bound the vertical boundary of the potential Cs-137 contamination. The locations of all CPT confirmation soil samples were measured and recorded using the GPS system.

Each soil sampling location was named, described, and documented in accordance with the New Mexico QAPP (Appendix B of the Work Plan [NNSA/NV, 2002]) and applicable contractor standard quality practices. CPT and driveover radiological survey confirmation samples were collected at the following locations:

- Eleven CPT subsurface confirmation samples were collected from the salvage yard AOC.
- Four CPT subsurface confirmation samples were collected from the salt muckpile AOC.
- Two CPT subsurface confirmation samples plus one duplicate were collected from the fallout plume AOC.

- Four CPT subsurface confirmation samples were collected from the new laundry/lab AOC.
- Two CPT subsurface confirmation samples were collected from the contaminated waste dump AOC.
- One surface confirmation sample was collected from the Area 57 AOC hot spot.
- Six surface confirmation samples were collected from fallout plume AOC hot spots.
- Nine surface confirmation samples were collected from the salvage yard ROAD hot spots.
- Two surface confirmation samples were collected from salvage yard AOC hot spots.
- Three surface confirmation samples plus a duplicate were collected from shaft hot spots.
- One surface confirmation sample plus duplicate was collected from the equipment storage area hot spot.
- Nine subsurface samples were collected from the drum storage area AOC.
- Three subsurface samples were collected from the LRL-8 drill pad AOC.
- Four subsurface samples were collected from the Sandia No. 1 drill pad AOC.
- Four subsurface samples were collected from the decontamination pad AOC.
- Three subsurface samples were collected from the LRL-1 drill pad AOC.
- Four subsurface samples were collected from the surface ground zero AOC.
- Ten subsurface samples were collected from the shaft AOC.
- Eight subsurface samples plus one duplicate were collected from the warehouse pad AOC.
- Eight subsurface samples plus one duplicate were collected from the new laundry/lab AOC.
- Eight subsurface samples were collected from the USGS-4/-8 AOC.
- Twenty-four samples were collected from the Gnome-Coach background area.

Four confirmation soil samples were analyzed for isotopic plutonium to confirm that Pu-239/240 is not a radiological COC at the site. One soil sample was collected from the Gnome-Coach shaft AOC at the equipment storage area (ESAA0001). Sample ESAA0001 was selected because it is in an area with elevated Cs-137 concentration in the surface soil. This hot spot represents the largest footprint of elevated Cs-137 in the shaft AOC, and the sample location is where an aliquot of an Environmental Evaluation Group (EEG) soil sample collected in 1995 had elevated Pu-239/240 (EEG, 1995). The remaining three soil samples selected for isotopic plutonium analysis are sample A57A001 collected from the Area 57 hot spot located in the SGZ AOC, sample SAYB0001 collected from a hot spot in the salvage yard AOC, and sample SAN1B1415 collected from the Sandia No. 1 drill pad.

The Gnome-Coach Site Characterization Work Plan stipulates that isotopic plutonium analysis will be done for soil samples with detectable concentrations of Am-241. This criterion was made because Am-241 is often co-located with weapons plutonium due to the fact that Pu-241, a trace isotope, decays to Am-241. No Am-241 was detected in any of the soil samples analyzed by gamma spectroscopy.

A.3.1 Data Quality

Global Positioning System coordinates were measured and recorded for all soil samples locations. The sample locations are defined in accordance with the UTM, 13 North NAD 1927 (CONUS) system and are accurate to within less than one meter.

Quality control samples at the Gnome-Coach Site were collected, labeled, handled, and shipped to the radioanalytical laboratory in accordance with the New Mexico QAPP located in Appendix B of the Work Plan (NNSA/NV, 2002). The samples were analyzed in accordance with the following Paragon Analytics, Inc., standing operating procedures:

- *Analysis of Alpha Emitting Radionuclides by Alpha Spectrometry* (PAI, 1999b)
- *Actinides - Preparation Methods for the Verification of Tracers and Spikes* (PAI, 1999a)
- *Preparation and Verification of Standards in the Actinides Laboratory* (PAI, 1999c)
- *Soil Preparations for Radiochemistry Analysis* (PAI, 1999d)
- *Tracing and Spike Witnessing Soil Actinides Samples* (PAI, 1999e)
- *Actinides - Thorium and Alpha Emitting Plutonium and Plutonium-241 Sequential Separation by Anion Exchange* (PAI, 2000a)

- *Total Dissolution of Solids for the Radiochemical Determination of Actinides and Other Non-Volatile Radionuclides* (PAI, 2000b)

On-site gamma spectrometry was performed in accordance with the following documents:

- Detailed Operating Procedure ITLV-FA-001, "Gamma Spectroscopy Systems Operations" (IT, 1999)
- IT Corporation Standard Quality Practice ITLV-0425, "Calibration and Maintenance of Measuring and Testing Equipment" (IT, 2002)
- IT Corporation Standard Quality Practice ITEES0009, "Field Equipment Calibration and Control," Revision 0, May 16, 1992 (IT, 1992)
- ANSI N42.14, *Calibration and Usage of Germanium Detectors for Measurement of Gamma Ray Emissions of Radionuclides* (ANSI, 1999)
- *Genie-2000 Inspector Spectroscopy System Hardware Manual* (Canberra, 1998b)
- *Model S503 PROcount-2000 User's Manual* (Canberra, 1998c)
- *Genie-2000 Inspector Spectroscopy System Customization Tools* (Canberra, 1998a)

A.3.2 Radioanalytical Results

The radioanalysis of the Gnome-Coach soil samples is summarized in Table A.3-1. This table lists the Cs-137 concentrations determined from on-site gamma spectroscopy analysis and the results of the isotopic plutonium analysis performed off site by Paragon Analytics. Table A.3-1 does not include the concentration of the natural-occurring radionuclides identified in the gamma spectra. Fifty-three soil samples were analyzed using gamma spectroscopy. Four samples were analyzed using radiochemistry and alpha spectroscopy for isotopic plutonium concentration. Seventeen of the 53 soil samples had Cs-137 concentrations exceeding the maximum Cs-137 concentration measured in a surface soil sample collected from undisturbed background locations in New Mexico (McArthur and Miller, 1989). None of the soil samples analyzed using gamma spectroscopy had a Cs-137 concentration exceeding the minimum Cs-137 PAL for the Gnome-Coach Site (167 pCi/g). The maximum Cs-137 concentration is 95.4 pCi/g ± 7.16 pCi/g in soil sample SAYA0001 collected from the salvage yard AOC.

Table A.3-1
Radioanalytical Data on Gnome-Coach Soil Samples
(Page 1 of 2)

Sample Number	AOC	Depth (ft)	Isotope	Concentration (pCi/g)	Uncertainty (pCi/g)	Exceed Maximum Background?[a]	Exceed Minimum Surface Soil?[b]
A57A0001	Area 57	surface	Cs-137	1.05E+01	1.02E+00	Yes	No
CPTBE0102	Salvage Yard	1 to 2	Cs-137	7.81E-02	9.61E-01	No	No
CPTBG0004	Salvage Yard	4	Cs-137	5.69E+00	2.56E+01	Yes	No
CPTBH0305	Salvage Yard	3 to 5	Cs-137	3.36E+00	1.70E+00	Yes	No
CPTBI0204	Salvage Yard	2 to 4	Cs-137	5.56E+00	6.68E-01	Yes	No
CPTBK0002	Salvage Yard	2	Cs-137	2.10E+00	3.51E-01	Yes	No
CPTFE0709	Salt Muckpile	7 to 9	Cs-137	9.29E-01	2.03E+00	No	No
CPTFG0406	Salt Muckpile	4 to 6	Cs-137	1.70E+00	1.02E+00	No	No
CPTFK0305	Salt Muckpile	3 to 5	Cs-137	2.10E+00	2.99E+00	Yes	No
CPTMC0001	Fallout Plume	1	Cs-137	1.32E+00	2.33E-01	No	No
CPTMC0001 DUP	Fallout Plume	1	Cs-137	1.15E+00	1.22E+00	No	No
DSAC0101	Drum Storage Area	QA	Cs-137	8.18E-02	9.72E-02	No	No
ESAA0001	Equipment storage area	1	Cs-137	1.43E+01	1.26E+00	Yes	No
ESAA0001 DUP	Equipment storage area	1	Cs-137	1.43E+01	7.44E+00	Yes	No
FALA0001	Fallout Plume	1	Cs-137	6.75E+01	5.12E+00	Yes	No
FALB0001	Fallout Plume	1	Cs-137	5.87E+01	4.51E+00	Yes	No
FALC0001	Fallout Plume	1	Cs-137	6.95E+00	7.89E-01	Yes	No
FALD0001	Fallout Plume	1	Cs-137	3.70E+00	1.12E+00	Yes	No
FALE0001	Fallout Plume	1	Cs-137	1.63E+01	1.45E+00	Yes	No
FALF0001	Fallout Plume	1	Cs-137	5.25E+00	3.83E+00	Yes	No
ROADA 0001	Road CWD & Storage Yard	1	Cs-137	9.01E+00	1.09E+00	Yes	No
ROADB 0001	RD CWD & SY	1	Cs-137	6.20E+00	5.33E+00	Yes	No
ROADC 0001	RD CWD & SY	1	Cs-137	1.11E+01	1.03E+00	Yes	No
ROADD 0001	RD CWD & SY	1	Cs-137	1.56E+01	4.75E+00	Yes	No
ROADE 0001	RD CWD & SY	1	Cs-137	8.93E+00	9.28E-01	Yes	No
ROADF0001	RD CWD & SY	1	Cs-137	1.59E+01	1.71E+00	Yes	No
ROADG 0001	RD CWD & SY	1	Cs-137	5.34E+00	6.59E-01	Yes	No
ROADH0001	RD CWD & SY	1	Cs-137	7.97E+01	1.92E+01	Yes	No
ROADI0001	RD CWD & SY	1	Cs-137	1.22E+01	1.12E+00	Yes	No
SAYA0001	Salvage Yard	1	Cs-137	9.54E+01	7.16E+00	Yes	No
SAYB0001	Salvage Yard	1	Cs-137	6.97E+00	1.02E+00	Yes	No
SHFA0001	Shaft	1	Cs-137	9.40E+00	9.29E-01	Yes	No

Table A.3-1
Radioanalytical Data on Gnome-Coach Soil Samples
(Page 2 of 2)

Sample Number	AOC	Depth (ft)	Isotope	Concentration (pCi/g)	Uncertainty (pCi/g)	Exceed Maximum Background?[a]	Exceed Minimum Surface Soil?[b]
SHFB0001	Shaft	1	Cs-137	1.56E+00	2.69E-01	No	No
SHFC0001	Shaft	1	Cs-137	3.28E+01	2.52E+00	Yes	No
SHFC0001 DUP	Shaft	1	Cs-137	3.31E+01	2.56E+00	Yes	No
BKGA0001	Background	1	Cs-137	1.92E-01	1.17E-01	No	No
BKGA0101	Background	1	Cs-137	1.38E-01	1.23E-01	No	No
BKGC0001	Background	1	Cs-137	1.14E-01	2.60E-01	No	No
BKGD0001	Background	1	Cs-137	6.31E-02	1.24E-01	No	No
BKGD0001-2	Background	1	Cs-137	1.10E-01	6.01E-02	No	No
BKGE0001	Background	1	Cs-137	1.10E-01	8.50E-02	No	No
BKGF0001	Background	1	Cs-137	9.03E-02	2.80E-01	No	No
DSAD0405	Drum storage area	4 to 5	Cs-137	1.05E-01	4.80E-02	No	No
DSAE0405	Drum storage area	4 to 5	Cs-137	6.60E-02	4.30E-02	No	No
DSAG0405	Drum storage area	4 to 5	Cs-137	1.73E+00	4.10E-01	No	No
DSAG0405	Drum storage area	4 to 5	Cs-137	1.54E+00	3.10E-01	No	No
DSAI0405	Drum storage area	4 to 5	Cs-137	1.84E-01	8.30E-02	No	No
LRL8C1112	LRL-8 Drill Pad	11 to 12	Cs-137	1.60E-01	1.00E-01	No	No
A57A0001	Area 57	1	Pu-239/240	6.00E-02	1.70E-02	No	No
ESAA0001	Equipment Storage Area	1	Pu-238	3.39E-01	5.50E-02	Yes	No
ESAA0001	Equipment Storage Area	1	Pu-239/240	2.22E+00	2.90E-01	Yes	No
SAN1B1415	Sandia No. 1 Drill Pad	14 to15	Pu-239/240	2.80E-03	4.50E-03	No	No
SAYB0001	Salvage Yard	1	Pu-239/240	2.80E-02	1.30E-02	No	No

[a]The maximum background concentration for Cs-137 (1.875 pCi/g) is based upon 62 surface soil samples collected from undisturbed background locations in New Mexico (McArthur and Miller, 1989). The maximum background concentration for plutonium-239/240 (0.19 pCi/g) is based upon 55 surface soil samples collected from undisturbed background locations in New Mexico (McArthur and Miller, 1989).
[b]The PAL for Cs-137 is 167 pCi/g, the minimum concentration that will result in 25 mrem/yr to an on-site rancher if the contaminated area equals or exceeds 20,000 square meters. For Pu-239/240 and Pu-238, the PAL is the National Council on Radiation Protection and Measurements, Report #129, soil screening level for the sparsely vegetated land use, 7.84 and 8.65 pCi/g, respectively (NCRP, 1999).

One of the four soil samples analyzed for isotopic plutonium (ESAA0001) had a concentration exceeding the maximum concentration measured in a surface soil sample collected from undisturbed background locations in New Mexico (McArthur and Miller, 1989). Sample ESAA0001, collected from the equipment storage area AOC, had Pu-238 and Pu-239/240 concentrations of 0.339 ± 0.055 pCi/g and 2.22 ± 0.29 pCi/g, respectively. These concentrations exceed background but are less than the screening level of 8.65 pCi/g and 7.84 pCi/g, respectively, for the sparsely vegetated rural land use established by the National Council on Radiation Protection and Measurements (NCRP, 1999).

Soil samples were collected from CPT sample locations to confirm the extent of Cs-137 concentrations in subsurface soil. Table A.3-2 lists the comparison between the estimated Cs-137 concentration using the CPT gamma spectroscopy system and the Cs-137 concentration in soil samples collected from the same locations.

Table A.3-2
Comparison of CPT Estimated Cs-137 Concentration to Gamma Spectroscopy Analysis

CPT Sample Number	CPT Depth (ft)	Estimated Cs-137 (pCi/g)	Subsurface Soil Sample Number	Sample Depth (ft)	Cs-137 (pCi/g)
CPTBE0000	0.5	75.25	CPTBE0102	1 - 2	7.81E-2 ± 9.61E-1
CPTBG0000	2.3	15.4	CPTBG0004	4	5.69 ± 2.56E+1
CPTBH0000	3.3	85.32	CPTBH0305	3 - 5	3.36 ± 1.70
CPTBI0000	2.8	16.42	CPTBI0204	2 - 4	5.55 ± 0.67
CPTBK0000	0.3[a]	184.82	CPTBK0002	2	2.1 ± 3.51E-1
CPTCA0000	0.1[b]	20.18	SHFC0001	1	32.8 ± 2.52

[a]Sample CPTBK0000, the CTP was pushed to a depth of 6 ft, maximum count rate is at 0.3 ft bgs
[b]Sample CPTCA0000, the CTP was pushed to a depth of 4.3 ft, maximum count rate is at 0.1 ft bgs

The 95 percent confidence level Cs-137 concentration in the CPT confirmatory soil samples did not exceed the maximum Cs-137 concentration measured in a surface soil sample collected from undisturbed background locations in New Mexico (McArthur and Miller, 1989).

A.4.0 Vegetation Sampling and Analysis

Vegetation sampling was conducted in order to characterize the radionculide concentrations in the important range species in the area and provide information of estimation of radionculide ingestion by range cattle as constituents of the human health risk screening evaluation. The vegetation sampling approach is to obtain sufficient mass of the important grass species, with emphasis on black grama (*Bouteloua eriopoda*) and sand dropseed (*Sporobolus cryptandrus*) species, to ensure that background concentrations of Cs-137 would be detected.

Thirteen sets of vegetation samples were collected from the Gnome-Coach Site. Samples were collected from the fallout plume AOC, upwind approximately 985 ft southwest of the Gnome-Coach ground zero, and from a control area approximately 490 to 655 ft southwest of the Gnome-Coach site. The vegetation sampling was conducted in accordance with the Field Sampling Plan in Appendix D of the Work Plan (NNSA/NV, 2002). A summary of the gamma spectroscopy results is listed in Table A.4-1. The only radionuclide contaminant identified by gamma spectroscopy is Cs-137. The 95 percent UCL in the mean Cs-137 concentration in the vegetation samples is 0.209 pCi/g. The descriptive statistics for the Cs-137 concentration in the vegetation samples are listed in Exhibit 12.

A.4.1 Dose Assessment

The Cs-137 concentration in the vegetation was used to calculate the dose to three hypothetical dose receptors who are assumed to ingest beef from cattle that grazed on Gnome-Coach grasses. The three hypothetical dose receptors include an adult, a teenager, and a child. The details regarding the calculation of the beef ingestion dose are included in Exhibit 13. The mean dose to an adult from the ingestion of beef obtained from cattle that grazed in the Fallout Plume at Gnome-Coach is 0.024 mrem/yr, the dose to the teenager is 0.025 mrem/yr, and the dose to the child is 0.011 mrem/yr. The calculated doses are less than 0.025 percent of the dose limit for protection of members of the public (100 mrem/yr) established in DOE Order 5400.5 (DOE, 1993).

Table A.4-1
Gamma Spectroscopy Results for Gnome-Coach Vegetation Samples

Sample Number	AOC	Isotope (pCi/g)	Concentration (pCi/g)	Uncertainty (pCi/g)	MDC (pCi/g)
VSA1A	Fallout Plume	Cs-137	0.114	0.035	0.039
VSA1B	Fallout Plume	Cs-137	0.084	0.026	0.028
VSA1C	Fallout Plume	Cs-137	0.534	0.1	0.035
VSA2A	Fallout Plume	Cs-137	0.215	0.05	0.038
VSA2B	Fallout Plume	Cs-137	0.116	0.035	0.039
VSA2C	Fallout Plume	Cs-137	0.12	0.04	0.047
VSA3A	Fallout Plume	Cs-137	0.115	0.042	0.051
VSA3B	Fallout Plume	Cs-137	0.273	0.059	0.035
VSA3C	Fallout Plume	Cs-137	0.57	0.11	0.044
VSA4A	Fallout Plume	Cs-137	0.222	0.052	0.041
VSA4B	Fallout Plume	Cs-137	0.096	0.033	0.04
VSA4C	Fallout Plume	Cs-137	0.13	0.039	0.041
VSA5A	Fallout Plume	Cs-137	0.092	0.034	0.043
VSA5B	Fallout Plume	Cs-137	0.082	0.03	0.038
VSA5C	Fallout Plume	Cs-137	0.1	0.037	0.047
VSA6A	Fallout Plume	Cs-137	0.306	0.065	0.045
VSA6B	Fallout Plume	Cs-137	0.263	0.064	0.057
VSA6C	Fallout Plume	Cs-137	0.15	0.043	0.047
VSA7A	Fallout Plume	Cs-137	0.119	0.033	0.036

A.5.0 Conclusion

The objectives, scope of work, and technical approach for investigating the radiological contamination in surface (0 to 1 ft) soil and the shallow subsurface (1 to 20 ft) soil met the requirements established in the Work Plan (NNSA/NV, 2002). Data of sufficient quality and quantity was obtained to confirm the Gnome-Coach conceptual site model. The radiological contaminant of concern is Cs-137. The driveover radiological surveys of the surface soil resulted in the following:

- >150,000 measurements were collected over an area >240,000 m^2
- 95% UCL of the mean Cs-137 concentration for the Gnome-Coach site is 1.01 pCi/g
- Maximum 95% UCL of the mean Cs-137 concentration for an AOC is 1.26 pCi/g
- Maximum AOC 95% UCL of the mean Cs-137 concentration is 0.75 percent of the PAL
- Maximum 95% UCL of the mean Cs-137 concentration at a hot spot is 7.67 pCi/g
- Maximum hot spot 95% UCL of the mean Cs-137 concentration is 1.08% of its PAL

The CPT shallow subsurface *in situ* radiological surveys resulted in only six locations with Cs-137 concentrations exceeding background. One of the CPT-estimated gamma spectroscopy analyses had a Cs-137 concentration exceeding the minimum surface soil PAL. On-site gamma spectroscopy of confirmatory subsurface soil samples collected at these CPT sample locations demonstrates that the 95 percent confidence level in the Cs-137 concentrations does not exceed the maximum Cs-137 concentration measured in a surface soil sample collected from undisturbed background locations in New Mexico (McArthur and Miller, 1989).

Gamma spectroscopy analysis was performed on 12 sets of vegetation samples. Vegetation samples collected from the fallout plume had a mean Cs-137 concentration is 0.195 pCi/g and a 95 percent UCL of the mean Cs-137 concentration of 0.209 pCi/g. The maximum calculated dose to a hypothetical receptor ingesting beef from cattle that grazed on the Gnome-Coach site is 0.025 mrem/year. This dose is less than 0.0025 percent of the dose limit established in DOE Order 5400.5 for protection of the public and environment (DOE, 1993).

The radiological *in situ*, soil sampling, and vegetation sampling and analysis activities provided sufficient quantity and quality of data to establish current site conditions and identify and evaluate if further action is required for permanent closure of the site.

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Attachment 1
Analysis of Radiological Constituents
Exhibits 1 through 13

(58 Pages)

Exhibit 1 Gnome-Coach Surface Ground Zero Radiological Drive Over Data Descriptive Statistics for Cesium-137 Concentration (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137	21059	0.9521	0.7231	0.8345	0.9386	0.0065
Variable	Minimum	Maximum	Q1	Q3		
Cs-137	0.0086	17.2432	0.4486	1.1272		

Descriptive Statistics: Natural Log of the Cs-137 Concentration (pCi/g)

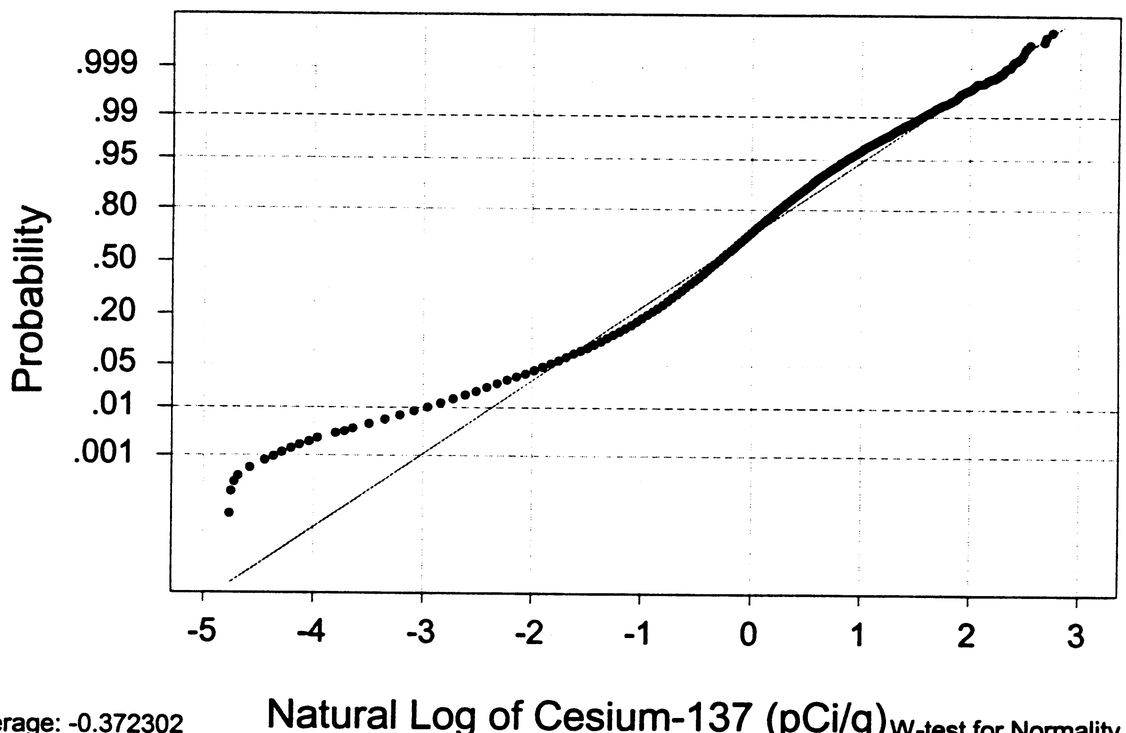
Variable	N	Mean	Median	TrMean	StDev	SE Mean
NL Cs-137	21059	-0.3723	-0.32417	-0.34454	0.84377	0.00581
Variable	Minimum	Maximum	Q1	Q3		
NL Cs-137	-4.75949	2.84742	-0.80169	0.11971		

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural Log of the Cs-137 concentration (pCi/g)
Mean = -0.372302
Standard Deviation = 0.843749
Goodness of Fit
Anderson-Darling (adjusted) = 149.2
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0010	-3.97080	-4.00701	-3.93459
0.0100	-3.51022	-3.54228	-3.47816
0.1000	-2.97968	-3.00707	-2.95230
1.0000	-2.33516	-2.35709	-2.31322
2.0000	-2.10515	-2.12524	-2.08506
3.0000	-1.95922	-1.97818	-1.94026
4.0000	-1.84944	-1.86758	-1.83131
5.0000	-1.76015	-1.77763	-1.74267
6.0000	-1.68414	-1.70108	-1.66721
7.0000	-1.61750	-1.63397	-1.60103
8.0000	-1.55783	-1.57389	-1.54177
9.0000	-1.50356	-1.51927	-1.48786
10.0000	-1.45361	-1.46899	-1.43823
20.0000	-1.08242	-1.09568	-1.06916
30.0000	-0.81476	-0.82692	-0.80261
40.0000	-0.58606	-0.59764	-0.57449
50.0000	-0.37230	-0.38370	-0.36091
60.0000	-0.15854	-0.17012	-0.14696
70.0000	0.07016	0.05801	0.08231
80.0000	0.33781	0.32455	0.35108
90.0000	0.70901	0.69363	0.72438
91.0000	0.75896	0.74326	0.77466
92.0000	0.81323	0.79716	0.82929
93.0000	0.87289	0.85642	0.88937
94.0000	0.93954	0.92260	0.95647
95.0000	1.01554	0.99806	1.03302
96.0000	1.10484	1.08670	1.12297
97.0000	1.21462	1.19565	1.23358
98.0000	1.36055	1.34045	1.38064
99.0000	1.59055	1.56861	1.61249
99.9970	3.01565	2.98135	3.04995

Fig. 1.A Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Surface Ground Zero



Average: -0.372302
StDev: 0.843769
N: 21059

W-test for Normality
R: 0.9836
P-Value (approx): < 0.0100

Fig. 1.B 95 Percent Confidence Levels of the Cesium-137 Concentration in Surface Soil at the Gnome-Coach Surface Ground Zero

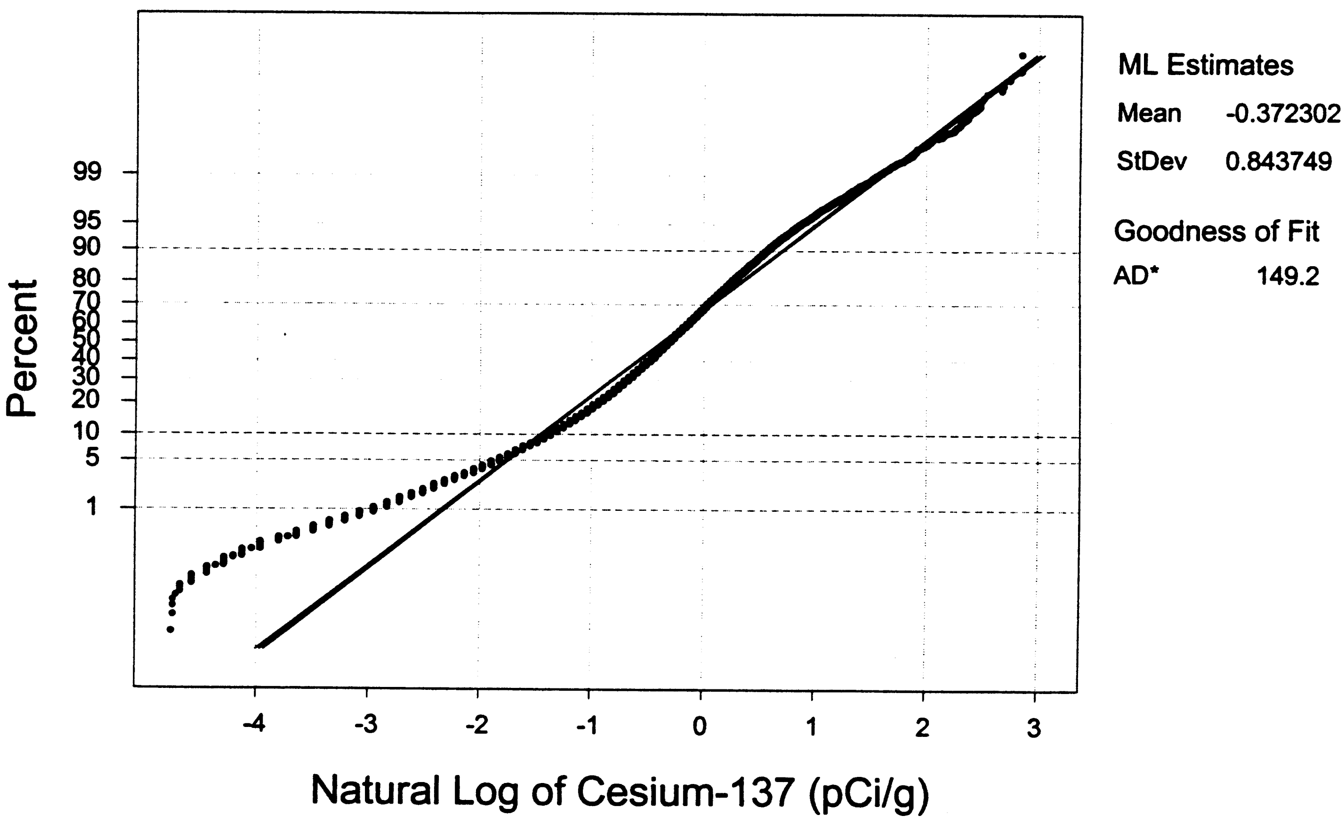


Exhibit 2 Gnome-Coach Fallout Plume Radiological Drive Over Data
Descriptive Statistics for Cesium-137 Concentration (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs137	45669	1.2614	0.9053	1.0297	2.3372	0.0109
Variable	Minimum	Maximum	Q1	Q3		
Cs137	0.0001	75.9747	0.5463	1.4259		

Descriptive Statistics: Natural Log of the Cs-137 Concentration (pCi/g)

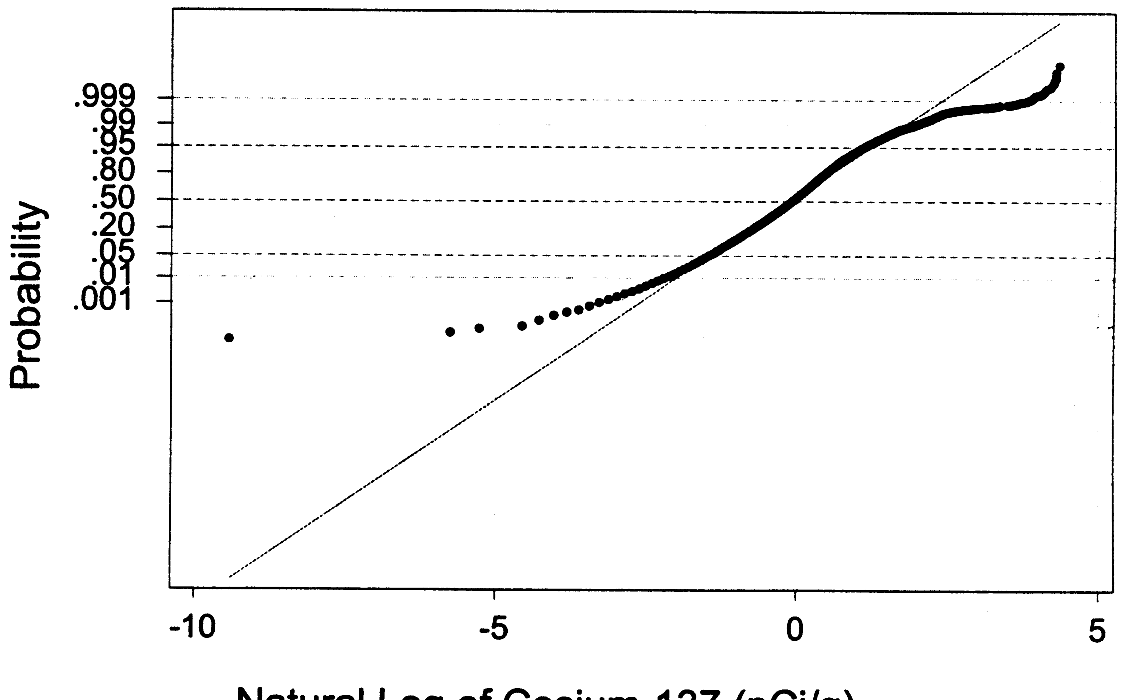
Variable	N	Mean	Median	TrMean	StDev	SE Mean
NL Cs-137	45669	-0.13255	-0.09951	-0.12943	0.80113	0.00375
Variable	Minimum	Maximum	Q1	Q3		
NL Cs-137	-9.43348	4.33040	-0.60455	0.35482		

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: = Natural Log of the Cesium-137 concentration (pCi/g)
Mean = -0.132551
StDev = 0.801123
Goodness of Fit
Anderson-Darling (adjusted) = 146.8
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0010	-3.54925	-3.57260	-3.52591
0.0100	-3.11194	-3.13261	-3.09127
0.1000	-2.60821	-2.62586	-2.59055
1.0000	-1.99624	-2.01039	-1.98210
2.0000	-1.77786	-1.79081	-1.76490
3.0000	-1.63930	-1.65152	-1.62707
4.0000	-1.53507	-1.54676	-1.52337
5.0000	-1.45028	-1.46155	-1.43901
6.0000	-1.37812	-1.38904	-1.36720
7.0000	-1.31484	-1.32546	-1.30422
8.0000	-1.25819	-1.26854	-1.24783
9.0000	-1.20666	-1.21679	-1.19654
10.0000	-1.15923	-1.16915	-1.14932
20.0000	-0.80679	-0.81534	-0.79824
30.0000	-0.55266	-0.56050	-0.54482
40.0000	-0.33551	-0.34298	-0.32805
50.0000	-0.13255	-0.13990	-0.12520
60.0000	0.07041	0.06295	0.07788
70.0000	0.28756	0.27972	0.29539
80.0000	0.54169	0.53314	0.55024
90.0000	0.89413	0.88421	0.90404
91.0000	0.94156	0.93143	0.95168
92.0000	0.99308	0.98273	1.00344
93.0000	1.04974	1.03912	1.06036
94.0000	1.11301	1.10209	1.12393
95.0000	1.18518	1.17391	1.19645
96.0000	1.26996	1.25827	1.28166
97.0000	1.37420	1.36197	1.38642
98.0000	1.51275	1.49980	1.52571
99.0000	1.73114	1.71700	1.74528
99.9986	3.22761	3.20461	3.25060

Fig. 2.A Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Fallout Plume



Average: -0.132551
StDev: 0.801132
N: 45669

W-test for Normality
R: 0.9905
P-Value (approx): < 0.0100

Fig. 2.B 95 Percent Confidence Level of the Cesium-137 Concentration in Surface Soil at the Gnome-Coach Fallout Plume

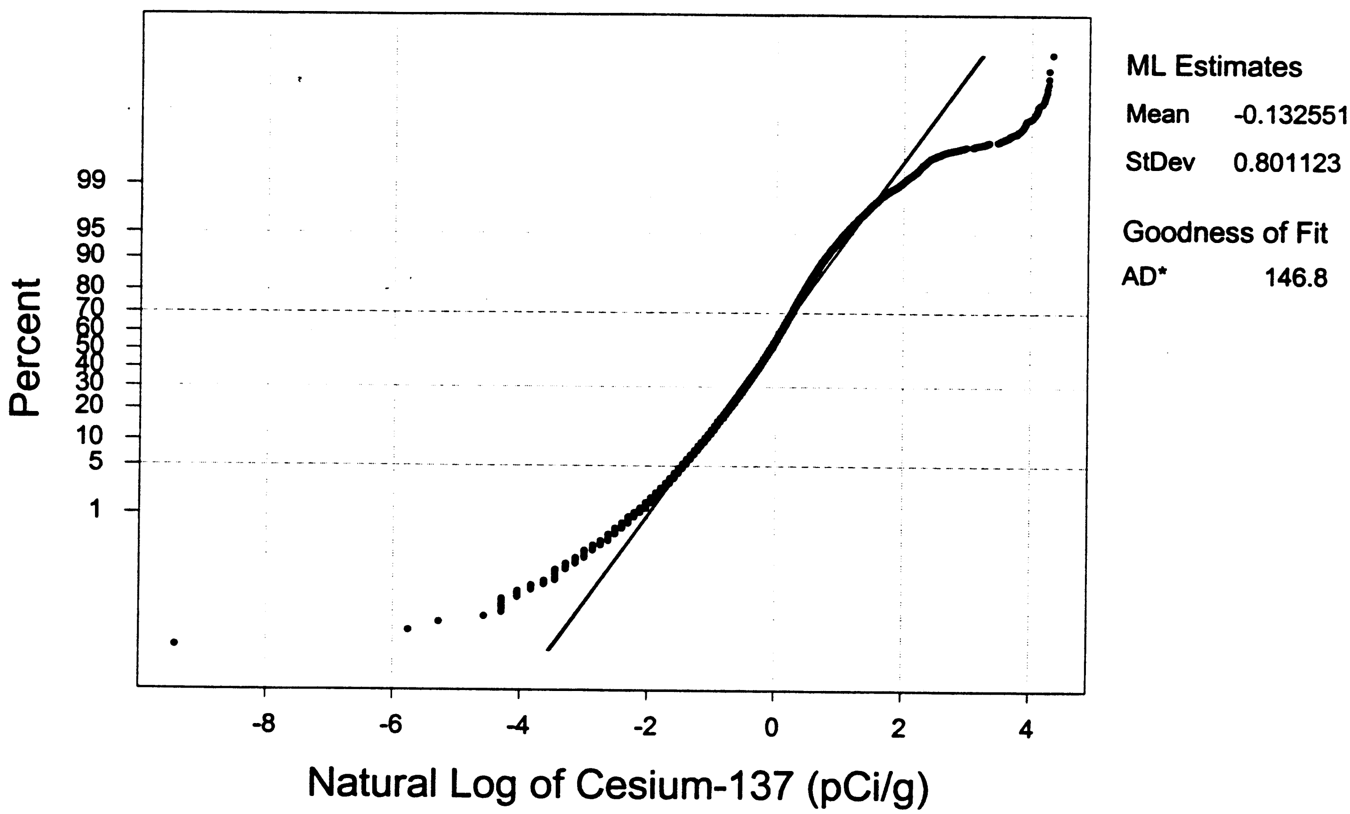


Exhibit 2.A. Gnome-Coach Fallout Plume FALA0001 Hot Spot Radiological Drive Over Data Descriptive Statistics for Cesium-137 Concentration in Surface Soil(pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137	20	6.45	2.83	4.71	10.33	2.31

Variable	Minimum	Maximum	Q1	Q3
Cs-137	0.14	44.07	0.70	6.90

Descriptive Statistics: Natural Log of Cesium-137 Concentration (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
LN Cs-137	20	0.902	0.998	0.901	1.513	0.338

Variable	Minimum	Maximum	Q1	Q3
LN Cs-137	-1.966	3.786	-0.377	1.931

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural log of Cesium-137 surface soil concentration
Mean = 0.901578
StDev = 1.47472
Goodness of Fit
Anderson-Darling (adjusted) = 0.743
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
1	-2.52913	-3.77333	-1.28492
2	-2.12712	-3.26671	-0.98753
3	-1.87206	-2.94748	-0.79664
4	-1.68019	-2.70871	-0.65167
5	-1.52412	-2.51548	-0.53275
6	-1.39127	-2.35179	-0.43075
7	-1.27480	-2.20893	-0.34066
8	-1.17050	-2.08158	-0.25943
9	-1.07566	-1.96626	-0.18506
10	-0.98835	-1.86055	-0.11614
20	-0.33958	-1.09168	0.41253
30	0.12824	-0.56108	0.81755
40	0.52796	-0.12864	1.18456
50	0.90158	0.25527	1.54789
60	1.27519	0.61859	1.93179
70	1.67492	0.98561	2.36423
80	2.14273	1.39063	2.89483
90	2.79150	1.91930	3.66371
91	2.87881	1.98821	3.76941
92	2.97366	2.06259	3.88473
93	3.07795	2.14382	4.01209
94	3.19443	2.23391	4.15495
95	3.32727	2.33591	4.31863
96	3.48334	2.45483	4.51186
97	3.67522	2.59979	4.75064
98	3.93028	2.79069	5.06987
99	4.33228	3.08808	5.57649

Fig. 2.A.1 Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Fallout Plume FALA0001 Hot Spot

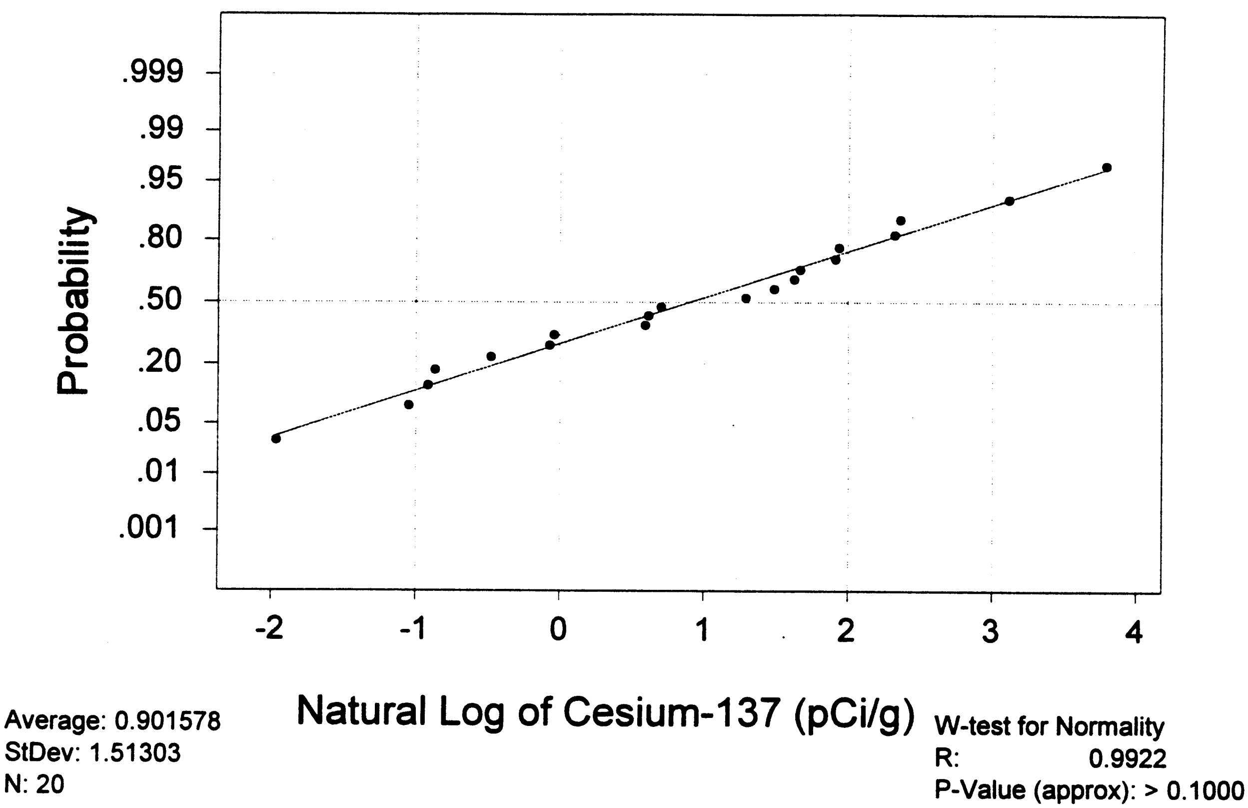


Fig. 2.B.1 95 Percent Confidence Limits in the Log Normal Cesium-137 Concentration in Surface Soil at Gnome-Coach Fallout Plume FALA0001 Hot Spot

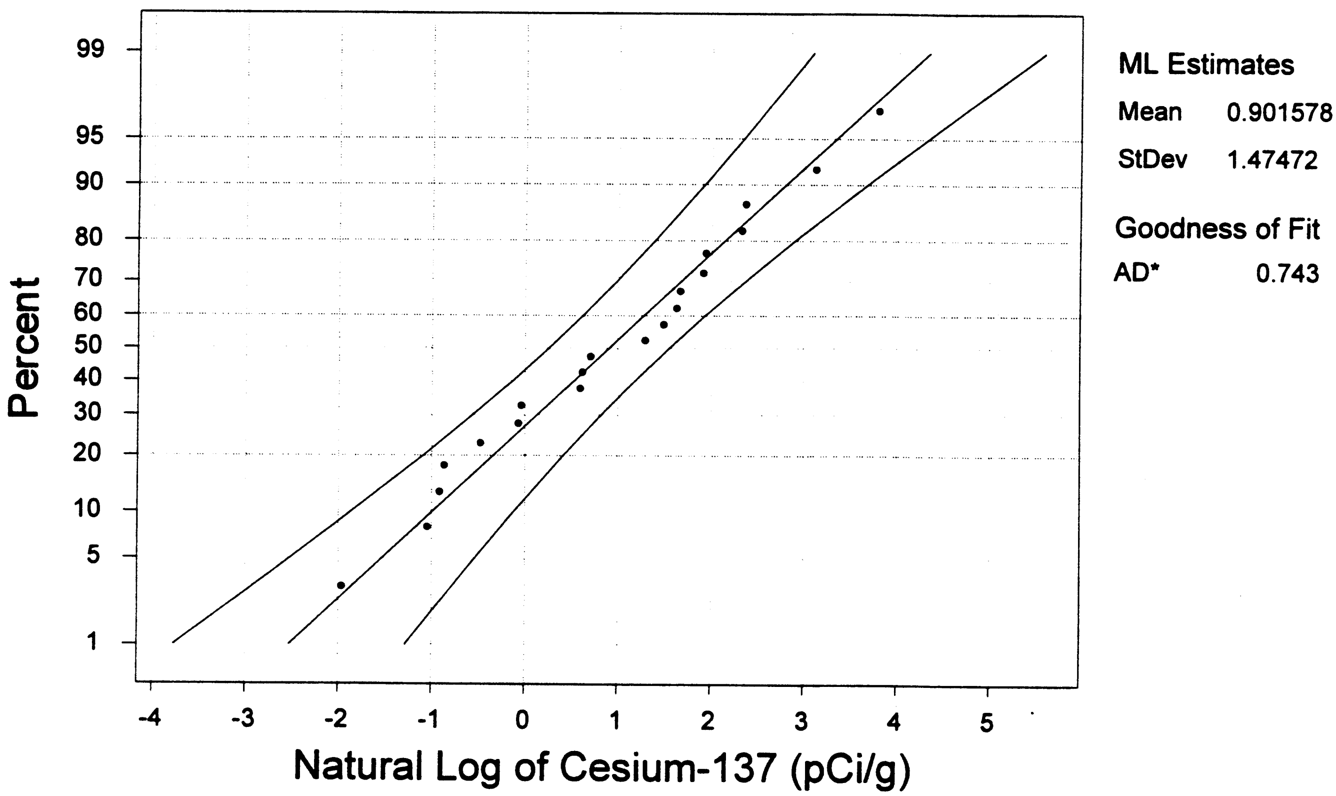


Exhibit 2.B. Gnome-Coach Fallout Plume FALB0001 Hot Spot Radiological Drive Over Data Descriptive Statistics, Surface Soil Cesium-137 Concentration (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137	300	16.45	5.44	14.50	20.26	1.17

Variable	Minimum	Maximum	Q1	Q3
Cs-137	0.64	75.97	1.62	27.18

Descriptive Statistics: Natural Log of Cesium-137 Concentration FALB001

Variable	N	Mean	Median	TrMean	StDev	SE Mean
LN Cs-137	300	1.8732	1.6937	1.8601	1.4544	0.0840

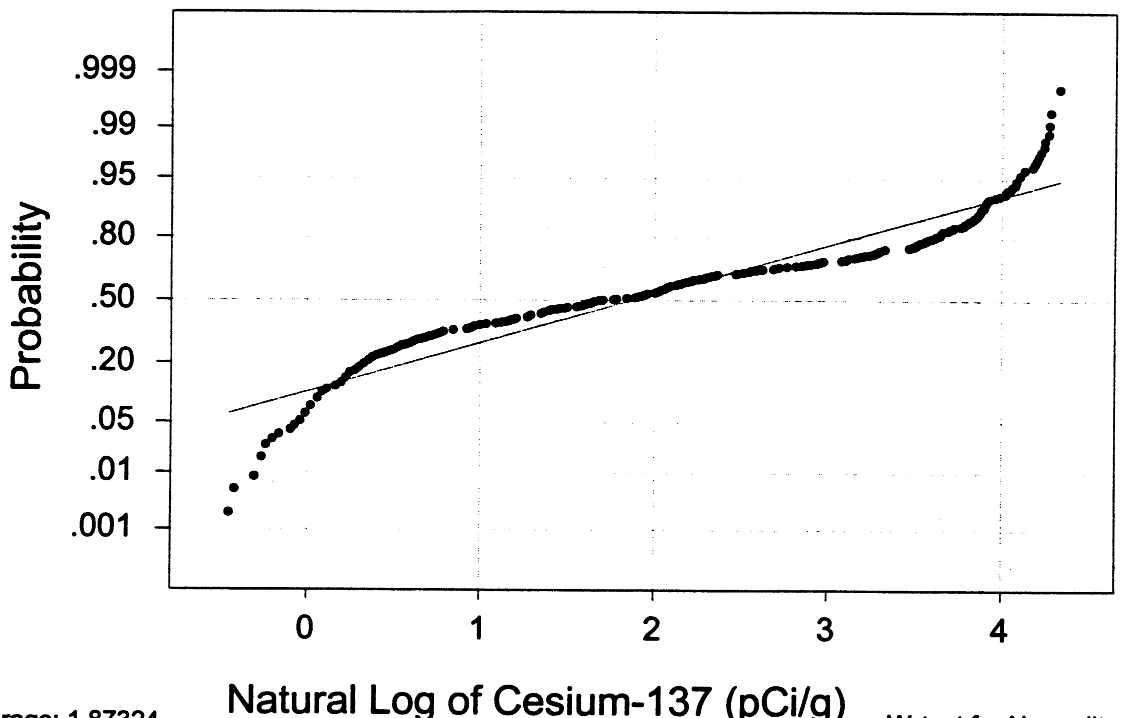
Variable	Minimum	Maximum	Q1	Q3
LN Cs-137	-0.4463	4.3303	0.4824	3.3025

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural Log of the Cesium-137 concentration at FALA0001
Mean = 1.87324
StDev = 1.45202
Goodness of Fit
Anderson-Darling (adjusted) = 7.665
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.1	-2.61384	-3.00869	-2.21899
1.0	-1.50466	-1.82097	-1.18836
2.0	-1.10884	-1.39856	-0.81913
3.0	-0.85771	-1.13111	-0.58431
4.0	-0.66879	-0.93027	-0.40731
5.0	-0.51512	-0.76715	-0.26309
6.0	-0.38432	-0.62851	-0.14013
7.0	-0.26964	-0.50712	-0.03216
8.0	-0.16695	-0.39857	0.06467
9.0	-0.07356	-0.29997	0.15285
10.0	0.01240	-0.20933	0.23414
20.0	0.65119	0.45999	0.84240
30.0	1.11180	0.93656	1.28704
40.0	1.50538	1.33845	1.67230
50.0	1.87324	1.70894	2.03755
60.0	2.24111	2.07418	2.40803
70.0	2.63468	2.45944	2.80993
80.0	3.09530	2.90409	3.28650
90.0	3.73408	3.51235	3.95582
91.0	3.82005	3.59364	4.04646
92.0	3.91344	3.68182	4.14506
93.0	4.01612	3.77864	4.25360
94.0	4.13081	3.88662	4.37500
95.0	4.26161	4.00958	4.51364
96.0	4.41528	4.15380	4.67675
97.0	4.60420	4.33080	4.87760
98.0	4.85533	4.56562	5.14504
99.0	5.25115	4.93484	5.56746
99.9	6.36033	5.96548	6.75517

Fig. 2.A.2 Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Fallout Plume FALB0001 Hot Spot



Average: 1.87324
StDev: 1.45445
N: 300

W-test for Normality
R: 0.9612
P-Value (approx): < 0.0100

Fig. 2.B.2 95 Percent Confidence Levels of the Natural Log of the Cesium-137 Concentration in Surface Soil at the Gnome-Coach Fallout Plume FALB0001 Hot Spot

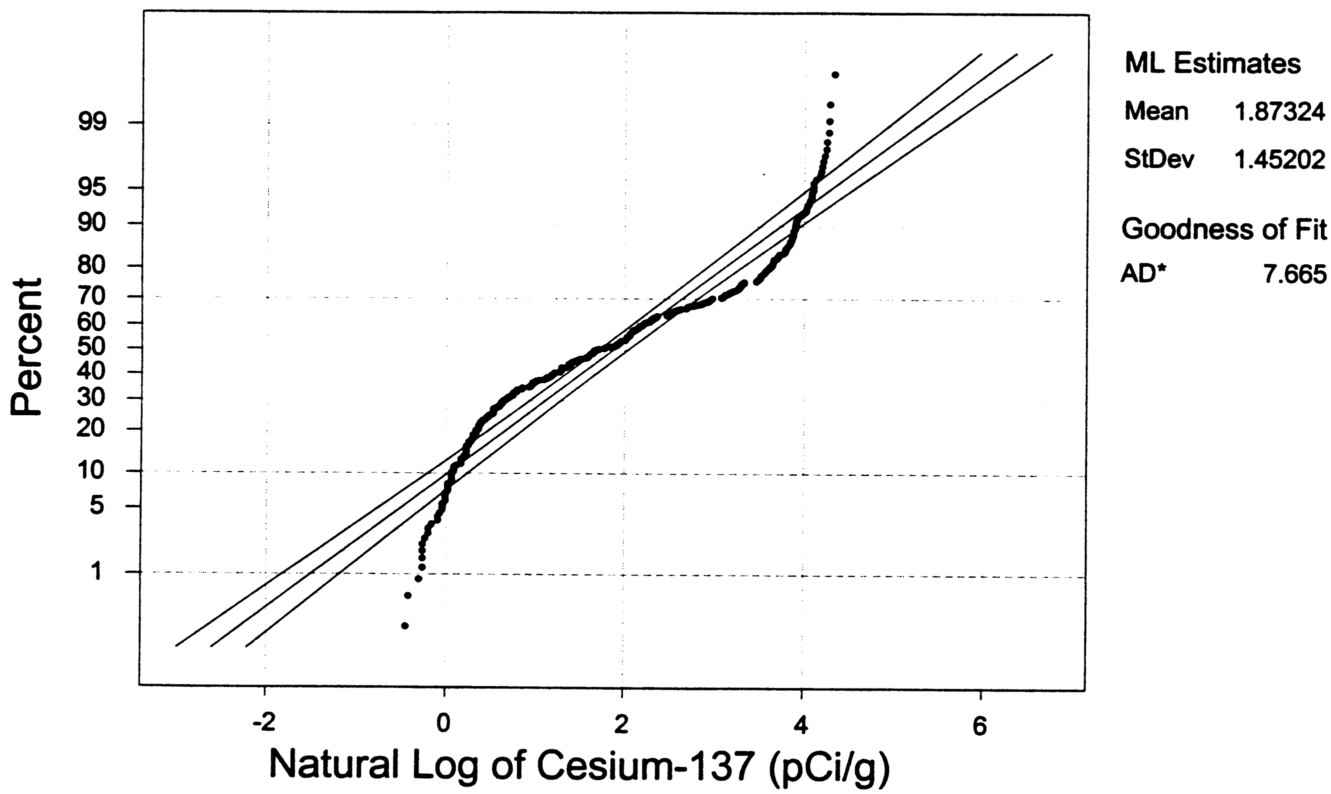


Exhibit 3. Gnome-Coach Salvage Yard Radiological Drive Over Data

Descriptive Statistics for Cesium-137 Concentration (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137 (pCi/g)	28950	2.1233	1.2592	1.4298	6.1747	0.0363

Variable	Minimum	Maximum	Q1	Q3
Cs-137 (pCi/g)	0.0086	93.8457	0.8571	1.8197

Descriptive Statistics: Natural Log of the Cesium-137 Concentration (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
NL Cs-137	28950	0.21907	0.23045	0.22014	0.86979	0.00511

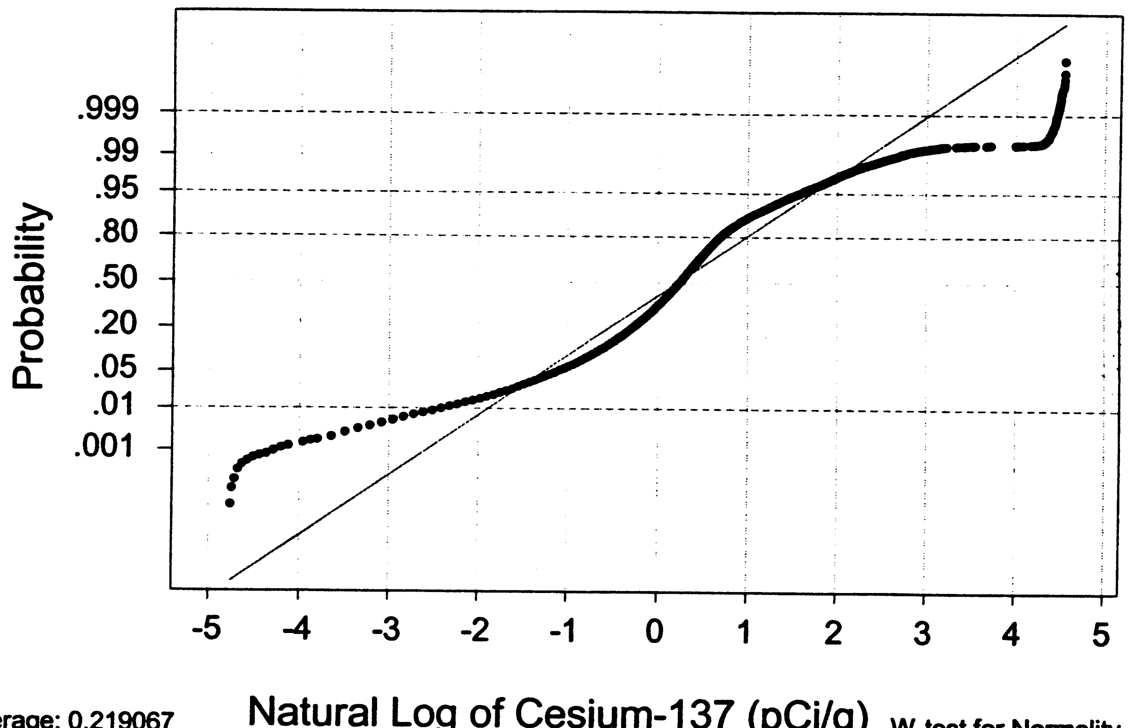
Variable	Minimum	Maximum	Q1	Q3
NL Cs-137	-4.75984	4.54165	-0.15423	0.59868

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural Log of Cs-137 Surface Soil Concentration
Mean 0.219067
StDev 0.869779
Goodness of Fit
Anderson-Darling (adjusted) = 556
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0010	-3.49044	-3.52228	-3.45861
0.0100	-3.01565	-3.04384	-2.98747
0.1000	-2.46875	-2.49283	-2.44467
1.0000	-1.80434	-1.82363	-1.78505
2.0000	-1.56724	-1.58491	-1.54957
3.0000	-1.41681	-1.43348	-1.40014
4.0000	-1.30364	-1.31959	-1.28770
5.0000	-1.21159	-1.22696	-1.19622
6.0000	-1.13324	-1.14813	-1.11835
7.0000	-1.06454	-1.07903	-1.05006
8.0000	-1.00303	-1.01716	-0.98891
9.0000	-0.94709	-0.96090	-0.93329
10.0000	-0.89560	-0.90912	-0.88208
20.0000	-0.51296	-0.52462	-0.50130
30.0000	-0.23705	-0.24773	-0.22636
40.0000	-0.00129	-0.01147	0.00889
50.0000	0.21907	0.20905	0.22909
60.0000	0.43942	0.42924	0.44960
70.0000	0.67518	0.66449	0.68587
80.0000	0.95109	0.93943	0.96275
90.0000	1.33373	1.32021	1.34725
91.0000	1.38523	1.37142	1.39903
92.0000	1.44117	1.42704	1.45529
93.0000	1.50268	1.48820	1.51716
94.0000	1.57138	1.55649	1.58627
95.0000	1.64973	1.63436	1.66509
96.0000	1.74178	1.72583	1.75772
97.0000	1.85494	1.83827	1.87161
98.0000	2.00537	1.98771	2.02304
99.0000	2.24247	2.22319	2.26176
99.9978	3.77627	3.74562	3.80693

Fig. 3.A Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Salvage Yard



Average: 0.219067
StDev: 0.869794
N: 28950

W-test for Normality
R: 0.9586
P-Value (approx): < 0.0100

Fig. 3.B 95 Percent Confidence Levels of the Cesium-137 Concentration in Surface Soil at the Gnome-Coach Salvage Yard

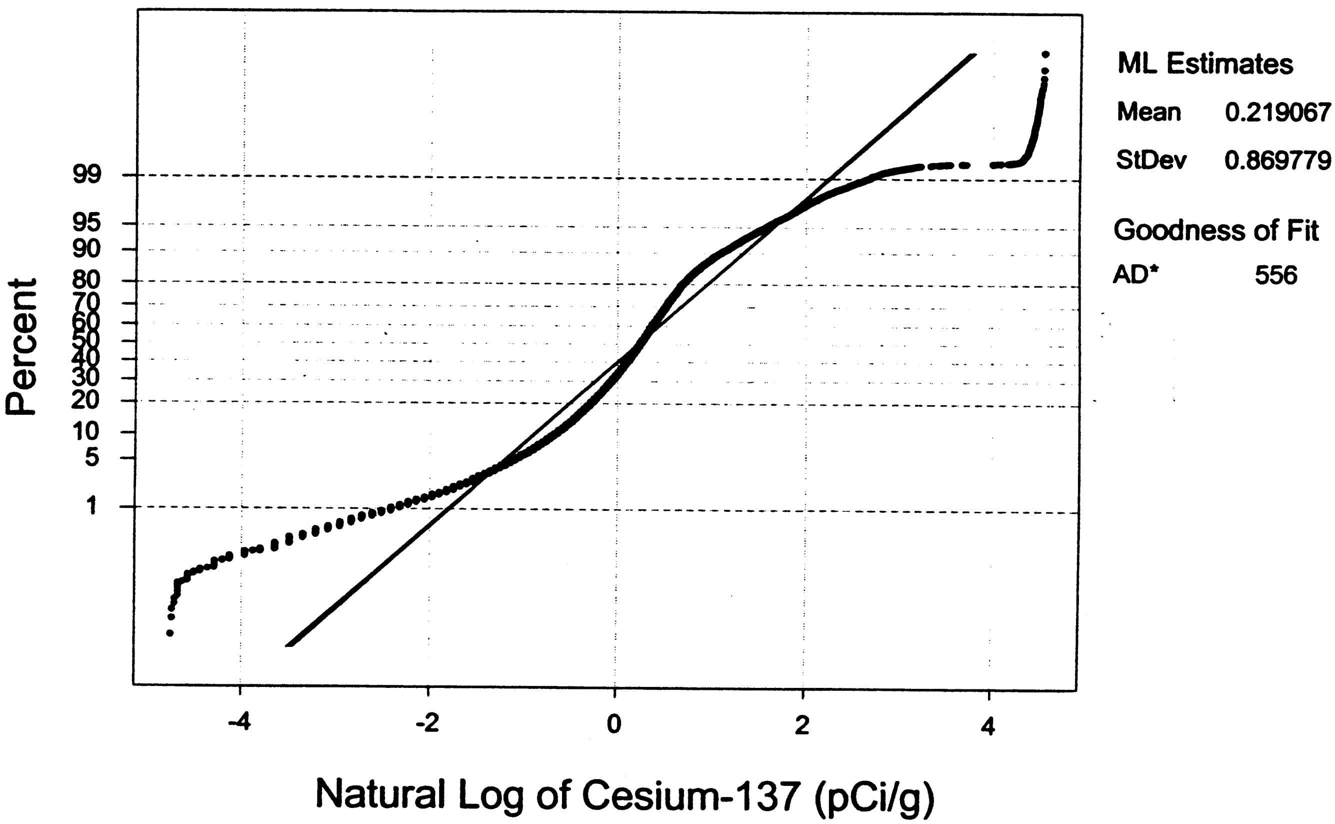


Exhibit 3A: Gnome Coach Salvage Yard Road Hot Spots Descriptive Statistics of Cesium-137 Concentration in Surface Soil (pCi/g)

Variable	N	Mean	Median	TrMean	StDev
Cs-137	7630	2.8903	1.9440	2.4591	3.1033
Variable	SE Mean	Minimum	Maximum	Q1	Q3
Cs-137	0.0355	0.0190	64.3090	1.2590	3.3060

Descriptive Statistics: Natural Log of Cesium-137 Concentration (pCi/g)

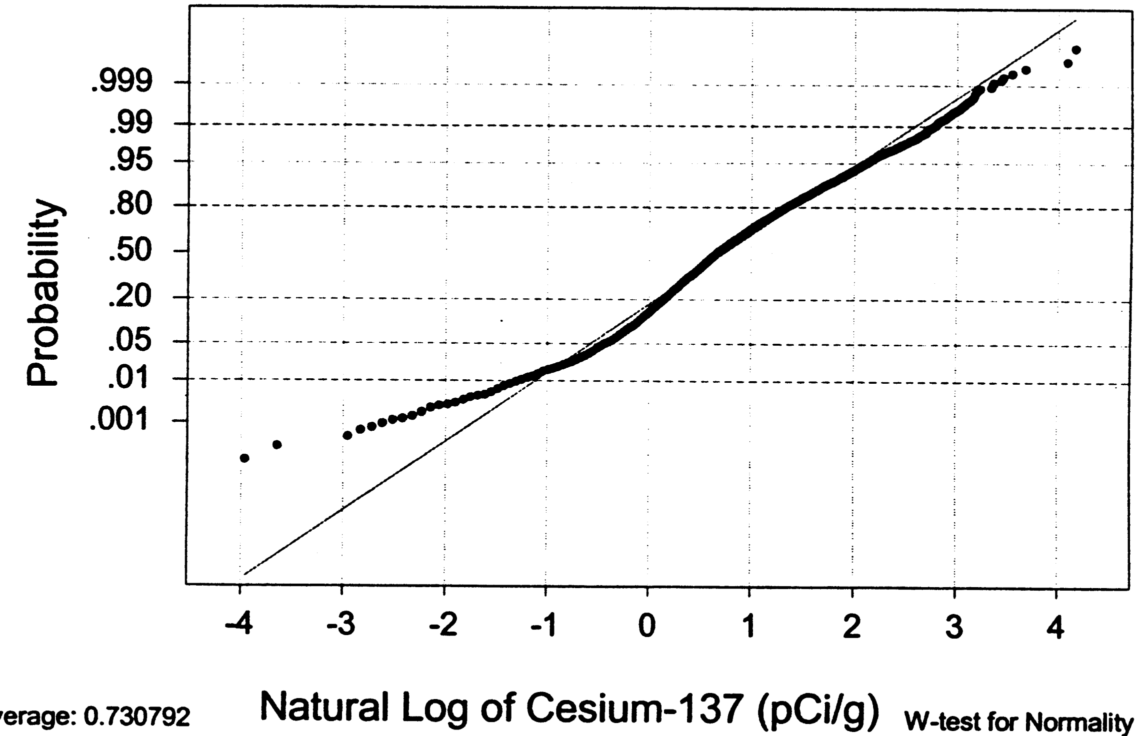
Variable	N	Mean	Median	TrMean	StDev
NL Cs-137	7630	0.73079	0.66475	0.72504	0.78830
Variable	SE Mean	Minimum	Maximum	Q1	Q3
NL Cs-137	0.00902	-3.96332	4.16370	0.23032	1.19574

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural Log Cesium-137 (pCi/g)
Mean = 0.730792
StDev = 0.788253
Goodness of Fit
Anderson-Darling (adjusted) = 30.07
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0010	-2.63102	-2.68721	-2.57482
0.0100	-2.20073	-2.25049	-2.15097
0.1000	-1.70509	-1.74759	-1.66259
1.0000	-1.10296	-1.13701	-1.06891
2.0000	-0.88808	-0.91927	-0.85690
3.0000	-0.75175	-0.78118	-0.72232
4.0000	-0.64919	-0.67734	-0.62104
5.0000	-0.56577	-0.59290	-0.53864
6.0000	-0.49476	-0.52105	-0.46848
7.0000	-0.43250	-0.45807	-0.40694
8.0000	-0.37676	-0.40169	-0.35183
9.0000	-0.32606	-0.35043	-0.30169
10.0000	-0.27939	-0.30326	-0.25553
20.0000	0.06738	0.04680	0.08796
30.0000	0.31743	0.29857	0.33630
40.0000	0.53109	0.51312	0.54906
50.0000	0.73079	0.71311	0.74848
60.0000	0.93049	0.91252	0.94846
70.0000	1.14415	1.12529	1.16302
80.0000	1.39420	1.37362	1.41478
90.0000	1.74098	1.71711	1.76485
91.0000	1.78765	1.76327	1.81202
92.0000	1.83834	1.81341	1.86328
93.0000	1.89409	1.86852	1.91965
94.0000	1.95635	1.93006	1.98263
95.0000	2.02735	2.00022	2.05448
96.0000	2.11077	2.08263	2.13892
97.0000	2.21333	2.18390	2.24276
98.0000	2.34966	2.31848	2.38085
99.0000	2.56454	2.53049	2.59859
99.9918	3.70181	3.65147	3.75216

Fig. 3.A.1 Log Normal Probability Plot of Cesium-137 Concentration in Surface Soil at Gnome-Coach Salvage Yard Road Hot Spots



Average: 0.730792
StDev: 0.788304
N: 7630

W-test for Normality
R: 0.9924
P-Value (approx): < 0.0100

Fig. 3.B.1 95 Percent Confidence Level of the Cesium-137 Concentration in Surface Soil at the Gnome-Coach Salvage Yard Road Hot Spots

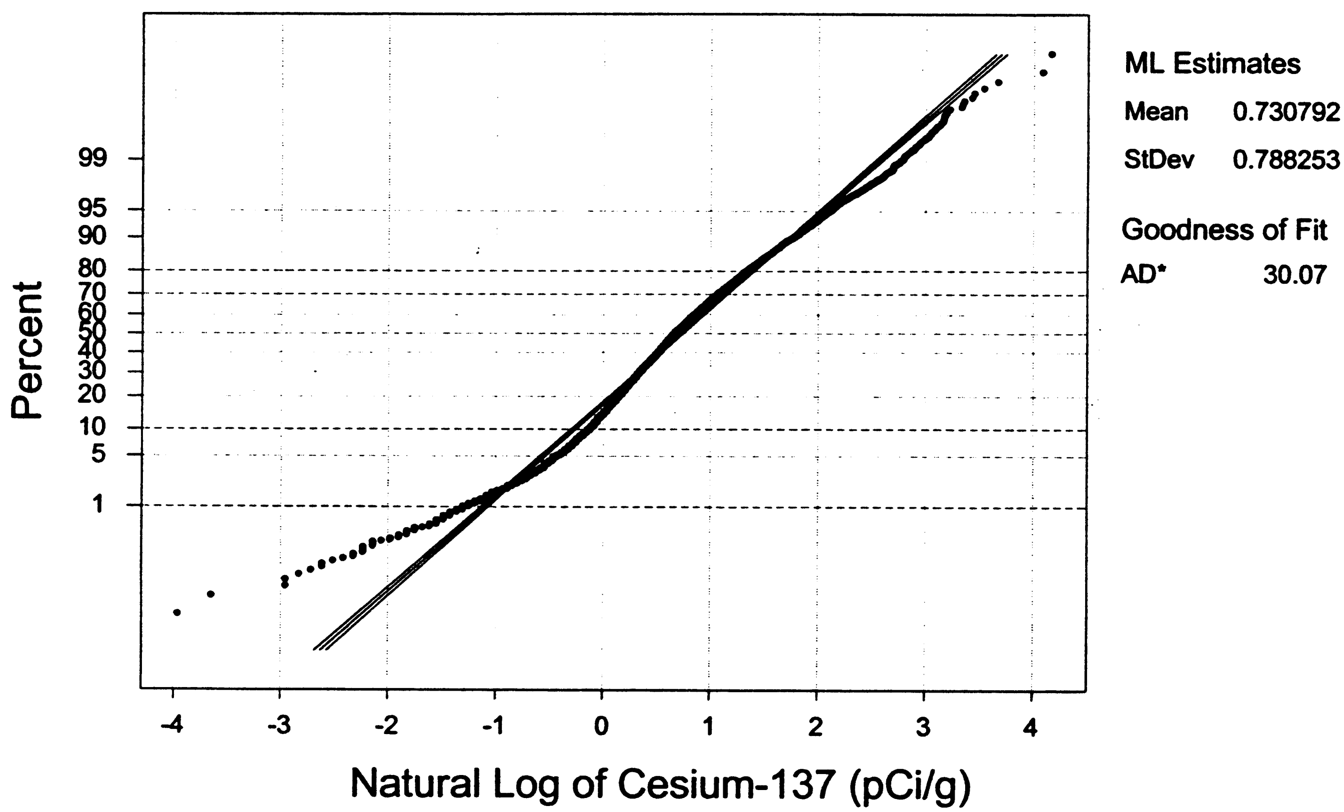


Exhibit 3.B: Gnome Coach Salvage Yard Hot Spot, Descriptive Statistics of Radiological Drive Over Data, Cesium-137 (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137 (pCi/g)	772	19.99	4.09	17.25	31.22	1.12

Variable	Minimum	Maximum	Q1	Q3
Cs-137 (pCi/g)	0.34	93.85	1.86	11.63

Descriptive Statistics: Natural Log Cesium-137 (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
NL Cs-137	772	1.7614	1.4089	1.7364	1.5472	0.0557

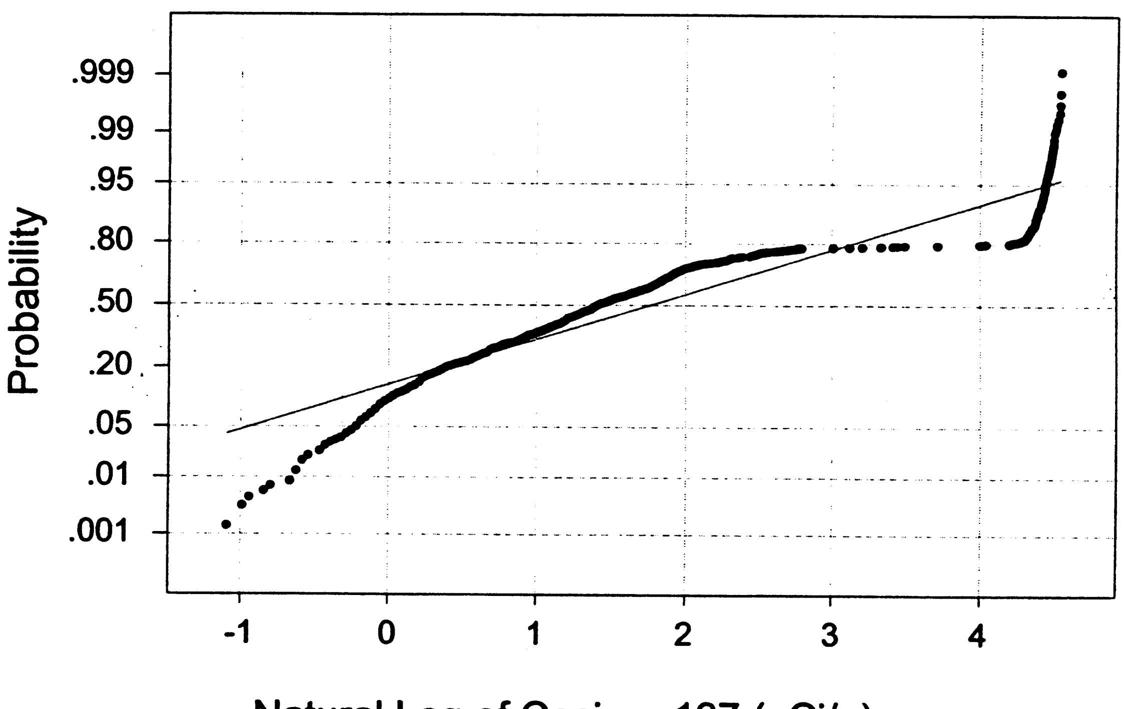
Variable	Minimum	Maximum	Q1	Q3
NL Cs-137	-1.0906	4.5417	0.6211	2.4532

Distribution Function Analysis

Normal Distribution. Parameter Estimates (ML)
Variable: Natural Log of the Cesium-137 in Salvage Yard Hot Spot Surface Soil
Mean = 1.76136
StDev = 1.54623
Goodness of Fit
Anderson-Darling (adjusted) = 29.37
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0100	-3.98909	-4.29596	-3.68222
0.1000	-3.01685	-3.27896	-2.75474
1.0000	-1.83571	-2.04568	-1.62573
2.0000	-1.41421	-1.60652	-1.22189
3.0000	-1.14678	-1.32827	-0.96529
4.0000	-0.94560	-1.11918	-0.77203
5.0000	-0.78196	-0.94926	-0.61466
6.0000	-0.64268	-0.80477	-0.48058
7.0000	-0.52055	-0.67820	-0.36291
8.0000	-0.41120	-0.56496	-0.25745
9.0000	-0.31175	-0.46205	-0.16146
10.0000	-0.22021	-0.36741	-0.07302
20.0000	0.46002	0.33310	0.58695
30.0000	0.95052	0.83419	1.06685
40.0000	1.36963	1.25882	1.48044
50.0000	1.76136	1.65229	1.87043
60.0000	2.15309	2.04229	2.26390
70.0000	2.57221	2.45588	2.68853
80.0000	3.06270	2.93578	3.18963
90.0000	3.74294	3.59574	3.89013
91.0000	3.83448	3.68418	3.98478
92.0000	3.93393	3.78017	4.08768
93.0000	4.04327	3.88563	4.20092
94.0000	4.16540	4.00330	4.32750
95.0000	4.30468	4.13738	4.47199
96.0000	4.46833	4.29475	4.64190
97.0000	4.66950	4.48801	4.85099
98.0000	4.93693	4.74461	5.12925
99.0000	5.35843	5.14846	5.56840
99.9191	6.63589	6.36941	6.90238

Fig. 3.A.2 Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at the Salvage Yard Hot Spot



Average: 1.76136
StDev: 1.54723
N: 772

W-test for Normality
R: 0.9471
P-Value (approx): < 0.0100

Fig. 3.B.2 95 Percent Confidence Level of the Cesium-137
Concentration in Surface Soil at the Salvage Yard Hot Spot

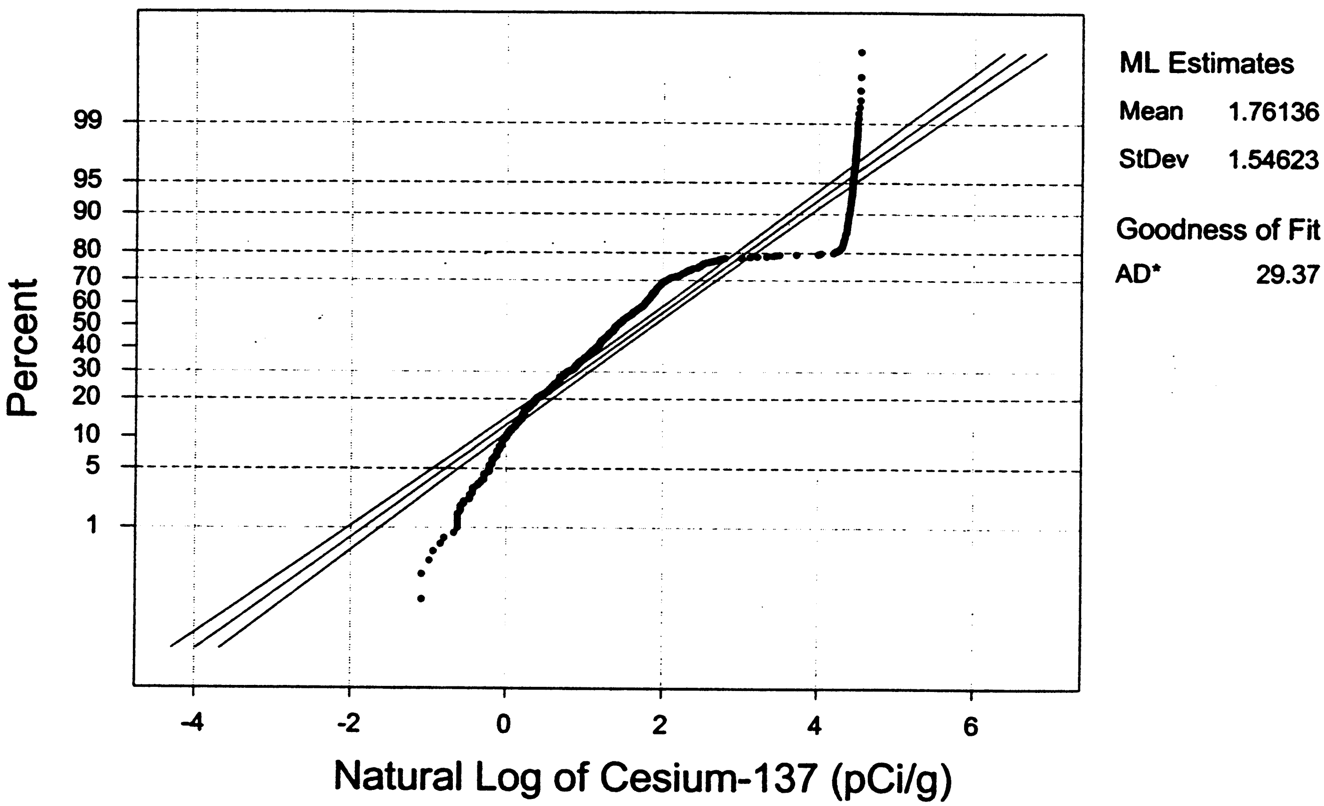


Exhibit 4. Gnome-Coach USGS Drill Pad Radiological Drive Over Data Descriptive Statistics for Cesium-137 Concentration in Surface Soil (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137	2321	0.51542	0.47592	0.49545	0.26871	0.00558
Variable	Minimum	Maximum	Q1	Q3		
Cs-137	0.00000	2.74329	0.33669	0.63769		

Descriptive Statistics: Natural Log of the Cesium-137 Concentration (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
NL Cs-137	2321	-0.7967	-0.7425	-0.7752	0.6125	0.0127
Variable	Minimum	Maximum	Q1	Q3		
NL Cs-137	-16.1181	1.0092	-1.0886	-0.4499		

Descriptive Statistics: Natural Log of the Trimmed Cs-137 Concentration (pCi/g)

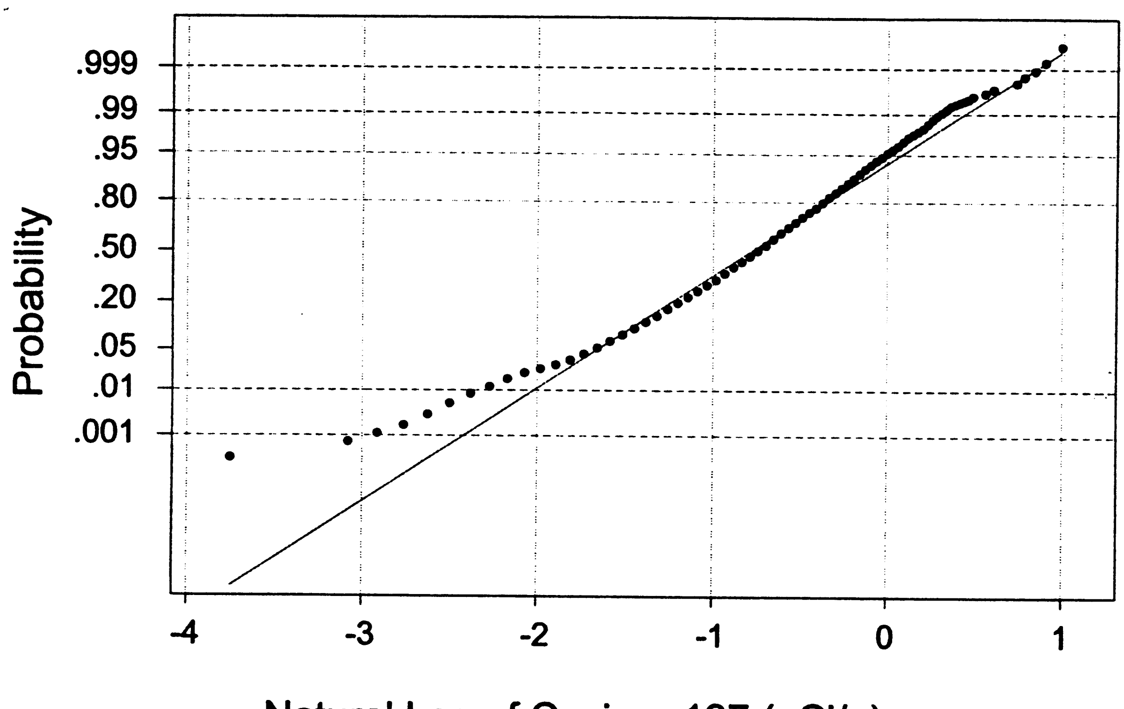
Variable	N	Mean	Median	TrMean	StDev	SE Mean
NL Cs-137	2319	-0.7909	-0.7425	-0.7752	0.5222	0.0108
Variable	Minimum	Maximum	Q1	Q3		
NL Cs-137	-3.7533	0.9907	-1.0886	-0.4499		

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural log of the trimmed Cesium-137
Mean = -0.790876
StDev = 0.522122
Goodness of Fit
Anderson-Darling (adjusted) = 8.021
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0100	-2.73266	-2.79244	-2.67287
0.1000	-2.40435	-2.45542	-2.35329
1.0000	-2.00551	-2.04642	-1.96460
2.0000	-1.86318	-1.90065	-1.82571
3.0000	-1.77288	-1.80824	-1.73752
4.0000	-1.70495	-1.73877	-1.67113
5.0000	-1.64969	-1.68229	-1.61710
6.0000	-1.60266	-1.63424	-1.57108
7.0000	-1.56142	-1.59213	-1.53071
8.0000	-1.52450	-1.55445	-1.49454
9.0000	-1.49091	-1.52020	-1.46163
10.0000	-1.46000	-1.48868	-1.43132
20.0000	-1.23031	-1.25503	-1.20558
30.0000	-1.06468	-1.08734	-1.04201
40.0000	-0.92315	-0.94474	-0.90157
50.0000	-0.79088	-0.81213	-0.76963
60.0000	-0.65860	-0.68019	-0.63701
70.0000	-0.51708	-0.53974	-0.49441
80.0000	-0.35145	-0.37618	-0.32672
90.0000	-0.12175	-0.15043	-0.09307
91.0000	-0.09084	-0.12012	-0.06156
92.0000	-0.05726	-0.08721	-0.02730
93.0000	-0.02033	-0.05105	0.01038
94.0000	0.02091	-0.01068	0.05249
95.0000	0.06794	0.03534	0.10053
96.0000	0.12320	0.08938	0.15701
97.0000	0.19113	0.15577	0.22649
98.0000	0.28143	0.24396	0.31890
99.0000	0.42376	0.38285	0.46467
99.9731	1.01598	0.95981	1.07216

Fig. 4.A Log Normal Probability Plot of the Trimmed Cesium-137 Concentration in Surface Soil at Gnome-Coach USGS Drill Pad



Average: -0.790876
StDev: 0.522235
N: 2319

W-test for Normality
R: 0.9909
P-Value (approx): < 0.0100

Fgi. 4.B 95 Percent Confidence Levels in the Natural Log of the Trimmed Cesium-137 Concentration in Surface Soil at the Gnome-Coach USGS Drill Pad

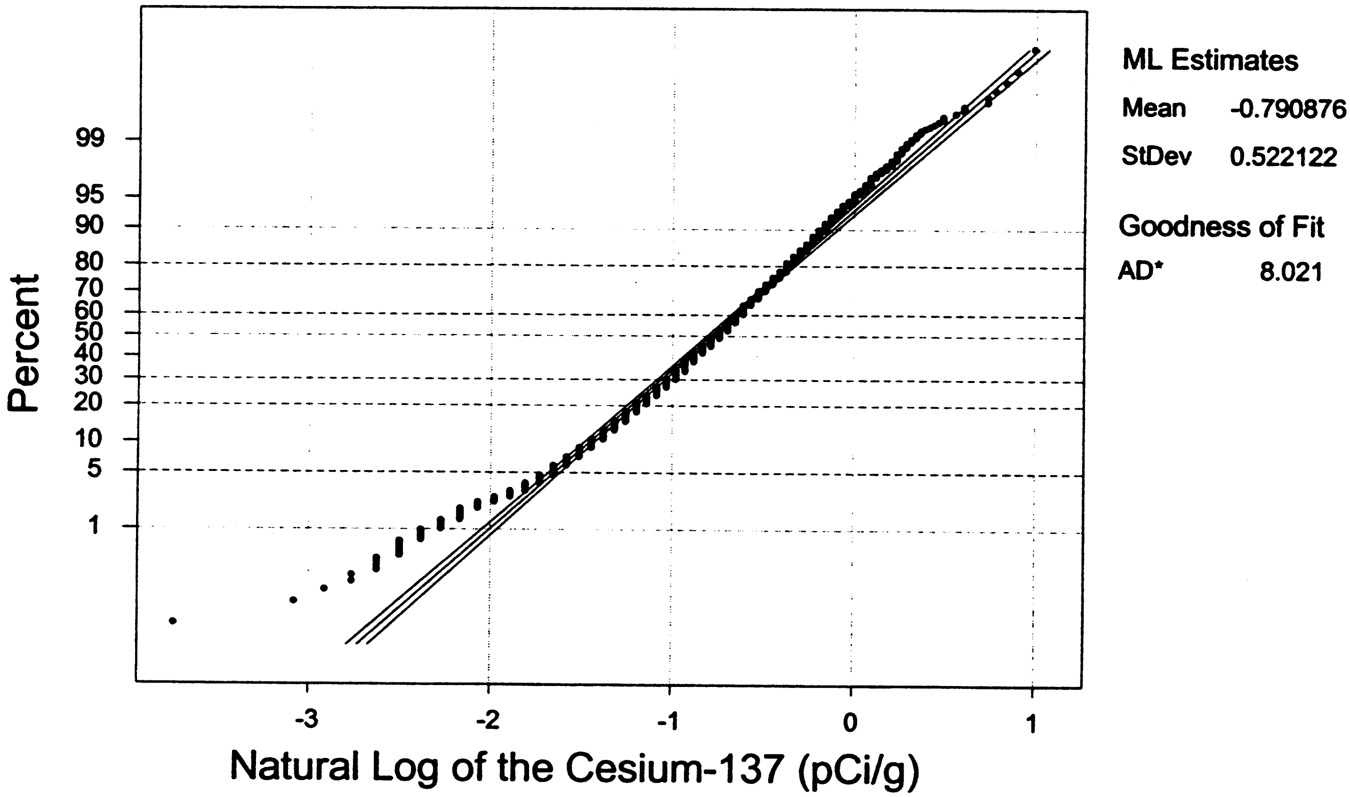


Exhibit 5. Gnome-Coach Warehouse Pad Radiological Drive Over Data Descriptive Statistics for Cesium-137 Concentration (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137 (pCi/g)	9171	0.87380	0.71400	0.79514	0.65983	0.00689
Variable	Minimum	Maximum	Q1	Q3		
Cs-137 (pCi/g)	0.00008	8.16672	0.47600	1.06032		

Descriptive Statistics: Natural Log of the Cesium-137 Concentration (pCi/g)

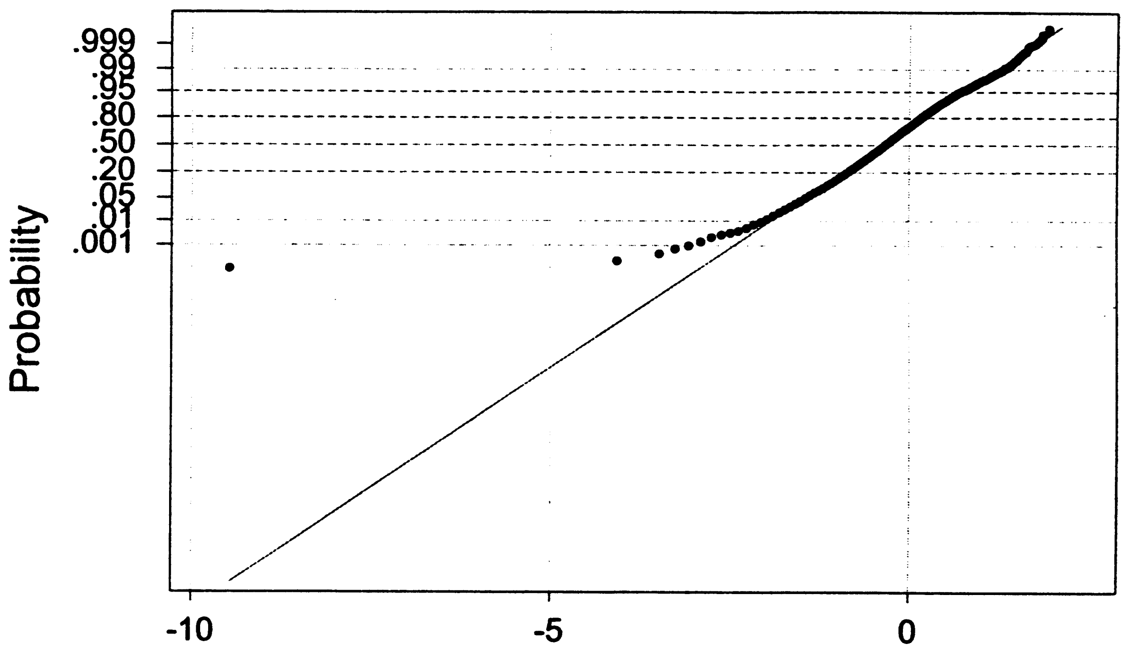
Variable	N	Mean	Median	TrMean	StDev	SE Mean
NL Cs-137	9171	-0.35369	-0.33688	-0.34946	0.67038	0.00700
Variable	Minimum	Maximum	Q1	Q3		
NL Cs-137	-9.47171	2.10007	-0.74234	0.05857		

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural log Cesium-137 concentration surface soil (pCi/g)
Mean = -0.353694
StDev = 0.670346
Goodness of Fit
Anderson-Darling (adjusted) = 14.51
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0010	-3.21265	-3.25624	-3.16906
0.0100	-2.84672	-2.88532	-2.80812
0.1000	-2.42522	-2.45819	-2.39225
1.0000	-1.91315	-1.93956	-1.88674
2.0000	-1.73042	-1.75461	-1.70623
3.0000	-1.61448	-1.63731	-1.59165
4.0000	-1.52726	-1.54909	-1.50543
5.0000	-1.45632	-1.47736	-1.43527
6.0000	-1.39593	-1.41632	-1.37554
7.0000	-1.34299	-1.36281	-1.32316
8.0000	-1.29558	-1.31492	-1.27624
9.0000	-1.25246	-1.27137	-1.23356
10.0000	-1.21278	-1.23129	-1.19426
20.0000	-0.91787	-0.93384	-0.90191
30.0000	-0.70522	-0.71986	-0.69059
40.0000	-0.52352	-0.53746	-0.50959
50.0000	-0.35369	-0.36741	-0.33997
60.0000	-0.18386	-0.19780	-0.16993
70.0000	-0.00216	-0.01680	0.01247
80.0000	0.21048	0.19452	0.22645
90.0000	0.50539	0.48687	0.52390
91.0000	0.54508	0.52617	0.56398
92.0000	0.58819	0.56885	0.60753
93.0000	0.63560	0.61577	0.65543
94.0000	0.68854	0.66815	0.70893
95.0000	0.74893	0.72788	0.76997
96.0000	0.81987	0.79804	0.84170
97.0000	0.90709	0.88426	0.92992
98.0000	1.02303	0.99884	1.04722
99.0000	1.20576	1.17935	1.23218
99.9932	2.20354	2.16407	2.24301

Fig. 5.A Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at the Gnome-Coach Warehouse Pad



Average: -0.353694
StDev: 0.670383
N: 9171

W-test for Normality
R: 0.9915
P-Value (approx): < 0.0100

Fig. 5.B Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Warehouse Pad

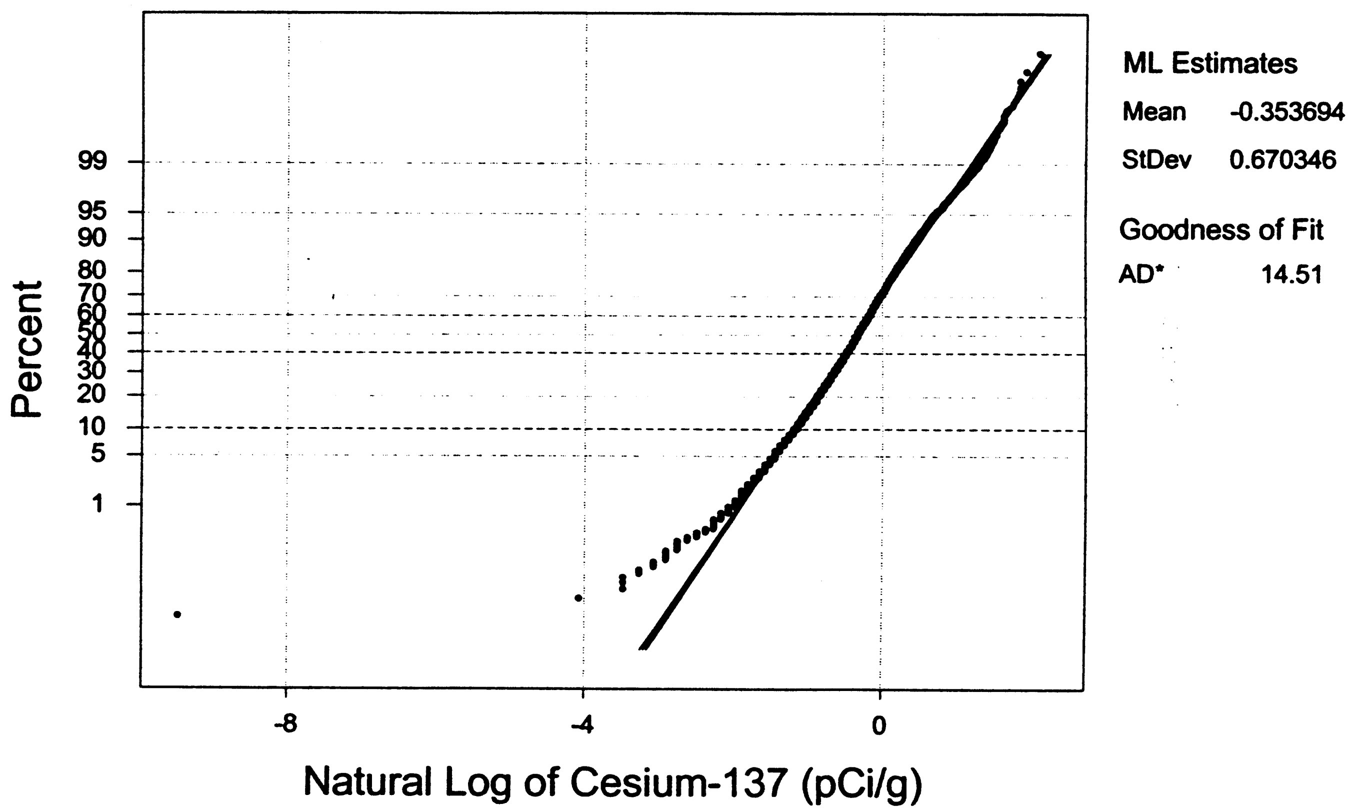


Exhibit 6. Gnome-Coach LRL-7 Radiological Drive Over Data Descriptive Statistics for Cesium-137 Concentration in Surface Soil (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137	5205	0.50573	0.48500	0.49403	0.24077	0.00334
Variable	Minimum	Maximum	Q1	Q3		
Cs-137	0.00012	2.41028	0.32772	0.64677		

Descriptive Statistics: LN LRL-7 pCi/g

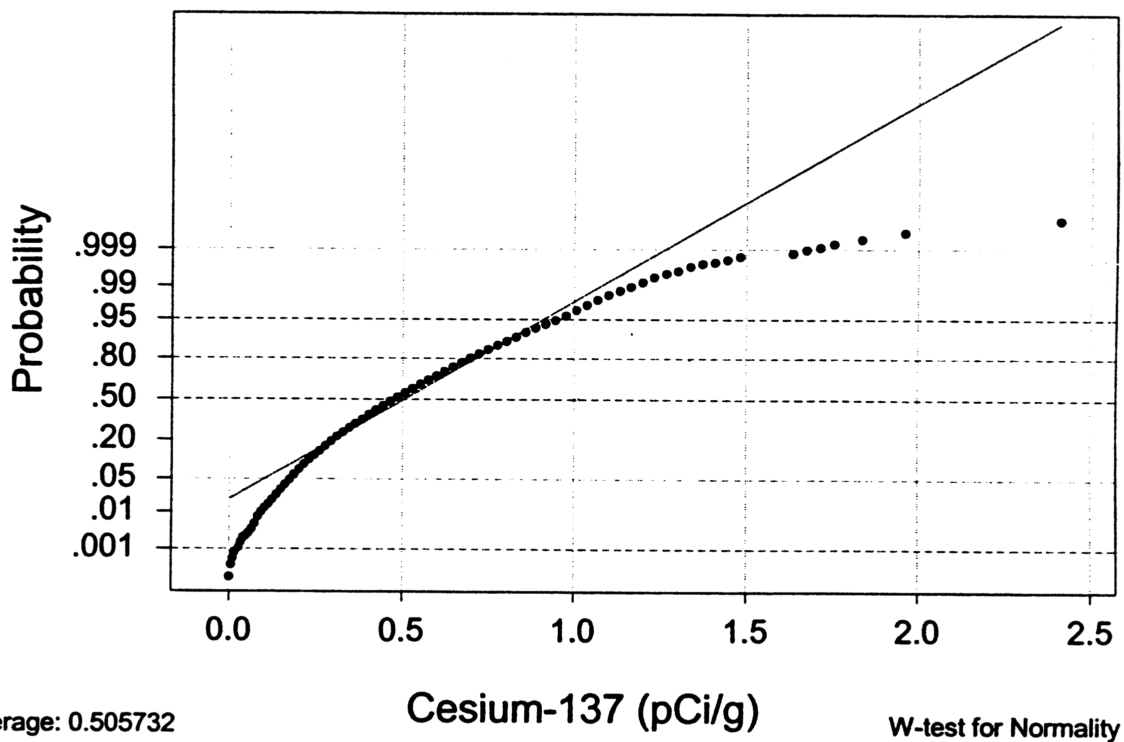
Variable	N	Mean	Median	TrMean	StDev	SE Mean
LN Cs-137	5205	-0.80843	-0.72361	-0.78228	0.54829	0.00760
Variable	Minimum	Maximum	Q1	Q3		
LN Cs-137	-9.02802	0.87974	-1.11560	-0.43576		

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Cesium-137 concentration in LRL-7 surface soil (pCi/g)
Mean = 0.505732
StDev = 0.240742
Goodness of Fit
Anderson-Darling (adjusted) = 37.67
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0100	-0.38959	-0.40799	-0.37119
0.1000	-0.23822	-0.25393	-0.22250
1.0000	-0.05432	-0.06691	-0.04173
2.0000	0.01131	-0.00022	0.02284
3.0000	0.05295	0.04206	0.06383
4.0000	0.08427	0.07386	0.09468
5.0000	0.10975	0.09971	0.11978
6.0000	0.13143	0.12171	0.14115
7.0000	0.15045	0.14099	0.15990
8.0000	0.16747	0.15825	0.17669
9.0000	0.18296	0.17394	0.19197
10.0000	0.19721	0.18838	0.20603
20.0000	0.30312	0.29551	0.31073
30.0000	0.37949	0.37251	0.38646
40.0000	0.44474	0.43810	0.45139
50.0000	0.50573	0.49919	0.51227
60.0000	0.56672	0.56008	0.57337
70.0000	0.63198	0.62500	0.63895
80.0000	0.70835	0.70074	0.71596
90.0000	0.81426	0.80543	0.82308
91.0000	0.82851	0.81950	0.83752
92.0000	0.84399	0.83477	0.85321
93.0000	0.86102	0.85156	0.87047
94.0000	0.88003	0.87031	0.88975
95.0000	0.90172	0.89169	0.91175
96.0000	0.92720	0.91679	0.93760
97.0000	0.95852	0.94764	0.96940
98.0000	1.00016	0.98862	1.01169
99.0000	1.06578	1.05319	1.07837
99.9880	1.38987	1.37167	1.40807

Fig. 6.A Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach LRL-7



Average: 0.505732
StDev: 0.240766
N: 5205

W-test for Normality
R: 0.9806
P-Value (approx): < 0.0100

Fig. 6.B 95 Percent Probability Plot of the Cesium-137 Concentration in Surface Soil at the Gnome-Coach LRL-7 Pad

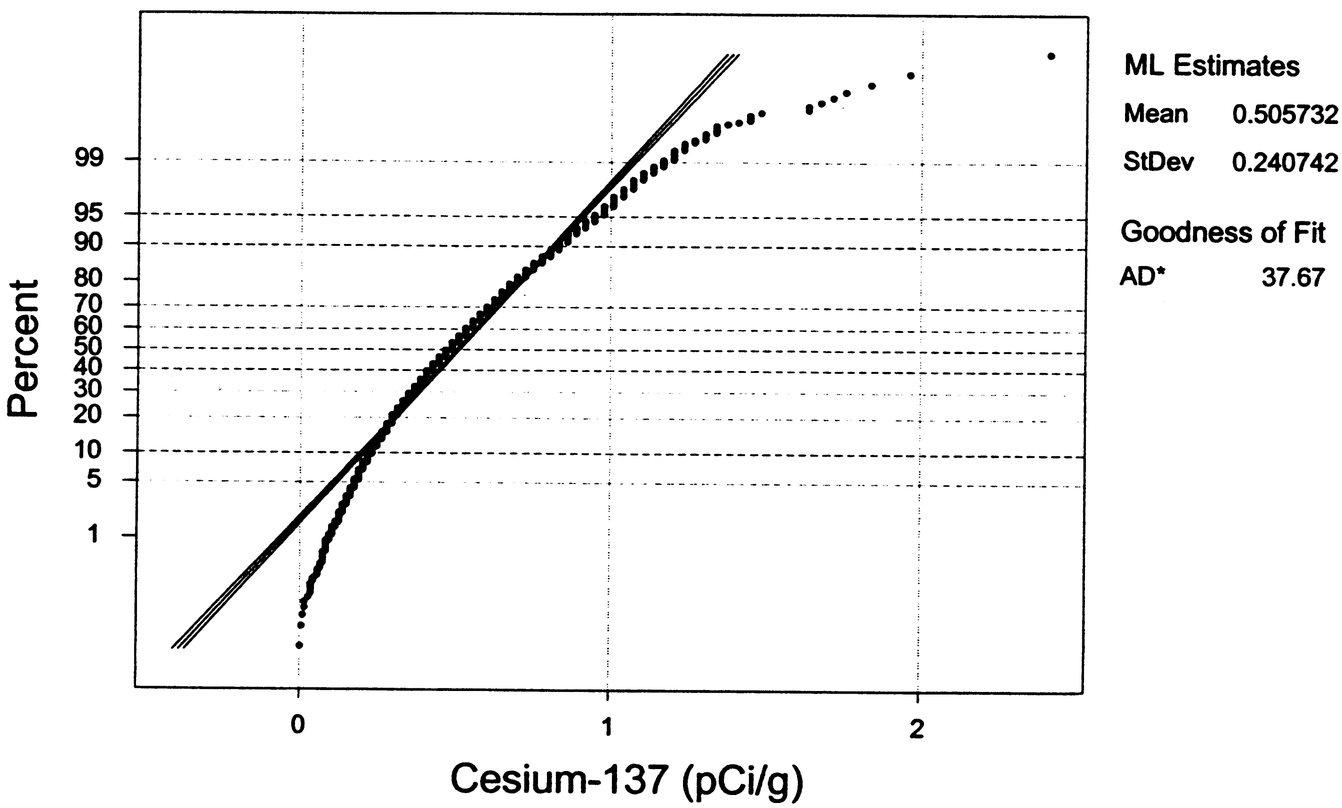


Exhibit 7 Gnome-Coach Shaft Radiological Drive Over Data
Descriptive Statistics for Cesium-137 in Surface Soil (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137	13245	1.2561	0.8979	1.0718	1.3593	0.0118
Variable	Minimum	Maximum	Q1	Q3		
Cs-137	0.0063	24.5470	0.5847	1.4550		

Descriptive Statistics: Natural Log of Cesium-137 Concentration (pCi/g)

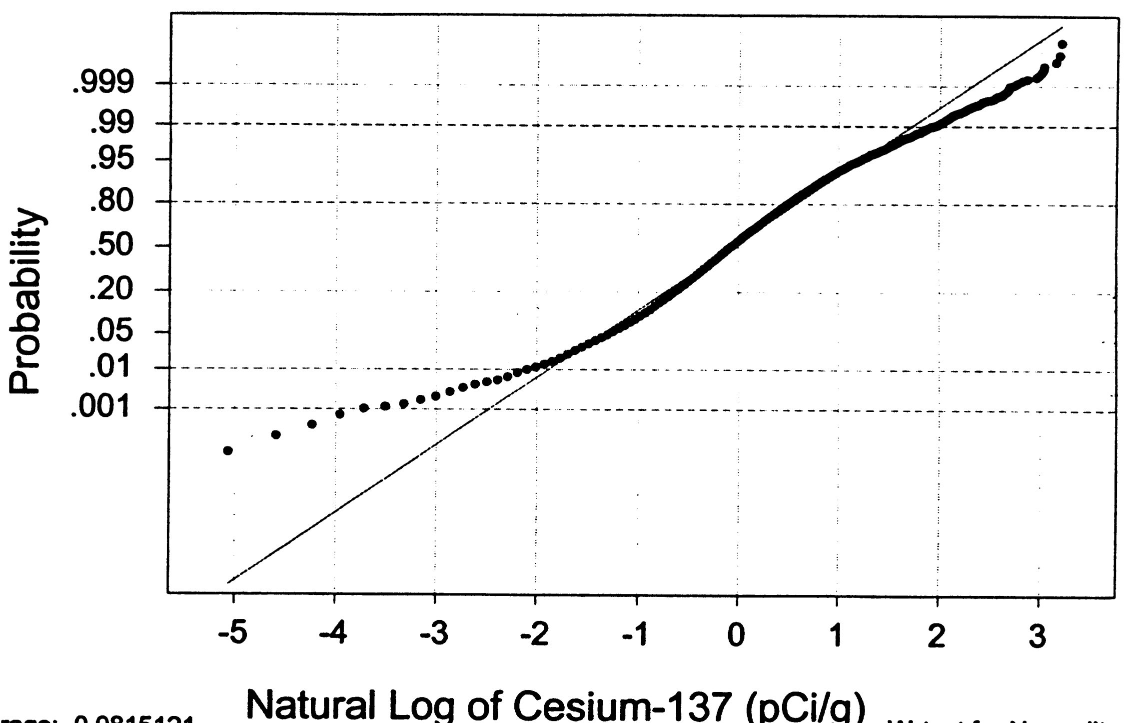
Variable	N	Mean	Median	TrMean	StDev	SE Mean
NL Cs-137	13245	-0.08151	-0.10770	-0.08111	0.76942	0.00669
Variable	Minimum	Maximum	Q1	Q3		
NL Cs-137	-5.06721	3.20059	-0.53666	0.37501		

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural Log of the Cesium-137 concentration(pCi/g)
Mean = -0.0815121
StDev = 0.769392
Goodness of Fit
Anderson-Darling (adjusted) = 41.37
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0010	-3.36289	-3.40452	-3.32126
0.0100	-2.94289	-2.97976	-2.90603
0.1000	-2.45911	-2.49060	-2.42763
1.0000	-1.87139	-1.89661	-1.84616
2.0000	-1.66165	-1.68475	-1.63855
3.0000	-1.52858	-1.55038	-1.50678
4.0000	-1.42848	-1.44933	-1.40762
5.0000	-1.34705	-1.36715	-1.32695
6.0000	-1.27774	-1.29722	-1.25827
7.0000	-1.21697	-1.23591	-1.19804
8.0000	-1.16256	-1.18103	-1.14409
9.0000	-1.11308	-1.13113	-1.09502
10.0000	-1.06753	-1.08521	-1.04985
20.0000	-0.72905	-0.74430	-0.71380
30.0000	-0.48498	-0.49896	-0.47101
40.0000	-0.27644	-0.28975	-0.26312
50.0000	-0.08151	-0.09462	-0.06841
60.0000	0.11341	0.10010	0.12672
70.0000	0.32196	0.30798	0.33593
80.0000	0.56602	0.55078	0.58127
90.0000	0.90450	0.88682	0.92219
91.0000	0.95005	0.93200	0.96811
92.0000	0.99954	0.98107	1.01801
93.0000	1.05395	1.03501	1.07289
94.0000	1.11472	1.09525	1.13419
95.0000	1.18403	1.16393	1.20412
96.0000	1.26545	1.24460	1.28630
97.0000	1.36556	1.34375	1.38736
98.0000	1.49863	1.47552	1.52173
99.0000	1.70836	1.68314	1.73359
99.9953	2.92267	2.88420	2.96115

Fig. 7.A Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Shaft



Average: -0.0815121
StDev: 0.769421
N: 13245

W-test for Normality
R: 0.9915
P-Value (approx): < 0.0100

Fig. 7.B 95 Percent Confidence Levels in the Log Normal Cesium-137 Concentration in Surface Soil at the Gnome-Coach Shaft

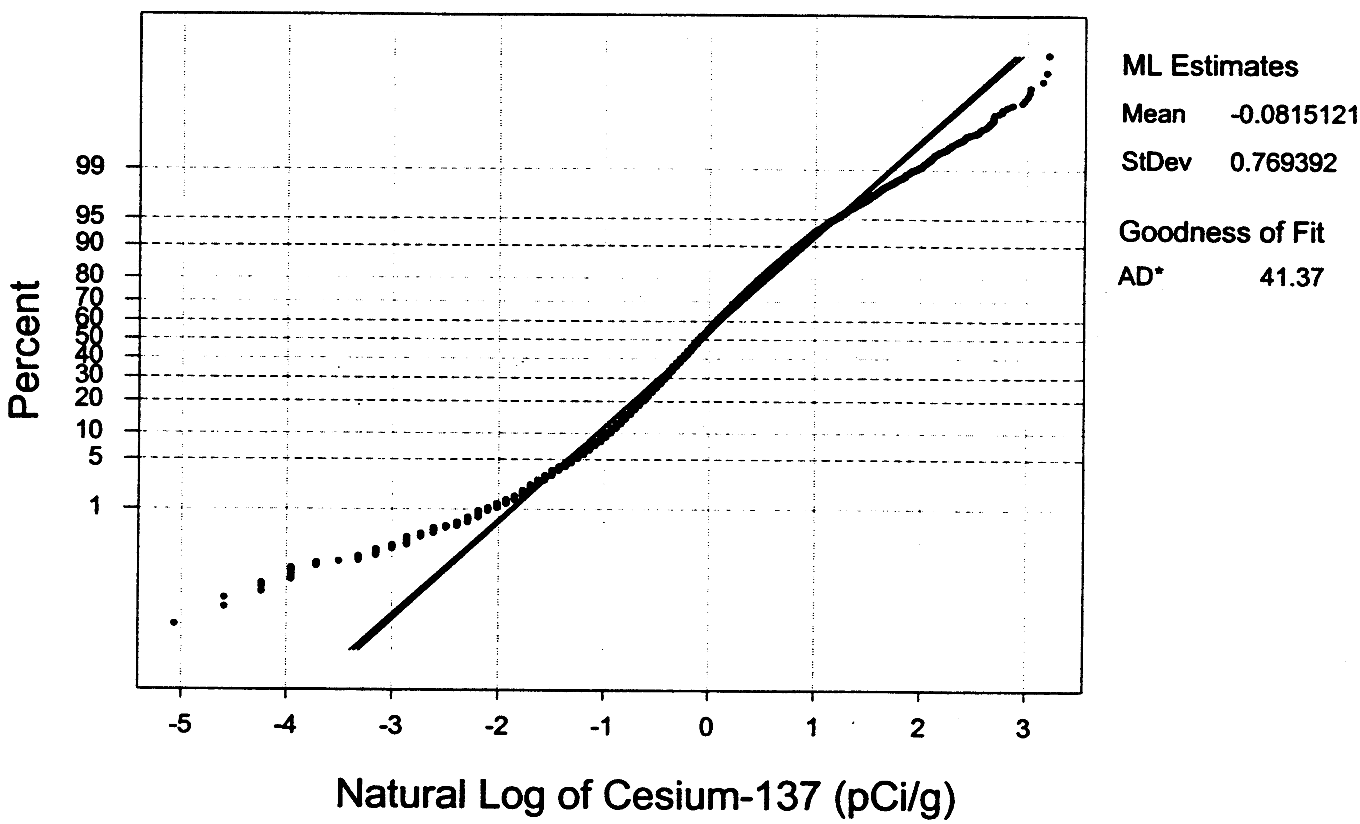


Exhibit 7.A Gnome-Coach Shaft Hot Spot SHFA001Radiological Drive Over Data
Descriptive Statistics for Surface Soil Cesium-137 Concentration (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137	642	2.547	1.723	2.254	2.574	0.102
Variable	Minimum	Maximum	Q1	Q3		
Cs-137	0.019	15.870	0.657	3.571		

Descriptive Statistics: Natural Log Cesium-137 Concentration (pCi/g)

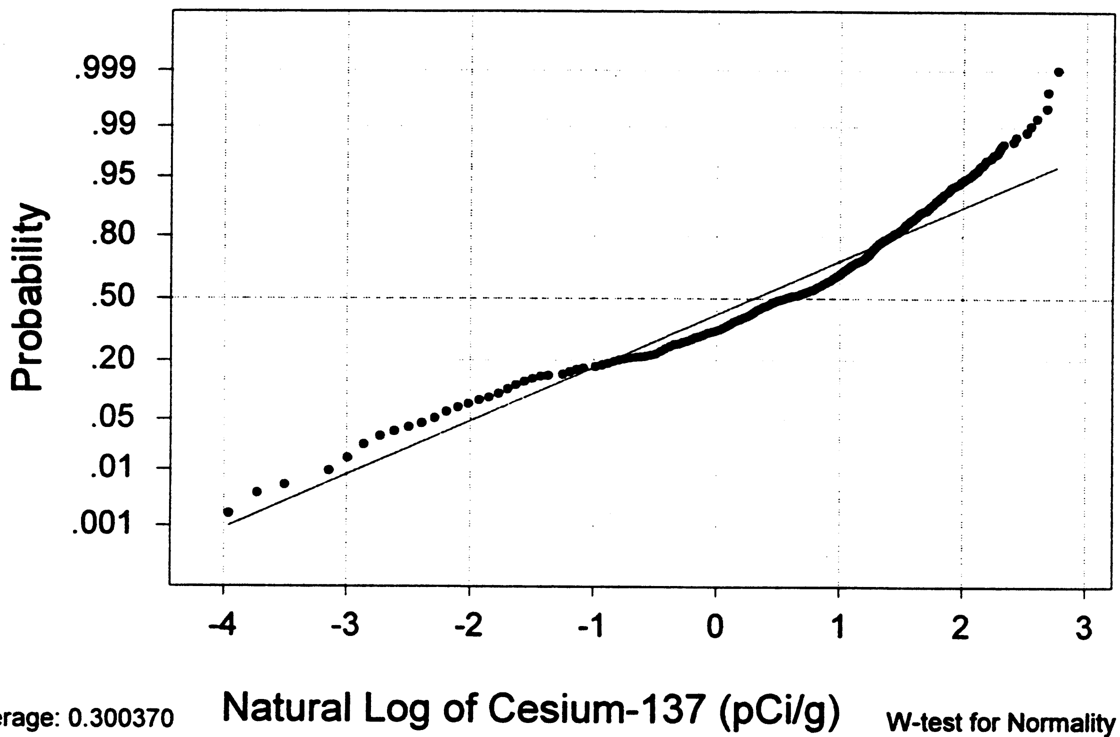
Variable	N	Mean	Median	TrMean	StDev	SE Mean
LN Cs-137	642	0.3004	0.5441	0.3653	1.3377	0.0528
Variable	Minimum	Maximum	Q1	Q3		
LN Cs-137	-3.9633	2.7644	-0.4201	1.2728		

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural log of the Cesium-137 concentration (pCi/g)
Mean = 0.300370
StDev = 1.33661
Goodness of Fit
Anderson-Darling (adjusted) = 11.34
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0100	-4.67051	-4.96140	-4.37962
0.1000	-3.83007	-4.07853	-3.58161
1.0000	-2.80905	-3.00809	-2.61002
2.0000	-2.44470	-2.62700	-2.26239
3.0000	-2.21352	-2.38556	-2.04148
4.0000	-2.03962	-2.20415	-1.87508
5.0000	-1.89816	-2.05675	-1.73957
6.0000	-1.77776	-1.93142	-1.62410
7.0000	-1.67219	-1.82163	-1.52275
8.0000	-1.57767	-1.72341	-1.43192
9.0000	-1.49170	-1.63417	-1.34923
10.0000	-1.41257	-1.55210	-1.27304
20.0000	-0.82455	-0.94487	-0.70424
30.0000	-0.40055	-0.51082	-0.29028
40.0000	-0.03826	-0.14329	0.06678
50.0000	0.30037	0.19698	0.40376
60.0000	0.63900	0.53396	0.74403
70.0000	1.00129	0.89102	1.11156
80.0000	1.42529	1.30498	1.54561
90.0000	2.01331	1.87378	2.15284
91.0000	2.09244	1.94997	2.23491
92.0000	2.17841	2.03266	2.32415
93.0000	2.27293	2.12350	2.42237
94.0000	2.37850	2.22484	2.53216
95.0000	2.49890	2.34031	2.65749
96.0000	2.64036	2.47582	2.80489
97.0000	2.81426	2.64222	2.98630
98.0000	3.04544	2.86313	3.22774
99.0000	3.40979	3.21076	3.60883
99.9027	4.44161	4.19261	4.69060

Fig. 7.A.1 Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Shaft Hot Spot SHFA0001



Average: 0.300370
StDev: 1.33765
N: 642

W-test for Normality
R: 0.9732
P-Value (approx): < 0.0100

Fig. 7.B.1 95 Percent Confidence Levels of the Natural Log of the Cesium-137 Concentration in Surface Soil at the Gnome-Coach Shaft Hot Spot SHFA0001

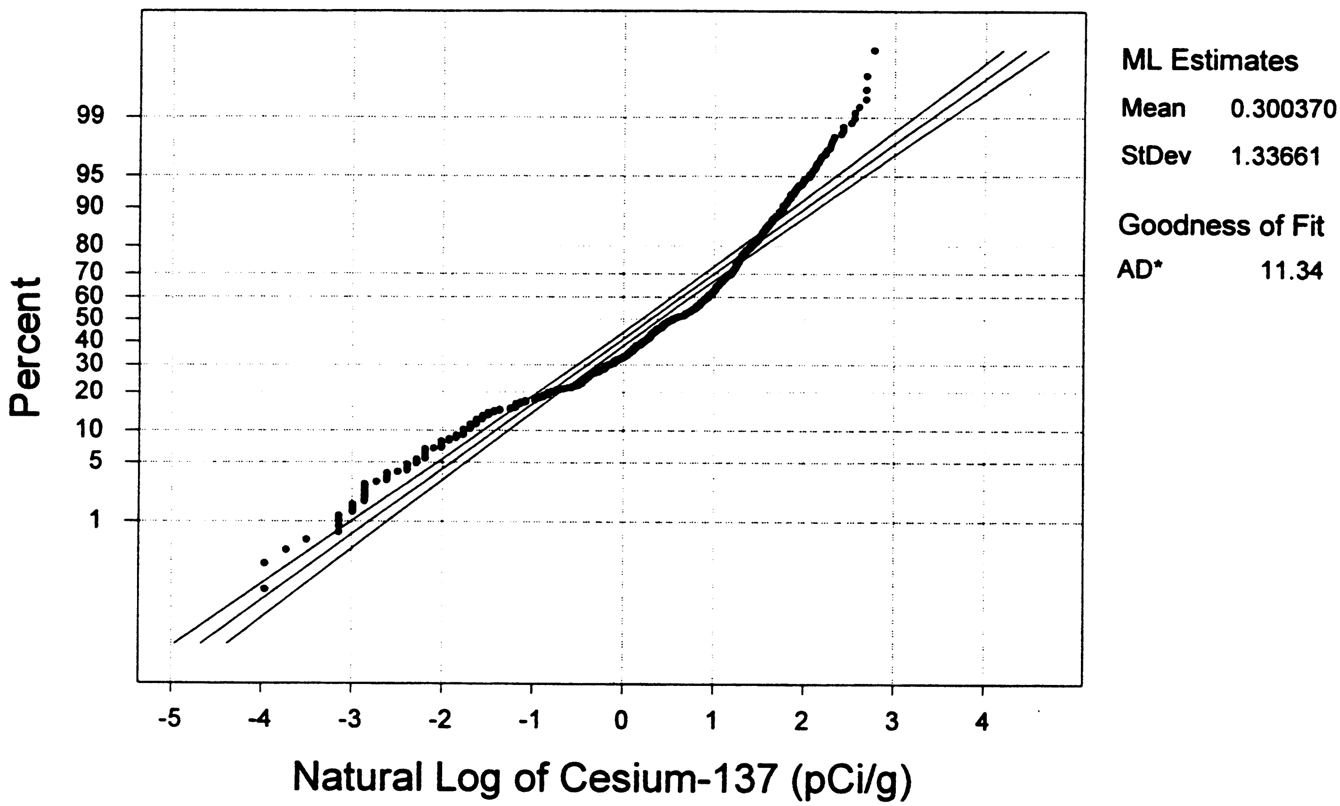


Exhibit 7.B Gnome-Coach Shaft Hot Spot SHFB001 Radiological Drive Over Data Descriptive Statistics for Cesium-137 Concentration in Surface Soil (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137	120	2.053	0.485	1.363	4.054	0.37
Variable	Minimum	Maximum	Q1	Q3		
Cs-137	0.010	24.098	0.183	1.495		

Descriptive Statistics: Natural Log of Cesium-137 (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
NL Cs-137	120	-0.562	-0.725	-0.564	1.616	0.148
Variable	Minimum	Maximum	Q1	Q3		
NL Cs-137	-4.605	3.182	-1.698	0.398		

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural Log of Cesium-137 (pCi/g)
Mean = -0.561861
StDev = 1.60915
Goodness of Fit
Anderson-Darling (adjusted) = 0.877
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.1	-5.53451	-6.22637	-4.84264
1.0	-4.30530	-4.85955	-3.75106
2.0	-3.86665	-4.37430	-3.35901
3.0	-3.58834	-4.06740	-3.10928
4.0	-3.37898	-3.83715	-2.92081
5.0	-3.20868	-3.65029	-2.76706
6.0	-3.06373	-3.49160	-2.63585
7.0	-2.93663	-3.35275	-2.52051
8.0	-2.82283	-3.22868	-2.41698
9.0	-2.71934	-3.11607	-2.32261
10.0	-2.62407	-3.01261	-2.23553
20.0	-1.91616	-2.25119	-1.58112
30.0	-1.40570	-1.71277	-1.09864
40.0	-0.96954	-1.26203	-0.67704
50.0	-0.56186	-0.84977	-0.27395
60.0	-0.15419	-0.44668	0.13830
70.0	0.28198	-0.02509	0.58904
80.0	0.79243	0.45740	1.12747
90.0	1.50035	1.11181	1.88888
91.0	1.59561	1.19888	1.99234
92.0	1.69911	1.29326	2.10496
93.0	1.81291	1.39679	2.22903
94.0	1.94000	1.51213	2.36788
95.0	2.08496	1.64334	2.52657
96.0	2.25526	1.79709	2.71342
97.0	2.46462	1.98556	2.94368
98.0	2.74293	2.23528	3.25057
99.0	3.18158	2.62733	3.73583
99.9	4.41079	3.71892	5.10265

Fig. 7.A.2 Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Shaft Hot Spot SHFB0001

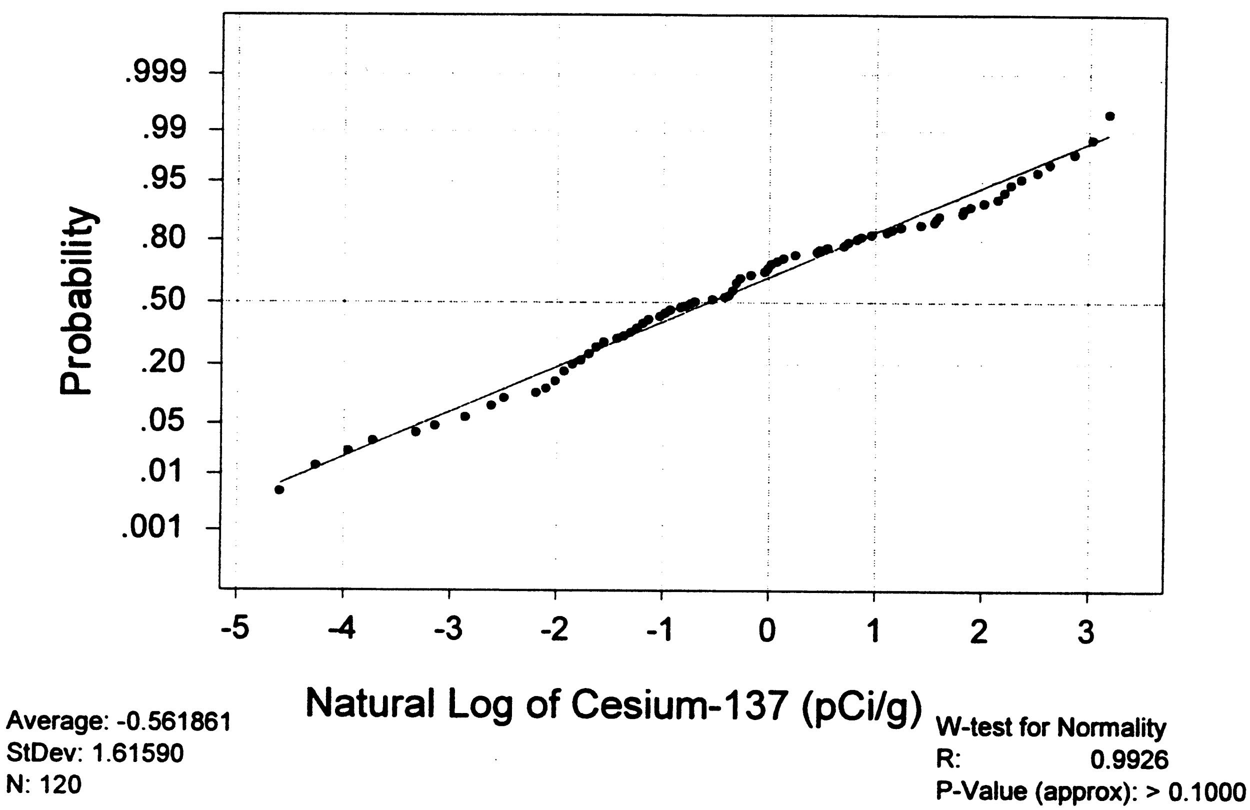


Fig. 7.B.2 95 Percent Confidence Levels in the Log Normal Cesium-137 Concentration in Surface Soil at Gnome-Coach Shaft Hot Spot SHFB0001

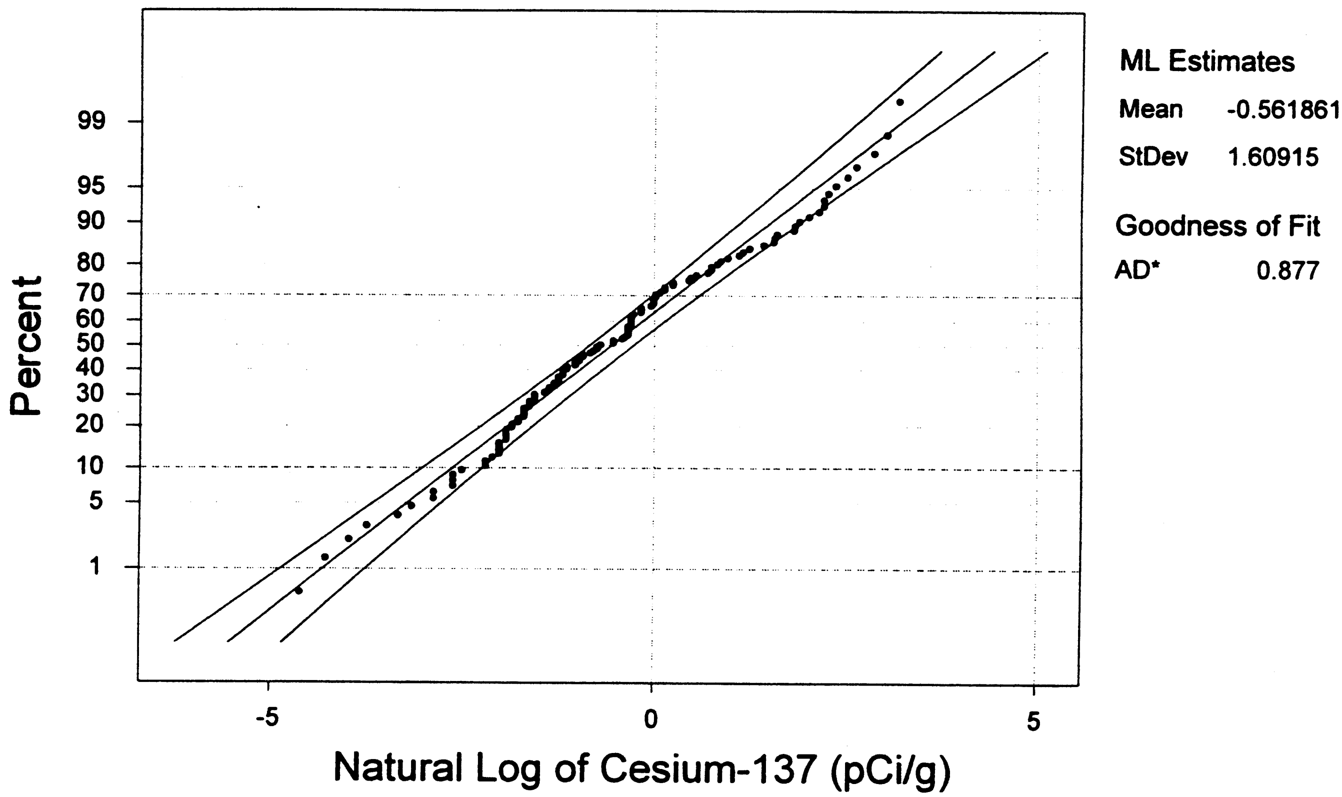


Exhibit 7.C Gnome-Coach Shaft Hot Spot SHFC0001 Radiological Drive Over Data Descriptive Statistics Cesium-137 Concentration (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137	257	2.392	1.567	1.862	2.995	0.187

Variable	Minimum	Maximum	Q1	Q3
Cs-137	0.539	24.547	1.127	2.281

Descriptive Statistics: Natural Log of Cesium-137 (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
LN Cs-137	257	0.5569	0.4492	0.4979	0.6720	0.0419

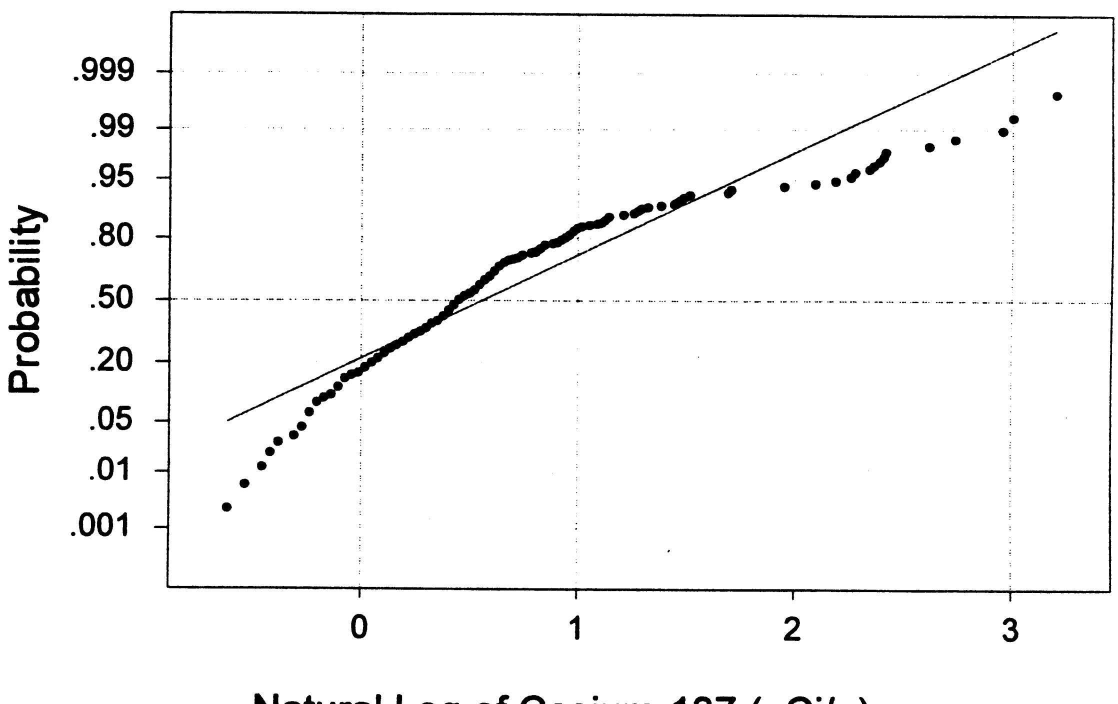
Variable	Minimum	Maximum	Q1	Q3
LN Cs-137	-0.6182	3.2006	0.1198	0.8244

Distribution Function Analysis

Normal Distribution. Parameter Estimates (ML)
Variable: Natural Log of Cesium-137 concentration (pCi/g)
Mean = 0.556929
StDev = 0.670668
Goodness of Fit
Anderson-Darling (adjusted) = 7.399
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.1	-1.51559	-1.71263	-1.31855
1.0	-1.00328	-1.16112	-0.84543
2.0	-0.82045	-0.96503	-0.67588
3.0	-0.70446	-0.84089	-0.56802
4.0	-0.61720	-0.74768	-0.48671
5.0	-0.54622	-0.67199	-0.42045
6.0	-0.48581	-0.60767	-0.36395
7.0	-0.43284	-0.55135	-0.31433
8.0	-0.38541	-0.50099	-0.26982
9.0	-0.34227	-0.45526	-0.22928
10.0	-0.30257	-0.41322	-0.19191
20.0	-0.00752	-0.10294	0.08790
30.0	0.20523	0.11778	0.29268
40.0	0.38702	0.30372	0.47032
50.0	0.55693	0.47493	0.63892
60.0	0.72684	0.64354	0.81014
70.0	0.90863	0.82118	0.99608
80.0	1.12138	1.02596	1.21679
90.0	1.41642	1.30577	1.52708
91.0	1.45613	1.34314	1.56912
92.0	1.49926	1.38368	1.61485
93.0	1.54669	1.42818	1.66520
94.0	1.59967	1.47781	1.72152
95.0	1.66008	1.53431	1.78585
96.0	1.73106	1.60057	1.86154
97.0	1.81832	1.68188	1.95475
98.0	1.93431	1.78974	2.07889
99.0	2.11714	1.95929	2.27498
99.9	2.62945	2.43241	2.82649

Fig. 7.A.3 Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Shaft Hot Spot SHFC0001



Average: 0.556929
StDev: 0.671976
N: 257

W-test for Normality
R: 0.9440
P-Value (approx): < 0.0100

Fig. 7.B.3 95 Percent Confidence Levels in the Log Normal Cesium-137 Concentration in Surface Soil at Gnome-Coach Shaft Hot Spot SHFC0001

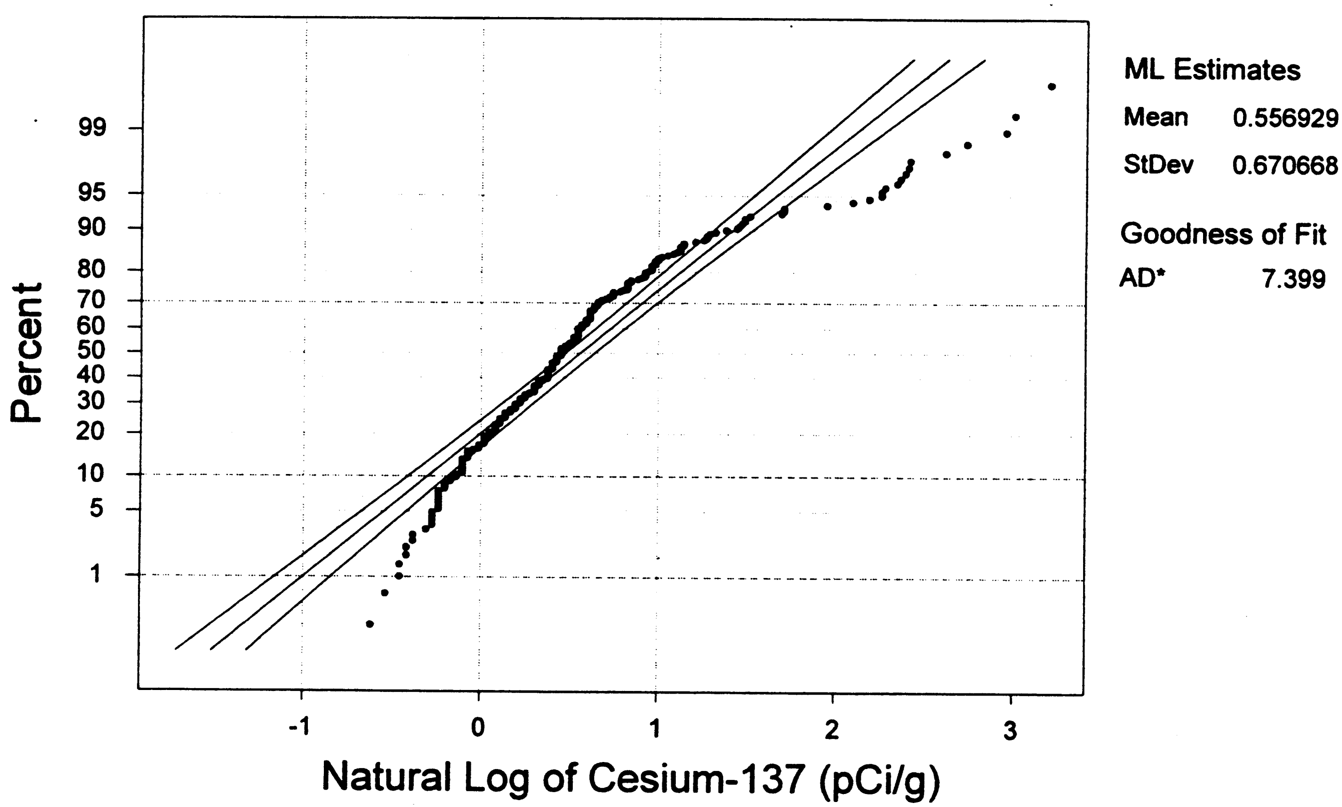


Exhibit 8 Gnome Coach Salt Muckpile Radiological Drive Over Data Descriptive Statistics for Cesium-137 in Surface Soil (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137	17654	0.8155	0.7071	0.7607	0.6526	0.0049
Variable	Minimum	Maximum	Q1	Q3		
Cs-137	0.0001	24.0982	0.4326	1.0479		

Descriptive Statistics: Natural Log Cesium-137 (pCi/g)

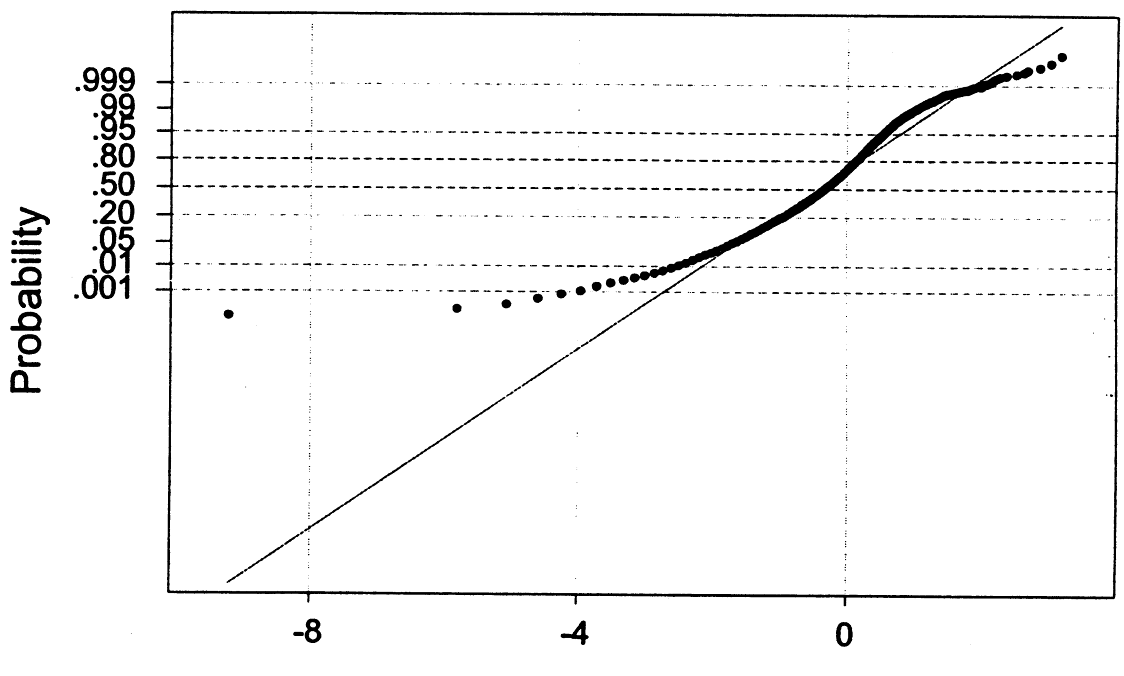
Variable	N	Mean	Median	TrMean	StDev	SE Mean
LN Cs-137	17654	-0.43272	-0.34658	-0.40115	0.72511	0.00546
Variable	Minimum	Maximum	Q1	Q3		
LN Cs-137	-9.21034	3.18214	-0.83794	0.04679		

Distribution Function Analysis

Normal Distribution. Parameter Estimates (ML)
Variable: Natural Log of the Cesium-137 concentration (pCi/g)
Mean = -0.432721
StDev = 0.725091
Goodness of Fit
Anderson-Darling (adjusted) = 149.2
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0010	-3.52516	-3.55914	-3.49117
0.0100	-3.12935	-3.15944	-3.09926
0.1000	-2.67342	-2.69912	-2.64772
1.0000	-2.11954	-2.14013	-2.09895
2.0000	-1.92188	-1.94074	-1.90302
3.0000	-1.79647	-1.81427	-1.77867
4.0000	-1.70213	-1.71915	-1.68511
5.0000	-1.62539	-1.64180	-1.60898
6.0000	-1.56007	-1.57597	-1.54418
7.0000	-1.50280	-1.51826	-1.48734
8.0000	-1.45153	-1.46660	-1.43645
9.0000	-1.40489	-1.41963	-1.39015
10.0000	-1.36196	-1.37640	-1.34753
20.0000	-1.04297	-1.05542	-1.03053
30.0000	-0.81296	-0.82437	-0.80155
40.0000	-0.61642	-0.62729	-0.60555
50.0000	-0.43272	-0.44342	-0.42202
60.0000	-0.24902	-0.25989	-0.23815
70.0000	-0.05248	-0.06389	-0.04107
80.0000	0.17753	0.16509	0.18998
90.0000	0.49652	0.48209	0.51096
91.0000	0.53945	0.52471	0.55419
92.0000	0.58608	0.57101	0.60116
93.0000	0.63736	0.62190	0.65282
94.0000	0.69463	0.67874	0.71053
95.0000	0.75995	0.74354	0.77636
96.0000	0.83669	0.81967	0.85371
97.0000	0.93103	0.91323	0.94882
98.0000	1.05644	1.03758	1.07529
99.0000	1.25409	1.23350	1.27469
99.9965	2.44848	2.41658	2.48038

Fig. 8.A Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Salt Muckpile



Average: -0.432721
StDev: 0.725112
N: 17654

W-test for Normality
R: 0.9768
P-Value (approx): < 0.0100

Fig. 8.B 95 Percent Confidence Level of the Cesium-137 Concentration in Surface Soil at the Gnome-Coach Salt Muckpile

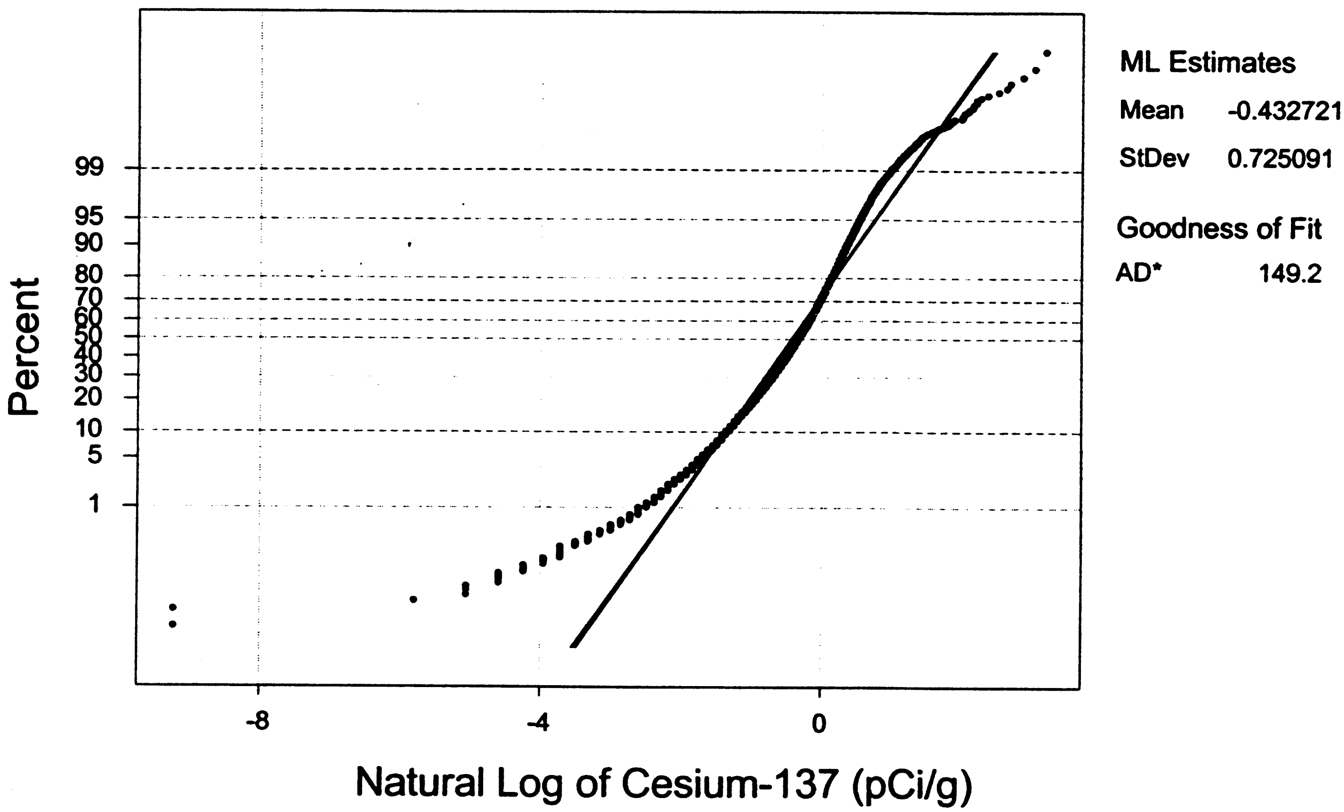


Exhibit 9 Gnome-Coach Equipment Storage Area Hot Spot ESAA0001, Radiological Drive Over Data Descriptive Statistics for Cesium-137 Concentration in Surface Soil (pCi/g)

Variable	N	Mean	Median	TrMean	StDev
Cs-137	845	3.2908	2.6130	3.0048	2.3999
Variable	SE Mean	Minimum	Maximum	Q1	Q3
Cs-137	0.0826	0.5850	23.2130	1.8450	3.9540

Descriptive Statistics: Natural Log Cesium-137

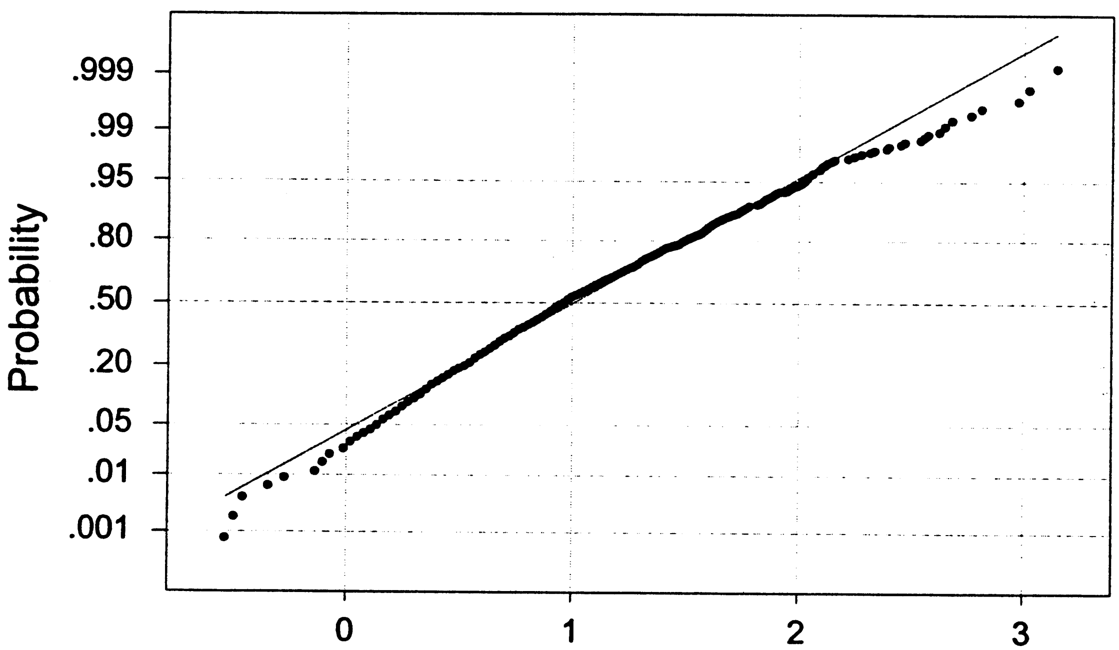
Variable	N	Mean	Median	TrMean	StDev
NL Cs-137	845	1.0077	0.9605	0.9945	0.5827
Variable	SE Mean	Minimum	Maximum	Q1	Q3
NL Cs-137	0.0200	-0.5361	3.1447	0.6125	1.3747

Distribution Function Analysis

Normal Distribution. Parameter Estimates (ML)
Variable: Natural Log of the Cesium-137 concentration
Mean = 1.00767
StDev = 0.582351
Goodness of Fit
Anderson-Darling (adjusted) = 1.753
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0100	-1.15810	-1.26857	-1.04763
0.1000	-0.79193	-0.88628	-0.69757
1.0000	-0.34708	-0.42267	-0.27149
2.0000	-0.18833	-0.25756	-0.11910
3.0000	-0.08761	-0.15294	-0.02228
4.0000	-0.01184	-0.07433	0.05064
5.0000	0.04979	-0.01044	0.11002
6.0000	0.10225	0.04389	0.16060
7.0000	0.14824	0.09149	0.20499
8.0000	0.18943	0.13408	0.24478
9.0000	0.22688	0.17278	0.28099
10.0000	0.26136	0.20837	0.31435
20.0000	0.51755	0.47186	0.56324
30.0000	0.70229	0.66041	0.74416
40.0000	0.86013	0.82024	0.90002
50.0000	1.00767	0.96841	1.04694
60.0000	1.15521	1.11532	1.19510
70.0000	1.31306	1.27118	1.35493
80.0000	1.49779	1.45210	1.54348
90.0000	1.75398	1.70100	1.80697
91.0000	1.78846	1.73435	1.84257
92.0000	1.82592	1.77057	1.88127
93.0000	1.86710	1.81035	1.92385
94.0000	1.91309	1.85474	1.97145
95.0000	1.96555	1.90533	2.02578
96.0000	2.02718	1.96470	2.08967
97.0000	2.10295	2.03762	2.16829
98.0000	2.20367	2.13444	2.27291
99.0000	2.36242	2.28683	2.43801
99.9261	2.85885	2.76225	2.95545

Fig. 9.A Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Equipment Storage Area Hot Spot ESAA0001



Average: 1.00767
StDev: 0.582695
N: 845

W-test for Normality
R: 0.9955
P-Value (approx): < 0.0100

Fig. 9.B 95 Percent Confidence Levels in the Cesium-137 Concentration in Surface Soil at Gnome-Coach Equipment Storage Area Hot Spot ESAA0001

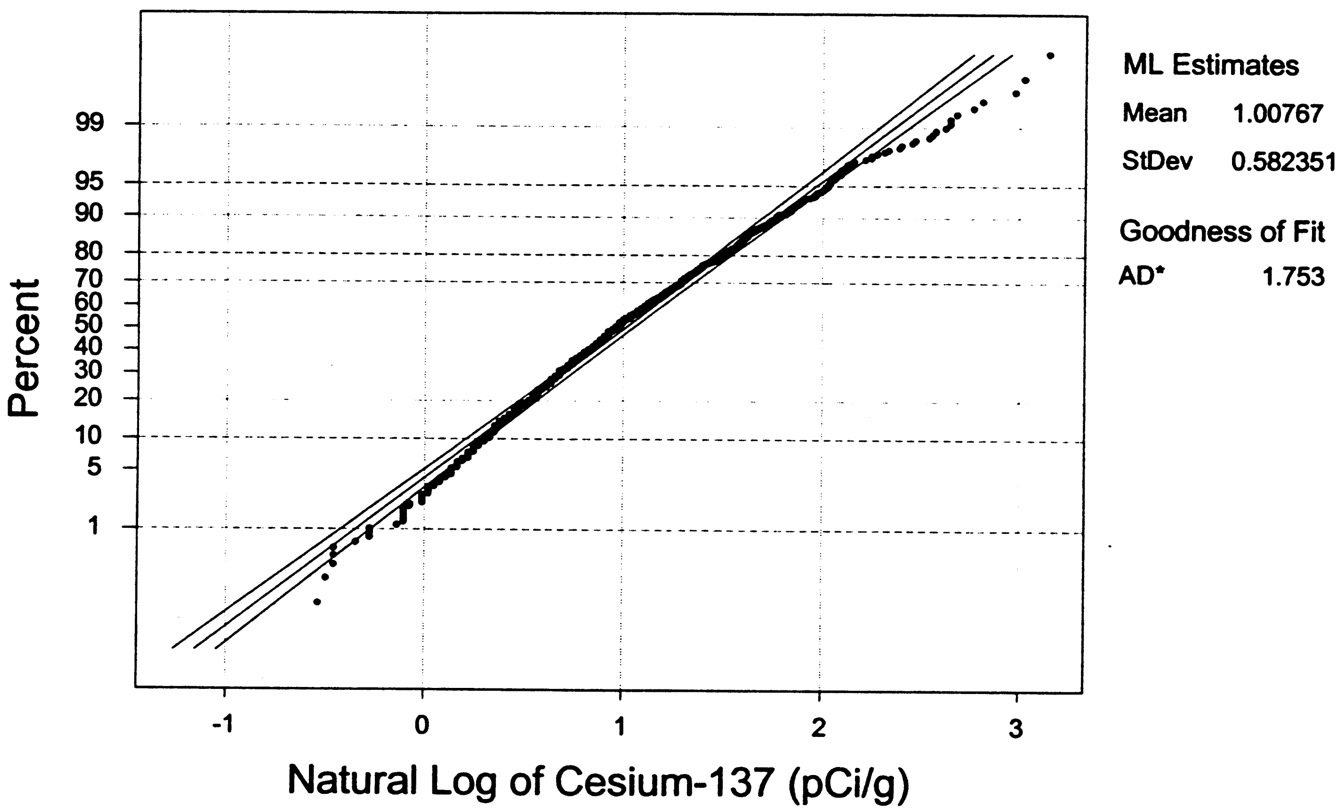


Exhibit 10: Gnome Coach Area 57 Hot Spot A57A0001Descriptive Statistics of Cesium-137 Concentration in Surface Soil (pCi/g)

Variable	N	Mean	Median	TrMean	StDev
Cs-137	1061	2.3643	1.7900	2.0957	1.9056
Variable	SE Mean	Minimum	Maximum	Q1	Q3
Cs-137	0.0585	0.1190	14.4000	1.3000	2.6000

Descriptive Statistics: Natural Log of Cesium-137 Concentration (pCi/g)

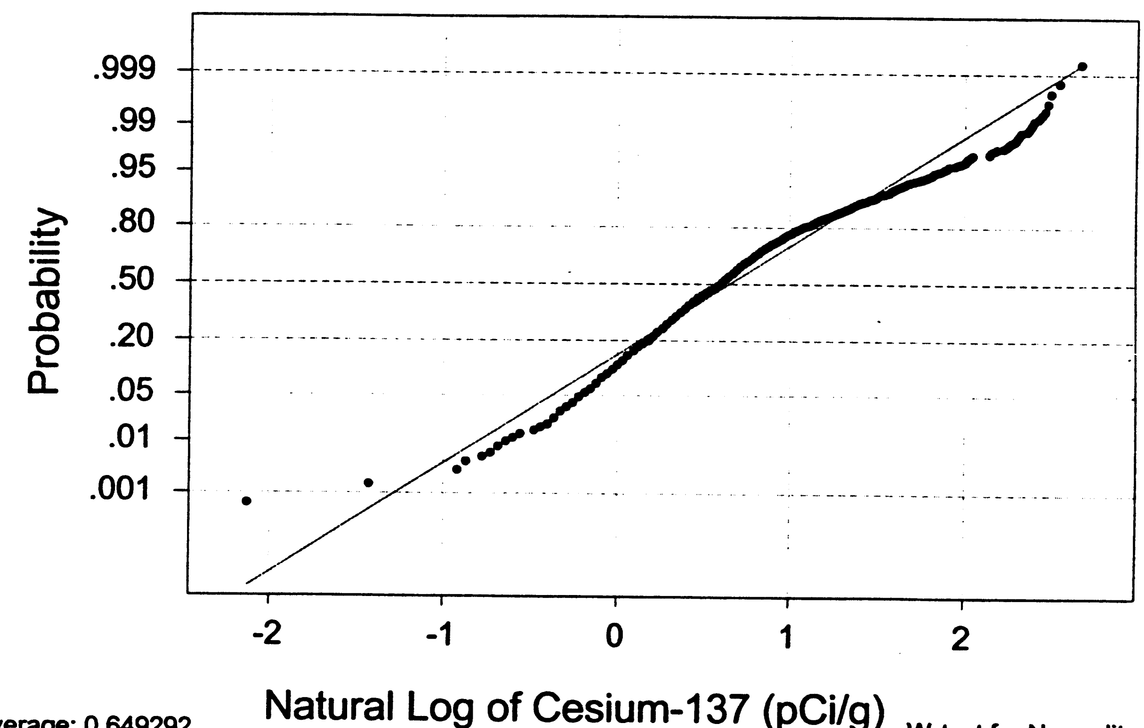
Variable	N	Mean	Median	TrMean	StDev
NL Cs-137	1061	0.6493	0.5822	0.6273	0.6131
Variable	SE Mean	Minimum	Maximum	Q1	Q3
NL Cs-137	0.0188	-2.1286	2.6672	0.2624	0.9555

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural Log of Cesium-137 Concentration (pCi/g)
Mean = 0.649292
StDev = 0.612787
Goodness of Fit
Anderson-Darling (adjusted) = 9.089
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
0.0100	-1.62967	-1.73341	-1.52594
0.1000	-1.24436	-1.33297	-1.15576
1.0000	-0.77626	-0.84725	-0.70528
2.0000	-0.60922	-0.67423	-0.54421
3.0000	-0.50323	-0.56459	-0.44188
4.0000	-0.42351	-0.48218	-0.36483
5.0000	-0.35865	-0.41521	-0.30210
6.0000	-0.30345	-0.35825	-0.24866
7.0000	-0.25505	-0.30835	-0.20176
8.0000	-0.21172	-0.26370	-0.15974
9.0000	-0.17231	-0.22311	-0.12150
10.0000	-0.13603	-0.18579	-0.08627
20.0000	0.13356	0.09065	0.17646
30.0000	0.32795	0.28862	0.36727
40.0000	0.49404	0.45658	0.53150
50.0000	0.64929	0.61242	0.68616
60.0000	0.80454	0.76708	0.84200
70.0000	0.97064	0.93131	1.00996
80.0000	1.16503	1.12212	1.20793
90.0000	1.43461	1.38485	1.48437
91.0000	1.47089	1.42008	1.52170
92.0000	1.51030	1.45832	1.56228
93.0000	1.55364	1.50034	1.60693
94.0000	1.60204	1.54724	1.65683
95.0000	1.65724	1.60068	1.71379
96.0000	1.72209	1.66341	1.78077
97.0000	1.80182	1.74046	1.86317
98.0000	1.90780	1.84279	1.97282
99.0000	2.07485	2.00387	2.14583
99.9411	2.63729	2.54502	2.72956

Fig. 10A Log Normal Probability Plot of the Cesium-137 Concentration in Surface Soil at Gnome-Coach Area 57 Hot Spot A570001



Average: 0.649292
StDev: 0.613076
N: 1061

W-test for Normality
R: 0.9856
P-Value (approx): < 0.0100

Fig. 10.B 95 Percent Confidence Levels of the Cesium-137 Concentration in Surface Soil at the Gnome-Coach Area 57 Hot Spot A57A0001

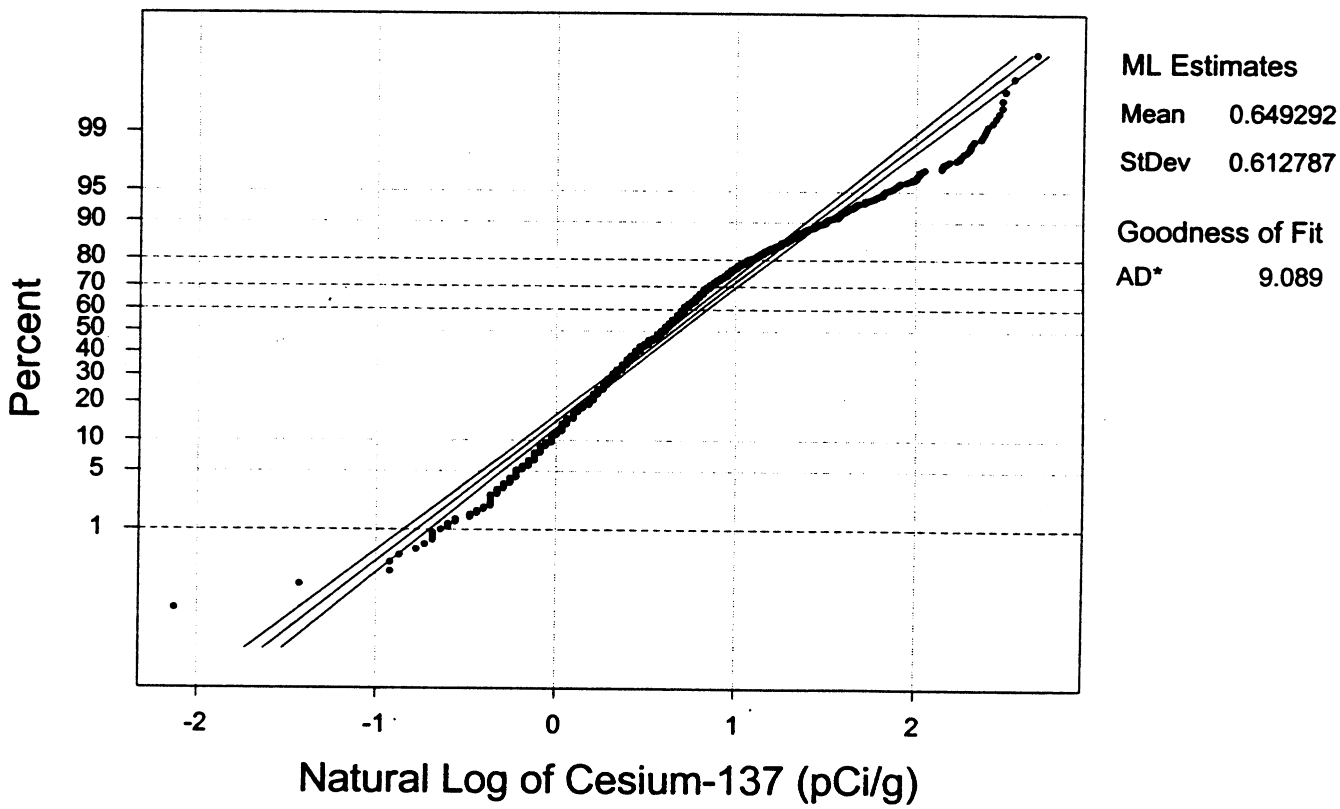


Exhibit 11 Cesium-137 Concentration in Surface Soil Samples Collected from Undisturbed Background Locations in New Mexico (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs137	62	0.5617	0.4520	0.5328	0.3227	0.0410

Variable	Minimum	Maximum	Q1	Q3
Cs137	0.1620	1.8750	0.3408	0.7188

Descriptive Statistics: Natural Log of Cesium-137 Concentration (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
LN of Cs137	62	-0.7106	-0.7941	-0.7130	0.5102	0.0648

Variable	Minimum	Maximum	Q1	Q3
LN of Cs137	-1.8202	0.6286	-1.0766	-0.3314

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural log of Cs-137 in New Mexico Background Soil (pCi/g)
Mean = -0.710613
StDev = 0.506025
Goodness of Fit
Anderson-Darling (adjusted) = 0.785
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
1	-1.88780	-2.13028	-1.64533
2	-1.74986	-1.97195	-1.52777
3	-1.66234	-1.87193	-1.45276
4	-1.59650	-1.79695	-1.39606
5	-1.54295	-1.73615	-1.34975
6	-1.49737	-1.68456	-1.31018
7	-1.45740	-1.63945	-1.27535
8	-1.42162	-1.59917	-1.24406
9	-1.38907	-1.56264	-1.21550
10	-1.35911	-1.52909	-1.18913
20	-1.13649	-1.28307	-0.98992
30	-0.97597	-1.11031	-0.84163
40	-0.83881	-0.96678	-0.71085
50	-0.71061	-0.83657	-0.58466
60	-0.58241	-0.71038	-0.45445
70	-0.44525	-0.57959	-0.31091
80	-0.28473	-0.43131	-0.13816
90	-0.06212	-0.23210	0.10787
91	-0.03216	-0.20572	0.14141
92	0.00039	-0.17717	0.17794
93	0.03617	-0.14588	0.21823
94	0.07614	-0.11105	0.26333
95	0.12172	-0.07148	0.31493
96	0.17528	-0.02517	0.37572
97	0.24112	0.03153	0.45070
98	0.32864	0.10654	0.55073
99	0.46658	0.22410	0.70906

Fig. 11.A Log Normal Probability Plot of the Cesium-137 Concentration in Soil Samples Collected from Undisturbed Background Locations in New Mexico

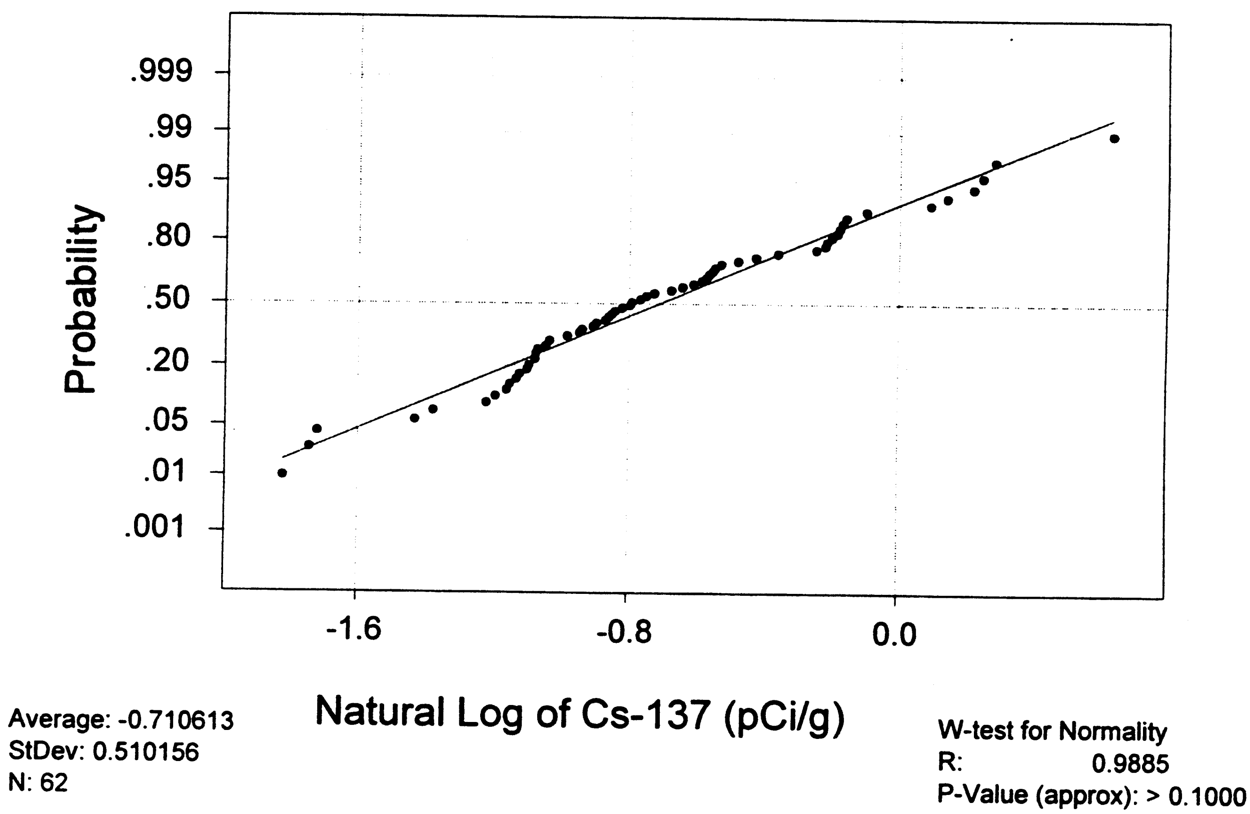


Fig. 11.B 95 Percent Confidence Levels in the Cesium-137 Concentration in Surface Soil Samples Collected from Undisturbed Background Locations in New Mexico

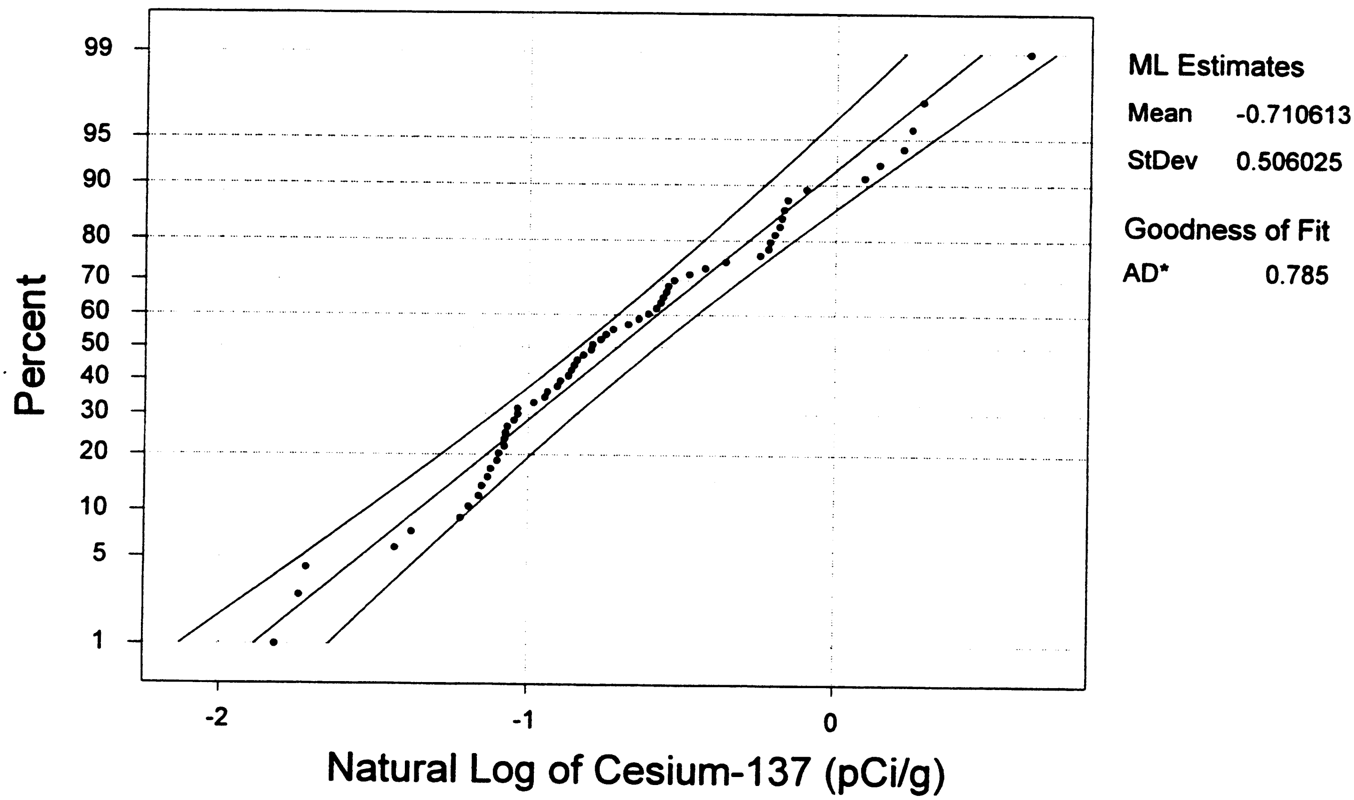


Exhibit 12. Descriptive Statistics for Cesium-137 in Vegetation Samples Collected from Gnome-Coach Site (pCi/g)

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Cs-137	19	0.1948	0.1200	0.1794	0.1436	0.0329
Variable	Minimum	Maximum	Q1	Q3		
Cs-137	0.0820	0.5700	0.1000	0.2630		

Descriptive Statistics: Natural Log of Cesium-137 in Vegetation (pCi/g)

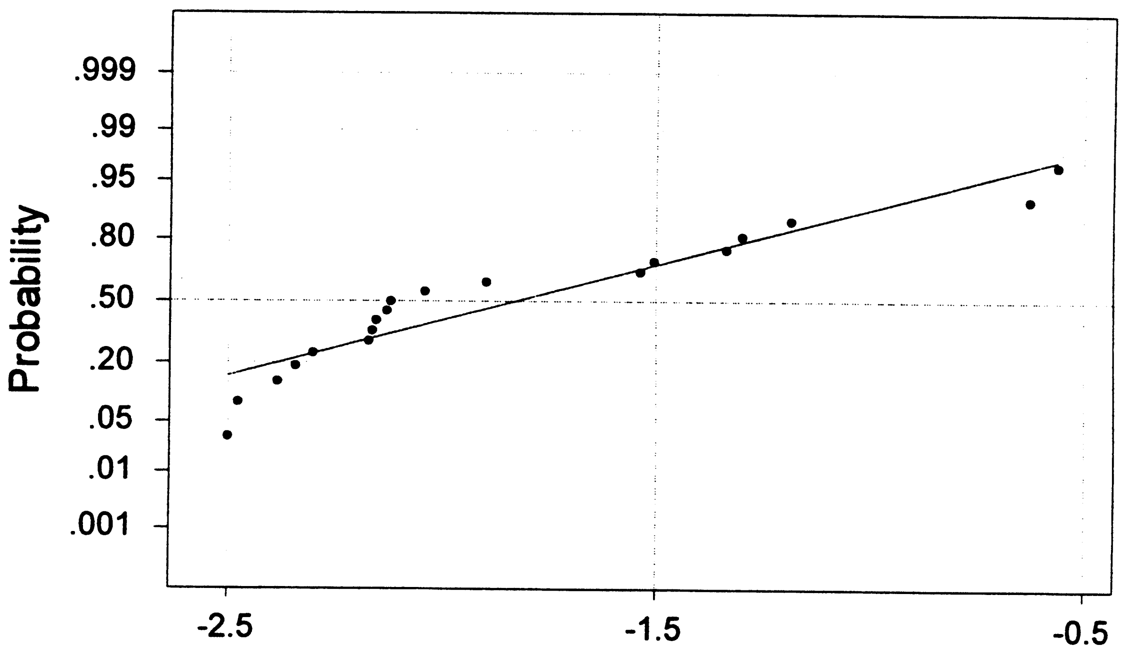
Variable	N	Mean	Median	TrMean	StDev	SE Mean
NL Cs-137	19	-1.828	-2.120	-1.863	0.597	0.137
Variable	Minimum	Maximum	Q1	Q3		
NL Cs-137	-2.501	-0.562	-2.303	-1.336		

Distribution Function Analysis

Normal Distribution Parameter Estimates (ML)
Variable: Natural Log Cesium-137 in Vegetation
Mean = -1.82813
StDev = 0.580784
Goodness of Fit
Anderson-Darling (adjusted) = 1.419
Percentile Estimates

Percent	Percentile	95% CI Approximate Lower Limit	95% CI Approximate Upper Limit
1	-3.17923	-3.68197	-2.67650
2	-3.02091	-3.48137	-2.56045
3	-2.92046	-3.35500	-2.48593
4	-2.84490	-3.26048	-2.42932
5	-2.78343	-3.18400	-2.38287
6	-2.73112	-3.11922	-2.34301
7	-2.68524	-3.06269	-2.30780
8	-2.64417	-3.01230	-2.27605
9	-2.60682	-2.96667	-2.24696
10	-2.57243	-2.92486	-2.22001
20	-2.31693	-2.62082	-2.01304
30	-2.13269	-2.41122	-1.85417
40	-1.97527	-2.24057	-1.70996
50	-1.82813	-2.08928	-1.56698
60	-1.68099	-1.94629	-1.41568
70	-1.52357	-1.80209	-1.24504
80	-1.33933	-1.64322	-1.03543
90	-1.08382	-1.43625	-0.73140
91	-1.04944	-1.40929	-0.68958
92	-1.01209	-1.38021	-0.64396
93	-0.97101	-1.34846	-0.59357
94	-0.92514	-1.31325	-0.53703
95	-0.87282	-1.27339	-0.47226
96	-0.81136	-1.22694	-0.39578
97	-0.73579	-1.17033	-0.30126
98	-0.63534	-1.09580	-0.17488
99	-0.47702	-0.97975	0.02571

Fig. 12.A Log Normal Probability Plot of the Cesium-137 Concentration in Vegetation Samples Collected from the Gnome-Coach Site



Average: -1.82813
StDev: 0.596699
N: 19

W-test for Normality
R: 0.9429
P-Value (approx): 0.0404

Fig. 12.B 95 Percent Confidence Levels in the Cesium-137 Concentration in Vegetation Samples Collected from the Gnome-Coach Site

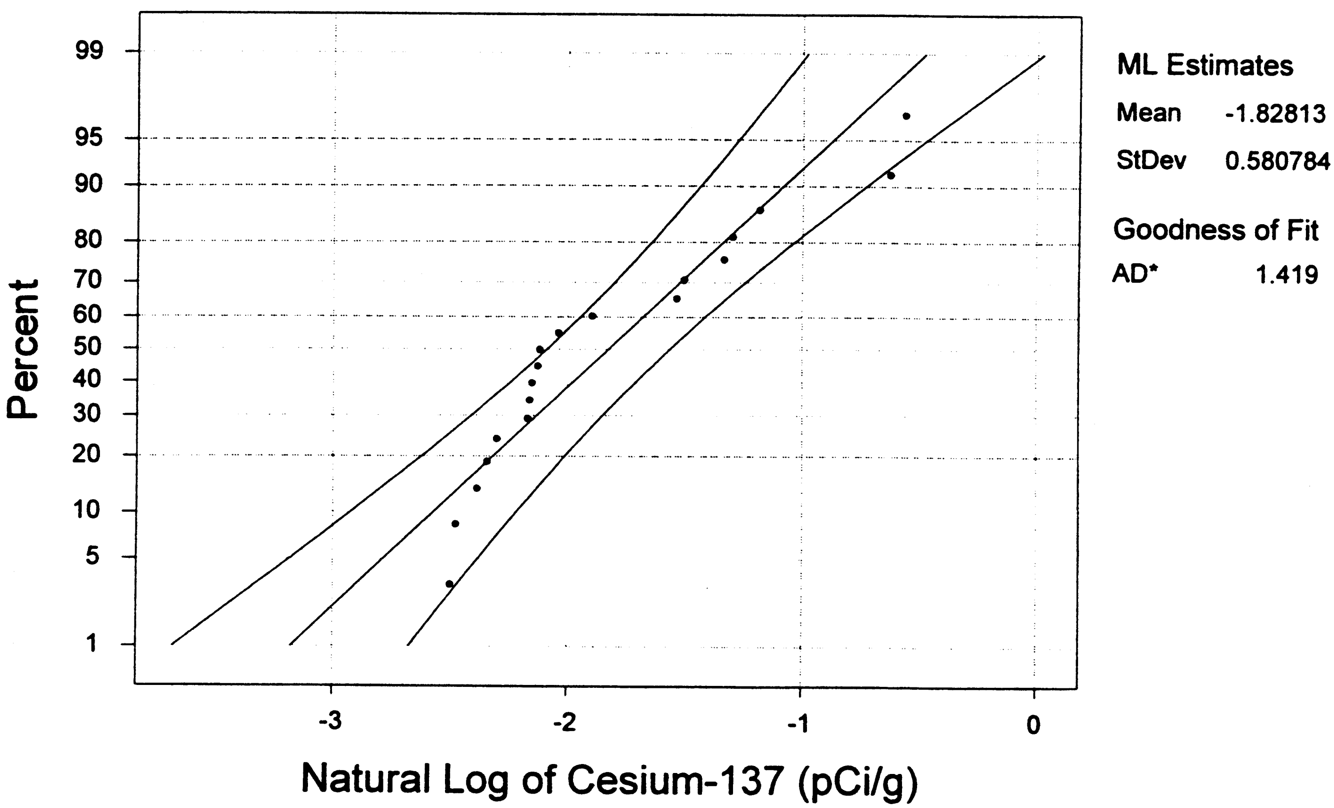


Exhibit 13: Beef Ingestion Dose from Cattle Grazed on the Gnome-Coach Fallout Plume

PURPOSE

Calculate the committed effective dose equivalent to dose receptors consuming beef from cattle that grazed on the Gnome-Coach Fallout Plume.

GIVEN

$E_{(t)} = U_f \times f_M \times F_f \times C_f Q_f \times DCF$ Equation 1 (EG&G, 1985)

$E_{(t)}$ = Committed Effective Dose Equivalent from ingesting cesium-137 contaminated beef

U_f = annual rate of consumption of beef by a dose receptor (EPA, 1990,1991)

f_M = fraction of cattle's annual consumption of forage from the Gnome-Coach Fallout Plume

F_f = feed-to-meat transfer parameter, the concentration of cesium-137 in beef per unit intake of time of cesium-137, $(pCi/kg_{beef})/(pCi/day)$. Value is a distribution based on 10 references.

C_f = cesium-137 concentration distribution in Gnome-Coach Fallout Plume forage (pCi/g)

Q_f = cattle ingestion rate of forage in the Gnome-Coach Fallout Plume (g_{dry}/day)

DCF = dose conversion factor from ingestion of cesium-137 (mrem/pCi) (ICRP, 1996)

MEASURMENTS

C_f, ^{137}Cs concentration distribution in forage vegetation, Gnome-Coach Fallout Plume (pCi/g)

Sample No.	^{137}Cs (pCi/g)	Sample No.	^{137}Cs (pCi/g)	Sample No.	^{137}Cs (pCi/g)	Sample No.	^{137}Cs (pCi/g)
VSA1A	0.114	VSA2C	0.12	VSA4B	0.096	VSA6A	0.306
VSA1B	0.084	VSA3A	0.115	VSA4C	0.13	VSA6B	0.263
VSA1C	0.534	VSA3B	0.273	VSA5A	0.092	VSA6C	0.15
VSA2A	0.215	VSA3C	0.57	VSA5B	0.082	VSA7A	0.119
VSA2B	0.116	VSA4A	0.222	VSA5C	0.1		

ASSUMPTIONS

The contaminant of concern is cesium-137 (^{137}Cs)

U_f varies from 44 g/day (EPA, 1990) to 75 g/day (EPA, 1991), equivalent to 16 to 27.4 kg/yr. It is assumed that the mean value for U_f $(kg_{beef}/year)$ for an adult = 21.7175

U_f for a child (kg/yr) = 14.22 U_f for a teenager (kg/yr) = 22.67

f_M is assumed to be equivalent to the fraction of the year the cattle graze in the Gnome-Coach Fallout Plume. The cattle are assumed to graze there 30 to 210 days per year. Therefore, the value of f_M varies from 0.0822 (30/365) to 0.575 (210/365) with a mean value = 0.32877

F_f ranges from 0.002 (NRC, 1983) to 0.051 (IAEA, 1982)$(pCi/kg_{beef})/(pCi/day)$, mean = 0.0355

C_f ranges from 0.082 to 0.534 pCi/g with a mean ^{137}Cs concentration = 0.194789

Q_f ranges from 6,000 to 14,000 g_{dry}/day (Martin and Bloom, 1980, CEC, 1979) mean = 10,000

DCF ranges from 9.6E-9 to 1.3E-8 Sv/Bq, DCF for adults and teenager (mrem/pCi) = 4.80E-05

DCF for a child (mrem/pCi) = 3.55E-05

CALCULATIONS

$E_{(t)} = U_f \times f_M \times F_f \times C_f \times Q_f \times DCF$ (mrem) = 0.024 mrem/year for an adult

$E_{(t)} = U_f \times f_M \times F_f \times C_f \times Q_f \times DCF$ (mrem) = 0.025 mrem/year for a teenager

$E_{(t)} = U_f \times f_M \times F_f \times C_f \times Q_f \times DCF$ (mrem) = 0.011 mrem/yr for a child

CONCLUSION

The mean dose to an adult from the ingestion of beef obtained from cattle that grazed in the Fallout Plume at Gnome-Coach is 0.024 mrem/year. This dose is 0.024 percent of the dose limit in DOE Order 5400.5 and 0.096 percent of the 25 mrem/year dose criterion in MARSSIM (NRC,2002)

Appendix B

Human Health Risk Assessment

B.1.0 Introduction

This appendix provides an evaluation of the overall baseline human health effects of exposure to radionuclides of concern in surface and shallow subsurface soil at the Gnome-Coach Site. The radiological dose to future hypothetical land users has been calculated as a function of the Cs-137 concentration in the surface and shallow subsurface soil and the area of the radiological contamination. The calculated results are used to define the following:

- Selection of survey areas where corrective actions may be required if the area of radiological contamination exceeds the survey unit area limits recommended in federal guidance documents

On December 10, 1961, the DOE detonated a 3-kiloton nuclear device approximately 25 miles southwest of Carlsbad, New Mexico. The Gnome test took place at a depth of 1,184 ft bgs in the bedded salts of the Salado Formation. Contamination occurred at the ground surface when venting from the shaft occurred a few minutes following the detonation and continued for approximately 24 hours. In addition, several holes were drilled for reentry into the test cavity which also resulted in surface contamination when radionuclides were entrained in the drilling fluids and soil borings and disposed of at the ground surface (Earman et al., 1996; Cooper and Glanzman, 1971; Gardner and Sigalove, 1970; USGS, 1962). Additionally, decontamination and decommissioning activities contributed to the surface contamination (Tappan and Lorenz, 1969; DOE/NV, 1978 and 1981).

The human health risk/dose assessment is an estimation of potential risk that may occur at the Gnome-Coach Site under current and future use conditions. This dose assessment was performed in accordance with regulatory guidance using the Residual Radiation (RESRAD) computer code (Version 6.1) (ANL, 2001).

B.2.0 Identification of Radionuclides of Potential Concern

Appendix A of the Work Plan (NNSA/NV, 2002) discussed the historical sampling and survey programs conducted at the Gnome-Coach Site; this includes the Phase I, II, and III radiation surveys of the 1979 restoration effort. Appendix A of this investigation report discusses the radiological results obtained during the recent (2002) sampling and survey activities at the Gnome-Coach Site. Both historical and recent sampling and survey programs have established that Cs-137 is the primary radiological contaminant of concern for the surface/shallow subsurface soil investigation.

B.2.1 Summary of Impacted Areas

The Gnome-Coach Site had 18 potentially impacted areas from radiological contamination that were investigated during the months of March to June 2002. A brief summary for each of these potentially impacted areas was presented in Appendix C of the Work Plan (NNSA/NV, 2002). Section 2.0 and Appendix A of the Work Plan provide additional details of historical operations and potential contamination of the areas of concern that were investigated.

B.2.2 Historical Analytical Data Used for Preliminary Dose/Risk Calculations

The historical analytical data (1979 Phase I, II, and III) for each of the potential impacted areas were used to calculate the estimated dose to receptors in the preliminary radiological screening evaluation. This screening evaluation was presented in Appendix C of the Work Plan (NNSA/NV, 2002). Both maximum (to characterize potential hot spots) and 95 percent UCL (to characterize an AOC as a whole) concentrations for each of the impacted areas were evaluated in the preliminary dose assessment. These concentrations were used to obtain conservative values for dose/risk to the receptor. Although not used in the preliminary screening evaluation, a more representative dose may be obtained by using the mean concentration of each impacted area. The mean was evaluated in this final dose assessment using newly collected data and is presented later in the report.

B.2.3 Recent Survey Analytical Data Used for Final Dose/Risk Calculation

The Cs-137 soil analytical data generated during the 2002 sampling and survey activities are addressed in detail in Appendix A of this report. These soil data are used to calculate the estimated dose to a receptor in the final dose/risk assessment presented in this appendix. Table B.2-1 presents the mean, median, 95 percent UCL of the mean, and the maximum Cs-137 soil concentrations that resulted from the surface soil driveover radiological survey. The area-specific derived concentration guideline levels (DCGL) (i.e., the PAL) given in column 3 represents the DCGL for the most limiting scenario, which is typically the rancher scenario, especially for the AOCs with areas greater than 5,000 m^2.

Vegetation samples were collected and analyzed for gamma spectroscopy to characterize the radionuclide concentrations in important range species at the Gnome-Coach Site. The vegetation sample results provide crucial information of estimation of radionuclide ingestion by range cattle as constituents of the human health dose/risk screening evaluation. Vegetation sampling emphasized the collection of two important grass species, black grama (*Bouteloua eriopoda*) and sand dropseed (*Sporobolus cryptandrus*) within the fallout plume where the driveover radiological survey indicated the highest gamma measurements. Section 6.0 and Appendix A of this report provide summaries of the gamma spectroscopy results. The only radionuclide identified was Cs-137. The 95 percent UCL in the mean Cs-137 concentration is 0.209 pCi/g.

Table B.2-1
Gnome-Coach 2002 Surface Soil Analysis Results

Gnome-Coach Area of Concern	Area (m^2)	AOC Area Specific DCGL (pCi/g)[a]	Mean Cs-137 Concentration (pCi/g)	Median Cs-137 Concentration (pCi/g)	95% UCL of Mean Cs-137 Concentration (pCi/g)	Maximum Cs-137 Concentration (pCi/g)	Are the mean, median, 95% UCL Mean, and Maximum <DCGL?
Fallout Plume	54,511	167	0.88	0.91	0.88	76.0	Yes
Fallout Plume Elevated Area A, FALA0001	35	971	2.46	2.71	4.7	44.1	Yes
Fallout Plume Elevated Area B, FALB0001	70	893	6.51	5.4	7.67	76.0	Yes
Salvage Yard	60,076	167	1.24	1.26	1.26	93.8	Yes
Salvage Yard Road Elevated Area	16,398	195	2.08	1.94	2.11	64.3	Yes
Salvage Yard Hot Spot, SAYA0001	531	752	5.82	4.09	6.49	93.9	Yes
USGS Drill Pad	2,904	693	0.45	.048	0.46	2.74	Yes
Surface Ground Zero	29,455	167	0.69	0.72	0.7	17.24	Yes
Area 57 Hot Spot, A57A0001	663	738	1.91	1.79	1.99	14.4	Yes
Warehouse Pad	14,261	217	0.7	0.71	0.71	8.17	Yes
Salt Muckpile	31,790	167	0.65	0.71	0.66	24.1	Yes
LRL-7	8,151	351	0.45	0.48	1.67	2.42	Yes
Equipment Storage Area Hot Spot, ESAA0001	792	745	2.74	2.61	2.85	23.21	Yes
Shaft	19,659	170	0.92	0.90	0.93	24.55	Yes
Shaft Hot Spot, SHFC0001	153	825	1.75	1.57	1.89	24.5	Yes
Shaft Hot Spot, SHFB0001	130	832	0.57	0.48	0.76	24.1	Yes
Shaft Hot Spot, SHFA0001	447	763	1.35	1.72	1.5	15.9	Yes

[a]Area-specific DCGL is the most restrictive concentration between the trespasser and rancher scenario. Section B.3.3.2 discusses the influence of size of the AOC on PAL concentration.

B.3.0 Human Health Dose Assessment

This human health assessment was performed in accordance with applicable state and federal guidance.

B.3.1 Exposure Assessment

This section identifies exposure pathways and quantifies radionuclide exposure. The purpose of this exposure assessment is to estimate the type and magnitude of exposure to humans based on existing and potential future land use. This information, in turn, will be used to determine if corrective actions are required to close the surface/shallow subsurface at the Gnome-Coach Site.

For each potentially complete exposure pathway identified in Section B.3.1.1, a reasonable maximum exposure (RME) scenario has been developed. The RME is the highest exposure that is reasonably expected to occur at a site (EPA, 1989). The intent of the RME, as defined by EPA, is to estimate a conservative exposure case (i.e., significantly exceeding the average case) that is still within the possible range of exposures. The RME is both protective and reasonable but is not the worst possible case (EPA, 1991a).

B.3.1.1 Exposure Pathways

For exposure and potential risks to occur, complete exposure pathways must exist. A complete pathway requires the following elements (EPA, 1989):

- A source and mechanism for release of contamination
- A transport or retention medium
- A point of potential human contact (exposure point)
- An exposure route at the exposure point

If any one of these elements is missing, the pathway is not considered complete. Following is a brief discussion of the exposure pathway elements.

Contamination sources and the transport/retention medium are the same as those addressed in Section B.2.0 of this appendix. However, at the Gnome-Coach Site, the primary medium of concern is surface soil (0 to 1 ft bgs) and shallow subsurface soil (1 to 20 ft bgs).

Exposure points are locations of human contact with contaminated media. Exposure points consider human activity patterns and the location of potentially exposed individuals relative to the location of contaminated media. Because the Gnome-Coach Site is in a remote area, the future land use for the site is considered to be recreational open space or trespasser. The current land use at the Gnome-Coach Site is ranching. Both the trespassing and ranching scenarios are examined in this assessment. To maintain the conservative methodology, the contact point for soil contamination, both surface and shallow subsurface, in all exposure scenarios is located at the center of the area of contamination. In addition, the surface and shallow subsurface mean, UCL, and maximum concentrations at a given area of concern are carried through this dose assessment (i.e., surface and shallow subsurface soil are considered separate media). However, surface soil is considered the primary media of concern at the Gnome-Coach Site. Subsurface intrusion is restricted at the site and the shielding provided by the one foot of surface soil further limits the potential for subsurface exposure. Shallow subsurface soils were evaluated in the preliminary screening evaluation in the Work Plan to determine the potential need for additional data collection. Data from the 2002 investigation have been used in this risk assessment to modify the historical results.

The following exposure routes were examined:

- Ingestion (soil and beef)
- Inhalation
- External exposure (includes dermal)

The potentially complete exposure pathways include exposure to surface and shallow subsurface soil. Figure 3-1 in the work plan illustrates the conceptual site model for the Gnome-Coach Site. Table B.3-1 lists the complete human exposure pathways for current and future land use. This table also indicates which pathways have been selected for risk characterization and presents the rationale for inclusion or exclusion of each pathway.

Two exposure scenarios are assumed for the future hypothetical land users. A rancher is assumed to be exposed to contaminated soil and air and consumes contaminated meat from cattle raised on site. The trespasser exposure scenario assumes an individual is exposed to contaminated soil and air but does not consume any contaminated food or water.

Table B.3-1
Potentially Complete Human Exposure Pathways at Gnome-Coach Site

Environmental Medium	Exposure Route	Potentially Exposed Population	Pathway Selected for Evaluation	Reason for Selection or Exclusion
Surface Soil	Inhalation Ingestion External Exposure	Residential Occupational	No	Gnome-Coach is in a remote area and the land use is expected to remain similar in the future.
Surface Soil	Inhalation Ingestion External Exposure	Trespasser Rancher	Yes	Potential intermittent recreational exposure is likely under current and future conditions. Ranching currently occurs at the Gnome-Coach Site.
Shallow Subsurface Soil	Inhalation Ingestion External Exposure	Residential Occupational	No	Gnome-Coach is in a remote area and the land use is expected to remain similar in the future.
Shallow Subsurface Soil	Inhalation Ingestion External Exposure	Trespasser Rancher	Yes	Potential intermittent recreational exposure is likely under current and future conditions. Ranching currently occurs at the Gnome-Coach Site.
Surface Soil	Ingestion of Meat	Rancher	Yes	Ranching occurs at the Gnome-Coach Site. It is assumed the ranchers ingest meat from on-site cattle.
Surface Soil	Ingestion of Meat	Residential Occupational Trespasser	No	Gnome-Coach is in a remote area and the land use is expected to remain similar in the future.
Surface Water	Inhalation Ingestion External Exposure	Residential Occupational Trespasser Rancher	No	There are no permanent on-site surface water bodies at the Gnome-Coach Site.
Groundwater	Inhalation Ingestion External Exposure	Residential Occupational Trespasser Rancher	No	Groundwater at the Gnome-Coach Site is nonpotable.

Since land use at the Gnome-Coach Site is expected to remain similar (i.e., no development is planned), future pathways will be similar to the current pathways listed above. Therefore, this risk assessment assumes that any restrictions currently in place will remain in place. Under these conditions, the current and future human health risks are identical (i.e., the pathways and receptors are the same). For the remainder of the document, these risks/doses will be linked to the same receptors with no further consideration of whether the exposure is current or future.

B.3.1.2 Exposure Models

The RESRAD computer code was developed at Argonne National Laboratory for the U.S. Department of Energy to calculate site-specific residual radioactive material guidelines as well as radiation dose and excess lifetime cancer risk to a chronically exposed on-site receptor (ANL, 1993b; 2001). A soil release guideline or PAL is defined as the radionuclide concentration in soil that is acceptable if the site is to be used without restrictions. Soil is defined as unconsolidated earth material at the surface and shallow subsurface, including rubble and debris that might be present. These guidelines are based on the following principles: (1) the annual radiation dose received by a member of the critical population group from the residual radioactive material, predicted by a realistic but reasonably conservative analysis and calculated as committed effective dose equivalent, should not exceed 25 mrem/yr (CFR, 2000); and (2) doses should be kept as-low-as-reasonably-achievable, a concept commonly known as ALARA (DOE, 1997).

The RESRAD code uses a pathway analysis method in which the relation between radionuclide concentrations in soil and the dose to a member of a critical population group is expressed as a pathway sum, which is the sum of products of “pathway factors.” Pathway factors correspond to pathway segments connecting compartments in the environment between which radionuclides can be transported or radiation emitted. Radiation doses, health risks, soil guidelines, and media concentrations are calculated over user-specified time intervals. The source is adjusted over time to account for radioactive decay and ingrowth, leaching, erosion, and mixing.

B.3.1.3 Exposure Parameters

Three types of parameters are used in exposure models to estimate potential dose:

- Radionuclide-related parameters (e.g., exposure point concentrations, dose conversion factors, area/size of contamination source)
- Parameters that describe the exposed population (e.g., contact rate, exposure frequency, and duration)
- Site-specific parameters that are independent of the radionuclides and exposed receptors (e.g., climatology, geology)

The RESRAD dose calculations were performed to determine the dose to the trespasser and rancher as a function of Cs-137, area of contamination, and exposure pathways. Note that tritium was previously included in the preliminary screening evaluation and was shown to have negligible effects on dose; therefore, tritium is not evaluated in this risk assessment. The exposed populations, exposure-related parameters, and site-specific parameters are summarized in Table B.3-2. The exposure parameters are the same used for the preliminary screening evaluation in the Gnome-Coach Work Plan. These parameters are based on available site information, EPA guidance, industry standards, and best professional judgement using site-specific information where available. The area of contamination ranged from 30 to >20,000 m^2 for the trespasser and rancher scenarios. For the rancher scenario, the Area Factor is set to -1 instead of +1. The use of +1 results in the maximum calculated dose from the ingestion of meat, independent of the contaminated area. RESRAD calculates the meat ingestion dose as a function of the area of contamination if the Area Factor is set to -1. Upper-bound values are generally 90^{th} or 95^{th} percentile values, depending on the data available for each parameter. If no site-specific information was available, the RESRAD default was used as a reasonable upper bound estimate (ANL, 1993a). A combination of upper bound and average exposure parameters were used to estimate the RME for each scenario.

B.3.2 Dose/Risk Screening Evaluation

This section provides an evaluation of the potential doses and risks associated with the exposure to Cs-137 at the Gnome-Coach Site. This assessment employs a health-protective bias that leads to the overestimation of potential dose. Individuals are exposed to an RME (Section B.3.1) and exposure is evaluated (Section B.3.1.1) to provide estimates of annual exposure. This dose/risk data generated for each area of concern will be compared to the dose/risk screening criteria. Areas of concern having dose/risks above the screening criteria will have additional soil data collected (e.g., *in situ* radiological survey).

Table B.3-2
RESRAD Parameters for the Gnome-Coach Site
(Page 1 of 4)

Parameters	Trespasser Scenario	Rancher Scenario	Source of Parameter Data
Area of contaminated zone (m^2)	Refer to Table B.2-1	Refer to Table B.2-1	Based on the site dimensions
Initial input concentrations (pCi/g)	Refer to Table B.2-1	Refer to Table B.2-1	Based on the on site measured radionuclide concentrations
Thickness of contaminated zone (m)	0.3 m (surface) 0.3 to 5 m (shallow subsurface)	0.3 m (surface) 0.3 to 5 m (shallow subsurface)	Assumes 1 ft depth of contamination for surface soils
Length parallel to aquifer flow (m)	Refer to Table B.2-1	Refer to Table B.2-1	Based on total site area
Basic radiation dose limit (mrem/yr)	25	25	CFR, 2000
Time since placement of radioactive material (yr)	0	0	Based on current radionuclide levels in soil (decayed values)
Cover depth (m)	0 (surface soil) 0.3 m (shallow subsurface)	0 (surface soil) 0.3 m (shallow subsurface)	Assumes no cover for surface contamination
Density of cover material (g/cm^3)	2.0	2.0	USDA, 1971
Cover depth erosion rate (m/yr)	0.001 m	0.001 m	RESRAD default
Density of contaminated zone (g/cm^3)	2.0	2.0	USDA, 1971
Contaminated zone erosion rate (m/yr)	0.001	0.001	RESRAD default
Contaminated zone total porosity	0.4	0.4	RESRAD default
Contaminated zone effective porosity	0.2	0.2	RESRAD default
Contaminated zone hydraulic conductivity (m/yr)	10	10	RESRAD default
Contaminated zone *b* parameter	5.3	5.3	RESRAD default
Evapotranspiration coefficients	0.99	0.99	Calculated value based on the regional climate data
Precipitation (m/yr)	0.3	0.3	DRI, 1988
Irrigation (m/yr)	0	0	No current on site irrigation
Irrigation mode	Overhead	Overhead	RESRAD default
Runoff coefficient	0.2	0.2	RESRAD default
Watershed area from nearby stream or pond	NA	NA	No groundwater consumption
Accuracy for water/soil computations	NA	NA	No groundwater consumption
Density of saturated zone (g/cm^3)	NA	NA	No groundwater consumption
Saturated zone total porosity	NA	NA	No groundwater consumption
Saturated zone effective porosity	NA	NA	No groundwater consumption
Saturated zone hydraulic conductivity (m/yr)	NA	NA	No groundwater consumption
Saturated zone hydraulic gradient	NA	NA	No groundwater consumption

Table B.3-2
RESRAD Parameters for the Gnome-Coach Site
(Page 2 of 4)

Parameters	Trespasser Scenario	Rancher Scenario	Source of Parameter Data
Saturated zone b parameter	NA	NA	No groundwater consumption
Water table drop rate (m/yr)	NA	NA	No groundwater consumption
Well pump intake depth (m below water table)	NA	NA	No groundwater consumption
Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	RESRAD default
Well pumping rate (m^3/yr)	NA	NA	No groundwater consumption
Number of Uncontaminated unsaturated zone strata	NA	NA	No groundwater consumption
Unsaturated zone 1, thickness (m)	NA	NA	No groundwater consumption
Unsaturated zone 1, soil density (g/cm^3)	NA	NA	No groundwater consumption
Unsaturated zone 1, total porosity	NA	NA	No groundwater consumption
Unsaturated zone 1, effective porosity	NA	NA	No groundwater consumption
Unsaturated zone 1, soil-specific *b* parameter	NA	NA	No groundwater consumption
Unsaturated zone 1, hydraulic conductivity (m/yr)	NA	NA	No groundwater consumption
Exposure Frequency (d/yr) (used as a calculation value)	4d/yr @ 24 hr/d	6 d/yr @ 8 hr/d	Personal communication with BLM (Arnold, 2000)
Daily inhalation rate (m^3/d) (used as a calculation value)	14.56	9.84	Upper bound estimated based on the time spent on site (Layton, 1993)
Annual inhalation rate (m^3/y)	58.24	59.04	Calculated value based on the daily inhalation rate and the exposure frequency
Daily drinking rate (L/d)	NA	NA	No groundwater consumption
Annual drinking rate (L/y)	NA	NA	No groundwater consumption
Mass loading for inhalation (g/m^3)	0.00001	0.00001	Anspaugh et al., 1974, and a factor of $1x10^{-1}$ to account for arid environments
Dilution length for airborne dust, inhalation (m)	3	3	RESRAD default
Exposure duration (yr)	30	30	EPA, 1991a
Shielding factor, inhalation	0.4	0.4	RESRAD default
Shielding factor, external gamma	1.0	1.0	Assumes no shielding (worst case)
Fraction of time spent indoors (on site per year)	0	0	No time spent indoors
Fraction of time spent outdoors (on site per year)	0.011	0.0055	Calculated from the exposure frequencies
Shape factor, external gamma	1.0	1.0	RESRAD default

Table B.3-2
RESRAD Parameters for the Gnome-Coach Site
(Page 3 of 4)

Parameters	Trespasser Scenario	Rancher Scenario	Source of Parameter Data
Fruits, vegetables, and grain consumption (kg/yr)	NA	NA	NA
Leafy vegetable consumption (kg/yr)	NA	NA	NA
Meat consumption (kg/yr)	NA	63.0	RESRAD default adjusted for home range area
Milk consumption (L/yr)	NA	NA	Milk ingestion not considered; primarily beef cattle
Soil ingestion rate (g/yr)	1.92	2.88	Based on 480 mg/day for the trespasser and the rancher (EPA, 1999b)
Household water fraction contaminated	NA	NA	No groundwater consumption
Livestock water fraction contaminated	NA	NA	No groundwater consumption
Irrigation water fraction contaminated	0	0	No on-site irrigation water
Contaminated fraction of plants	NA	NA	NA
Contaminated fraction of meat	NA	-1.0	Accounts for area of contamination
Livestock fodder intake for meat (kg/d)	NA	68	RESRAD default
Livestock water intake for meat (L/d)	NA	50	RESRAD default
Livestock intake for soil (kg/d)	NA	0.5	RESRAD default
Mass loading for foliar deposition (g/m^3)	NA	0.00001	Anspaugh et al., 1974 and a factor of $1x10^{-1}$ to account for arid environments
Depth of soil mixing layer (m)	0.3	0.3	Based on depth of surface contamination
Depth of roots (m)	NA	0.9	RESRAD default
Household fractional usage from groundwater	NA	NA	No groundwater consumption
Irrigation fractional usage from groundwater	NA	NA	No groundwater consumption
Livestock fractional usage from groundwater	NA	NA	No groundwater consumption
Storage times for contaminated foodstuffs			
Fruits, non-leafy veg. & grains (d)	NA	NA	NA
Leafy vegetables (d)	NA	NA	NA
Meat (d)	NA	20	RESRAD default
Milk (d)	NA	NA	NA
Water well (d)	NA	NA	No groundwater consumption
Water surface (d)	NA	NA	NA
Livestock fodder (d)	NA	45	RESRAD default

Table B.3-2
RESRAD Parameters for the Gnome-Coach Site
(Page 4 of 4)

Parameters	Trespasser Scenario	Rancher Scenario	Source of Parameter Data
Thickness of material (m)			
In foundation	NA	NA	NA
In contaminated zone soil	NA	NA	NA
Density of material (g/cm)			
In the foundation	NA	NA	NA
In the contaminated soil	NA	NA	NA
Total porosity of material			
In the foundation	NA	NA	NA
In the contaminated soil	NA	NA	NA
Volumetric water content	NA	NA	NA
Diffusion coefficient for radon gas (m/sec)			
In the foundation	NA	NA	NA
In the contaminated soil	NA	NA	NA
Contamination zone radon diffusion coefficient	NA	NA	NA
Radon vertical dimension of mixing	NA	NA	NA
Average annual wind speed (m/sec)	3.5	3.5	EEG, 1999
Average building air exchange rate (1/hr)	NA	NA	NA
Height of the building (room) (m)	NA	NA	A
Building interior area factor	NA	NA	NA
Building depth below ground surface (m)	NA	NA	NA
Emanating power of Radon-222 gas	NA	NA	NA
Emanating power of Radon-220 gas	NA	NA	NA

y = Year
m/yr = Meter per year
d/yr =Days per year
L/d = Liters per day
L/y = Liters per year
kg/yr = Kilogram per year
kg/d = Kilogram per day
d = Day
m/sec = Meter per second
1/hr = 1 cubic meter per hour
NA = Not applicable

B.3.2.1 Dose Screening Criteria

This section summarizes the dose criteria guidelines from existing and proposed regulations and guidance. The dose criteria is used in the corrective action level evaluation by determining what level of residual concentrations of contaminants in the soil is acceptable and does not exceed established guidelines. The following is a brief summary of the applicable DOE and U.S. Nuclear Regulatory Commission (NRC) regulations. Also included is a discussion of the as-low-as-reasonably-achievable (ALARA) analysis as outlined in each of the regulations. The regulatory dose standards are summarized below:

- DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE, 1993)
- Title 10 of the *Code of Federal Regulations* (CFR), Part 20, *"*Standards for Protection Against Radiation*"* (CFR, 2000)

DOE 5400.5

The primary dose limits for members of the public from all DOE activities, including remedial actions, are established in Chapters II and IV in DOE Order 5400.5 (DOE, 1993). Chapter II of DOE Order 5400.5 states, "the exposure of members of the public to radiation sources as a consequence of all routine DOE activities shall not cause, in a year, an effective dose equivalent greater then 100 mrem."

The primary dose limit is expressed as a committed effective-dose equivalent, a term developed by the International Commission on Radiological Protection (ICRP) for their risk-based system, which requires the risk-weighted summation of doses to various tissues and organs of the body. The basic dose limit (100 millirem [mrem]) is used in establishing guideline concentrations of residual radioactive material in the soil. This basic dose limit is an annual limit for members of the public who are assumed to participate in worst-case exposure scenarios (e.g., residential rancher and farmer). Other exposure scenarios could include an industrial worker and/or a recreational user. This regulation requires an environmental pathway analysis using approved models, such as RESRAD, to derive acceptable levels of radionuclides in soils from all exposure pathways. Radiation dose is assessed for these exposure scenarios every year during a 1,000-year time frame.

Chapter II of DOE Order 5400.5 requires that the ALARA process be adopted in planning, monitoring, cleanup, and control of residual radioactive material (DOE, 1993). DOE Order 5400.5 states "ALARA requires judgement with respect to what is reasonably achievable. Factors that relate to societal, technological, economic, and other policy considerations shall be evaluated to the extent practicable in making such judgements." These factors include:

- The maximum dose to members of the public
- The collective dose to the population
- Alternative processes
- Doses for each alternative process
- Costs for each technological alternative
- Differential doses from various pathways

The ALARA analysis may be quantitative (cost-benefit analysis) or qualitative. However, in either case, the bases for judgement should be clearly stated. The ALARA process for DOE Order 5400.5 is summarized in greater detail in the Draft document, *Applying the ALARA Process for Radiation Protection of the Public and Environmental Compliance with 10 CFR Part 834 and DOE 5400.5 ALARA Program Requirements* - Volumes I and II (DOE, 1997).

10 CFR 20

The NRC regulations establish standards for protection against ionizing radiation resulting from activities conducted under licenses issued by the NRC (CFR, 2000). Subpart D of 10 CFR 20 states that operations should be conducted so: "the total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (100 mrem or 1 millisievert) in a year, exclusive of the dose contributions from background radiation, any medical administration the individual has received, voluntary participation in medical research programs, and the licensee's disposal of radioactive material into sanitary sewerage." Subpart E further states this criteria for license termination: "a site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a total effective dose equivalent to an average member of the critical group that does not exceed 25 mrem/yr, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to ALARA levels." Subpart E further states that if the land use was restricted, the 25 mrem/yr limit would still apply. Therefore, an unrestricted exposure scenario would still have to be considered.

The radiation dose (if the land restrictions fail) shall not exceed 100 mrem/yr. Therefore, any individual will not receive more than the ICRP-recommended dose limit of 100 mrem/yr under any land-use scenarios.

Title 10 CFR 20 states that, to the extent practicable, procedures and engineering controls are based upon sound radiation protection principles to achieve ALARA occupational doses and doses to members of the public.

Based on the available information and regulations, a dose criteria of 25 mrem/yr is the only promulgated dose criteria and is considered protective to human health and will be used for comparison purposes at the Gnome-Coach Site.

B.3.2.2 Risk Screening Criteria

The EPA classifies all radionuclides as Group A carcinogens. Ingestion and inhalation slope factors are central estimates in a linear model of the age-averaged, lifetime attributable radiation cancer incidence (fatal and nonfatal cancer) risk per unit of activity, inhaled or ingested, expressed as risk/pCi. External exposure slope factors are central estimates of lifetime-attributable radiation cancer incidence risk for each year of exposure to external radiation from photon-emitting radionuclides distributed uniformly in a thick layer of soil and are expressed as risk/yr per pCi/g soil. When combined with site-specific media concentration data and appropriate exposure assumptions, slope factor can be used to estimate lifetime cancer risks to members of the general population due to radionuclide exposures. In most cases, cancer risks are limiting, exceeding both mutagenic and teratogenic risks.

In evaluating the calculated exposure from potentially carcinogenic radionuclides, a reasonable level of risk must be selected. The EPA used an incremental lifetime cancer risk (ILCR) (also referred to as excess cancer risk) of one in one million (1×10^{-6}) as the lower bound of an acceptable range. The upper bound of an acceptable ILCR recommended by the EPA for drinking water is 1 in 10,000 (1×10^{-4}) (EPA, 1999a). In addition, the EPA specifies a risk range of 10^{-6} to 10^{-4} associated with the consideration and selection of remedial alternatives for contaminated media in the National Contingency Plan (NCP) (CFR, 1999).

Based on the regulatory precedents cited above, a reasonable and appropriate ILCR range would be from 10^{-6} to 10^{-4}. As implemented under the NCP, pathway risks greater than 10^{-6} ILCR must receive risk management consideration (CFR, 1999). This quantitative risk screening is one of many factors that are considered in the decision-making process for the need for additional data collection. Therefore, there is no single risk value that defines “acceptable” and “unacceptable” risk. The purpose of this risk screening is to present qualitative estimates of potential risk; thus, all sites greater than the cumulative upper bound of 10^{-4} will be examined further for the need of additional data collection.

Cumulative site radionuclide ILCRs were developed for surface and shallow subsurface soils. However, the risks for the individual media were not combined. These cumulative ILCRs included all media and pathways that were appropriate to combine. Combined pathways occur when there is potential for an individual to be exposed to multiple pathways at the same given instant in time. Where the cumulative ILCR site risk to an individual based on the RME for both current and future land use is less than 10^{-4}, action generally is not warranted unless there are adverse environmental impacts (EPA, 1991b).

B.3.3 Preliminary Action Levels and Area Correction Factors

Remediation of radiologically contaminated land requires the development of PALs for the radiological COPCs. For the Gnome-Coach Site, a PAL is defined as the concentration of a radionuclide in soil that will not be exceeded if the land is to be released without restrictions on use. The PAL is used to define potential areas that may require remediation to ensure that a future hypothetical land user will not receive a total effective dose equivalent exceeding 25 mrem/yr. A PAL must be defined for both large areas of radiological-contaminated surface and shallow subsurface soil, on the order of 100 m^2, and for small areas that have contamination that is significantly elevated in comparison to the surrounding area. These small areas of elevated radiological surface contamination, commonly known as hot spots, may result in a greater dose to the future land user than larger areas with lower radiological surface contamination.

B.3.3.1 Regulatory Guidance

The derivation of PALs typically assumes homogenous contamination of relatively large areas of land. Federal guidance varies on the definition of what constitutes a large area of land and a hot spot. The DCGLs, analogous to PALs, are defined in DOE Order 5400.5, *Radiation Protection of the Public and the Environment,* in terms of radionuclide concentrations averaged over an area of 100 m^2 (Gilbert, et al., 1989, as cited in DOE, 1993).

Because of the averaging process described in DOE Order 5400.5, there may exist small areas of land with radionuclide concentrations exceeding the PAL. If hot spots are present and if the concentration of the radionuclide contaminant in the hot spot is significantly greater than the PAL, the hot spot could potentially pose a greater dose to the future hypothetical land users than the dose associated with homogeneous contamination. In order to ensure that individuals are adequately protected and to ensure that the ALARA process required in DOE Order 5400.5 is satisfied, a hot spot criteria must be applied along with the general criterion for homogeneous contamination. Applying the terminology and symbols in Section 3.3.2 and Equation 3.15 of Gilbert et al., (1989), and Section 3.3.2 and Equations 3.16 and 3.17 of the User's Manual for RESRAD Version 6.0 (ANL, 2001), the hot spot criterion for field applications is defined as:

$$M^{**} = \Sigma_i S_i^{**} / G_i^{**} \leq 1 \qquad \text{(B-1)}$$

where:

M^{**} = Hot spot mixture sum for field use (dimensionless),
S_i^{**} = Measured concentration of the i^{th} principal radionuclide in the hot spot (pCi/g), and
G_i^{**} = Single-radionuclide PAL for the i^{th} principal radionuclide in the hot spot (pCi/g)

Gilbert et al. (1989) states: "The measured hot spot concentrations S_i^* are the peak concentrations if the hot spot area is 1 m^2 or less or the average concentration if the hot spot area is larger than 1 m^2." It also recommends that the value for G_i^{**} should be obtained from a RESRAD analysis prior to the remediation activities."

The original RESRAD Manual cited in DOE Order 5400.5 (Gilbert et al., 1989) and the User's Manual for RESRAD Version 6.0 (ANL, 2001) state that the following equation should be used for defining a single radionuclide, hot spot soil guideline:

$$G_i^{**} = G_i(t_m) \times (100/A)^{05} \qquad \text{(B-2)}$$

where:

$G_i(t_m)$ = Single-radionuclide PAL for the i th principal radionuclide in a homogeneous contaminated zone at the time (t_m) when the value of $G_i(t)$ is a minimum (pCi/g),
A = Area of the hot spot (m^2), and
$(100/A)^{0.5}$ = Hot spot multiplication factor

Equations B-1 and B-2 are from Gilbert et al. (1989), cited in DOE Order 5400.5, and apply to hot spots with areas of 25 m^2 or less. For larger hot spot areas, the RESRAD manuals state that the homogeneous PAL is sufficient. An area of A = 1 m^2 is used in Equation B-1 if the actual hot spot area is less than 1 m^2. Gilbert et al. (1989) states that the average radionuclide concentration for any 100 m^2 area must always comply with the homogeneous release criterion, irrespective of hot spot criteria. It should be noted that the RESRAD code and supporting manuals are not federal regulations or DOE Orders, although the original RESRAD Manual is cited in DOE Order 5400.5 (DOE, 1993). A significant difference exists between the guidance recommended in the RESRAD Manual and its applicability to the Gnome-Coach Site. Equations B-1 and B-2 were developed for the "kitchen-garden" scenario where a family resides full time on the site and raises a large portion of the food on the site. For the "kitchen-garden" scenario, an area as small as 1 m^2 with elevated radiological contamination could result in a dose exceeding the approved limit. As will be demonstrated in the following sections of this attachment, the dose to trespasser and rancher are not as sensitive to small areas of radiological contamination.

B.3.3.2 PAL Calculations

The area dose correction factors listed in Tables B.3-3 and B.3-4 are calculated using two different methodologies. As used in Equation B-2, the hot spot area correction factors are listed in column 2 of Tables B.3-3 and B.3-4. RESRAD Version 6.1 was used to calculate the hot spot area correction factors listed in column 4 of Tables B.3-3 and B.3-4. The area factors given in column 4 were computed by taking the ratio of the dose per unit concentration generated by RESRAD for the 10,000 m^2 area to that generated for the other areas listed. If the PAL for residual radioactivity distributed over 10,000 m^2 is multiplied by the area factor, the resulting concentration distributed over

Table B.3-3
Hot Spot Area Correction Factors for Trespasser Scenario

Area (m^2)	DOE Order 5400.5 Correction Factor $(100/A)^{0.5}$	Maximum RESRAD 6.1 Dose from 287 pCi/g Cs-137 (mrem/year)	RESRAD 6.1 Correction Factor	Cs-137 Concentration Resulting in 25 mrem/year (pCi/g) (PAL)
1	10.0000	0.9919	10.5152	7,234
3	5.7735	2.2421	4.6519	3,200
5	4.4721	3.103	3.3613	2,312
8	3.5355	4.116	2.5340	1,743
10	3.1623	4.868	2.1426	1,474
30	1.8257	6.64	1.5708	1,081
50	1.4142	7.591	1.3740	945
80	1.1180	8.112	1.2857	884
100	1.0000	8.405	1.2409	854
300	0.5774	9.18	1.1362	782
500	0.4472	9.495	1.0985	756
800	0.3536	9.643	1.0816	744
1,000	0.3162	9.726	1.0724	738
2,000	0.2236	9.843	1.0596	729
3,000	0.1826	9.93	1.0504	723
5,000	0.1414	10.07	1.0357	713
8,000	0.1118	10.14	1.0286	708
10,000	0.1000	10.17	1.0256	706
15,000	0.0816	10.2	1.0225	703
20,000	0.0707	10.23	1.0196	701
30,000	0.0577	10.27	1.0156	699
40,000	0.0500	10.31	1.0116	696
50,000	0.0447	10.34	1.0087	694
60,000	0.0408	10.37	1.0058	692
81,755	0.0350	10.43	1.0000	688

Table B.3-4
Hot Spot Area Correction Factors for Rancher Scenario

Area (m^2)	DOE Order 5400.5 Correction Factor $(100/A)^{0.5}$	Area Factor = -1 Maximum RESRAD 6.1 Dose from 287 pCi/g Cs-137 (mrem/year)	AF = -1 RESRAD 6.1 Correction Factor	G_i** (PAL) AF = -1 Cs-137 Concentration Resulting in 25 mrem/year (pCi/g)
1	10.0000	0.4977	86.1623	14,416
3	5.7735	1.127	38.0506	6,366
5	4.4721	1.561	27.4715	4,596
8	3.5355	2.073	20.6864	3,461
10	3.1623	2.362	18.1554	3,038
30	1.8257	3.388	12.6573	2,118
50	1.4142	3.89	11.0239	1,844
80	1.1180	4.207	10.1932	1,705
100	1.0000	4.391	9.7661	1,634
300	0.5774	5.155	8.3187	1,392
500	0.4472	5.689	7.5379	1,261
800	0.3536	6.328	6.7767	1,134
1,000	0.3162	6.747	6.3559	1,063
2,000	0.2236	8.689	4.9353	826
3,000	0.1826	10.62	4.0379	676
5,000	0.1414	14.46	2.9656	496
8,000	0.1118	20.14	2.1292	356
10,000	0.1000	23.93	1.7920	300
12,500	0.0894	28.64	1.4973	251
15,000	0.0816	33.36	1.2855	215
20,000	0.0707	42.78	1.0024	168
25,000	0.0632	42.8	1.0019	168
30,000	0.0577	42.81	1.0017	168
40,000	0.0500	42.83	1.0012	168
50,000	0.0447	42.84	1.0010	167
60,000	0.0408	42.86	1.0005	167
81,755	0.0350	42.88	1.0000	167

the specified smaller area delivers a calculated dose of 25 mrem/year. Other than changing the area of contamination, the Gnome Site-specific and default RESRAD parameter values were not changed.

Based upon the Cs-137 concentration in surface soil samples collected during the Phase I/II/III investigations at the Gnome-Coach Site, the area of Cs-137-contaminated surface soil at several areas of concern exceeds the DOE Order 5400.5 recommended area for a survey unit. A series of RESRAD calculations were performed to determine the dose to the hypothetical future land user as a function of the area and concentration of Cs-137 in the surface soil. The calculated doses were used to compute the area dose correction factors for the Gnome-Coach Site. The data listed in Table B.3-4 demonstrates that the area correction factor for the rancher exposure scenario, based upon the RESRAD calculations, is greater than 1.0 until the area of contamination exceeds 20,000 m^2. The area factor for the rancher is not less than one, even for an area of 81,755 m^2 (the estimated area for the largest Gnome-Coach survey unit, the Fallout Plume). As demonstrated in Table B.3-3, the area correction factor for the trespasser exposure scenario is greater than 1.0 until the area of contamination exceeds 2,000 m^2. The area factor for the trespasser is not less than one, even for an area of 81,755 m^2. The area dose correction factors are greater than or equal to 1.0 even for the largest proposed survey unit at the Gnome-Coach Site. Therefore, the size of the Gnome-Coach Site survey units can be the largest AOC at the site.

Additional RESRAD calculations were performed to generate PALs for tritium and Sr-90. These calculations did not account for area of contamination as provided for Cs-137 for the rancher and trespasser scenario. Calculations provided a PAL of 14,980 pCi/g for tritium and 66 pCi/g for Sr-90.

B.3.4 Results of the Preliminary Dose Screening Evaluation

A series of preliminary dose calculations were performed and presented in Appendix C of the Work Plan. A summary of those results are presented again in this section.

RESRAD calculations for six of the Gnome-Coach AOCs that showed the highest 1979 Phase II/III analytical results indicated that none of the AOCs exceeded the dose criteria of 25 mrem/yr when the dose was calculated as a function of the 95 percent UCL values for Cs-137, area of contamination, exposure pathways, and an Area Factor set at -1. Additional RESRAD calculations were performed for tritium concentrations at the surface, tritium and Cs-137 concentrations at shallow subsurface, and maximum Cs-137 concentrations without considering the area of contamination (i.e., the Area Factor was left as +1). Results confirmed that tritium has a minimal contribution to the total dose. The only site(s) to exceed the dose criteria of 25 mrem/yr for the surface, based on a maximum Cs-137 value from Phase II/III data, was the new laundry/lab for both the trespasser and rancher. This occurred as a result of including the analytical result of 28,100 pCi/g. None of the AOCs exceeded the dose criteria of 25 mrem/yr for the shallow subsurface. Three AOCs exceeded the upper bound cumulative ILCR of 10^{-4} based on maximum Cs-137 concentrations on the surface for the trespasser: new laundry/lab, Gnome-Coach shaft surface area, and the fallout track from venting.

To confirm concentrations of the historical data used, and reduce the uncertainty of the calculation results for a final dose/risk assessment, the new laundry/lab, Gnome-Coach shaft surface area, and the fallout track from venting were targeted for additional soil data collection during the 2002 investigation. However, due to the thoroughness of the driveover radiological survey and other field activities, additional soil data was collected on all potentially radiologically-contaminated AOCs.

B.3.5 Results of the Final Dose Assessment

Using newly collected surface soil data from the 2002 field investigation summarized in Section B.2.3, a final series of dose/risk calculations were performed for recently surveyed areas at the Gnome-Coach Site. The dose to the hypothetical future land user was calculated as a function of the maximum, 95 percent UCL, and mean of Cs-137 concentrations, area of contamination, exposure pathways, and an Area Factor set at -1. Tables B.3-5 through B.3-7 summarize the dose to the hypothetical trespasser at the specified AOCs. Tables B.3-8 through B.3-10 summarize the dose to the hypothetical rancher at the specified AOCs. Note that all values are approximately one order of magnitude below the dose criteria of 25 mrem/yr for both scenarios.

Essentially 100 percent of the calculated dose to the trespasser is from external dose, regardless of the area of contamination. The dose contribution from inhalation of resuspended Cs-137-contaminated dust and the inadvertent ingestion of Cs-137-contaminated soil never exceeds 0.01 percent of the total dose to either the trespasser or the rancher. For areas of contamination # 300 m^2, greater than 90 percent of the dose to the rancher is from external dose. As the area of contamination is increased to > 300 m^2, the dose to the rancher from meat ingestion increases faster than the dose due to external exposure. This is because the RESRAD code assumes that the dose receptor is located within the area

Table B.3-5
Estimated Dose to Trespasser Using Maximum Cs-137 Concentration at Selected Gnome-Coach AOCs

Site Name	External Dose (mrem/yr)	Inhalation Dose (mrem/yr)	Meat Ingestion Dose (mrem/yr)	Soil Ingestion Dose (mrem/yr)	Total Dose (mrem/yr)
Salvage Yard	3.39E+00	1.23E-08	0.00E+00	9.41E-05	3.39E+00
Warehouse Pad	2.90E-01	9.24E-10	0.00E+00	8.19E-06	2.90E-01
Surface Ground Zero	6.17E-01	2.10E-09	0.00E+00	1.73E-05	6.17E-01
Salt Muckpile	8.63E-01	2.96E-09	0.00E+00	2.42E-05	8.63E-01
Gnome-Coach Shaft	8.75E-01	2.87E-09	0.00E+00	2.46E-05	8.75E-01
Equipment Storage Area Hot Spot ESAA0001	7.80E-01	1.94E-09	0.00E+00	1.84E-05	7.80E-01
Area 57 Hot Spot A57A0001	4.81E-01	1.18E-09	0.00E+00	9.57E-06	4.81E-01
Salvage Yard Road Elevated Area	2.29E+00	7.38E-09	0.00E+00	6.45E-05	2.29E+00
USGS Drill Pad	9.48E-02	2.63E-10	0.00E+00	2.75E-06	9.48E-02
LRL-7	8.55E-02	2.58E-10	0.00E+00	2.43E-06	8.55E-02
Fallout Plume	2.74E+00	9.86E-09	0.00E+00	7.62E-05	2.74E+00
Fallout Plume Elevated Area A, FALA0001	1.06E+00	2.63E-09	0.00E+00	1.55E-06	1.06E+00
Fallout Plume Elevated Area B, FALB0001	2.11E+00	4.89E-09	0.00E+00	5.33E-06	2.11E+00
Salvage Yard Hot Spot, SAYA0001	3.11E+00	7.51E-09	0.00E+00	5.00E-05	3.11E+00
Shaft Hot Spot, SHFA0001	5.21E-01	1.25E-09	0.00E+00	7.11E-06	5.21E-01
Shaft Hot Spot, SHFB0001	7.26E-01	1.67E-09	0.00E+00	3.33E-06	7.26E-01
Shaft Hot Spot, SHFC0001	7.46E-01	1.72E-09	0.00E+00	3.76E-06	7.46E-01

of contamination where they would receive the maximum dose, in the middle of the contaminated land. As you increase the size of the radiologically contaminated land, the probability increases that the photons emitted from the Cs-137 present on the outer edge of the contaminated area are absorbed or scattered away from the dose receptor. Increasing the area of the radiologically contaminated land beyond a certain point does not result in a significant increase in external dose.

The RESRAD-calculated dose to the rancher from the ingestion of meat increases as a linear function of the contaminated land area, until the area is equal to 20,000 m^2. As the radiological-contaminated land area is assumed to increase to > 20,000 m^2, the dose from the ingestion of Cs-137 meat remains constant. Although the amount of radiological-contaminated forage available for feeding cattle

Table B.3-6
Estimated Dose to Trespasser Using 95 Percentile Cs-137 Concentration at Selected Gnome-Coach AOCs

Site Name	External Dose (mrem/yr)	Inhalation Dose (mrem/yr)	Meat Ingestion Dose (mrem/yr)	Soil Ingestion Dose (mrem/yr)	Total Dose (mrem/yr)
Salvage Yard	4.55E-02	1.65E-10	0.00E+00	1.26E-06	4.55E-02
Warehouse Pad	2.52E-02	8.03E-11	0.00E+00	7.19E-07	2.52E-02
Surface Ground Zero	2.51E-02	8.53E-11	0.00E+00	7.02E-07	2.51E-02
Salt Muckpile	2.36E-02	8.11E-11	0.00E+00	6.62E-07	2.36E-02
Gnome-Coach Shaft	3.31E-02	1.09E-10	0.00E+00	9.32E-07	3.31E-02
Equipment Storage Area Hot Spot ESAA0001	9.57E-02	2.38E-10	0.00E+00	2.26E-06	9.57E-02
Area 57 Hot Spot A57A0001	6.64E-02	1.63E-10	0.00E+00	1.32E-06	6.64E-02
Salvage Yard Road Elevated Area	7.51E-02	2.42E-10	0.00E+00	2.12E-06	7.51E-02
USGS Drill Pad	1.59E-02	4.41E-11	0.00E+00	4.61E-07	1.59E-02
LRL-7	5.90E-02	1.78E-10	0.00E+00	1.67E-06	5.90E-02
Fallout Plume	3.17E-02	1.14E-10	0.00E+00	8.82E-07	3.17E-02
Fallout Plume Elevated Area A, FALA0001	1.13E-01	2.81E-10	0.00E+00	1.65E-07	2.81E-10
Fallout Plume Elevated Area B, FALB0001	2.13E-01	4.94E-10	0.00E+00	5.38E-07	2.13E-01
Salvage Yard Hot Spot, SAYA0001	2.15E-01	5.20E-10	0.00E+00	3.46E-06	2.15E-01
Shaft Hot Spot, SHFA0001	4.92E-02	1.18E-10	0.00E+00	6.72E-07	4.92E-02
Shaft Hot Spot, SHFB0001	2.29E-02	5.27E-11	0.00E+00	1.05E-07	2.29E-02
Shaft Hot Spot, SHFC0001	5.75E-02	1.32E-10	0.00E+00	2.90E-07	5.75E-02

increases, the RESRAD code assumes that the amount of meat ingested by the rancher, as defined by the RESRAD code user, can be obtained from the number of cattle that can be supported on 20,000 m^2 of radiological-contaminated land. Therefore, increasing the area of contamination will not increase the RESRAD-calculated dose due to the amount of contaminated meat ingested by the rancher.

The Cs-137 concentration in the vegetation was used to calculate the dose to three hypothetical dose receptors who are assumed to ingest beef from cattle that grazed on Gnome-Coach grasses. The three hypothetical dose receptors include an adult, a teenager, and a child. The details regarding the calculation of the beef ingestion dose are included in Exhibit 13 of Attachment A. Using the

Table B.3-7
Estimated Dose to Trespasser Using Mean Cs-137 Concentration at Selected Gnome-Coach AOCs

Site Name	External Dose (mrem/yr)	Inhalation Dose (mrem/yr)	Meat Ingestion Dose (mrem/yr)	Soil Ingestion Dose (mrem/yr)	Total Dose (mrem/yr)
Salvage Yard	4.48E-02	1.63E-10	0.00E+00	1.24E-06	4.48E-02
Warehouse Pad	2.49E-02	7.92E-11	0.00E+00	7.02E-07	2.49E-02
Surface Ground Zero	2.47E-02	8.41E-11	0.00E+00	6.92E-07	2.47E-02
Salt Muckpile	2.33E-02	7.98E-11	0.00E+00	6.52E-07	2.33E-02
Gnome-Coach Shaft	3.28E-02	1.08E-10	0.00E+00	9.22E-07	3.28E-02
Equipment Storage Area Hot Spot ESAA0001	9.20E-02	2.29E-10	0.00E+00	2.18E-06	9.20E-02
Area 57 Hot Spot A57A0001	6.38E-02	1.57E-10	0.00E+00	1.27E-06	6.38E-02
Salvage Yard Road Elevated Area	7.40E-02	2.39E-10	0.00E+00	2.09E-06	7.40E-02
USGS Drill Pad	1.56E-02	4.31E-11	0.00E+00	4.51E-07	1.56E-02
LRL-7	1.59E-02	4.80E-11	0.00E+00	4.51E-07	1.59E-02
Fallout Plume	3.17E-02	1.14E-10	0.00E+00	8.82E-07	3.17E-02
Fallout Plume Elevated Area A, FALA0001	5.93E-02	1.47E-10	0.00E+00	8.63E-08	5.93E-02
Fallout Plume Elevated Area B, FALB0001	1.80E-01	4.19E-10	0.00E+00	4.57E-07	1.80E-01
Salvage Yard Hot Spot, SAYA0001	1.93E-01	4.66E-10	0.00E+00	3.10E-06	1.93E-01
Shaft Hot Spot, SHFA0001	4.43E-02	1.06E-10	0.00E+00	6.05E-07	4.43E-02
Shaft Hot Spot, SHFB0001	1.72E-02	3.95E-11	0.00E+00	7.89E-08	1.72E-02
Shaft Hot Spot, SHFC0001	5.33E-02	1.23E-10	0.00E+00	2.68E-07	5.33E-02

95 percent UCL of the mean Cs-137 concentration of 0.209 pCi/g, the mean dose to an adult, a teenager, and a child are 0.024 mrem/yr, 0.025 mrem/yr, and 0.011 mrem/yr, respectively.

B.3.6 Conclusions

None of the AOCs exceeded the dose criteria of 25 mrem/yr for either of the receptors evaluated. Two AOCs, the salvage yard and fallout plume, slightly exceeded the upper bound cumulative ILCR of 10^{-4} based on maximum Cs-137 concentrations on the surface for the rancher scenario. None of the AOCs exceeded the upper bound cumulative ILCR of 10^{-4} based on maximum Cs-137 concentrations on the surface for the trespasser.

Table B.3-8
Estimated Dose to Rancher Using Maximum Cs-137 Concentration at Selected Gnome-Coach AOCs

Site Name	External Dose (mrem/yr)	Inhalation Dose (mrem/yr)	Meat Ingestion Dose (mrem/yr)	Soil Ingestion Dose (mrem/yr)	Total Dose (mrem/yr)
Salvage Yard	1.70E+00	6.23E-09	1.19E+01	7.06E-05	1.35E+01
Warehouse Pad	4.75E-04	7.79E-13	9.50E-01	1.02E-08	9.51E-01
Surface Ground Zero	3.08E-01	1.07E-09	2.18E+00	1.30E-05	2.49E+00
Salt Muckpile	4.32E-01	1.50E-09	3.04E+00	1.81E-05	3.47E+00
Gnome-Coach Shaft	4.37E-01	1.46E-09	3.05E+00	1.85E-05	3.48E+00
Equipment Storage Area Hot Spot ESAA0001	3.90E-01	3.83E-10	1.16E-01	1.38E-05	5.06E-01
Area 57 Hot Spot A57A0001	2.40E-01	5.98E-10	6.03E-02	7.18E-06	3.01E-01
Salvage Yard Road Elevated Area	1.14E+00	3.74E-09	6.66E+00	4.84E-05	7.80E+00
USGS Drill Pad	4.74E-02	1.33E-10	5.02E-02	2.06E-06	9.76E-02
LRL-7	4.28E-02	1.31E-10	1.25E-01	1.82E-06	1.67E-01
Fallout Plume	1.37E+00	5.00E-09	9.59E+00	5.71E-05	1.10E+01
Fallout Plume Elevated Area A, FALA0001	5.32E-01	1.34E-09	9.74E-03	1.16E-06	5.41E-01
Fallout Plume Elevated Area B, FALB0001	1.05E+00	2.48E-09	3.36E-02	4.00E-06	1.09E+00
Salvage Yard Hot Spot, SAYA0001	1.56E+00	3.81E-09	3.15E-01	3.75E-05	1.87E+00
Shaft Hot Spot, SHFA0001	2.60E-01	6.32E-10	4.48E-02	5.33E-06	3.05E-01
Shaft Hot Spot, SHFB0001	3.63E-01	8.46E-10	2.10E-02	2.50E-06	3.84E-01
Shaft Hot Spot, SHFC0001	3.73E-01	8.70E-10	2.37E-02	2.82E-06	3.96E-01

The mean dose to an adult from the ingestion of beef obtained from cattle that grazed in the Fallout Plume at Gnome-Coach is 0.024 mrem/yr, the dose to a teenager is 0.025 mrem/yr, and the dose to a child is 0.011 mrem/yr. The calculated doses are less than 0.025 percent of the dose limit for protection of members of the public established in DOE Order 5400.5 (100 mrem/yr) (DOE, 1993).

Table B.3-9
Estimated Dose to Rancher Using 95 Percentile Cs-137 Concentration at Selected Gnome-Coach AOCs

Site Name	External Dose (mrem/yr)	Inhalation Dose (mrem/yr)	Meat Ingestion Dose (mrem/yr)	Soil Ingestion Dose (mrem/yr)	Total Dose (mrem/yr)
Salvage Yard	2.28E-02	8.37E-11	1.59E-01	9.47E-07	1.82E-01
Warehouse Pad	4.13E-05	6.77E-14	8.26E-02	8.88E-10	8.26E-02
Surface Ground Zero	1.25E-02	4.32E-11	8.84E-02	5.26E-07	1.01E-01
Salt Muckpile	1.18E-02	4.11E-11	8.33E-02	4.96E-07	9.52E-02
Gnome-Coach Shaft	1.66E-02	5.51E-11	1.15E-01	6.99E-07	1.32E-01
Equipment Storage Area Hot Spot ESAA0001	4.79E-02	1.21E-10	1.43E-02	1.70E-06	6.21E-02
Area 57 Hot Spot A57A0001	3.32E-02	8.27E-11	8.33E-03	9.92E-07	4.15E-02
Salvage Yard Road Elevated Area	3.75E-02	1.23E-10	2.18E-01	1.59E-06	2.56E-01
USGS Drill Pad	7.95E-03	2.23E-11	8.43E-03	3.46E-07	1.64E-02
LRL-7	2.95E-02	9.04E-11	8.59E-02	1.26E-06	1.15E-01
Fallout Plume	1.59E-02	5.79E-11	1.11E-01	6.62E-07	1.27E-01
Fallout Plume Elevated Area A, FALA0001	5.67E-02	1.42E-10	1.04E-03	1.24E-07	5.77E-02
Fallout Plume Elevated Area B, FALB0001	1.06E-01	2.50E-10	3.39E-03	4.04E-07	1.10E-01
Salvage Yard Hot Spot, SAYA0001	1.08E-01	2.63E-10	2.18E-02	2.59E-06	1.29E-01
Shaft Hot Spot, SHFA0001	2.46E-02	5.98E-11	4.23E-03	5.04E-07	2.88E-02
Shaft Hot Spot, SHFB0001	1.15E-02	2.67E-11	6.62E-04	7.89E-08	1.21E-02
Shaft Hot Spot, SHFC0001	2.88E-02	6.71E-11	1.83E-03	2.17E-07	3.06E-02

Table B.3-10
Estimated Dose to Rancher Using Mean Cs-137 Concentration at Selected Gnome-Coach AOCs

Site Name	External Dose (mrem/yr)	Inhalation Dose (mrem/yr)	Meat Ingestion Dose (mrem/yr)	Soil Ingestion Dose (mrem/yr)	Total Dose (mrem/yr)
Salvage Yard	2.24E-02	8.24E-11	1.57E-01	9.32E-07	1.79E-01
Warehouse Pad	4.07E-05	6.67E-14	8.14E-02	8.75E-10	8.15E-02
Surface Ground Zero	1.23E-02	4.26E-11	8.71E-02	5.19E-07	9.95E-02
Salt Muckpile	1.16E-02	4.05E-11	8.21E-02	4.89E-07	9.37E-02
Gnome-Coach Shaft	1.64E-02	5.45E-11	1.14E-01	6.92E-07	1.31E-01
Equipment Storage Area Hot Spot ESAA0001	4.60E-02	1.16E-10	1.37E-02	1.63E-06	5.97E-02
Area 57 Hot Spot A57A0001	3.19E-02	7.94E-11	7.99E-03	9.52E-07	3.99E-02
Salvage Yard Road Elevated Area	3.70E-02	1.21E-10	2.15E-01	1.56E-06	2.52E-01
USGS Drill Pad	7.78E-03	2.19E-11	8.25E-03	3.38E-07	1.60E-02
LRL-7	7.95E-03	2.43E-11	2.32E-02	3.38E-07	3.11E-02
Fallout Plume	1.59E-02	5.79E-11	1.11E-01	6.62E-07	1.27E-01
Fallout Plume Elevated Area A, FALA0001	2.97E-02	7.45E-11	5.44E-04	6.47E-08	3.02E-02
Fallout Plume Elevated Area B, FALB0001	9.02E-02	2.13E-10	2.88E-03	3.43E-07	2.13E-10
Salvage Yard Hot Spot, SAYA0001	9.65E-02	2.36E-10	1.95E-02	2.32E-06	1.16E-01
Shaft Hot Spot, SHFA0001	2.22E-02	5.38E-11	3.81E-03	4.54E-07	2.60E-02
Shaft Hot Spot, SHFB0001	8.59E-03	2.00E-11	4.97E-04	5.92E-08	9.08E-03
Shaft Hot Spot, SHFC001	2.66E-02	6.21E-11	1.69E-03	2.01E-07	2.83E-02

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Appendix C
Gnome-Coach Site Surface Investigation
Quality Control Summary Report

C.1.0 Quality Assurance/Data Assessment

This appendix contains a summary of the quality assurance (QA) and quality control (QC) process implemented during the Gnome-Coach field investigation. Laboratory analyses were conducted for samples used in the decision-making process to provide a quantitative measurement of any COPCs present. The QA/QC process was implemented for all laboratory samples including documentation, data verification and validation of analytical results, and affirmation of data requirements related to laboratory analyses. Detailed information regarding the QA program is contained in the New Mexico QAPP (NNSA/NV, 2002).

C.1.1 Data Validation

Data validation was performed in accordance with the New Mexico QAPP (NNSA/NV, 2002) and approved procedures. All laboratory data from samples collected and analyzed for Gnome-Coach were evaluated for data quality according to the EPA Functional Guidelines (EPA, 1994 and 1999). These guidelines are implemented in a tiered process and are presented in Sections C.1.1.1 through C.1.1.3. Data were reviewed to ensure that samples were appropriately processed and analyzed, and the results passed data validation criteria. Documentation of the data qualifications resulting from these reviews is retained in project files as a hard copy and electronic media.

One hundred percent of the data analyzed as part of this investigation were subjected to Tier I and Tier II evaluations. A Tier III evaluation was performed on eleven percent of the samples.

C.1.1.1 Tier I Evaluation

Tier I evaluation for both chemical and radiological analysis examines (but was not limited to):

- Sample count/type consistent with chain of custody
- Analysis count/type consistent with chain of custody
- Correct sample matrix
- Significant problems stated in cover letter or case narrative
- Completeness of certificates of analysis
- Completeness of Contract Laboratory Program (CLP) or CLP-like packages
- Completeness of signatures, dates, and times on chain of custody
- Condition-upon-receipt variance form included
- Requested analyses performed on all samples

- Date received/analyzed given for each sample
- Correct concentration units indicated
- Electronic data transfer supplied
- Results reported for field and laboratory QC samples
- Whether or not the deliverable met the overall objectives of the project
- Proper field documentation accompanies project packages

C.1.1.2 Tier II Evaluation

Tier II evaluation for both chemical and radiological analysis examines (but is not limited to):

Chemical:

- Correct detection limits achieved
- Sample date, preparation date, and analysis date for each sample
- Holding time criteria met
- QC batch association for each sample
- Cooler temperature upon receipt
- Sample pH for aqueous samples, as required
- Detection limits properly adjusted for dilution, as required
- Blank contamination evaluated and applied to sample results/qualifiers
- Matrix spike (MS)/matrix spike duplicate (MSD), percent recovery (%R), and relative percent difference (RPDs) evaluated and applied to laboratory results/qualifiers
- Field duplicate RPDs evaluated using professional judgement and applied to laboratory results/qualifiers
- Laboratory duplicate RPDs evaluated and applied to laboratory results/qualifiers
- Surrogate %Rs evaluated and applied to laboratory results/qualifiers
- Laboratory control sample %R evaluated and applied to laboratory results/qualifiers
- Initial and continuing calibration evaluated and applied to laboratory results/qualifiers
- Internal standard evaluated and applied to laboratory results/qualifiers

- Mass spectrometer tuning criteria
- Organic compound quantitation
- Inductively coupled plasma (ICP) interference check sample evaluation
- Graphite furnace atomic absorption quality control
- ICP serial dilution effects
- Recalculation of 10 percent of laboratory results from raw data

Radioanalytical:

- Correct detection limits achieved
- Blank contamination evaluated and applied to sample results/qualifiers
- Certificate of analysis consistent with data package documentation
- Quality control sample results (e.g., duplicates, laboratory control samples, laboratory blanks) evaluated and applied to laboratory result qualifiers
- Sample results, error, and minimum detectable activity evaluated and applied to laboratory result qualifiers
- Detector system calibrated to NIST-traceable sources
- Calibration sources preparation was documented, demonstrating proper preparation and appropriateness for sample matrix, emission energies, and concentrations
- Detector system response to daily, weekly, and monthly background and calibration checks, which may include peak energy, peak centroid, peak full-width half-maximum, and peak efficiency, depending on the detection system
- NIST-traceable tracers, appropriate for the analysis performed, and recoveries that met QC requirements
- Documentation of all QC sample preparation complete and properly performed
- QC sample results (e.g., calibration source concentration, %R, and RPD) verified
- Spectra lines, emissions, particle energies, peak areas, and background peak areas support the identified radionuclide and its concentration

- Recalculation of 10 percent of laboratory results from raw data

C.1.1.3 Tier III Review

Tier III evaluations examine a limited portion of data reviewed during Tier II validation. The Tier III review includes the evaluations discussed in the following paragraphs.

Chemical:

- Recalculation of laboratory results from raw data

Radioanalytical:

- Radionuclides and their concentration appropriate considering their decay schemes and half-lives
- Each identified line in spectra verified against emission libraries and calibration results
- Independent identification of spectra lines, area under the peaks, and quantification of radionuclide concentration in a random number of sample results
- Recalculation of laboratory results from raw data

A Tier III review of approximately eleven percent of the samples was conducted by TechLaw, Inc. in Lakewood, Colorado. Tier II and Tier III results were compared and where differences were noted, data were reviewed, and changes made accordingly.

C.1.2 Quality Control Samples

There were 41 trip blanks, 10 field blanks, 3 source blanks, 4 equipment rinsate blanks, 7 MS/MSD, and 9 field duplicates collected and submitted for laboratory analysis as shown in Table C.1-1. The quality control samples were assigned individual sample numbers and sent to the laboratory "blind." Additional samples were selected by the laboratory to be analyzed as laboratory duplicates.

C.1.2.1 Field Quality Control Samples

Review of the field-blank analytical data for the Gnome-Coach soil sampling indicates that cross-contamination from field methods did not occur during sample collection. Field, equipment rinsate, and source blanks were analyzed for the parameters listed in Table A.2-1 and trip blanks were

Table C.1-1
QA/QC Sample Summary
(Page 1 of 2)

Borehole Number	Sample Type	Sample Number	Sample Matrix	Analyses
NA	Potable Water Source Blank	WARA0101	Water	SC, GS, H3, Pu, Sr-90
NA	Distilled Water Source Blank	WARB0101	Water	SC, GS, H3, Pu, Sr-90
NA	JWS Water Source Blank	WARE0101	Water	SC, GS, H3, Pu, Sr-90
NA	Rinsate Associated With Salvage Yard CPT Sampling	SAYC0101	Water	Metals, GS
NA	Rinsate of New Geoprobe Liner Tubes	SAN3D0101	Water	SC, GS, H3, Sr-90, Pu
NA	Rinsate Associated With Geoprobe	WARG0101	Water	SC
NA	Rinsate of Backhoe Bucket	LRL7C0101	Water	SC
NA	Field Blank	BKGB0101	Water	Metals, GS, Pu, Sr-90
NA	Field Blank	WARD0101	Water	Metals, GS
NA	Field Blank	DECA0101	Water	VOCs, Metals, SVOCs, GS
NA	Field Blank	SRN6B0101	Water	SC
NA	Field Blank	SRN3B0101	Water	SC
NA	Field Blank	USG5B0101	Water	SC
NA	Field Blank	SAN3B0101	Water	SC
NA	Field Blank	DSAB0101	Water	SC, GS
NA	Field Blank	LRL7B0101	Water	SC
NA	Field Blank	LRL8A0101	Water	SC, GS
NA	Trip Blank	WARC0101	Water	VOCs
NA	Trip Blank	WARF0101	Water	VOCs
NA	Trip Blank	DECB0101	Water	VOCs
NA	Trip Blank	DECC0101	Water	VOCs
NA	Trip Blank	DECD0101	Water	VOCs
NA	Trip Blank	DECF0101	Water	VOCs
NA	Trip Blank	DECG0101	Water	VOCs
NA	Trip Blank	SRN7A0101	Water	VOCs
NA	Trip Blank	SRN7B0101	Water	VOCs
NA	Trip Blank	SRN6A0101	Water	VOCs
NA	Trip Blank	SRN5A0101	Water	VOCs
NA	Trip Blank	GENA0101	Water	VOCs
NA	Trip Blank	GENB0101	Water	VOCs
NA	Trip Blank	WARH0101	Water	VOCs
NA	Trip Blank	SRN1A0101	Water	VOCs

Table C.1-1
QA/QC Sample Summary
(Page 2 of 2)

Borehole Number	Sample Type	Sample Number	Sample Matrix	Analyses
NA	Trip Blank	SRN2A0101	Water	VOCs
NA	Trip Blank	SRN3A0101	Water	VOCs
NA	Trip Blank	SAN1A0101	Water	VOCs
NA	Trip Blank	SAN1B0101	Water	VOCs
NA	Trip Blank	USG5A0101	Water	VOCs
NA	Trip Blank	USG4C0101	Water	VOCs
NA	Trip Blank	USG4A0101	Water	VOCs
NA	Trip Blank	USG4B0101	Water	VOCs
NA	Trip Blank	USG4Z0101	Water	VOCs
NA	Trip Blank	USG7A0101	Water	VOCs
NA	Trip Blank	LRL2A0101	Water	VOCs
NA	Trip Blank	SAN3F0101	Water	VOCs
NA	Trip Blank	SAN3C0101	Water	VOCs
NA	Trip Blank	LRL1A0101	Water	VOCs
NA	Trip Blank	SGZD0101	Water	VOCs
NA	Trip Blank	USG1A0101	Water	VOCs
NA	Trip Blank	DECH0101	Water	VOCs
NA	Trip Blank	DSAA0101	Water	VOCs
NA	Trip Blank	DSAD0101	Water	VOCs
NA	Trip Blank	LRL7A0101	Water	VOCs
NA	Trip Blank	LRLD0101	Water	VOCs
NA	Trip Blank	NEWA0101	Water	VOCs
NA	Trip Blank	SHFA0101	Water	VOCs
NA	Trip Blank	GNMA0101	Water	VOCs
NA	Trip Blank	SHFC0101	Water	VOCs
NA	Trip Blank	GNMI0101	Water	VOCs

Notes:
SC = Site Characterization parameters are: total VOCs, total SVOCs, total RCRA metals with mercury, total petroleum hydrocarbons (DRO and GRO).
GS = Gamma spectroscopy analysis
Sr-90 = Strontium-90 analysis
Pu = Isotopic plutonium analysis
H3 = Tritium analysis
Metals = Total RCRA metals with mercury

analyzed for VOCs only. Several different contaminants were detected in some of the samples, but they were below or slightly above the contract required detection limits.

During the sampling events, nine field duplicate soil samples were sent as blind samples to the laboratory to be analyzed for the investigation parameters listed in Table A.2-1. For these samples, the duplicate results precision (i.e., RPDs between the environmental sample results and their corresponding field duplicate sample results) were evaluated to the guidelines set forth in *EPA Functional Guidelines* (EPA, 1994).

C.1.2.2 Laboratory Quality Control Samples

Analysis of method QC blanks were performed on each sample delivery group (SDG) for inorganics. Analysis for surrogate spikes and preparation blanks (PBs) were performed on each SDG for organics only. Initial and continuing calibration and laboratory control samples (LCS) were performed for each SDG by Paragon Analytics Laboratory. The results of these analyses were used to qualify associated environmental sample results according to EPA Functional Guidelines (EPA, 1994 and 1999). Documentation of data qualifications resulting from the application of these guidelines is retained in project files as both hard copy and electronic media.

C.1.3 Field Nonconformances

One field nonconformance was identified for the corrective action investigation. The scale used for weighing the surface soil samples being analyzed by the HPGe on site was not in calibration. Based on this nonconformance, the gamma spectroscopy results for the 22 surface samples were reviewed to determine the potential effect of the uncalibrated scale on the calculated concentration of the target analyte, Cs-137. It was demonstrated that the calculated difference in the Cs-137 concentration are insignificant and less than 5 percent of the reported uncertainty in the Cs-137 concentration measurement. Therefore, the qualification of the sample results were not affected by the uncalibrated scale and remain valid.

C.1.4 Laboratory Nonconformances

Laboratory nonconformances are due to inconsistencies in analytical instrumentation operation, sample preparations, extractions, missed holding times, and fluctuations in internal standard and calibration results. Three SDGs had laboratory nonconformances identified during the analysis of isotopic plutonium due to tracer recoveries not being met. All affected samples were re-extracted with the resulting data meeting the method and client-specific requirements. Therefore, no data was rejected during the Gnome-Coach investigation due to the laboratory's performance.

C.2.0 Data Assessment

This appendix provides a summary of the assessment of Gnome-Coach data validation results for each data quality indicator (DQI). In addition, a reconciliation of the data with the general conceptual site model established for this project is provided.

C.2.1 Statement of Acceptability and Usability

This section provides an evaluation of the DQIs in determining the degree of acceptability and usability of the reported data in the decision-making process.

Data were evaluated against specific criteria to verify the achievement of DQI goals established to meet the project DQOs as provided in the New Mexico QAPP (Appendix B of the Work Plan [NNSA/NV, 2002]) and the Gnome-Coach Work Plan (NNSA/NV, 2002). The DQIs for this project include precision, accuracy, completeness representativeness, and comparability.

C.2.2 Precision

Precision is a measure of agreement among a replicate set of measurements of the same property under similar conditions. This agreement is expressed as the RPD between duplicate measurements (EPA, 1996). The RPD is determined by dividing the difference between the replicate measurement values by the average measurement value and multiplying the result by 100.

Determinations of precision can be made for field duplicates, laboratory duplicates, or both. For field duplicates, samples are collected simultaneously with a sample from the same source under similar conditions in separate containers. The duplicate sample is treated independently of the original sample in order to assess field impacts and laboratory performance on precision through a comparison of results. Laboratory precision is evaluated as part of the required laboratory internal QC program to assess performance of analytical procedures. The laboratory sample duplicates are generated in a laboratory and are an aliquot or subset of the same field sample. Typically, other laboratory duplicate QC samples include MSD and LCS duplicate (LCSD) samples for organic and inorganic analytes.

The variability in results from analyses of field duplicates is generally greater than the variability in the results of laboratory duplicates. This higher variability for field duplicates results from the increased potential to introduce factors influencing the analytical results during sampling, sample preparation, containerization, handling, packaging, preservation, and environmental conditions before the samples reach the laboratory. Laboratory QC only samples assess the variability of results introduced by sample handling and preparation in the laboratory and by the analytical procedure, which also impacts field duplicates. In addition, the variability in duplicate results is expected to be greater for soil samples than water samples, primarily due to the inherent nonhomogeneous nature of soil samples, despite sample preparation methods that include mixing to improve sample homogeneity.

C.2.2.1 Chemical Precision

Precision measures the reproducibility of data under a given set of conditions. Specifically, precision is a quantitative measurement of the variability of a population of measurements compared to their average. Precision for chemical measurements was assessed by collecting, preparing, and analyzing duplicate field samples, MS and MSD samples, and LCS and LCSD samples. Precision was reported as RPD. The RPD is calculated as the difference between two measured concentrations, divided by the average of the two, and multiplied by 100. When the RPD exceeded predetermined limits for a given parameter, the data was evaluated for usability based on the purpose for the data and reasons for the increased RPD. No data were rejected due to problems with precision. Any deviation from these requirements has been documented and explained and the related data qualified accordingly.

C.2.2.2 Radiological Precision

The precision of radiochemical measurements is evaluated by measuring two aliquots of a sample and comparing the results. Duplicate results are obtained from the measurement of two sample aliquots by the laboratory, duplicate field samples, and matrix spike duplicates. The results of the laboratory duplicates, field duplicates, and matrix spike duplicates were satisfactory indicating that field sample results were not adversely affected by precision.

C.2.3 Accuracy

Analytical accuracy is defined as the nearness of a measurement to the true or accepted reference value. It is the composite of the random and systematic components of the measurement system and measures bias in a measurement system. The accuracy of the LCS determination is expressed as a percent recovery by the following:

$$\%\ \text{Recovery}\ (\%R) = \frac{\text{Amount of Analyte Measured}}{\text{Amount of Analyte Added}} \times 100$$

The accuracy of the matrix spike determination is expressed as a percent recovery by the following:

$$\%\ \text{Recovery}\ (\%R) = \frac{\text{MS Result} - \text{Sample Result}}{\text{Amount of Analyte Added}} \times 100$$

If LCS results are outside acceptable control limits, qualifiers will be added to the field samples analyzed with the LCS. However, matrix spike results outside acceptable control limits may not result in qualification of the data. An assessment of the entire analytical process including the sample matrix is performed to determine if qualification is necessary.

Field accuracy is assessed by confirming that the documents of record track the sample from origin, through transfer of custody, to disposal. The goal of field accuracy is for all samples to be collected from the correct locations, at the correct time, placed in a correctly labeled container with the correct preservative, and sealed with custody tape to prevent tampering. No data were rejected due to problems with field accuracy.

C.2.3.1 Chemical Accuracy

Accuracy for chemical measurements is determined by analyzing for surrogates, MSs and LCSs which were calculated as percent recovery, which was calculated by dividing the measured sample concentration by the true concentration and multiplying the quotient by 100. Values exceeding the acceptance criteria were evaluated for corrective actions. The only data rejected due to problems with accuracy were six phenol results. These results were rejected because the associated LCS/LCSD recoveries were below the lower control limit. Any deviation from these requirements has been documented and explained and the related data qualified accordingly.

C.2.3.2 Radiological Accuracy

Accuracy for radiological measurements is determined by analyzing an LCS containing a known concentration of the target radionuclide or by measuring an MS which is a field sample to which a known amount of the target radionuclide has been added. Accuracy is expressed as the percent recovery and is determined by dividing the measured result by the known concentration. Since all the accuracy tests performed for Gnome-Coach were within the control limits, no field sample results were determined to be unusable based on accuracy.

C.2.3.3 Completeness

Completeness was calculated for the investigative soil sample data based on the number of measurements analyzed, minus the number of measurements rejected during validation, divided by the number of measurements analyzed multiplied by 100 percent. All investigative soil samples were collected in accordance with the approved Work Plan (NNSA/NV, 2002).

A total of 246 samples were collected and analyzed for Gnome Coach. Out of a total of 24,334 measurements analyzed, 176 measurements total for Methods 8260B and 8270C were rejected. No measurements were rejected in the other methods for Gnome Coach. The resulting calculated completeness is 99.28 percent for investigative soil sample data.

C.2.3.4 Representativeness

A seven-step DQO process was utilized to identify Gnome-Coach requirements. During the process, locations were selected which enabled the samples collected to be representative of the media being evaluated. Samples were collected as planned. Quality control blanks are used as a way of measuring outside factors that could impact sample results. No data was qualified due to QC blanks. Therefore, the analytical data acquired during the Gnome-Coach corrective action investigation are representative of site characteristics.

C.2.3.5 Comparability

Field sampling activities were performed and documented in accordance with approved procedures that are comparable to standard industry practices. Approved standardized analytical methods and procedures were used to analyze, report, and validate the data. Therefore, datasets within this project are comparable to all other datasets generated using standardized quality procedures.

C.2.4 Reconciliation of DQOs and Conceptual Model(s)

This section provides a reconciliation of the data collected and analyzed during this investigation, with the preliminary conceptual site models established in the DQO process.

C.2.4.1 Initial Conceptual Model

A surface/shallow subsurface conceptual model was developed for Gnome-Coach as presented in the Work Plan (NNSA/NV, 2002) based on historical information, previous septic tank sample analyses, and process knowledge. This data assessment reconciles the investigation results with the conceptual model.

The surface/shallow subsurface conceptual model was applied at Gnome-Coach. This model assumed that any contamination would be located on the surface and in the shallow subsurface. The extent of surface and underlying soil impact was expected to be dependent upon the nature of COPCs and other factors.

C.2.4.2 Investigation Design and Contaminant Identification

The presence of contamination was identified by sample results and *in situ* radiological surveys showing COPC concentrations exceeding PALs, thereby defining COCs at the Gnome-Coach Site. All chemical COCs were identified in association with the location of a buried cement pad near the historical location of the decontamination pad. Arsenic, although detected above PALs, was not considered a COC because it was identified at concentrations considered to be representative of background conditions. See Section 5.1 for a discussion of the arsenic results. Radiological COPCs (specifically Cs-137) were identified above background concentrations but not above dose-based PALs; however, Cs-137 is still considered a COC in terms of contaminant identification. Soil sample results and *in situ* radiological survey results demonstrate that COCs were identified in soil within the physical boundaries of the general surface/shallow subsurface model defined in the Work Plan (NNSA/NV, 2002).

C.2.4.3 Contaminant Nature and Extent

The conceptual site model was used as the basis for identifying appropriate sampling and surveying strategies and data collection methods.

To address the conceptual model, surface and shallow subsurface *in situ* radiological data and soil samples were collected for analyses designed to define the extent of the COPCs identified in the Work Plan. A biased strategy was developed to focus the investigation on areas of potential contamination. The model assumed that the contamination would be limited to the boundaries of the site due to the minimal potential for migration based on the geological conditions, historical information for the site, information from other similar sites, and the physical properties of the COPCs. Implementation of the investigation design has shown that contamination did not extend beyond the boundaries of historically defined AOCs; therefore, the pattern of contamination agreed with the conceptual site model.

C.2.5 Conclusions

The DQIs (precision, accuracy, completeness, representativeness, and comparability) were all evaluated for quality and impact to the data. All of the data, except data qualified as rejected, can be used in project decisions.

C.3.0 References

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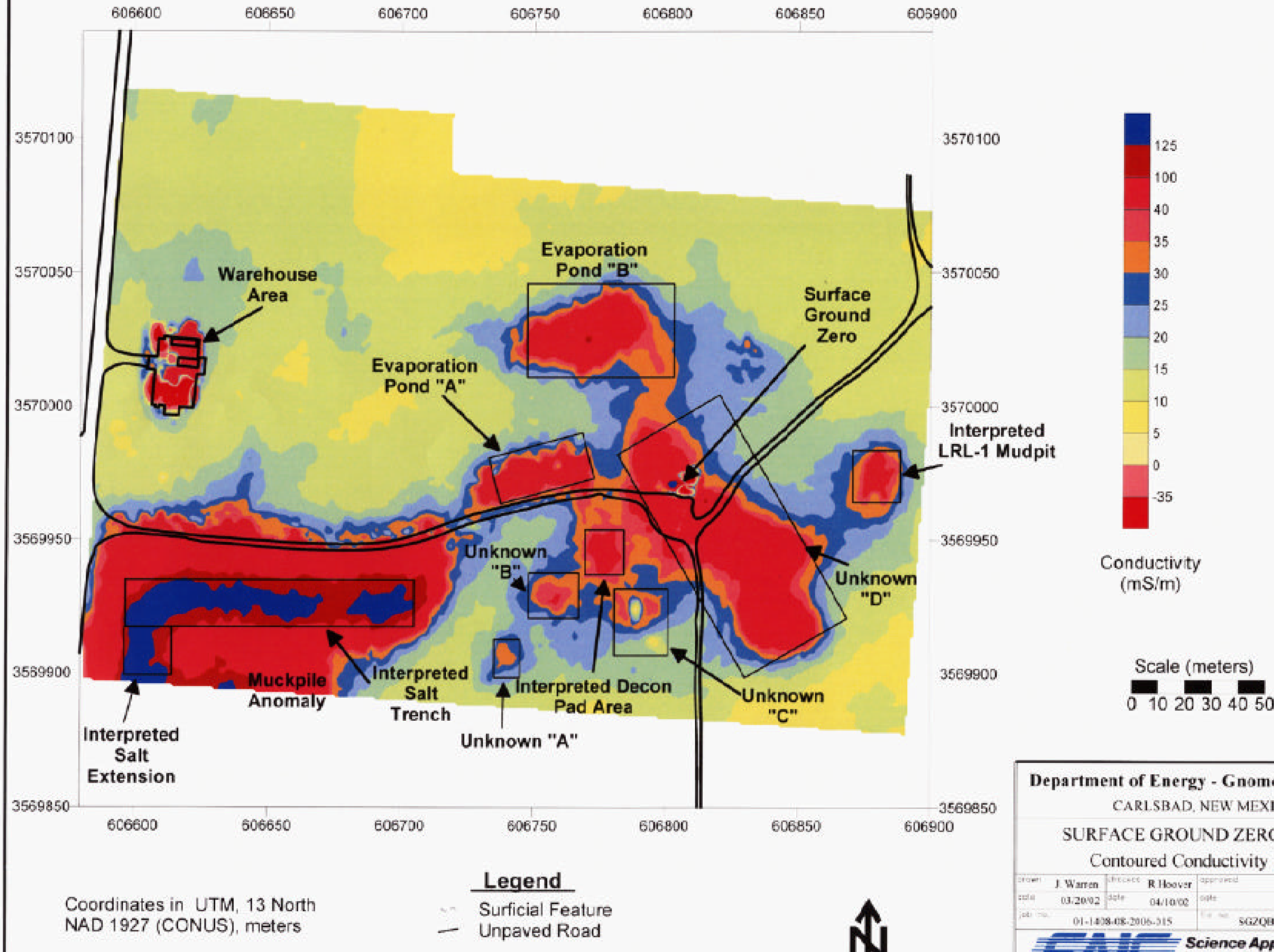
Appendix D
Geophysics Figures

(Science Applications International Corporation. 2002. *Gnome-Coach Geophysical Survey Report, Carlsbad, New Mexico*, October. Prepared for U.S. Department of Energy. Harrisburg, PA.)

(19 Pages)



Coordinates in UTM, 13 North
NAD 1927 (CONUS), meters

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Department of Energy - Gnome Coach Site			
CARLSBAD, NEW MEXICO			
SURFACE GROUND ZERO AREA			
Contoured Conductivity Data			
drawn: J. Warren	checked: R Hoover	approved	figure no. 3
date: 03/20/02	date: 04/10/02	date	
job no.: 01-1408-08-2006-315	file no.: SGZQB SRF		

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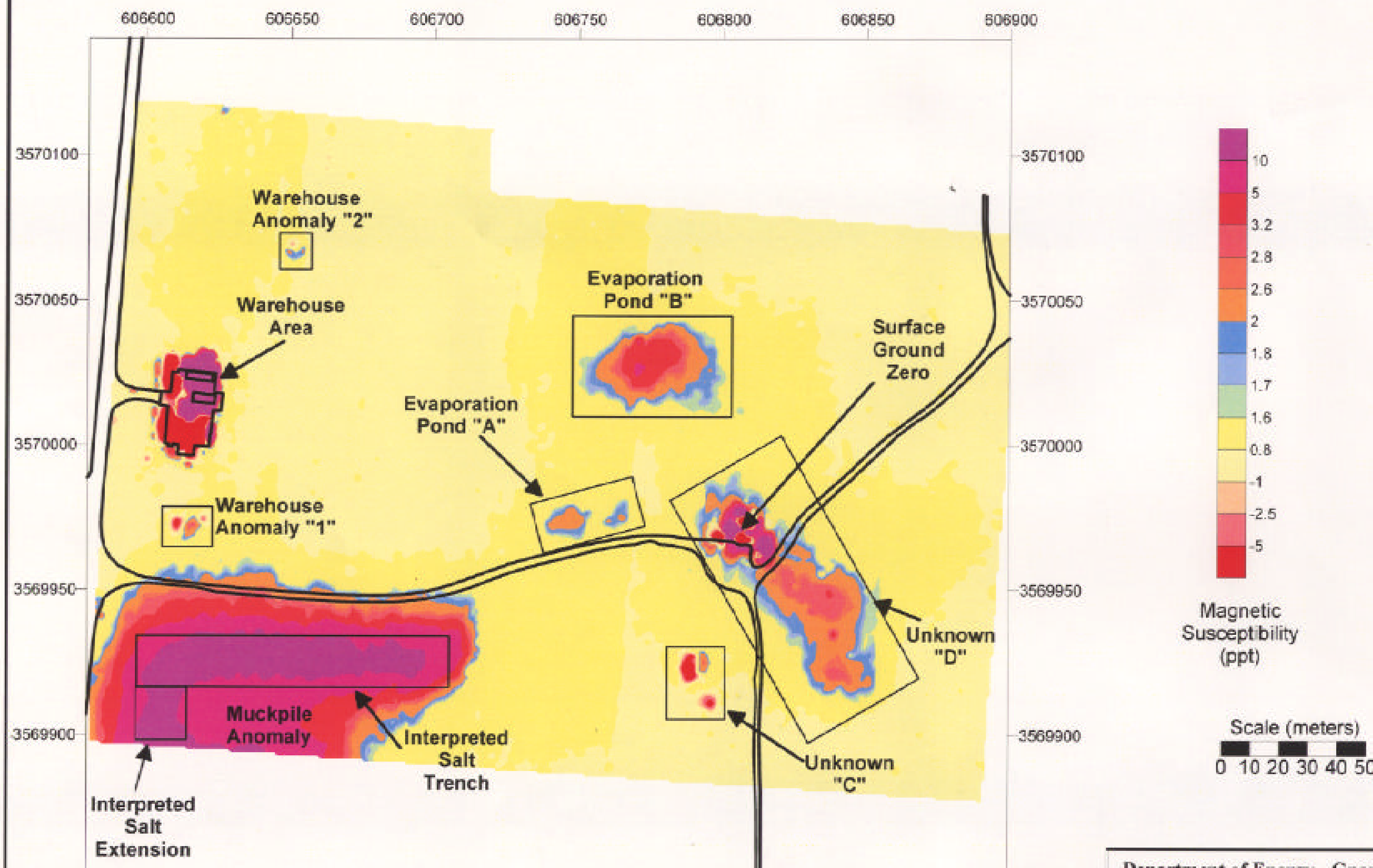

Coordinates in UTM, 13 North
NAD 1927 (CONUS), meters

Legend

Surficial Feature
Unpaved Road

N

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Department of Energy - Gnome Coach Site
CARLSBAD, NEW MEXICO

SURFACE GROUND ZERO AREA
Contoured Magnetic Susceptibility Data

drawn J. Warren	checked R.Hoover	approved	figure no.
date 03/20/02	date 04/10/02	date	4
job no. 01-1404-08-2006-015		file no. SGZIB SRF	

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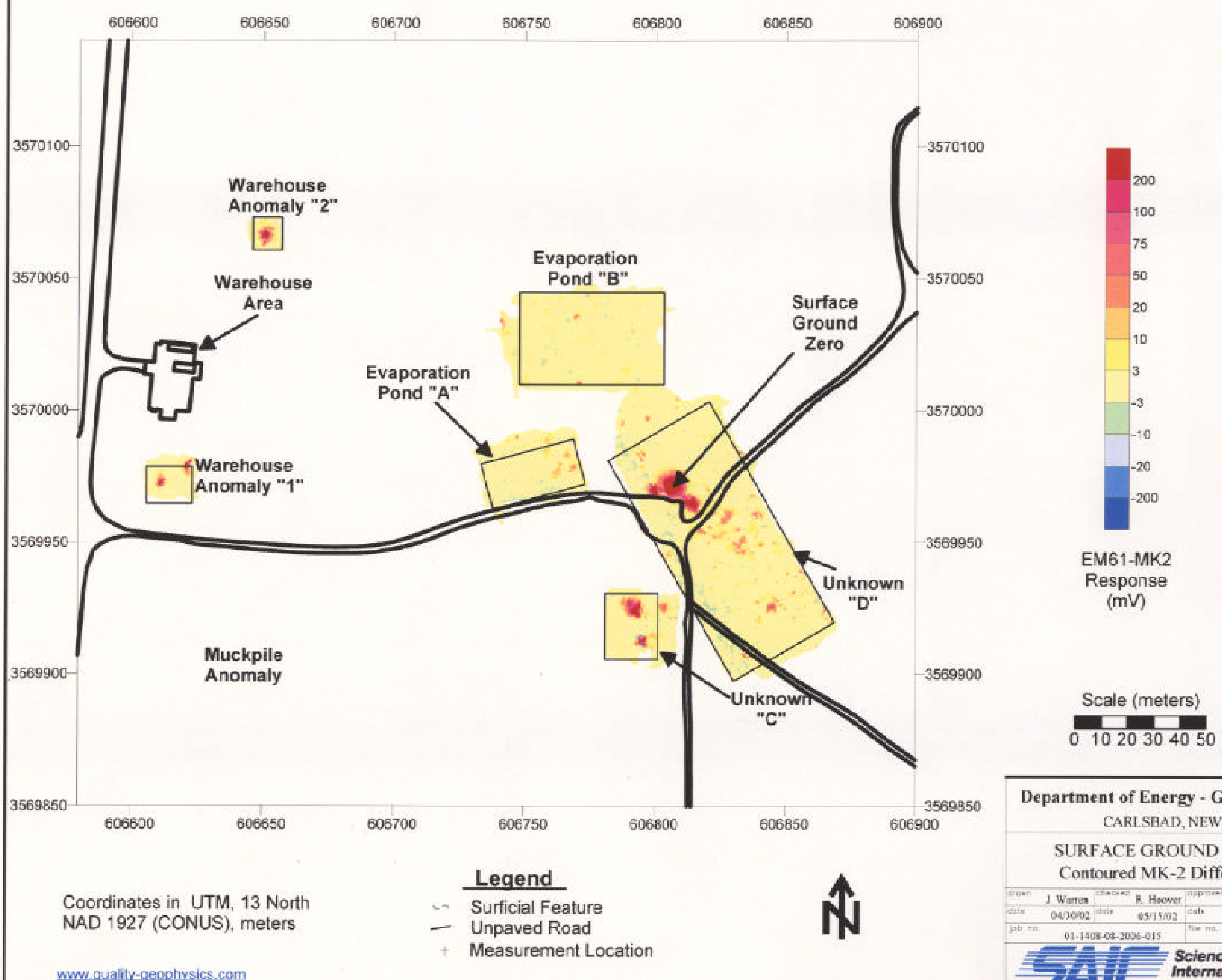

Department of Energy - Gnome Coach Site	
CARLSBAD, NEW MEXICO	
SURFACE GROUND ZERO AREA	
Contoured MK-2 Differential Data	
drawn J. Warren; checked R. Hoover; approved	figure no. 5
date 04/30/02; date 05/15/02; date	
job no. 01-1408-08-2006-015; file no. SGZ.SRF	

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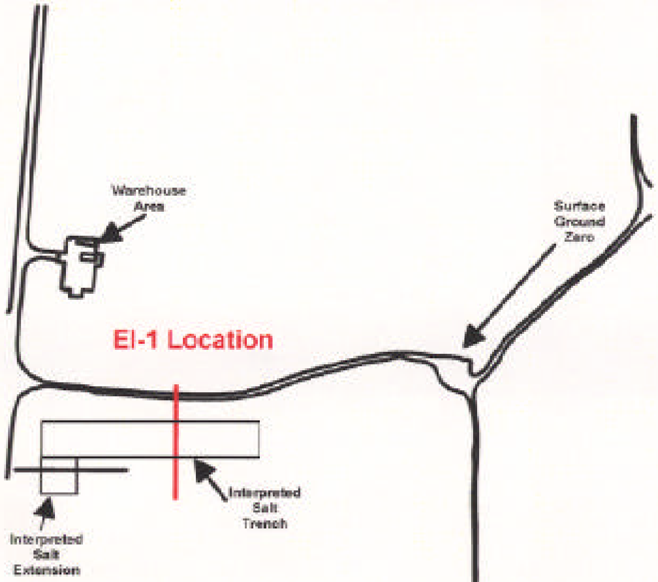

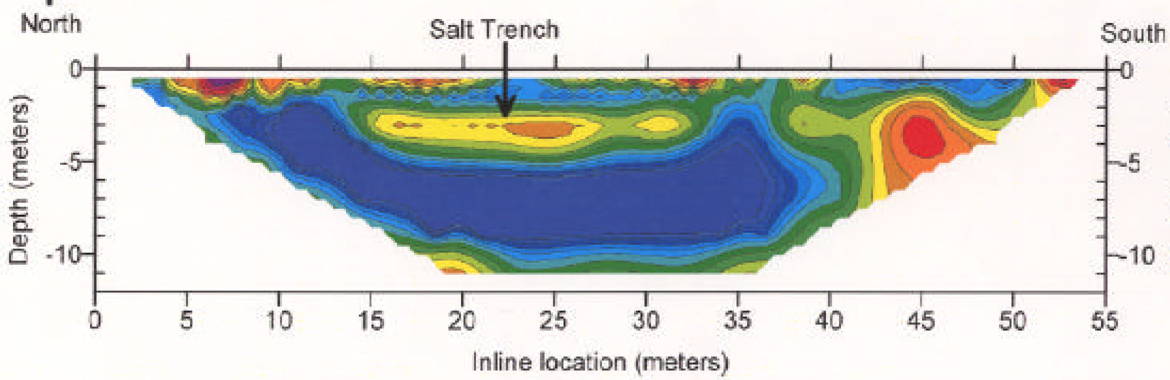

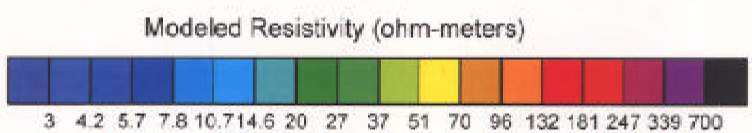

1-meter electrode spacing

Department of Energy - Gnome Coach Site
CARLSBAD, NEW MEXICO

ELECTRICAL IMAGING
Traverse 1

drawn R.A. Hoover	checked R. Hoover	approved	figure no.
date 05/21/02	date 05/22/02	date	6
job no. 01-1408-08-2006-015		file no. EI1.SRF	

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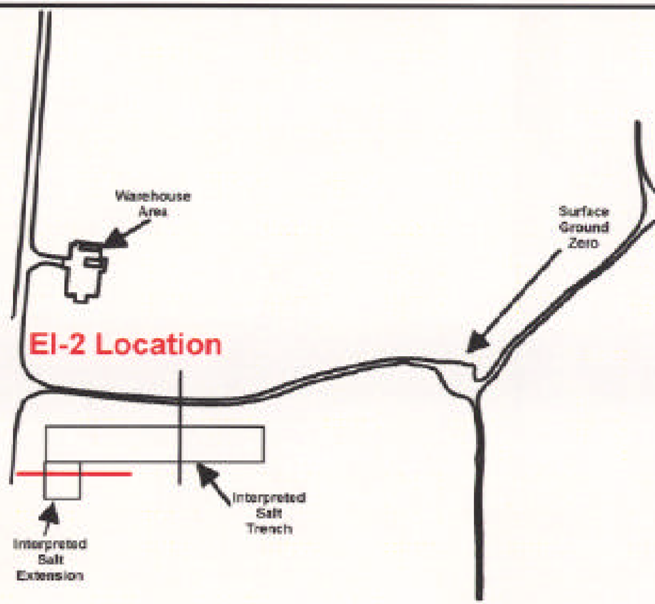

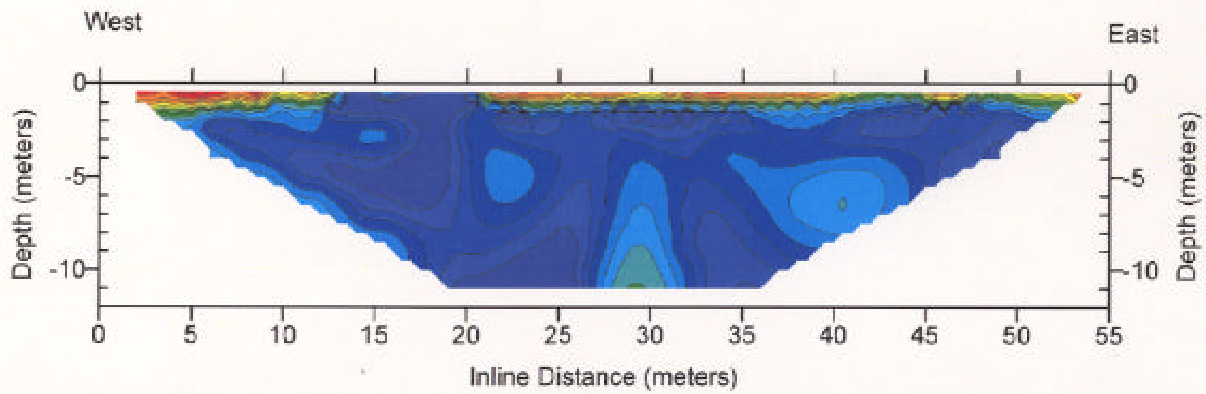

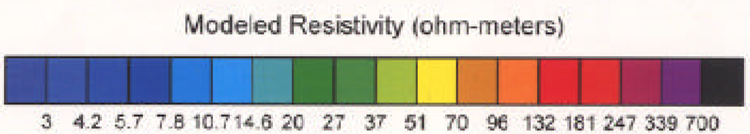

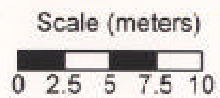

1-meter electrode spacing

Department of Energy - Gnome Coach Site CARLSBAD, NEW MEXICO			
ELECTRICAL IMAGING Traverse 2			
drawn R.A Hoover	checked R. Hoover	approved	figure no. 7
date 05/21/02	date 05/22/02	date	
job no. 01-1408-08-2006-015		file no. EI2 SRF	

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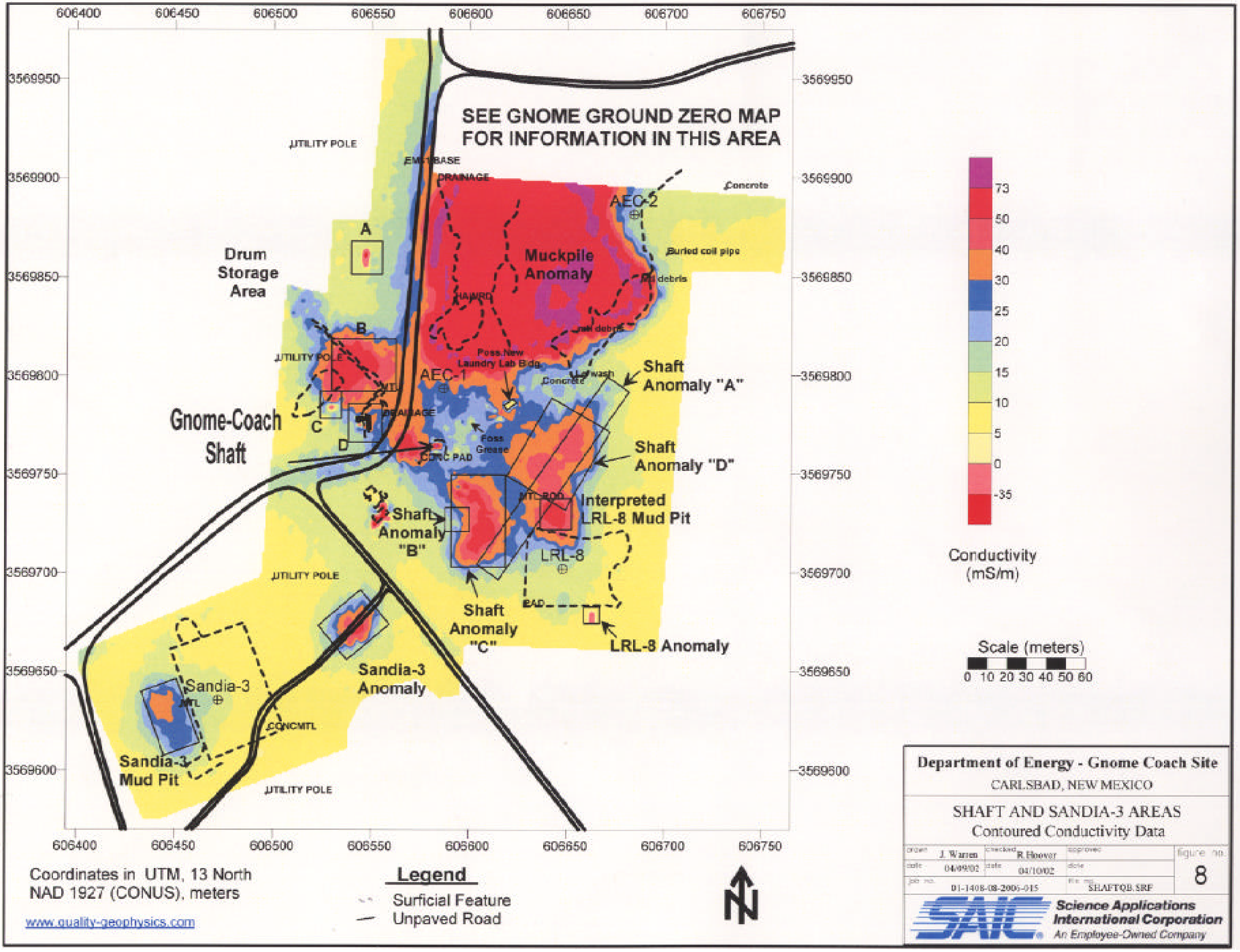
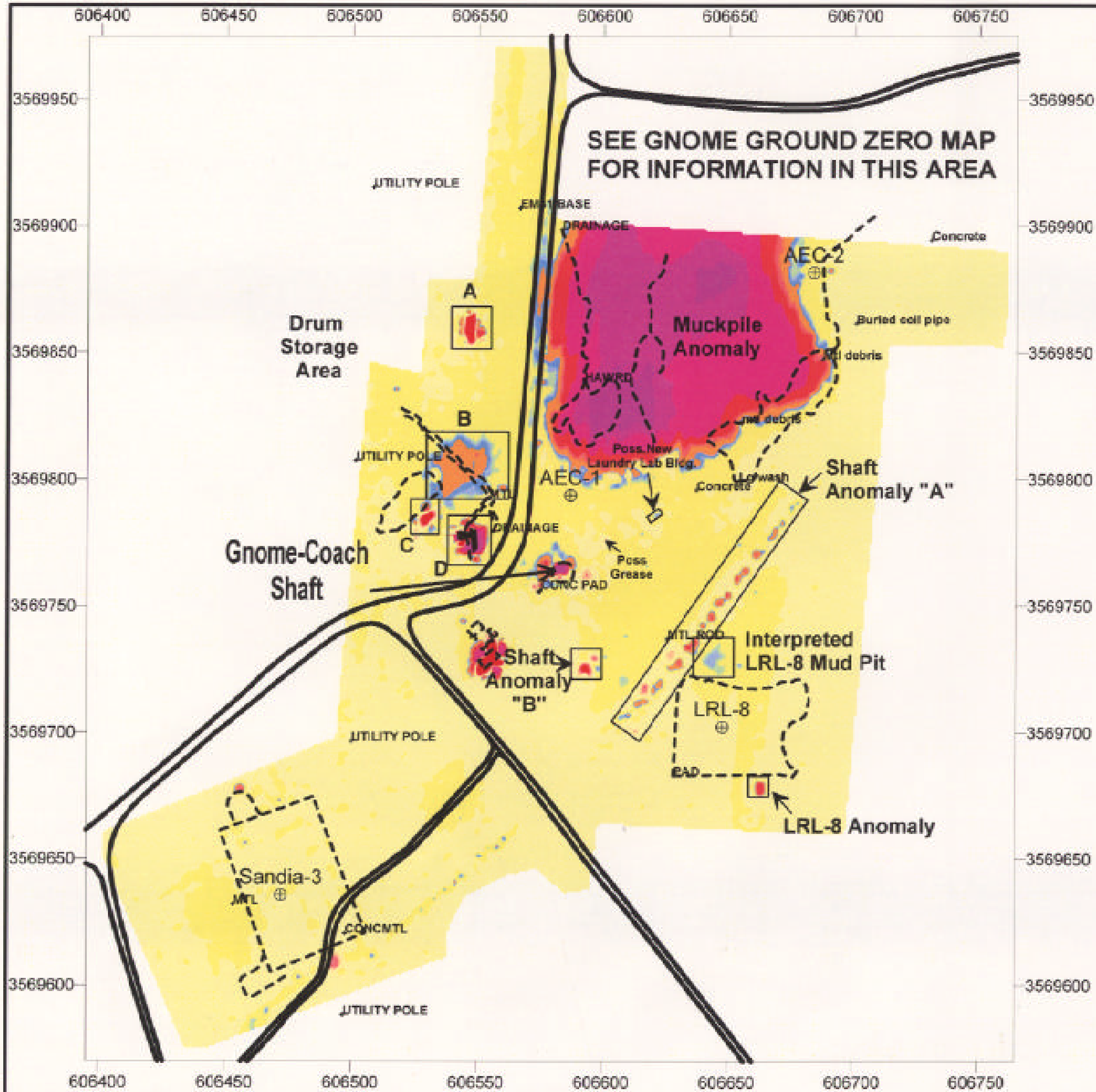


SEE GNOME GROUND ZERO MAP FOR INFORMATION IN THIS AREA
606400
606450
606500
606550
606600
606650
606700
606750
3569950
3569900
3569850
3569800
3569750
3569700
3569650
3569600
UTILITY POLE
Concrete
AEC-2
Buried coil pipe
Muckpile Anomaly
Drum Storage Area
A
B
C
D
AEC-1
Poss.New Laundry Lab Bldg
Shaft Anomaly "A"
Gnome-Coach Shaft
CONC PAD
Shaft Anomaly "D"
Interpreted LRL-8 Mud Pit
Shaft Anomaly "B"
LRL-8
Shaft Anomaly "C"
LRL-8 Anomaly
Sandia-3
Sandia-3 Anomaly
CONCMTL
Sandia-3 Mud Pit
73
50
40
30
25
20
15
10
5
0
-35
Conductivity (mS/m)
Scale (meters)
0 10 20 30 40 50 60
Coordinates in UTM, 13 North
NAD 1927 (CONUS), meters
www.quality-geophysics.com
Legend
Surficial Feature
Unpaved Road
N
Department of Energy - Gnome Coach Site
CARLSBAD, NEW MEXICO
SHAFT AND SANDIA-3 AREAS
Contoured Conductivity Data
drawn J. Warren
checked R. Hoover
approved
figure no. 8
date 04/09/02
date 04/10/02
job no. 01-1408-08-2006-015
file no. SHAFTQB.SRF
SAIC
Science Applications International Corporation
An Employee-Owned Company



Magnetic Susceptibility (ppt)

15, 10, 5, 3.2, 2.8, 2.6, 2, 1.8, 1.7, 1.6, 0.8, -1, -2.5, -5

Scale (meters)

0 10 20 30 40 50 60

Coordinates in UTM, 13 North
NAD 1927 (CONUS), meters

www.quality-geophysics.com

Legend

Surficial Feature
Unpaved Road

N

Department of Energy - Gnome Coach Site

CARLSBAD, NEW MEXICO

SHAFT AND SANDIA-3 AREAS
Contoured Magnetic Susceptibility Data

drawn	J. Warren	checked	R. Hoover	approved		figure no.
date	04/09/02	date	04/10/02	date		9
job no.	01-1408-08-2006-015	file no.	SHAFTIB.SRF			

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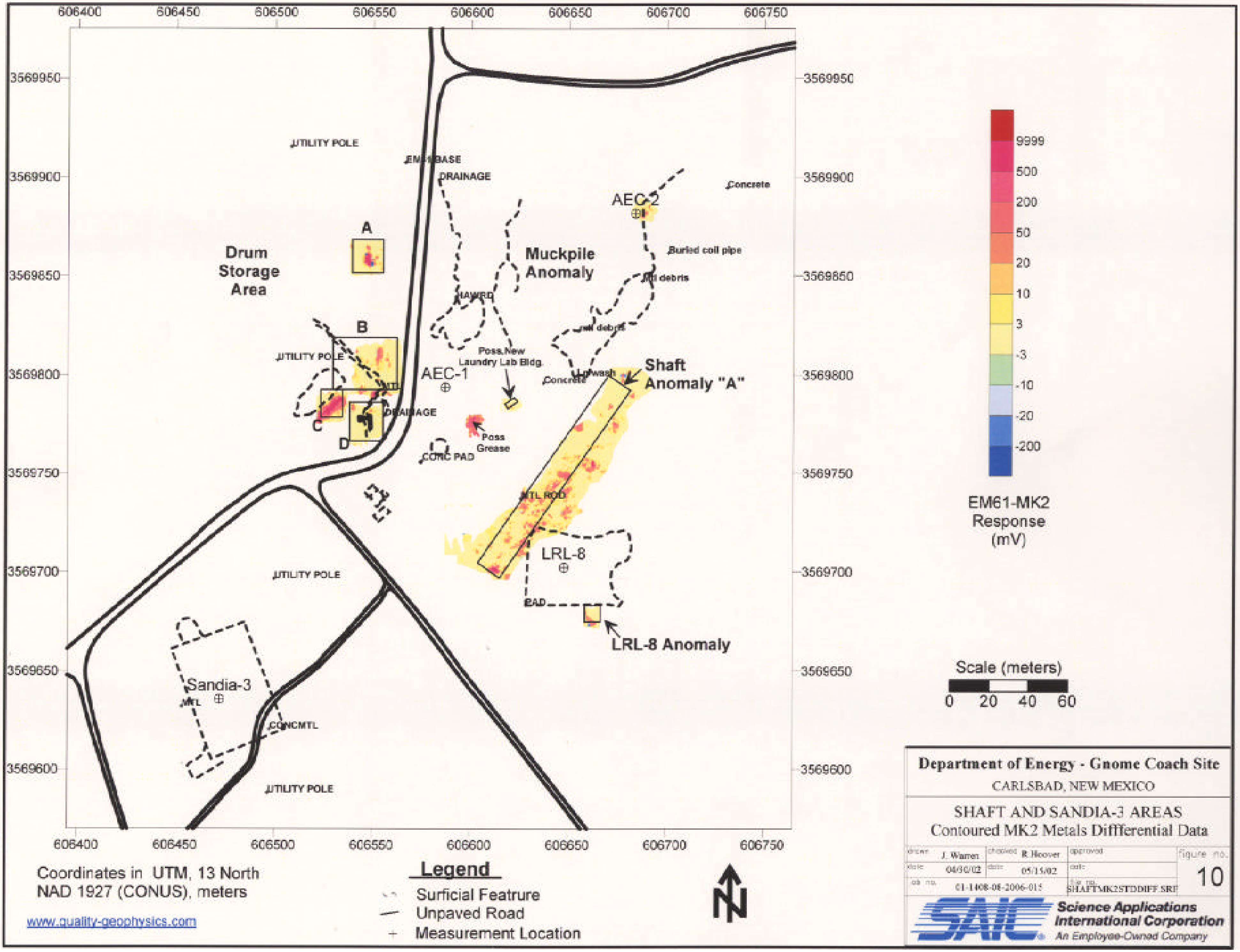
Drum Storage Area
A
B
C
D
UTILITY POLE
EM BASE
DRAINAGE
Muckpile Anomaly
AEC-2
Concrete
Buried coil pipe
debris
Poss.New Laundry Lab Bldg.
AEC-1
Concrete
Shaft Anomaly "A"
Poss Grease
CONC PAD
MTL ROD
LRL-8
PAD
LRL-8 Anomaly
Sandia-3
MTL
CONCMTL
EM61-MK2 Response (mV)
9999
500
200
50
20
10
3
-3
-10
-20
-200
Scale (meters)
0 20 40 60
Coordinates in UTM, 13 North
NAD 1927 (CONUS), meters
www.quality-geophysics.com
Legend
Surficial Featrure
Unpaved Road
Measurement Location
Department of Energy - Gnome Coach Site
CARLSBAD, NEW MEXICO
SHAFT AND SANDIA-3 AREAS
Contoured MK2 Metals Diffferential Data
drawn J. Warren
checked R. Hoover
approved
date 04/30/02
date 05/15/02
figure no. 10
01-1408-08-2006-015
SHAFTMK2STDDIFF.SRF
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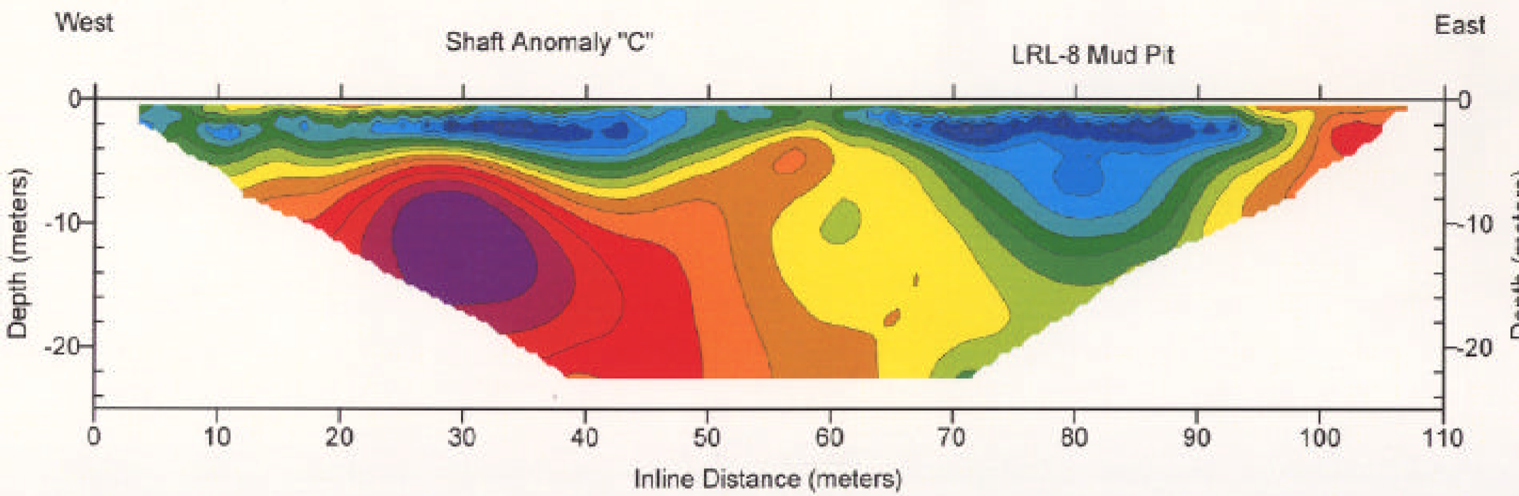

Modeled Resistivity (ohm-meters)

N

Scale (meters)

0 5 10 15

2-meter electrode spacing

Department of Energy - Gnome Coach Site

CARLSBAD, NEW MEXICO

ELECTRICAL IMAGING

Traverse 5

drawn	R.A.Hoover	checked	R.Hoover	approved		figure no.
date	05/21/02	date	05/22/02	date		11
job no.	01-1408-08-2006-015			file no.	EI5.SRF	

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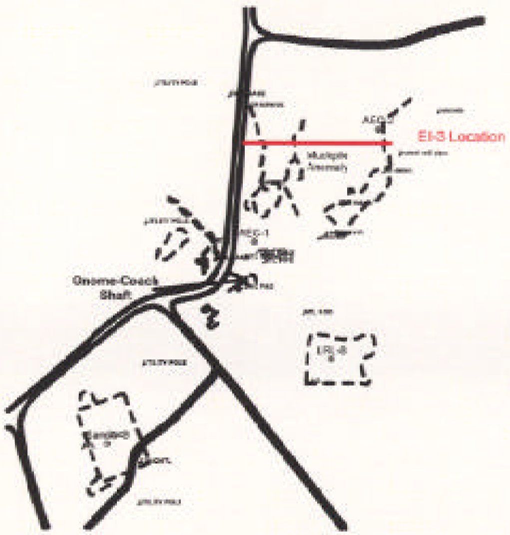

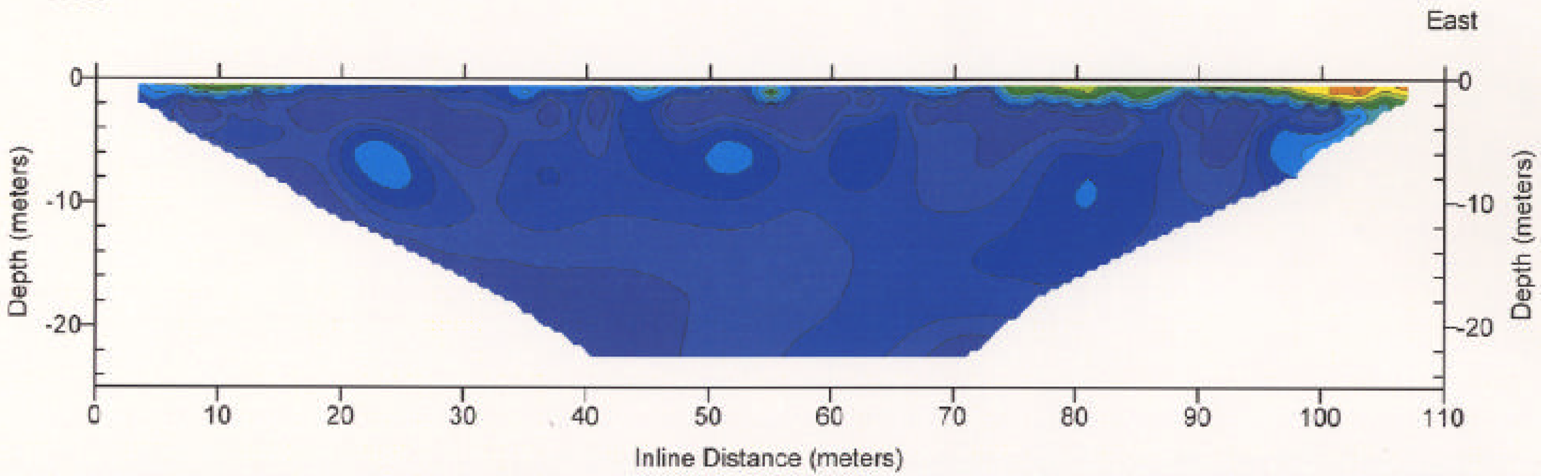

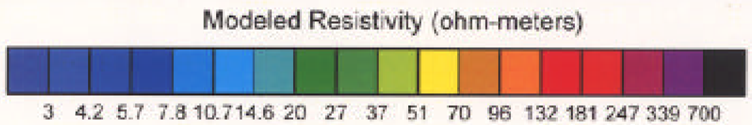

N

Scale (meters)

0 5 10 15

2-meter electrode spacing

Department of Energy - Gnome Coach Site

CARLSBAD, NEW MEXICO

ELECTRICAL IMAGING

Traverse 3

drawn R.A.Hoover	checked R.Hoover	approved		figure no.
date 05/21/02	date 05/22/02	date		12
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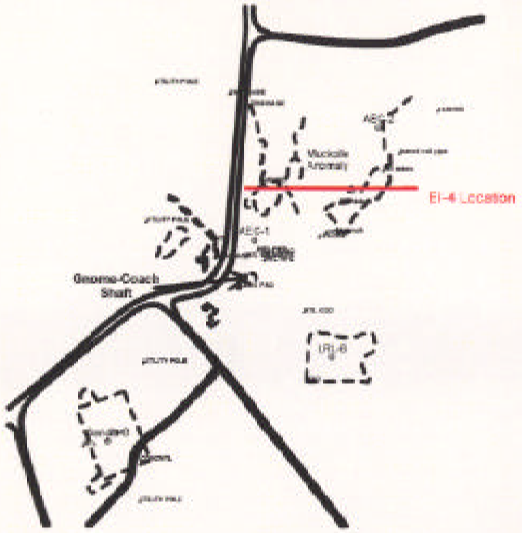

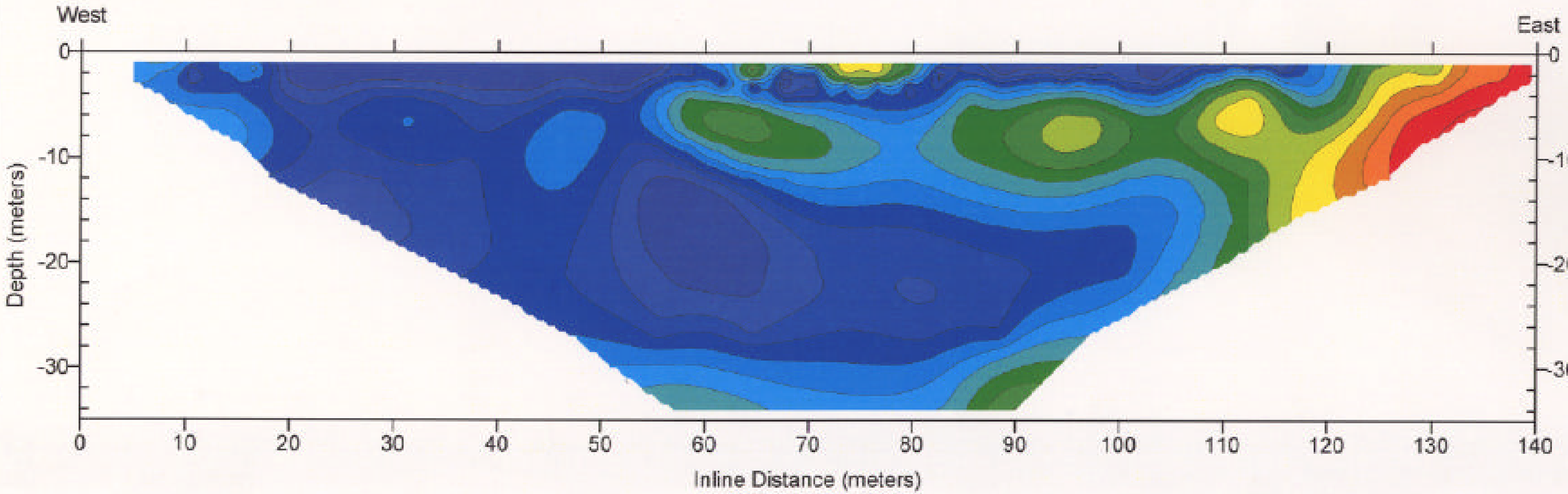

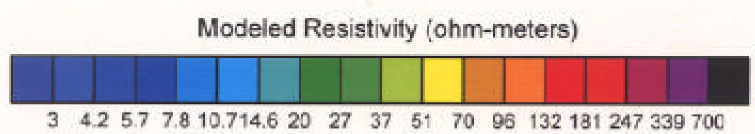

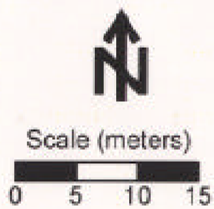

3-meter electrode spacing

Department of Energy - Gnome Coach Site
CARLSBAD, NEW MEXICO

ELECTRICAL IMAGING
Traverse 4

drawn R.A. Hoover	checked R. Hoover	approved	figure no. 13
date 05/21/02	date 05/22/02	date	
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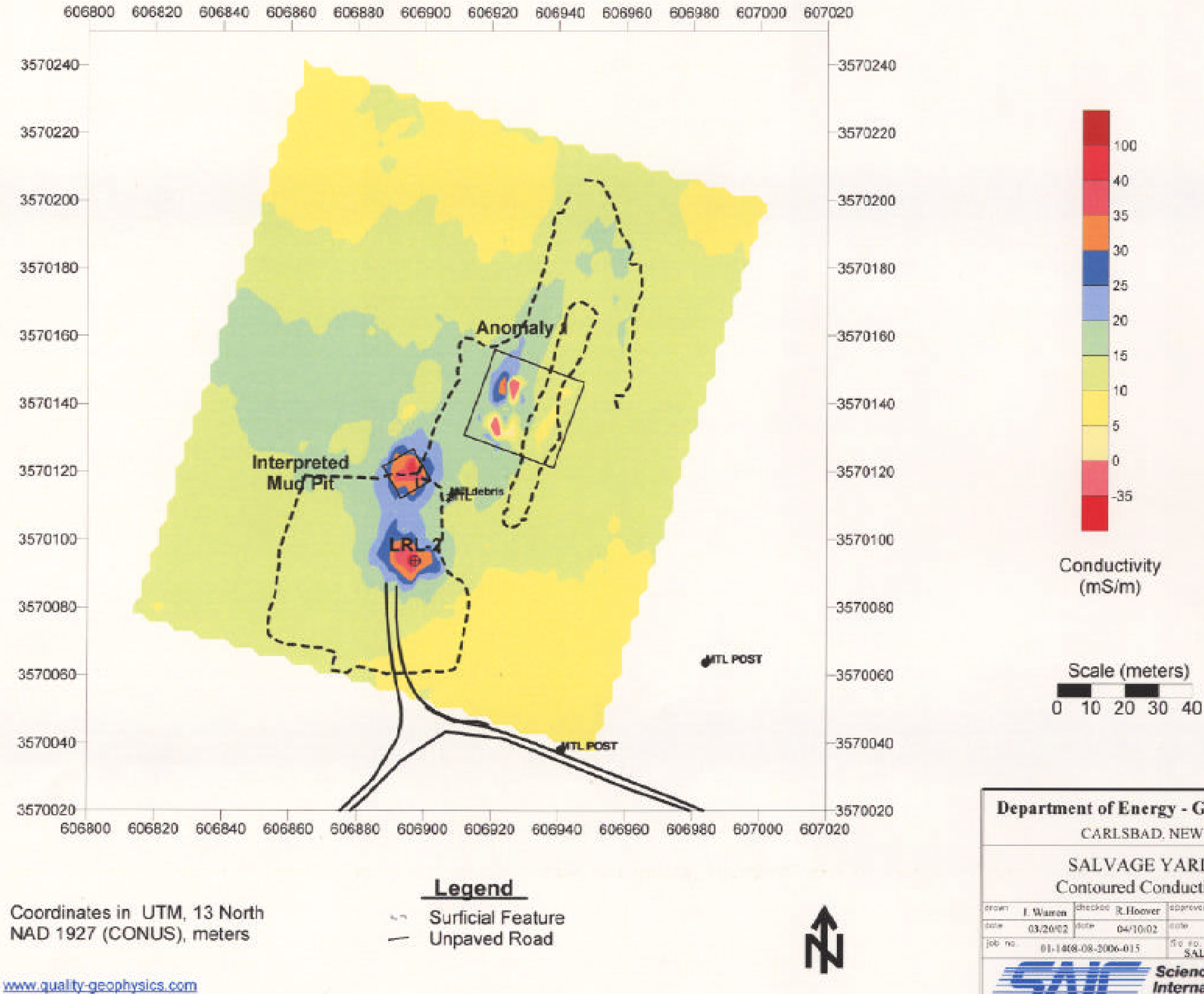

Department of Energy - Gnome Coach Site

CARLSBAD, NEW MEXICO

SALVAGE YARD AREA

Contoured Conductivity Data

drawn I. Warren	checked R.Hoover	approved	figure no.
date 03/20/02	date 04/10/02	date	15
job no. 01-1408-08-2006-015		file no. SALVAGEQB.SRF	

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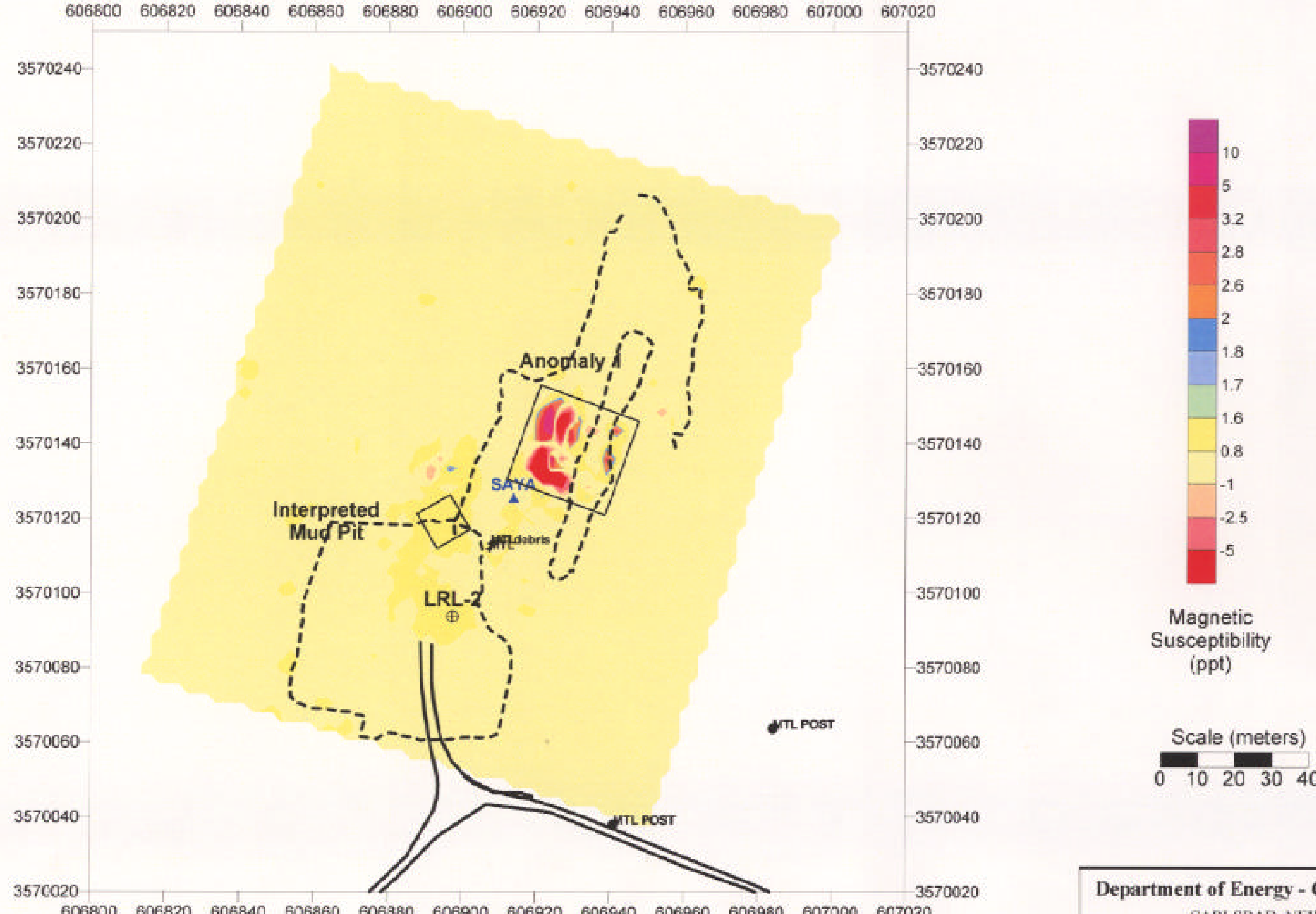

Coordinates in UTM, 13 North
NAD 1927 (CONUS), meters

Legend

Surficial Feature
Unpaved Road

N

Department of Energy - Gnome Coach Site
CARLSBAD, NEW MEXICO

SALVAGE YARD AREA
Contoured Magnetic Susceptibility Data

drawn J. Warren	checked R. Hoover	approved	figure no.
date 03/20/02	date 04/10/02	date	16
job no. 01-1408-08-2006-015		file no. SALVAGEIB.SRF	

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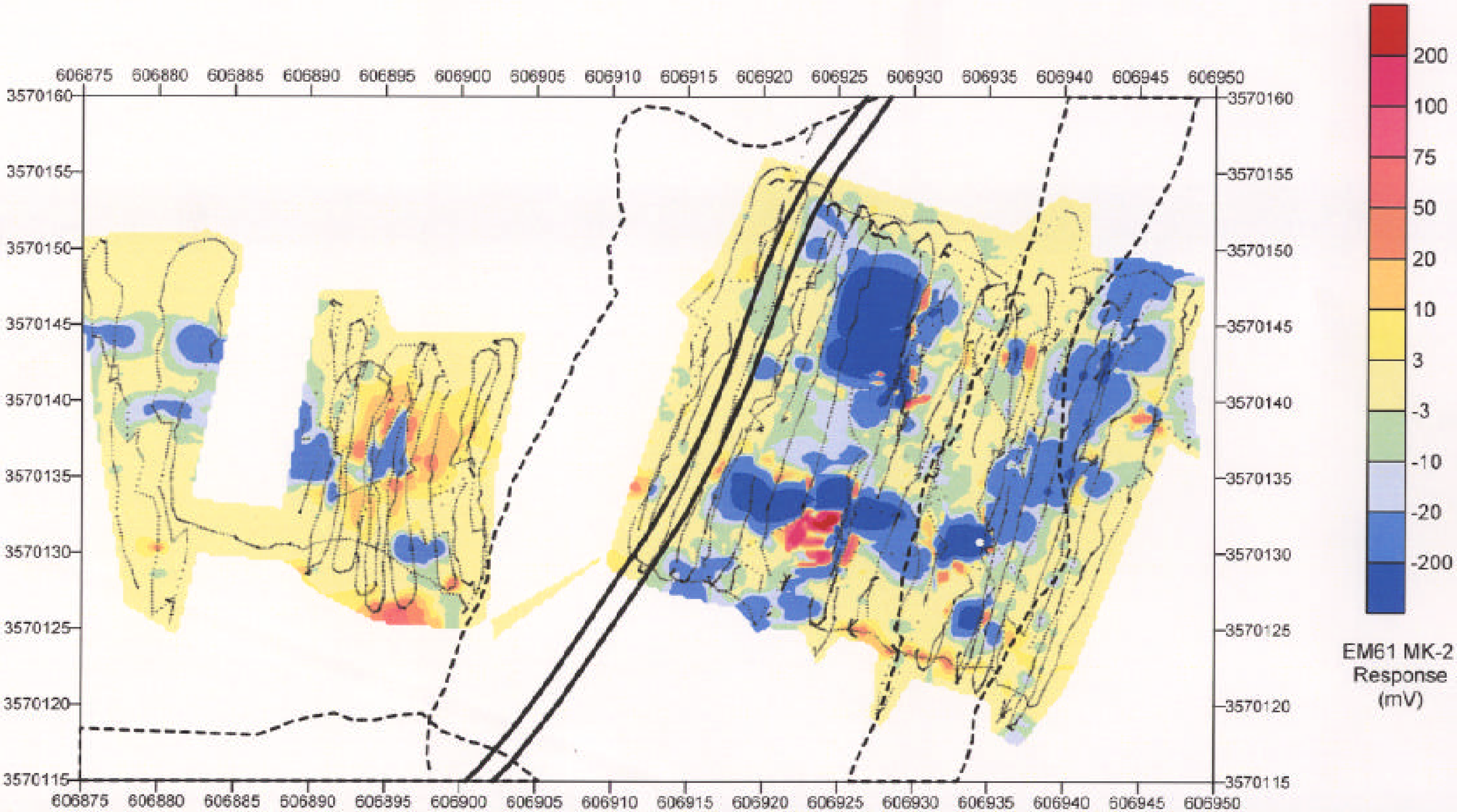

Coordinates in UTM, 13 North
NAD 1927 (CONUS), meters

www.quality-geophysics.com

Legend

- Surficial Feature
- Unpaved Road
- Measurement Location

N

Scale (meters)
0 2 4 6 8 10

Department of Energy - Gnome Coach Site			
CARLSBAD, NEW MEXICO			
SALVAGE AREA Contoured MK-2 Differential Data			
drawn J. Warren	checked R.Hoover	approved	figure no. 17
date 04/08/02	date 04/10/02	date	
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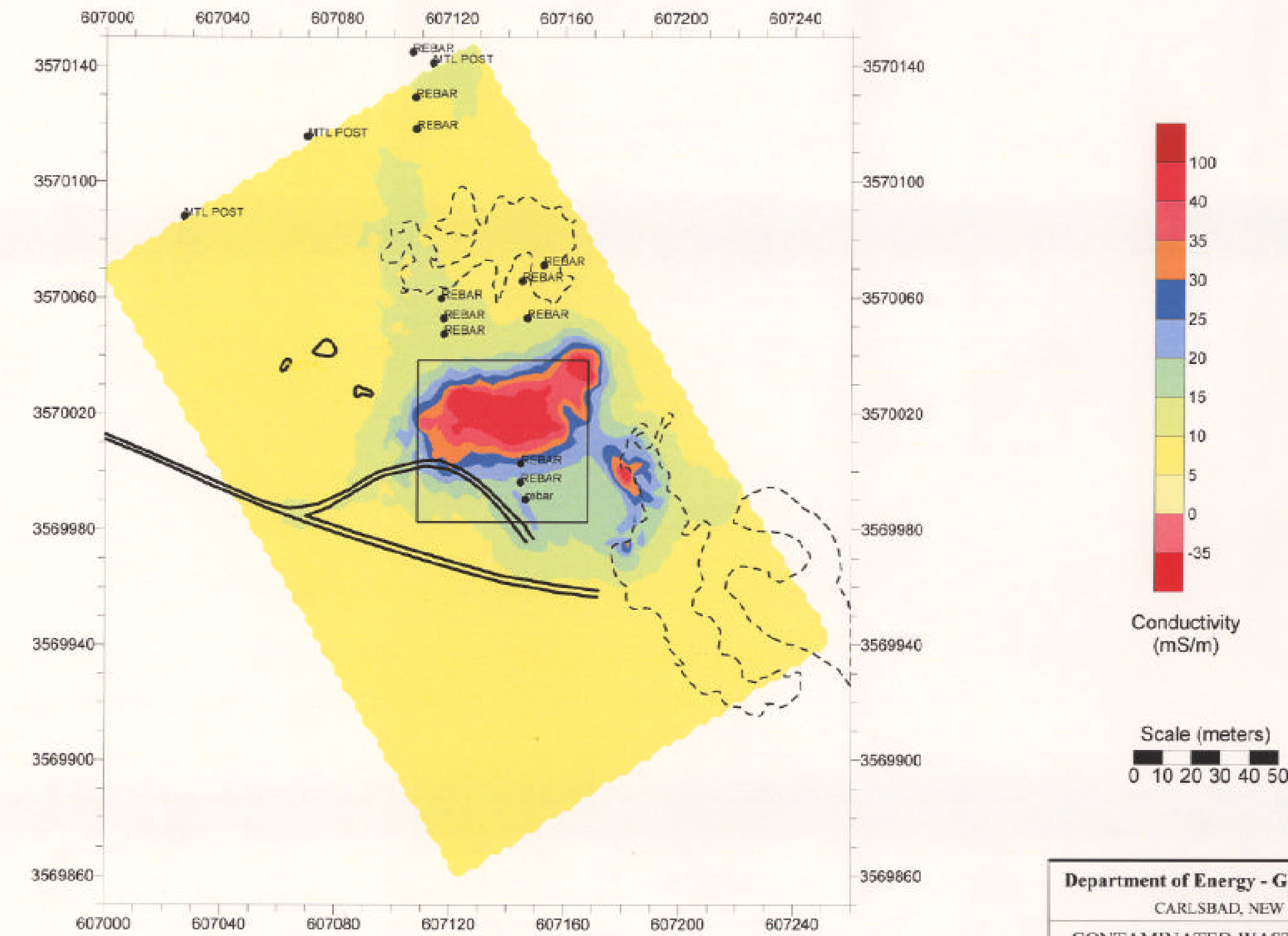

Coordinates in UTM, 13 North
NAD 1927 (CONUS), meters

Legend

Surficial Featrure
Unpaved Road

N

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Department of Energy - Gnome Coach Site		
CARLSBAD, NEW MEXICO		
CONTAMINATED WASTE DUMP AREA Contoured Conductivity Data		
drawn J. Warren	checked R. Hoover	approved
date 03/20/02	date 04/10/02	date
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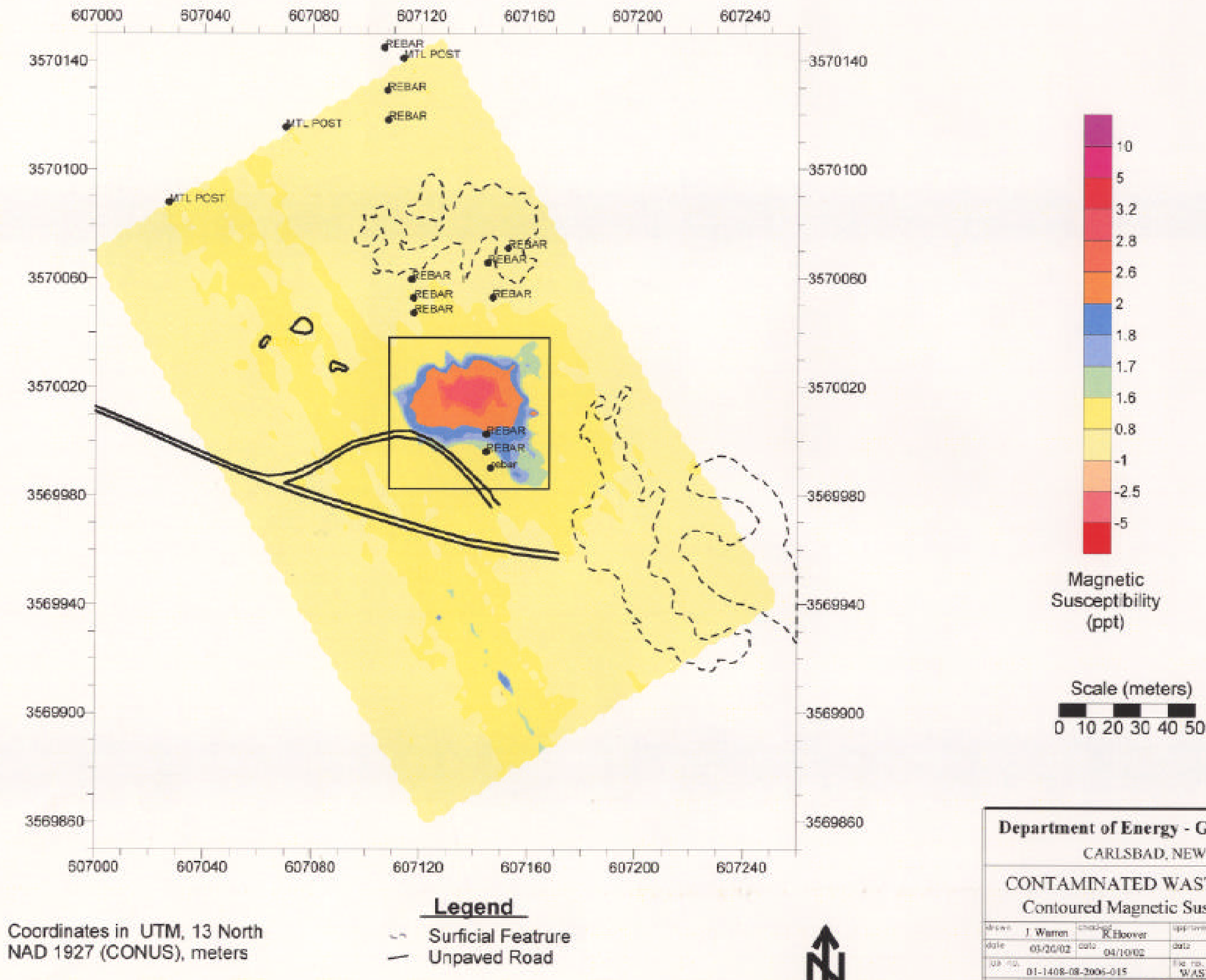

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Department of Energy - Gnome Coach Site

CARLSBAD, NEW MEXICO

CONTAMINATED WASTE DUMP AREA

Contoured Magnetic Susceptibility Data

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date	03/26/02	date	04/10/02	date		19
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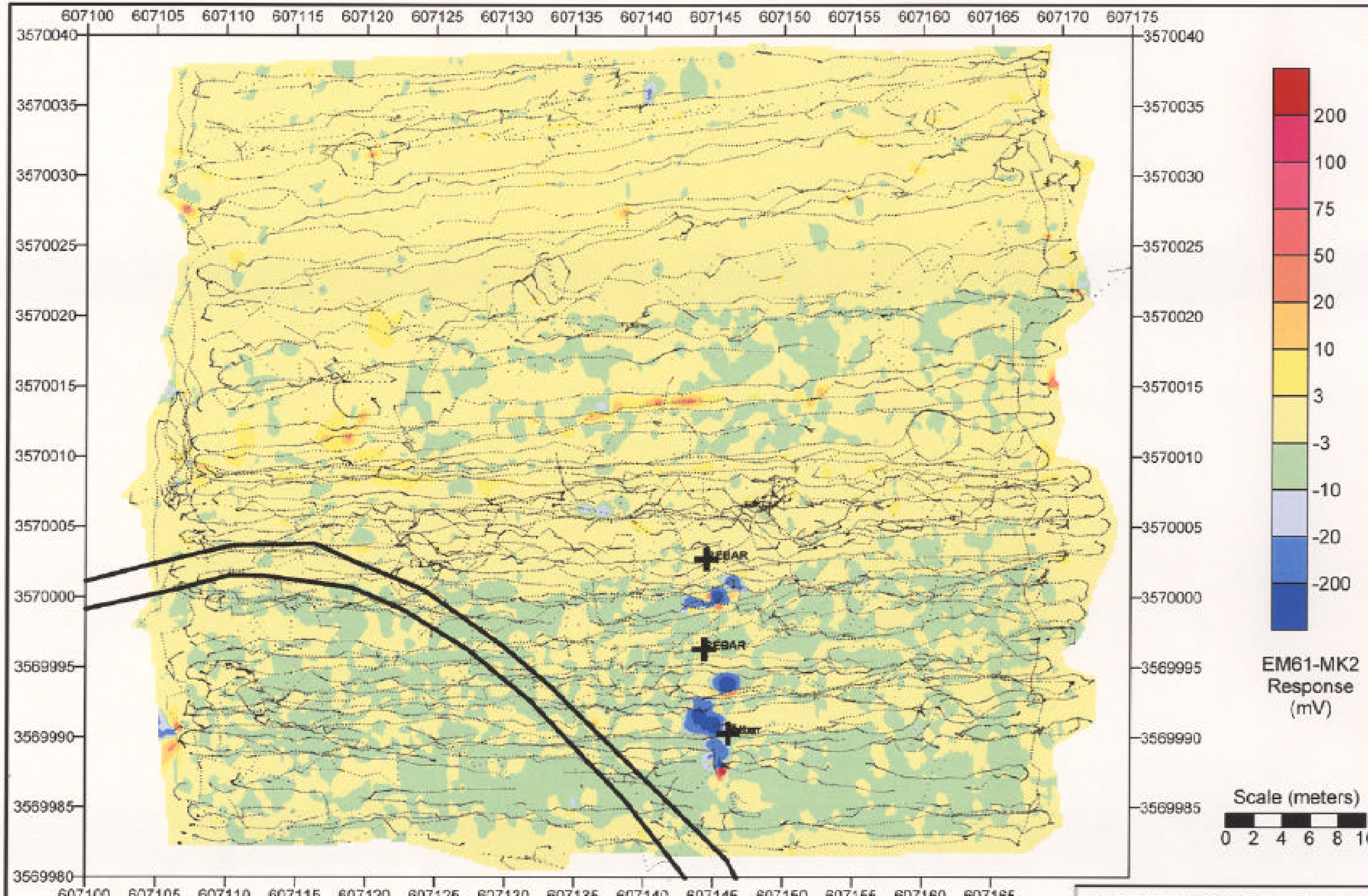
An Employee-Owned Company



Coordinates in UTM, 13 North
NAD 1927 (CONUS), meters

Legend

- Surficial Feature
- Unpaved Road
- Measurement Location

N

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Department of Energy - Gnome Coach Site

CARLSBAD, NEW MEXICO

CONTAMINATED WASTE DUMP

Contoured MK-2 Differential Data

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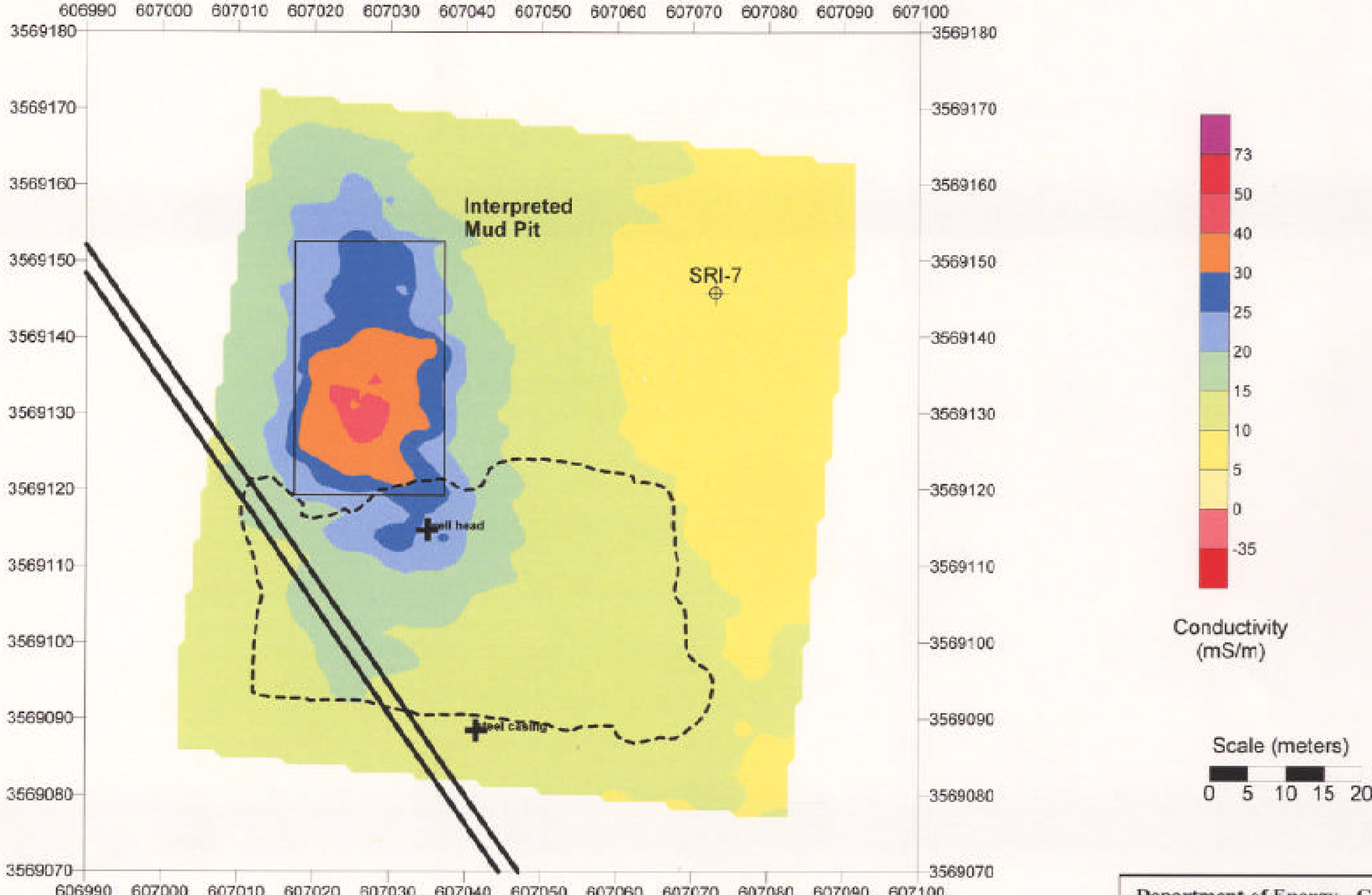
An Employee-Owned Company



Coordinates in UTM, 13 North
NAD 1927 (CONUS), meters

Legend

Surficial Feature
Unpaved Road

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Department of Energy - Gnome Coach Site
CARLSBAD, NEW MEXICO

WELL SRI-7
Contoured Conductivity Data

drawn	J. Warren	checked	R.Hoover	approved		figure no.
date	04/07/02	date	04/10/02	date		47
job no.	01-1408-08-2006-015			file no.	SRI7QB.SRF	

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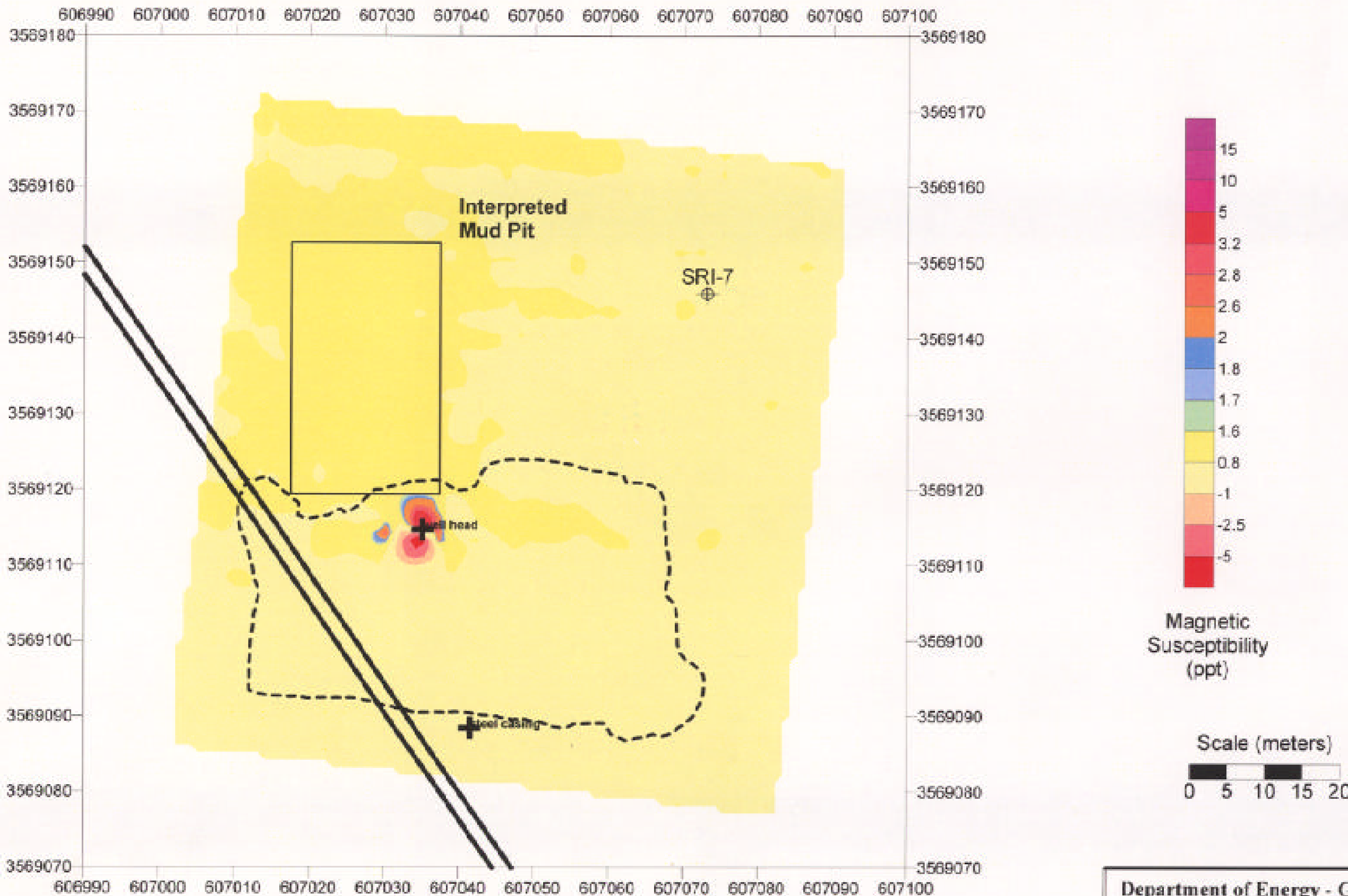

Coordinates in UTM, 13 North
NAD 1927 (CONUS), meters

Legend

Surficial Feature
Unpaved Road

N

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Department of Energy - Gnome Coach Site		
CARLSBAD, NEW MEXICO		
WELL SRI-7 Contoured Magnetic Susceptibility Data		
drawn J. Warren	checked R.Hoover	approved
date 04/07/02	date 04/10/02	date
job no. 01-1408-08-2006-015	file no. SRI7IB.SRF	figure no. 48

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Appendix E

Analytical Results

E.1.0 Analytical Results

Table E.1-1
Sample Locations, Types, and Analyses - Soils
(Page 1 of 8)

Borehole Number	Site Feature	Sample Number	Sample Matrix	Analyses
NA	Fallout Plume	FALA0001	Soil	GS
NA		FALB0001	Soil	GS
NA		FALC0001	Soil	GS
NA		FALD0001	Soil	GS
NA		FALE0001	Soil	GS
NA		FALF0001	Soil	GS
NA	Area 57	A57A0001	Soil	GS, Pu
NA	Salvage Yard	SAYA0001	Soil	GS
NA		SAYB0001	Soil	GS, Pu
NA	Equipment Storage Area	ESAA0001	Soil	GS, Pu
NA	Shaft Area	SHFA0001	Soil	GS
NA		SHFB0001	Soil	GS
NA		SHFC0001	Soil	GS
NA	Road Between Salvage Yard and Waste Dump	ROADA0001	Soil	GS
NA		ROADB0001	Soil	GS
NA		ROADC0001	Soil	GS
NA		ROADD0001	Soil	GS
NA	Road Near Waste Dump	ROADE0001	Soil	GS
NA		ROADF0001	Soil	GS
NA	Off of Road to Waste Dump	ROADG0001	Soil	GS
NA	East of Road to Waste Dump	ROADH0001	Soil	GS
NA	South of Road to Waste Dump	ROADI0001	Soil	GS

Table E.1-1
Sample Locations, Types, and Analyses - Soils
(Page 2 of 8)

Borehole Number	Site Feature	Sample Number	Sample Matrix	Analyses
CPTBA	Salvage Yard	CPTBA0708	Soil	Metals, GS
CPTBB		CPTBB0608	Soil	Metals, GS
CPTBC		CPTBC1012	Soil	Metals, GS
CPTBD		CPTBD1012	Soil	Metals, GS
CPTBE		CPTBE0102	Soil	GS
		CPTBE0305	Soil	Metals
CPTBF		CPTBF1214	Soil	Metals, GS
CPTBG		CPTBG0004	Soil	GS
		CPTBG0507	Soil	Metals
CPTBH		CPTBH0305	Soil	GS
		CPTBH0608	Soil	Metals
CPTBI		CPTBI0204	Soil	GS
		CPTBI0811	Soil	Metals
		CPTBI0101	Duplicate of CPTBI0811	Metals
CPTBJ		CPTBJ0507	Soil	GS
CPTBK		CPTBK0002	Soil	GS
CPTEC	New Lab Area	CPTEC0304	Soil	GS
CPTEE		CPTEE0608	Soil	GS
CPTEI		CPTEI0204	Soil	GS
CPTEJ		CPTEJ0204	Soil	GS
CPTFE	Salt Muckpile	CPTFE0709	Soil	GS
CPTFG		CPTFG0406	Soil	GS
CPTFJ		CPTFJ0305	Soil	GS
CPTFK		CPTFK0305	Soil	GS
CPTIC	Contaminated Waste Dump	CPTIC0305	Soil	GS
CPTID		CPTID0608	Soil	GS
CPTMC	Plume Area	CPTMC0001	Soil	GS
CPTMD		CPTMD0406	Soil	GS

Table E.1-1
Sample Locations, Types, and Analyses - Soils
(Page 3 of 8)

Borehole Number	Site Feature	Sample Number	Sample Matrix	Analyses
DECA	Decontamination Pad	DECA0304	Soil	VOCs, Metals, SVOCs
DECB		DECB0405	Soil	VOCs, Metals, SVOCs, GS
DECC		DECC0304	Soil	VOCs, Metals, SVOCs, GS
DECD		DECD0304	Soil	VOCs, Metals, SVOCs
DECE		DECE0304	Soil	VOCs, Metals, SVOCs, GS
DECF		DECF0304	Soil	VOCs, Metals, SVOCs
DECG		DECG0304	Soil	VOCs, Metals, SVOCs, GS
DECH		DECH0304	Soil	VOCs, Metals, SVOCs
DECI		DECI0304	Soil/Full Lab QC	VOCs, Metals, SVOCs
DECJ		DECJ0304	Soil	VOCs, Metals, SVOCs
DECK		DECK0304	Soil	VOCs, Metals, SVOCs
DECL		DECL0304	Soil	VOCs, Metals, SVOCs
		DECE0101	Duplicate of DECL0304	VOCs, Metals, SVOCs
DECM	Decontamination Pad Unknown Anomaly C	DECM0506	Soil	SC
DECQ		DECQ0102	Soil	SC
		DECQ0708	Soil	SC
DECR		DECR0708	Soil	SC
DECS		DECS0708	Soil	SC
DECT		DECT0708	Soil	SC
NA		DECU0102	Soil	TPH-Diesel
NA		DECV0102	Soil	TPH-Diesel
NA		DECW0102	Soil	TPH-Diesel
NA		DECX0102	Soil	TPH-Diesel
NA		DECY0102	Soil	TPH-Diesel
NA		DECZ0304	Soil	TPH-Diesel

Table E.1-1
Sample Locations, Types, and Analyses - Soils
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Borehole Number	Site Feature	Sample Number	Sample Matrix	Analyses
SHFA	Gnome-Coach Shaft	SHFA1112	Soil	SC, GS
SHFB		SHFB1112	Soil	SC, GS
SHFC		SHFC0304	Soil/Full Lab QC	SC, GS
SHFD		SHFD1112	Soil	SC, GS
SHFE		SHFE1112	Soil	SC, GS
SHFF		SHFF1112	Soil	SC, GS
SHFG		SHFG1112	Soil	SC, GS
SHFH		SHFH0506	Soil	SC, GS, Pu
SHFI		SHFI0506	Soil	SC, GS, Pu
SHFJ		SHFJ0506	Soil	SC, GS, Pu
SGZA	Unknown Anomaly “D” near Surface Ground Zero	SGZA0304	Soil/Full Lab QC	SC, GS
SGZB		SGZB0304	Soil	SC, GS
SGZC		SGZC0304	Soil	SC, GS
SGZD		SGZD0304	Soil	SC, GS
DSAA	Drum Storage Area	DSAA0405	Soil	SC, GS
DSAB		DSAB0405	Soil	SC, GS
DSAC		DSAC0405	Soil	SC, GS
DSAD		DSAD0405	Soil	SC, GS
DSAE		DSAE0405	Soil	SC, GS
		DSAC0101	Duplicate of DSAE0405	SC, GS
DSAF		DSAF0405	Soil	SC, GS
DSAG		DSAG0405	Soil/Full Lab QC	SC, GS
DSAH		DSAH0405	Soil	SC, GS
DSAI		DSAI0405	Soil	SC, GS

Table E.1-1
Sample Locations, Types, and Analyses - Soils
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Borehole Number	Site Feature	Sample Number	Sample Matrix	Analyses
WARA	Warehouse Area	WARA0506	Soil	Metals, GS
WARB		WARB0506	Soil	Metals, GS
WARC		WARC0506	Soil	Metals, GS
WARD		WARD0506	Soil	Metals, GS
WARZ		WARZ0101	Duplicate of WARD0506	Metals, GS
WARE		WARE0506	Soil/Full Lab QC	Metals, GS
WARF		WARF0506	Soil	Metals, GS
WARG		WARG0506	Soil	Metals, GS
WARH		WARH0506	Soil	Metals, GS
NEWA	New Laundry/Lab	NEWA0708	Soil	VOCs, Metals, SVOCs, GS
NEWB		NEWB0708	Soil	VOCs, Metals, SVOCs, GS
NEWC		NEWC0708	Soil	VOCs, Metals, SVOCs, GS
NEWD		NEWD0708	Soil	VOCs, Metals, SVOCs, GS
NEWE		NEWB0101	Duplicate of NEWE0708	VOCs, Metals, SVOCs, GS
		NEWE0708	Soil	VOCs, Metals, SVOCs, GS
NEWF		NEWF0708	Soil	VOCs, Metals, SVOCs, GS
NEWG		NEWG0708	Soil	VOCs, Metals, SVOCs, GS
NEWH		NEWH0708	Soil	VOCs, Metals, SVOCs, GS
GENA	Generator Pad	GENA0304	Soil	SC
GENB		GENB0304	Soil	SC
GENC		GENC0304	Soil	SC
GEND		GEND0304	Soil	SC
GENE		GENE0304	Soil	SC
GENF		GENF0304	Soil	SC
GENG		GENG0304	Soil	SC
GENH		GENH0304	Soil	SC

Table E.1-1
Sample Locations, Types, and Analyses - Soils
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Borehole Number	Site Feature	Sample Number	Sample Matrix	Analyses
USG1A	USGS-1 Drill Pad	USG1A0001	Soil	SC
		USG1A1112	Soil	SC
USG1B		USG1B0607	Soil	SC
USG1C		USG1C0607	Soil	SC
USG1D		USG1D0607	Soil	SC
USG2A	USGS-2 Drill Pad	USG2A1011	Soil	SC
USG2B		USG2B0910	Soil	SC
USG2C		USG2C0910	Soil	SC
USG5A	USGS-5 Drill Pad	USG5A0304	Soil	SC
USG5B		USG5B0203	Soil	SC
USG5C		USG5C0203	Soil	SC
USG4A	USGS-4 & 8 Drill Pad	USG4A0506	Soil	GS, Sr-90, H3
USG4B		USG4B0304	Soil	GS, Sr-90, H3
USG4C		USG4C0203	Soil	GS, Sr-90, H3
USG4D		USG4D0506	Soil	GS, Sr-90, H3
USG4E		USG4E0910	Soil	SC
		USG4D0101	Duplicate of USGE40910	SC
USG4F		USG4F0910	Soil	SC
USG4G		USG4G1011	Soil	SC, GS, H3, Sr-90
USG4H		USG4H0910	Soil	SC, GS, H3, Sr-90
USG4I		USG4I0910	Soil	SC, GS, H3, Sr-90
USG4J		USG4J0910	Soil	SC, GS, H3, Sr-90
USG4K		USG4K1011	Soil	SC
USG4L		USG4L1112	Soil	SC
USG7A	USGS-7 Drill Pad	USG7A1112	Soil	SC
USG7B		USG7B1112	Soil	SC
USG7D		USG7D1112	Soil	SC
LRL1A	LRL-1 Drill Pad	LRL1A1112	Soil	SC, GS
LRL1B		LRL1B1112	Soil	SC, GS
LRL1C		LRL1C1112	Soil	SC, GS

Table E.1-1
Sample Locations, Types, and Analyses - Soils
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Borehole Number	Site Feature	Sample Number	Sample Matrix	Analyses
LRL2A	LRL-2 Drill Pad	LRL2A1112	Soil	SC
LRL2B		LRL2B1112	Soil	SC
LRL2C		LRL2C1011	Soil	SC
LRL7A[1]	LRL-7 Drill Pad	LRL7A0809	Soil	SC
LRL7C[1]		LRL7C0910	Soil	SC
LRL7D[1]		LRL7D0809	Soil	SC
LRL8A	LRL-8 Drill Pad	LRL8A1112	Soil	SC, GS
LRL8B		LRL8B1112	Soil	SC, GS
LRL8C		LRL8C1112	Soil	SC, GS
SAN1A	Sandia No. 1 Drill Pad	SAN1A1011	Soil	SC
SAN1B		SAN1B1112	Soil	SC, Pu, GS
		SAN1B1415	Soil	SC, Pu, GS
SAN1C		SAN1C1112	Soil	SC
SAN1D		SAN1D1112	Soil	GS, Pu
SAN1E		SAN1E1112	Soil	GS, Pu
SAN3C	Sandia No. 3 Drill Pad	SAN3C1011	Soil	SC
		SAN3E0101	Duplicate of SAN3C1011	SC
SAN3D		SAN3D1112	Soil	SC
SAN3E		SAN3E1113	Soil	SC
SRN1A	SRI-1 Drill Pad	SRN1A1011	Soil	SC
SRN1B		SRN1B1112	Soil	SC
SRN1C		SRN1C0910	Soil	SC
SRN2A	SRI-2 Drill Pad	SRN2A0910	Soil	SC
SRN2B		SRN2B0809	Soil	SC
SRN2C		SRN2C1011	Soil	SC
		SRN2B0101	Duplicate of SRN2C1011	SC
SRN3A	SRI-3 Drill Pad	SRN3A0304	Soil/Full Lab QC	SC
SRN3B		SRN3B0506	Soil	SC
SRN3C		SRN3C0506	Soil	SC
SRN3D		SRN3D0506	Soil	SC

Table E.1-1
Sample Locations, Types, and Analyses - Soils
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Borehole Number	Site Feature	Sample Number	Sample Matrix	Analyses
SRN5A	SRI-5 Drill Pad	SRN5A1112	Soil	SC
SRN5B		SRN5B1011	Soil	SC
SRN5C		SRN5C0809	Soil	SC
SRN6A	SRI-6 Drill Pad	SRN6A1920	Soil	SC
SRN6B		SRN6B0910	Soil	SC
SRN6C		SRN6C0910	Soil	SC
SRN7A	SRI-7 Drill Pad	SRN7A0708	Soil	SC
SRN7B		SRN7B1920	Soil	SC
SRN7C		SRN7C1920	Soil	SC
SRN8A	SRI-8 Drill Pad	SRN8A1617	Soil	SC
SRN8B		SRN8B1718	Soil	SC
SRN8C		SRN8C1213	Soil	SC
SRN9A	SRI-9 Pad	SRN9A1112	Soil	SC
SRN9B		SRN9B1112	Soil/Full Lab QC	SC
SRN9C		SRN9C1112	Soil	SC
		SRN9A0101	Duplicate of SRN9C1112	SC

[1] LRL7 was excavated instead of drilled to collect soil samples.

Notes:
SC = Site Characterization parameters are: Total VOCs, total SVOCs, total RCRA metals with mercury, TPH (diesel-range organics and gasoline-range organics).
GS = Gamma spectroscopy
Sr-90 = Strontium-90
Pu = Isotopic plutonium
H3 = Tritium
Metals = Total RCRA metals with mercury
TPH = Diesel- and gasoline-range

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
GENC0304	Mercury	0.0029	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DECS0708	Mercury	0.0043	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SAN1C1112	Mercury	0.0027	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SAN1B1415	Mercury	0.0052	610	EPA PRGs	mg/kg	B	0.11	EPA7470
SAN1B1112	Mercury	0.0028	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SAN1A1011	Mercury	0.0048	610	EPA PRGs	mg/kg	B	0.11	EPA7470
NEWH0708	Mercury	0.0048	610	EPA PRGs	mg/kg	B	0.1	EPA7470
NEWG0708	Mercury	0.0043	610	EPA PRGs	mg/kg	B	0.1	EPA7470
NEWF0708	Mercury	0.0056	610	EPA PRGs	mg/kg	B	0.1	EPA7470
NEWE0708	Mercury	0.0066	610	EPA PRGs	mg/kg	B	0.11	EPA7470
NEWD0708	Mercury	0.006	610	EPA PRGs	mg/kg	B	0.1	EPA7470
NEWC0708	Mercury	0.0032	610	EPA PRGs	mg/kg	B	0.1	EPA7470
NEWB0708	Mercury	0.0042	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SAN3D1112	Mercury	0.0037	610	EPA PRGs	mg/kg	B	0.1	EPA7470
GEND0304	Mercury	0.0026	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SAN3E0101	Mercury	0.0029	610	EPA PRGs	mg/kg	B	0.1	EPA7470
GENA0304	Mercury	0.0036	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DSAI0405	Mercury	0.0086	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DSAH0405	Mercury	0.0094	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DSAG0405	Mercury	0.0056	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DSAF0405	Mercury	0.0079	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DSAE0405	Mercury	0.0078	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DSAD0405	Mercury	0.011	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DSAC0405	Mercury	0.0099	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DSAC0101	Mercury	0.0083	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DSAB0405	Mercury	0.0079	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DSAA0405	Mercury	0.0058	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DECT0708	Mercury	0.0049	610	EPA PRGs	mg/kg	B	0.11	EPA7470
NEWB0101	Mercury	0.0066	610	EPA PRGs	mg/kg	B	0.11	EPA7470
USG1B0607	Mercury	0.0045	610	EPA PRGs	mg/kg	B	0.1	EPA7470
WARZ0101	Mercury	0.0076	610	EPA PRGs	mg/kg	B	0.11	EPA7470
WARH0506	Mercury	0.23	610	EPA PRGs	mg/kg		0.11	EPA7470
WARG0506	Mercury	0.0059	610	EPA PRGs	mg/kg	B	0.11	EPA7470
WARF0506	Mercury	0.0065	610	EPA PRGs	mg/kg	B	0.1	EPA7470

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values

Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
WARE0506	Mercury	0.0079	610	EPA PRGs	mg/kg	B	0.11	EPA7470
WARD0506	Mercury	0.0067	610	EPA PRGs	mg/kg	B	0.11	EPA7470
WARC0506	Mercury	0.0053	610	EPA PRGs	mg/kg	B	0.1	EPA7470
WARB0506	Mercury	0.0061	610	EPA PRGs	mg/kg	B	0.1	EPA7470
WARA0506	Mercury	0.0055	610	EPA PRGs	mg/kg	B	0.1	EPA7470
USG2C0910	Mercury	0.0036	610	EPA PRGs	mg/kg	B	0.1	EPA7470
USG2B0910	Mercury	0.0035	610	EPA PRGs	mg/kg	B	0.1	EPA7470
USG2A1011	Mercury	0.0046	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SAN3C1011	Mercury	0.0026	610	EPA PRGs	mg/kg	B	0.1	EPA7470
USG1C0607	Mercury	0.0046	610	EPA PRGs	mg/kg	B	0.1	EPA7470
NEWA0708	Mercury	0.0034	610	EPA PRGs	mg/kg	B	0.1	EPA7470
USG1A1112	Mercury	0.005	610	EPA PRGs	mg/kg	B	0.1	EPA7470
USG1A0001	Mercury	0.0054	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SRN7A0708	Mercury	0.0037	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SRN5C0809	Mercury	0.0059	610	EPA PRGs	mg/kg	B	0.11	EPA7470
SRN5B1011	Mercury	0.0029	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SHFJ0506	Mercury	0.0069	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SHFI0506	Mercury	0.0081	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SHFH0506	Mercury	0.0089	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SHFG1112	Mercury	0.0037	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SHFF1112	Mercury	0.0041	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SHFE1112	Mercury	0.0028	610	EPA PRGs	mg/kg	B	0.1	EPA7470
SHFC0304	Mercury	0.004	610	EPA PRGs	mg/kg	B	0.1	EPA7470
USG1D0607	Mercury	0.0055	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGE0304	Mercury	0.0047	610	EPA PRGs	mg/kg	B	0.1	EPA7470
CPTBH0608	Mercury	0.31	610	EPA PRGs	mg/kg		0.1	EPA7470
CPTBG0507	Mercury	0.49	610	EPA PRGs	mg/kg		0.1	EPA7470
CPTBF1214	Mercury	0.0079	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGO1112	Mercury	0.003	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGN1112	Mercury	0.0041	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGM1112	Mercury	0.0033	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGK1112	Mercury	0.003	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGK0708	Mercury	0.0067	610	EPA PRGs	mg/kg	B	0.11	EPA7470
BKGJ1112	Mercury	0.0027	610	EPA PRGs	mg/kg	B	0.1	EPA7470

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
BKGJ0708	Mercury	0.0056	610	EPA PRGs	mg/kg	B	0.11	EPA7470
BKGI0708	Mercury	0.0029	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGF0304	Mercury	0.0063	610	EPA PRGs	mg/kg	B	0.1	EPA7470
CPTBI0101	Mercury	0.0052	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGE0708	Mercury	0.0048	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGI1112	Mercury	0.0028	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGA0001	Mercury	0.0033	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGE0001	Mercury	0.0057	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGD0304	Mercury	0.0052	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGD0101	Mercury	0.0071	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGD0001	Mercury	0.0063	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGC0708	Mercury	0.0034	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGC0304	Mercury	0.0034	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGC0001	Mercury	0.0032	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGB0304	Mercury	0.0031	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGB0001	Mercury	0.004	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGA0304	Mercury	0.0035	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGA0101	Mercury	0.0032	610	EPA PRGs	mg/kg	B	0.1	EPA7470
BKGF0001	Mercury	0.0051	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DECK0304	Mercury	0.0039	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DECR0708	Mercury	0.0055	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DECQ0708	Mercury	0.0069	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DECQ0102	Mercury	0.0078	610	EPA PRGs	mg/kg	B	0.12	EPA7470
DECM0506	Mercury	0.0029	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DECL0304	Mercury	0.0035	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DECJ0304	Mercury	0.0054	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DECI0304	Mercury	0.0062	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DECH0304	Mercury	0.0087	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DECG0304	Mercury	0.0071	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DECF0304	Mercury	0.006	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DECE0304	Mercury	0.0043	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DECA0304	Mercury	0.007	610	EPA PRGs	mg/kg	B	0.11	EPA7470
CPTBI0811	Mercury	0.0044	610	EPA PRGs	mg/kg	B	0.1	EPA7470
DECE0101	Mercury	0.0035	610	EPA PRGs	mg/kg	B	0.1	EPA7470

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
DECB0405	Mercury	0.0072	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DECC0304	Mercury	0.006	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DECD0304	Mercury	0.0054	610	EPA PRGs	mg/kg	B	0.11	EPA7470
DECQ0102	Diesel-Range Organics	12,000	2,200	NMED	mg/kg	D	60	EPA8015
DECV0102	Diesel-Range Organics	370	2,200	NMED	mg/kg	J	5.2	EPA8015
DECZ0304	Diesel-Range Organics	470	2,200	NMED	mg/kg	J	5.2	EPA8015
USG4I0910	Diesel-Range Organics	720	2,200	NMED	mg/kg		5.3	EPA8015
USG1A1112	Diesel-Range Organics	24	2,200	NMED	mg/kg	M	5.2	EPA8015
USG1A0001	Diesel-Range Organics	27	2,200	NMED	mg/kg	M	5.1	EPA8015
GENA0304	Diesel-Range Organics	1,200	2,200	NMED	mg/kg	M	5.1	EPA8015
SRN3A0304	Diesel-Range Organics	4.2	2,200	NMED	mg/kg	J	5.3	EPA8015
USG4I0910	1,2,3-Trichlorobenzene	1.2	N/A	N/A	µg/kg	J	5.3	EPA8260
SGZC0304	2-Butanone	14	2.8E+7	EPA PRGs	µg/kg	J	21	EPA8260
DSAH0405	2-Butanone	6.7	2.8E+7	EPA PRGs	µg/kg	J	21	EPA8260
LRL1C1112	2-Butanone	7.7	2.8E+7	EPA PRGs	µg/kg	J	21	EPA8260
LRL2C1011	Acetone	10	6.2E+6	EPA PRGs	µg/kg	J[a]	20	EPA8260
SGZC0304	Acetone	34	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SAN3C1011	Acetone	8.8	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
NEWH0708	Acetone	11	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
NEWG0708	Acetone	9.2	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
NEWE0708	Acetone	17	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
NEWD0708	Acetone	10	6.2E+6	EPA PRGs	µg/kg	J[b]	21	EPA8260
NEWB0101	Acetone	10	6.2E+6	EPA PRGs	µg/kg	J[b]	21	EPA8260
USG4L1112	Acetone	10	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
LRL2B1112	Acetone	22	6.2E+6	EPA PRGs	µg/kg	J[a]	22	EPA8260
LRL1B1112	Acetone	8.6	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
GENH0304	Acetone	11	6.2E+6	EPA PRGs	µg/kg	J[a]	20	EPA8260
GENG0304	Acetone	12	6.2E+6	EPA PRGs	µg/kg	J[a]	20	EPA8260
GENF0304	Acetone	9.5	6.2E+6	EPA PRGs	µg/kg	J[a]	20	EPA8260
GEND0304	Acetone	7.8	6.2E+6	EPA PRGs	µg/kg	J[a]	20	EPA8260
GENA0304	Acetone	21	6.2E+6	EPA PRGs	µg/kg	J[c]	20	EPA8260
DSAH0405	Acetone	18	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
NEWC0708	Acetone	10	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SRN1B1112	Acetone	8.2	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
SHFH0506	Acetone	11	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SRN5C0809	Acetone	10	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
USG1B0607	Acetone	8.5	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
USG1C0607	Acetone	8.4	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SHFE1112	Acetone	8.8	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
USG1D0607	Acetone	8.1	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
USG4I0910	Acetone	9.6	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SRN9A0101	Acetone	11	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SRN3D0506	Acetone	15	6.2E+6	EPA PRGs	µg/kg	J[d]	21	EPA8260
USG4G1011	Acetone	8.5	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SGZD0304	Acetone	10	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
USG1A0001	Acetone	14	6.2E+6	EPA PRGs	µg/kg	J[e]	20	EPA8260
SRN9B1112	Acetone	8.8	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SRN3A0304	Acetone	18	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SRN1C0910	Acetone	8	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SHFC0304	Acetone	9.1	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SRN9C1112	Acetone	11	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SRN3B0506	Acetone	24	6.2E+6	EPA PRGs	µg/kg	J[a]	22	EPA8260
SRN2C1011	Acetone	13	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
USG4D0101	Acetone	8.4	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
DECJ0304	Acetone	11	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
DECC0304	Acetone	8.9	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
DECL0304	Acetone	18	6.2E+6	EPA PRGs	µg/kg	J[a]	20	EPA8260
DECE0101	Acetone	17	6.2E+6	EPA PRGs	µg/kg	J[a]	20	EPA8260
DECF0304	Acetone	11	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
DSAA0405	Acetone	9.4	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
DSAC0101	Acetone	10	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
DSAC0405	Acetone	8.7	6.2E+6	EPA PRGs	µg/kg	J[a]	22	EPA8260
DECM0506	Acetone	14	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
DECI0304	Acetone	16	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
DECH0304	Acetone	17	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
DSAG0405	Acetone	12	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
DECG0304	Acetone	10	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
DSAD0405	Acetone	8.7	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
DECA0304	Acetone	8.7	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
DSAF0405	Acetone	19	6.2E+6	EPA PRGs	µg/kg	J[a]	21	EPA8260
SAN1B1112	Methylene Chloride	4.1	21,000	EPA PRGs	µg/kg	J	5.1	EPA8260
SAN1A1011	Methylene Chloride	4.5	21,000	EPA PRGs	µg/kg	J	5.6	EPA8260
SAN1B1415	Methylene Chloride	5.3	21,000	EPA PRGs	µg/kg	J	5.4	EPA8260
SAN1C1112	Methylene Chloride	5.5	21,000	EPA PRGs	µg/kg		5.2	EPA8260
SGZC0304	Methylene Chloride	9.3	21,000	EPA PRGs	µg/kg		5.3	EPA8260
SRN9A1112	Methylene Chloride	3	21,000	EPA PRGs	µg/kg	J	5.3	EPA8260
SGZD0304	Methylene Chloride	7.4	21,000	EPA PRGs	µg/kg		5.2	EPA8260
SHFC0304	Methylene Chloride	17	21,000	EPA PRGs	µg/kg		5.2	EPA8260
SGZA0304	Methylene Chloride	4.2	21,000	EPA PRGs	µg/kg	J	5.2	EPA8260
SRN5C0809	Methylene Chloride	30	21,000	EPA PRGs	µg/kg		5.3	EPA8260
SRN5B1011	Methylene Chloride	27	21,000	EPA PRGs	µg/kg		5.2	EPA8260
SRN9C1112	Methylene Chloride	3.1	21,000	EPA PRGs	µg/kg	J	5.2	EPA8260
LRL1A1112	Methylene Chloride	7.6	21,000	EPA PRGs	µg/kg		5.5	EPA8260
GENB0304	Methylene Chloride	18	21,000	EPA PRGs	µg/kg		5.1	EPA8260
GENC0304	Methylene Chloride	14	21,000	EPA PRGs	µg/kg		5.1	EPA8260
USG2C0910	Methylene Chloride	5.7	21,000	EPA PRGs	µg/kg		5.1	EPA8260
GENE0304	Methylene Chloride	11	21,000	EPA PRGs	µg/kg		5.1	EPA8260
LRL1B1112	Methylene Chloride	5.3	21,000	EPA PRGs	µg/kg	J	5.3	EPA8260
LRL1C1112	Methylene Chloride	4.9	21,000	EPA PRGs	µg/kg	J	5.3	EPA8260
LRL2B1112	Methylene Chloride	9.7	21,000	EPA PRGs	µg/kg		5.4	EPA8260
USG2B0910	Methylene Chloride	5.5	21,000	EPA PRGs	µg/kg		5.1	EPA8260
LRL2A1112	Methylene Chloride	5.9	21,000	EPA PRGs	µg/kg		5.2	EPA8260
USG2A1011	Methylene Chloride	4.2	21,000	EPA PRGs	µg/kg	J	5.1	EPA8260
USG4L1112	Methylene Chloride	11	21,000	EPA PRGs	µg/kg		5.4	EPA8260
GEND0304	Methylene Chloride	24	21,000	EPA PRGs	µg/kg		5.1	EPA8260
LRL2C1011	Methylene Chloride	4.1	21,000	EPA PRGs	µg/kg	J	5.1	EPA8260
DSAE0405	Toluene	2.1	520,000	EPA PRGs	µg/kg	J	5.3	EPA8260
GENA0304	Toluene	2.7	520,000	EPA PRGs	µg/kg	J[f]	5.1	EPA8260
SRN3A0304	Toluene	1.4	520,000	EPA PRGs	µg/kg	J	5.3	EPA8260
SRN7A0708	Toluene	1.5	520,000	EPA PRGs	µg/kg	J	5	EPA8260
DECL0304	Bis(2-Ethylhexyl)Phthalate	240	180,000	EPA PRGs	µg/kg	J	340	EPA8270
DECE0101	Bis(2-Ethylhexyl)Phthalate	2100	180,000	EPA PRGs	µg/kg		340	EPA8270

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
DECQ0102RR1	Chrysene	290	290,000	EPA PRGs	µg/kg	J[g]	2000	EPA8270
DECQ0102	Chrysene	170	290,000	EPA PRGs	µg/kg	J[h]	400	EPA8270
LRL2A1112	Gasoline-Range Organics	0.057	N/A	N/A	mg/kg	J	0.52	EPAG8015
USG1A0001	Gasoline-Range Organics	0.077	N/A	N/A	mg/kg	J	0.51	EPAG8015
USG4I0910	Gasoline-Range Organics	0.11	N/A	N/A	mg/kg	J	0.54	EPAG8015
DECQ0102	Gasoline-Range Organics	2.5	N/A	N/A	mg/kg	J[i]	0.61	EPAG8015
USG4G1011	Actinium-228	0.42 ± 0.14	N/A	N/A	pCi/g		0.23	HASL300
DSAF0405	Bismuth-212	1.24 ± 0.66	N/A	N/A	pCi/g	TI	0.54	HASL300
BKGG0001	Bismuth-214	0.3 ± 0.12	N/A	N/A	pCi/g		0.13	HASL300
WARA0101	Bismuth-214	0.34 ± 0.15	N/A	N/A	pCi/g		0.17	HASL300
WARC0506	Bismuth-214	0.26 ± 0.11	N/A	N/A	pCi/g		0.14	HASL300
DSAD0405	Bismuth-214	0.3 ± 0.12	N/A	N/A	pCi/g		0.16	HASL300
BKGE0001	Bismuth-214	0.242 ± 0.100	N/A	N/A	pCi/g		0.1	HASL300
DSAE0405	Bismuth-214	0.37 ± 0.14	N/A	N/A	pCi/g		0.15	HASL300
DSAI0405	Bismuth-214	0.43 ± 0.18	N/A	N/A	pCi/g		0.2	HASL300
DSAH0405	Bismuth-214	0.49 ± 0.20	N/A	N/A	pCi/g		0.2	HASL300
USG4B0304	Bismuth-214	0.34 ± 0.15	N/A	N/A	pCi/g		0.18	HASL300
BKGD0304	Bismuth-214	0.3 ± 0.13	N/A	N/A	pCi/g		0.13	HASL300
USG4A0506	Bismuth-214	0.36 ± 0.16	N/A	N/A	pCi/g		0.18	HASL300
DSAG0405A	Cesium-137	1.54 ± 0.31	167	NNSA/NV, 2002	pCi/g		0.11	HASL300
BKGA0001	Cesium-137	0.167 ± 0.051	167	NNSA/NV, 2002	pCi/g		0.053	HASL300
BKGC0001	Cesium-137	0.196 ± 0.063	167	NNSA/NV, 2002	pCi/g		0.036	HASL300
DSAG0405	Cesium-137	1.73 ± 0.41	167	NNSA/NV, 2002	pCi/g		0.21	HASL300
DSAI0405	Cesium-137	0.184 ± 0.083	167	NNSA/NV, 2002	pCi/g		0.09	HASL300
BKGA0101	Cesium-137	0.129 ± 0.056	167	NNSA/NV, 2002	pCi/g		0.059	HASL300
BKGD0101	Potassium-40	4.4 ± 1.5	N/A	N/A	pCi/g		1.4	HASL300
BKGG0304	Potassium-40	4.8 ± 1.3	N/A	N/A	pCi/g		0.79	HASL300
BKGD0102	Potassium-40	6.5 ± 1.4	N/A	N/A	pCi/g		0.87	HASL300
SHFG1112	Potassium-40	5.3 ± 2.3	N/A	N/A	pCi/g		2.5	HASL300
DSAF0405	Potassium-40	6.9 ± 1.9	N/A	N/A	pCi/g		1.1	HASL300

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
DSAD0405	Potassium-40	7.1 ± 1.5	N/A	N/A	pCi/g		1	HASL300
USG4H0910	Potassium-40	1.78 ± 0.77	N/A	N/A	pCi/g		0.76	HASL300
USG4G1011	Potassium-40	6.4 ± 1.4	N/A	N/A	pCi/g		0.84	HASL300
BKGD0001	Potassium-40	5.4 ± 1.5	N/A	N/A	pCi/g		0.89	HASL300
BKGC0304	Potassium-40	6.1 ± 1.7	N/A	N/A	pCi/g		0.85	HASL300
BKGC0102	Potassium-40	3.5 ± 1.3	N/A	N/A	pCi/g		1.4	HASL300
WARA0101	Potassium-40	6.2 ± 1.7	N/A	N/A	pCi/g		1.2	HASL300
WARA0506	Potassium-40	6 ± 1.8	N/A	N/A	pCi/g		1.2	HASL300
BKGG0001	Potassium-40	4.5 ± 1.3	N/A	N/A	pCi/g		0.81	HASL300
BKGG0102	Potassium-40	6.2 ± 1.3	N/A	N/A	pCi/g		0.83	HASL300
BKGF0304	Potassium-40	8.1 ± 1.7	N/A	N/A	pCi/g		0.96	HASL300
BKGD0304	Potassium-40	4.7 ± 1.4	N/A	N/A	pCi/g		1	HASL300
USG4B0304	Potassium-40	7 ± 1.8	N/A	N/A	pCi/g		0.99	HASL300
BKGF0102	Potassium-40	4.5 ± 1.6	N/A	N/A	pCi/g		1.7	HASL300
USG4D0506	Potassium-40	5.7 ± 1.7	N/A	N/A	pCi/g		1.1	HASL300
USG4I1011	Potassium-40	3.1 ± 1.3	N/A	N/A	pCi/g		1.6	HASL300
BKGE0001	Potassium-40	4.4 ± 1.2	N/A	N/A	pCi/g		0.68	HASL300
SHFF1112	Potassium-40	4.6 ± 1.8	N/A	N/A	pCi/g		1.6	HASL300
BKGH0001	Potassium-40	5.5 ± 1.7	N/A	N/A	pCi/g		1.6	HASL300
BKGH0304	Potassium-40	5.9 ± 1.6	N/A	N/A	pCi/g		1	HASL300
BKGE0102	Potassium-40	6 ± 1.9	N/A	N/A	pCi/g		1.8	HASL300
BKGF0001	Potassium-40	4.9 ± 1.4	N/A	N/A	pCi/g		0.93	HASL300
BKGE0304	Potassium-40	6 ± 1.8	N/A	N/A	pCi/g		1.1	HASL300
BKGH0102	Potassium-40	5.8 ± 1.7	N/A	N/A	pCi/g		1.2	HASL300
DSAE0405	Potassium-40	7.7 ± 1.9	N/A	N/A	pCi/g		0.87	HASL300
NEWB0708	Potassium-40	6.5 ± 2.7	N/A	N/A	pCi/g		2.4	HASL300
WARF0506	Potassium-40	6.7 ± 1.8	N/A	N/A	pCi/g		1	HASL300
WARC0506	Potassium-40	7.4 ± 1.6	N/A	N/A	pCi/g		0.93	HASL300
DSAI0405	Potassium-40	8.1 ± 2.1	N/A	N/A	pCi/g		1	HASL300
BKGB0304	Potassium-40	5.9 ± 1.3	N/A	N/A	pCi/g		0.99	HASL300
USG4C0203	Potassium-40	8.6 ± 2.3	N/A	N/A	pCi/g		1.8	HASL300
BKGC0001	Potassium-40	4.1 ± 1.2	N/A	N/A	pCi/g		0.73	HASL300
WARG0506	Potassium-40	5.8 ± 1.8	N/A	N/A	pCi/g		1.4	HASL300
NEWD0708	Potassium-40	5.2 ± 2.3	N/A	N/A	pCi/g		2.5	HASL300

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
NEWG0708	Potassium-40	5.3 ± 2.3	N/A	N/A	pCi/g		2.4	HASL300
WARD0506	Potassium-40	6.4 ± 1.7	N/A	N/A	pCi/g		0.9	HASL300
LRL8A1112	Potassium-40	6.3 ± 1.8	N/A	N/A	pCi/g		1.8	HASL300
LRL8B1112	Potassium-40	6.1 ± 2.3	N/A	N/A	pCi/g		2.1	HASL300
SHFJ0506	Potassium-40	9.1 ± 2.3	N/A	N/A	pCi/g		1.9	HASL300
WARE0506	Potassium-40	8.1 ± 2.2	N/A	N/A	pCi/g		1.5	HASL300
LRL8C1112	Potassium-40	6.2 ± 2.5	N/A	N/A	pCi/g		2.7	HASL300
NEWF0708	Potassium-40	6 ± 1.9	N/A	N/A	pCi/g		1.9	HASL300
WARB0506	Potassium-40	7.1 ± 1.5	N/A	N/A	pCi/g		1	HASL300
DSAG0405	Potassium-40	6.3 ± 1.8	N/A	N/A	pCi/g		1.5	HASL300
BKGB0102	Potassium-40	4.2 ± 1.4	N/A	N/A	pCi/g		1.3	HASL300
GNMH009	Potassium-40	6.3 ± 1.9	N/A	N/A	pCi/g		2	HASL300
SHFE1112	Potassium-40	6.9 ± 2.0	N/A	N/A	pCi/g		1.9	HASL300
USG4J0910	Potassium-40	2.7 ± 1.2	N/A	N/A	pCi/g		0.98	HASL300
WARH0506	Potassium-40	7.2 ± 1.6	N/A	N/A	pCi/g		1.1	HASL300
BKGA0101	Potassium-40	3.6 ± 1.1	N/A	N/A	pCi/g		0.78	HASL300
DSAH0405	Potassium-40	6 ± 2.0	N/A	N/A	pCi/g		1.8	HASL300
BKGA0001	Potassium-40	4.6 ± 1.0	N/A	N/A	pCi/g		0.73	HASL300
BKGB0001	Potassium-40	3.9 ± 1.2	N/A	N/A	pCi/g		0.87	HASL300
SHFC0304	Potassium-40	6.1 ± 1.8	N/A	N/A	pCi/g		1.9	HASL300
BKGA0304	Potassium-40	5.2 ± 1.6	N/A	N/A	pCi/g		1	HASL300
BKGA0102	Potassium-40	6.5 ± 1.8	N/A	N/A	pCi/g		1.2	HASL300
SHFI0506	Potassium-40	5.7 ± 2.7	N/A	N/A	pCi/g		2.9	HASL300
USG4A0506	Potassium-40	6.4 ± 1.7	N/A	N/A	pCi/g		0.77	HASL300
BKGG0001	Lead-212	0.233 ± 0.094	N/A	N/A	pCi/g		0.11	HASL300
BKGG0102	Lead-212	0.22 ± 0.077	N/A	N/A	pCi/g		0.095	HASL300
BKGG0304	Lead-212	0.27 ± 0.10	N/A	N/A	pCi/g		0.12	HASL300
BKGH0102	Lead-212	0.26 ± 0.11	N/A	N/A	pCi/g		0.14	HASL300
USG4B0304	Lead-212	0.55 ± 0.15	N/A	N/A	pCi/g		0.13	HASL300
BKGH0304	Lead-212	0.28 ± 0.11	N/A	N/A	pCi/g		0.13	HASL300
SHFE1112	Lead-212	0.34 ± 0.14	N/A	N/A	pCi/g		0.19	HASL300
DSAD0405	Lead-212	0.42 ± 0.11	N/A	N/A	pCi/g		0.12	HASL300
DSAE0405	Lead-212	0.42 ± 0.14	N/A	N/A	pCi/g		0.15	HASL300
DSAH0405	Lead-212	0.44 ± 0.16	N/A	N/A	pCi/g		0.17	HASL300

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
USG4A0506	Lead-212	0.43 ± 0.14	N/A	N/A	pCi/g		0.15	HASL300
DSAF0405	Lead-212	0.47 ± 0.15	N/A	N/A	pCi/g		0.14	HASL300
SHFJ0506	Lead-212	0.34 ± 0.14	N/A	N/A	pCi/g		0.19	HASL300
DSAI0405	Lead-212	0.54 ± 0.17	N/A	N/A	pCi/g		0.19	HASL300
BKGD0304	Lead-212	0.39 ± 0.12	N/A	N/A	pCi/g		0.12	HASL300
USG4J0910	Lead-212	0.217 ± 0.096	N/A	N/A	pCi/g		0.11	HASL300
BKGA0304	Lead-212	0.3 ± 0.12	N/A	N/A	pCi/g		0.14	HASL300
USG4C0203	Lead-212	0.47 ± 0.16	N/A	N/A	pCi/g		0.19	HASL300
BKGA0101	Lead-212	0.25 ± 0.096	N/A	N/A	pCi/g		0.12	HASL300
BKGA0001	Lead-212	0.241 ± 0.077	N/A	N/A	pCi/g		0.089	HASL300
BKGD0101	Lead-212	0.28 ± 0.11	N/A	N/A	pCi/g		0.13	HASL300
WARH0506	Lead-212	0.4 ± 0.12	N/A	N/A	pCi/g		0.13	HASL300
BKGD0102	Lead-212	0.44 ± 0.11	N/A	N/A	pCi/g		0.1	HASL300
WARG0506	Lead-212	0.31 ± 0.13	N/A	N/A	pCi/g		0.16	HASL300
BKGB0001	Lead-212	0.234 ± 0.094	N/A	N/A	pCi/g		0.12	HASL300
USG4G1011	Lead-212	0.303 ± 0.086	N/A	N/A	pCi/g		0.091	HASL300
BKGB0304	Lead-212	0.213 ± 0.073	N/A	N/A	pCi/g		0.089	HASL300
WARE0506	Lead-212	0.4 ± 0.15	N/A	N/A	pCi/g		0.19	HASL300
WARB0506	Lead-212	0.282 ± 0.091	N/A	N/A	pCi/g		0.11	HASL300
BKGE0001	Lead-212	0.243 ± 0.086	N/A	N/A	pCi/g		0.095	HASL300
WARA0101	Lead-212	0.33 ± 0.12	N/A	N/A	pCi/g		0.13	HASL300
WARC0506	Lead-212	0.345 ± 0.099	N/A	N/A	pCi/g		0.1	HASL300
BKGE0102	Lead-212	0.35 ± 0.13	N/A	N/A	pCi/g		0.16	HASL300
USG4D0506	Lead-212	0.36 ± 0.12	N/A	N/A	pCi/g		0.13	HASL300
BKGE0304	Lead-212	0.38 ± 0.13	N/A	N/A	pCi/g		0.15	HASL300
WARD0506	Lead-212	0.36 ± 0.13	N/A	N/A	pCi/g		0.15	HASL300
WARF0506	Lead-212	0.41 ± 0.14	N/A	N/A	pCi/g		0.16	HASL300
WARA0506	Lead-212	0.29 ± 0.12	N/A	N/A	pCi/g		0.16	HASL300
BKGF0304	Lead-212	0.34 ± 0.10	N/A	N/A	pCi/g		0.12	HASL300
BKGF0102	Lead-212	0.28 ± 0.12	N/A	N/A	pCi/g		0.15	HASL300
DSAH0405	Lead-214	0.48 ± 0.16	N/A	N/A	pCi/g		0.22	HASL300
WARA0101	Lead-214	0.233 ± 0.089	N/A	N/A	pCi/g		0.11	HASL300
BKGA0101	Lead-214	0.265 ± 0.094	N/A	N/A	pCi/g		0.12	HASL300
BKGA0001	Lead-214	0.239 ± 0.076	N/A	N/A	pCi/g		0.1	HASL300

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
WARH0506	Lead-214	0.29 ± 0.10	N/A	N/A	pCi/g		0.15	HASL300
WARB0506	Lead-214	0.26 ± 0.097	N/A	N/A	pCi/g		0.16	HASL300
WARF0506	Lead-214	0.36 ± 0.13	N/A	N/A	pCi/g		0.18	HASL300
WARC0506	Lead-214	0.249 ± 0.087	N/A	N/A	pCi/g		0.12	HASL300
DSAI0405	Lead-214	0.42 ± 0.14	N/A	N/A	pCi/g		0.16	HASL300
USG4G1011	Lead-214	0.281 ± 0.091	N/A	N/A	pCi/g		0.14	HASL300
BKGF0304	Lead-214	0.269 ± 0.087	N/A	N/A	pCi/g		0.12	HASL300
USG4C0203	Lead-214	0.37 ± 0.14	N/A	N/A	pCi/g		0.17	HASL300
USG4B0304	Lead-214	0.33 ± 0.12	N/A	N/A	pCi/g		0.15	HASL300
BKGG0304	Lead-214	0.21 ± 0.083	N/A	N/A	pCi/g		0.12	HASL300
BKGF0001	Lead-214	0.218 ± 0.082	N/A	N/A	pCi/g		0.12	HASL300
BKGH0102	Lead-214	0.29 ± 0.11	N/A	N/A	pCi/g		0.15	HASL300
BKGE0001	Lead-214	0.233 ± 0.086	N/A	N/A	pCi/g		0.12	HASL300
USG4D0506	Lead-214	0.265 ± 0.099	N/A	N/A	pCi/g		0.14	HASL300
BKGB0102	Lead-214	0.31 ± 0.13	N/A	N/A	pCi/g		0.16	HASL300
DSAD0405	Lead-214	0.36 ± 0.10	N/A	N/A	pCi/g		0.13	HASL300
BKGB0001	Lead-214	0.26 ± 0.091	N/A	N/A	pCi/g		0.12	HASL300
BKGD0102	Lead-214	0.29 ± 0.10	N/A	N/A	pCi/g		0.16	HASL300
DSAE0405	Lead-214	0.27 ± 0.11	N/A	N/A	pCi/g		0.15	HASL300
BKGD0101	Lead-214	0.28 ± 0.11	N/A	N/A	pCi/g		0.16	HASL300
USG4H0910	Lead-214	0.253 ± 0.090	N/A	N/A	pCi/g		0.12	HASL300
DSAF0405	Lead-214	0.39 ± 0.13	N/A	N/A	pCi/g		0.17	HASL300
BKGC0001	Lead-214	0.179 ± 0.073	N/A	N/A	pCi/g		0.097	HASL300
BKGA0304	Lead-214	0.3 ± 0.11	N/A	N/A	pCi/g		0.13	HASL300
USG4I1011	Lead-214	0.3 ± 0.13	N/A	N/A	pCi/g		0.15	HASL300
BKGD0304	Lead-214	0.27 ± 0.11	N/A	N/A	pCi/g		0.14	HASL300
USG4G1011	Thallium-208	0.142 ± 0.050	N/A	N/A	pCi/g		0.059	HASL300
WARC0506	Thallium-208	0.129 ± 0.054	N/A	N/A	pCi/g		0.069	HASL300
WARB0506	Thallium-208	0.129 ± 0.053	N/A	N/A	pCi/g		0.068	HASL300
USG4A0506	Thallium-208	0.189 ± 0.080	N/A	N/A	pCi/g		0.091	HASL300
BKGB0001	Thallium-208	0.107 ± 0.050	N/A	N/A	pCi/g		0.054	HASL300
DSAI0405	Thallium-208	0.204 ± 0.086	N/A	N/A	pCi/g		0.093	HASL300
BKGF0304	Thallium-208	0.129 ± 0.052	N/A	N/A	pCi/g		0.068	HASL300
BKGD0102	Thallium-208	0.15 ± 0.054	N/A	N/A	pCi/g		0.063	HASL300

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
BKGE0708	Arsenic	1.8	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGF0001	Arsenic	1.3	2.7	EPA PRGs	mg/kg		1	RCRAMetals
GENF0304	Arsenic	1.2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGF0304	Arsenic	2.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
GENE0304	Arsenic	1.5	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGI0708	Arsenic	1.9	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGI1112	Arsenic	2.2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DSAI0405	Arsenic	3.4	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGJ0708	Arsenic	1.3	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
GENC0304	Arsenic	1.1	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGJ1112	Arsenic	1.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGK0708	Arsenic	1.7	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
GENB0304	Arsenic	1.3	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGK1112	Arsenic	1.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGL0708	Arsenic	4.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
GENA0304	Arsenic	1.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGM1112	Arsenic	1.4	2.7	EPA PRGs	mg/kg		1	RCRAMetals
GEND0304	Arsenic	1.1	2.7	EPA PRGs	mg/kg		1	RCRAMetals
LRL1B1112	Arsenic	2.1	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
WARC0506	Arsenic	2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
WARD0506	Arsenic	1.8	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
WARE0506	Arsenic	3.1	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
WARF0506	Arsenic	2.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
WARG0506	Arsenic	2.7	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
WARH0506	Arsenic	2.9	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
LRL1C1112	Arsenic	1.6	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGE0304	Arsenic	2.3	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGB0304	Arsenic	1.2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGE0001	Arsenic	1.5	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGC0304	Arsenic	1.5	2.7	EPA PRGs	mg/kg		1	RCRAMetals
BKGD0001	Arsenic	1.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SAN1B1415	Arsenic	3.1	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGD0101	Arsenic	1.9	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SHFH0506	Arsenic	2.3	2.7	EPA PRGs	mg/kg		1	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
BKGD0304	Arsenic	2.8	2.7	EPA PRGs	mg/kg		1	RCRAMetals
GENH0304	Arsenic	1.2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
CPTBA0708	Arsenic	4	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGB0001	Arsenic	1.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECI0304	Arsenic	2.3	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECC0304	Arsenic	2.2	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
DECD0304	Arsenic	2.4	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
DSAB0405	Arsenic	1.9	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECE0101	Arsenic	1.4	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECE0304	Arsenic	1.9	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECF0304	Arsenic	2.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECG0304	Arsenic	2.2	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGO1112	Arsenic	1.8	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECT0708	Arsenic	2.5	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
DECA0304	Arsenic	2.7	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
WARZ0101	Arsenic	2.1	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
DECS0708	Arsenic	1.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECK0304	Arsenic	1.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECL0304	Arsenic	2.2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECR0708	Arsenic	2	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
DECM0506	Arsenic	2.2	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
DECQ0102	Arsenic	2.9	2.7	EPA PRGs	mg/kg		1.2	RCRAMetals
DECH0304	Arsenic	2.4	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DSAE0405	Arsenic	2.4	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
LRL2B1112	Arsenic	3.6	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
DSAH0405	Arsenic	3.1	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
LRL1A1112	Arsenic	2.5	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
DSAG0405	Arsenic	1.4	2.7	EPA PRGs	mg/kg		1	RCRAMetals
CPTBB0608	Arsenic	4	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
CPTBC1012	Arsenic	1.9	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DSAF0405	Arsenic	2.8	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
DSAC0101	Arsenic	2.7	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
CPTBE0305	Arsenic	2.1	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECB0405	Arsenic	2	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
CPTBF1214	Arsenic	1.8	2.7	EPA PRGs	mg/kg		1	RCRAMetals
CPTBG0507	Arsenic	10	2.7	EPA PRGs	mg/kg		1	RCRAMetals
CPTBH0608	Arsenic	3.1	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DSAD0405	Arsenic	3.6	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
CPTBI0101	Arsenic	4.1	2.7	EPA PRGs	mg/kg		1	RCRAMetals
CPTBI0811	Arsenic	3.4	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DSAC0405	Arsenic	2.6	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGN1112	Arsenic	1.2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
CPTBD1012	Arsenic	2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN3D0506	Arsenic	2.8	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
NEWC0708	Arsenic	1.4	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN1C0910	Arsenic	3	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN2A0910	Arsenic	2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
NEWB0708	Arsenic	1.2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN2B0101	Arsenic	1.6	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN2B0809	Arsenic	3.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN2C1011	Arsenic	1.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN3A0304	Arsenic	3.1	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN3B0506	Arsenic	3.9	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
LRL8B1112	Arsenic	1.8	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
NEWA0708	Arsenic	1.9	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SHFJ0506	Arsenic	1.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
WARB0506	Arsenic	1.3	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN5B1011	Arsenic	1.3	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN5C0809	Arsenic	1.8	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN6A1920	Arsenic	2.1	2.7	EPA PRGs	mg/kg		1	RCRAMetals
LRL8C1112	Arsenic	1.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN6B0910	Arsenic	2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN6C0910	Arsenic	2.3	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN7A0708	Arsenic	1.5	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN7B1920	Arsenic	1.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN3C0506	Arsenic	2.2	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
SHFA1112	Arsenic	2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SAN1C1112	Arsenic	2.2	2.7	EPA PRGs	mg/kg		1	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
SAN3C1011	Arsenic	2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SAN3D1112	Arsenic	1.8	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SAN1B1112	Arsenic	1.9	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SAN3E0101	Arsenic	2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SAN3E1112	Arsenic	1.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SGZA0304	Arsenic	1.5	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SAN1A1011	Arsenic	3.8	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
SGZB0304	Arsenic	3	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN1B1112	Arsenic	2.1	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SGZD0304	Arsenic	2.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN1A1011	Arsenic	3.8	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SHFB1112	Arsenic	1.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SHFC0304	Arsenic	2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SHFD1112	Arsenic	1.5	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SHFE1112	Arsenic	1.5	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SHFF1112	Arsenic	1.9	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SHFG1112	Arsenic	1.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECJ0304	Arsenic	2.7	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
SHFI0506	Arsenic	2.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
NEWD0708	Arsenic	1.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN5A1112	Arsenic	1.4	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SGZC0304	Arsenic	2.7	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
USG1B0607	Arsenic	2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
USG4E0910	Arsenic	1.4	2.7	EPA PRGs	mg/kg		1	RCRAMetals
USG4D0101	Arsenic	1.3	2.7	EPA PRGs	mg/kg		1	RCRAMetals
USG4K1011	Arsenic	2	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
USG5A0304	Arsenic	1.3	2.7	EPA PRGs	mg/kg		1	RCRAMetals
LRL7D0809	Arsenic	1.4	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
USG4F0910	Arsenic	1.9	2.7	EPA PRGs	mg/kg		1	RCRAMetals
LRL7C0910	Arsenic	1.9	2.7	EPA PRGs	mg/kg		1	RCRAMetals
LRL7A0809	Arsenic	1.8	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
USG4G1011	Arsenic	1.4	2.7	EPA PRGs	mg/kg		1	RCRAMetals
USG1D0607	Arsenic	1.9	2.7	EPA PRGs	mg/kg		1	RCRAMetals
USG4H0910	Arsenic	2.5	2.7	EPA PRGs	mg/kg		1	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
USG5B0203	Arsenic	0.99	2.7	EPA PRGs	mg/kg	B	1	RCRAMetals
USG5C0203	Arsenic	1.2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
USG2A1011	Arsenic	1.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
USG7B1112	Arsenic	1.8	2.7	EPA PRGs	mg/kg		1	RCRAMetals
LRL8A1112	Arsenic	2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
LRL2C1011	Arsenic	2.6	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN7C1920	Arsenic	1.9	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
WARA0506	Arsenic	1.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
USG7A1112	Arsenic	1.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
USG4I0910	Arsenic	2.1	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN9A1112	Arsenic	4.9	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN8C1213	Arsenic	3.3	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
USG4J0910	Arsenic	1.8	2.7	EPA PRGs	mg/kg		1.1	RCRAMetals
USG1C0607	Arsenic	2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
USG7D1112	Arsenic	1.7	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN8B1718	Arsenic	2	2.7	EPA PRGs	mg/kg		1	RCRAMetals
SRN8A1617	Arsenic	2.3	2.7	EPA PRGs	mg/kg		1	RCRAMetals
DECE0101	Barium	22	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGB0304	Barium	19	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DECD0304	Barium	37	100,000	EPA PRGs	mg/kg		11	RCRAMetals
DECC0304	Barium	57	100,000	EPA PRGs	mg/kg		11	RCRAMetals
BKGB0001	Barium	19	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGC0001	Barium	15	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DECE0304	Barium	42	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DECF0304	Barium	40	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DECG0304	Barium	35	100,000	EPA PRGs	mg/kg		11	RCRAMetals
BKGA0304	Barium	19	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DECB0405	Barium	140	100,000	EPA PRGs	mg/kg		11	RCRAMetals
DECH0304	Barium	74	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGA0001	Barium	15	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DECI0304	Barium	39	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DECJ0304	Barium	48	100,000	EPA PRGs	mg/kg		11	RCRAMetals
DECK0304	Barium	21	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DECL0304	Barium	25	100,000	EPA PRGs	mg/kg		10	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
DECM0506	Barium	1500	100,000	EPA PRGs	mg/kg		53	RCRAMetals
BKGA0101	Barium	16	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGF0304	Barium	55	100,000	EPA PRGs	mg/kg		10	RCRAMetals
CPTBI0101	Barium	640	100,000	EPA PRGs	mg/kg		10	RCRAMetals
CPTBA0708	Barium	64	100,000	EPA PRGs	mg/kg		11	RCRAMetals
BKGE0708	Barium	47	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGO1112	Barium	540	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGD0001	Barium	26	100,000	EPA PRGs	mg/kg		10	RCRAMetals
CPTBB0608	Barium	100	100,000	EPA PRGs	mg/kg		11	RCRAMetals
BKGM1112	Barium	25	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGE0001	Barium	48	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGL0708	Barium	1300	100,000	EPA PRGs	mg/kg		51	RCRAMetals
BKGK1112	Barium	140	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGI0708	Barium	290	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGK0708	Barium	550	100,000	EPA PRGs	mg/kg		11	RCRAMetals
BKGJ1112	Barium	700	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGI1112	Barium	480	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGF0001	Barium	22	100,000	EPA PRGs	mg/kg		10	RCRAMetals
CPTBG0507	Barium	370	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DECA0304	Barium	40	100,000	EPA PRGs	mg/kg		11	RCRAMetals
BKGC0304	Barium	19	100,000	EPA PRGs	mg/kg		10	RCRAMetals
CPTBI0811	Barium	450	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGC0708	Barium	18	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGN1112	Barium	33	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGE0304	Barium	45	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGJ0708	Barium	750	100,000	EPA PRGs	mg/kg		11	RCRAMetals
DECQ0102	Barium	95	100,000	EPA PRGs	mg/kg		12	RCRAMetals
BKGD0101	Barium	28	100,000	EPA PRGs	mg/kg		10	RCRAMetals
CPTBF1214	Barium	150	100,000	EPA PRGs	mg/kg		10	RCRAMetals
CPTBE0305	Barium	360	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGD0304	Barium	51	100,000	EPA PRGs	mg/kg		10	RCRAMetals
CPTBD1012	Barium	330	100,000	EPA PRGs	mg/kg		10	RCRAMetals
CPTBC1012	Barium	29	100,000	EPA PRGs	mg/kg		10	RCRAMetals
CPTBH0608	Barium	490	100,000	EPA PRGs	mg/kg		10	RCRAMetals

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Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
SHFB1112	Barium	190	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SHFI0506	Barium	48	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SHFH0506	Barium	50	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SHFG1112	Barium	140	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SHFF1112	Barium	150	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SHFE1112	Barium	96	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SHFD1112	Barium	340	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SAN3E1112	Barium	140	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SHFC0304	Barium	28	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DSAE0405	Barium	53	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SHFA1112	Barium	210	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SGZD0304	Barium	30	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SGZC0304	Barium	45	100,000	EPA PRGs	mg/kg		11	RCRAMetals
DSAG0405	Barium	63	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SGZB0304	Barium	50	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SGZA0304	Barium	25	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN6C0910	Barium	480	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DSAF0405	Barium	65	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SRN3A0304	Barium	72	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SRN6B0910	Barium	170	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN6A1920	Barium	52	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN5C0809	Barium	56	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SRN5B1011	Barium	700	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN5A1112	Barium	230	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DSAD0405	Barium	73	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SRN3D0506	Barium	58	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SHFJ0506	Barium	41	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN3B0506	Barium	82	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SRN1A1011	Barium	77	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN2C1011	Barium	390	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN2B0809	Barium	230	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN2B0101	Barium	77	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SAN1B1112	Barium	86	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN1C0910	Barium	230	100,000	EPA PRGs	mg/kg		10	RCRAMetals

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Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
SRN1B1112	Barium	300	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SAN3E0101	Barium	270	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN3C0506	Barium	91	100,000	EPA PRGs	mg/kg		11	RCRAMetals
LRL2A1112	Barium	20	100,000	EPA PRGs	mg/kg		10	RCRAMetals
GENC0304	Barium	17	100,000	EPA PRGs	mg/kg		10	RCRAMetals
LRL8A1112	Barium	740	100,000	EPA PRGs	mg/kg		10	RCRAMetals
LRL7D0809	Barium	79	100,000	EPA PRGs	mg/kg		11	RCRAMetals
LRL7C0910	Barium	35	100,000	EPA PRGs	mg/kg		10	RCRAMetals
GEND0304	Barium	17	100,000	EPA PRGs	mg/kg		10	RCRAMetals
LRL7A0809	Barium	570	100,000	EPA PRGs	mg/kg		11	RCRAMetals
DSAH0405	Barium	46	100,000	EPA PRGs	mg/kg		11	RCRAMetals
LRL2B1112	Barium	69	100,000	EPA PRGs	mg/kg		11	RCRAMetals
NEWA0708	Barium	390	100,000	EPA PRGs	mg/kg		10	RCRAMetals
GENE0304	Barium	22	100,000	EPA PRGs	mg/kg		10	RCRAMetals
LRL1C1112	Barium	250	100,000	EPA PRGs	mg/kg		11	RCRAMetals
GENF0304	Barium	23	100,000	EPA PRGs	mg/kg		10	RCRAMetals
LRL1B1112	Barium	230	100,000	EPA PRGs	mg/kg		11	RCRAMetals
GENG0304	Barium	16	100,000	EPA PRGs	mg/kg		10	RCRAMetals
LRL1A1112	Barium	900	100,000	EPA PRGs	mg/kg		11	RCRAMetals
GENH0304	Barium	16	100,000	EPA PRGs	mg/kg		10	RCRAMetals
LRL2C1011	Barium	260	100,000	EPA PRGs	mg/kg		10	RCRAMetals
NEWF0708	Barium	59	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SAN3D1112	Barium	130	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DSAI0405	Barium	52	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SAN3C1011	Barium	240	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SAN1C1112	Barium	28	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SAN1B1415	Barium	450	100,000	EPA PRGs	mg/kg		11	RCRAMetals
GENA0304	Barium	30	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SAN1A1011	Barium	1,200	100,000	EPA PRGs	mg/kg		22	RCRAMetals
LRL8B1112	Barium	46	100,000	EPA PRGs	mg/kg		11	RCRAMetals
NEWG0708	Barium	810	100,000	EPA PRGs	mg/kg		10	RCRAMetals
LRL8C1112	Barium	270	100,000	EPA PRGs	mg/kg		10	RCRAMetals
NEWE0708	Barium	820	100,000	EPA PRGs	mg/kg		11	RCRAMetals
GENB0304	Barium	19	100,000	EPA PRGs	mg/kg		10	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
NEWD0708	Barium	62	100,000	EPA PRGs	mg/kg		10	RCRAMetals
NEWC0708	Barium	370	100,000	EPA PRGs	mg/kg		10	RCRAMetals
NEWB0708	Barium	28	100,000	EPA PRGs	mg/kg		10	RCRAMetals
NEWB0101	Barium	530	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SRN2A0910	Barium	270	100,000	EPA PRGs	mg/kg		10	RCRAMetals
NEWH0708	Barium	730	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG4E0910	Barium	62	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG1B0607	Barium	29	100,000	EPA PRGs	mg/kg		10	RCRAMetals
WARC0506	Barium	68	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG1C0607	Barium	44	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG4G1011	Barium	19	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG1D0607	Barium	30	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG4K1011	Barium	290	100,000	EPA PRGs	mg/kg		11	RCRAMetals
USG2A1011	Barium	61	100,000	EPA PRGs	mg/kg		10	RCRAMetals
WARA0506	Barium	68	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG2B0910	Barium	130	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG2C0910	Barium	22	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DECR0708	Barium	120	100,000	EPA PRGs	mg/kg		11	RCRAMetals
USG7D1112	Barium	390	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DSAB0405	Barium	68	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG5C0203	Barium	21	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG4L1112	Barium	170	100,000	EPA PRGs	mg/kg		11	RCRAMetals
USG4J0910	Barium	190	100,000	EPA PRGs	mg/kg		11	RCRAMetals
DECS0708	Barium	24	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG5A0304	Barium	20	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG5B0203	Barium	15	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DSAA0405	Barium	47	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG4I0910	Barium	200	100,000	EPA PRGs	mg/kg		11	RCRAMetals
USG4D0101	Barium	63	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG4H0910	Barium	370	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG7A1112	Barium	120	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DSAC0405	Barium	80	100,000	EPA PRGs	mg/kg		11	RCRAMetals
USG7B1112	Barium	80	100,000	EPA PRGs	mg/kg		10	RCRAMetals
USG4F0910	Barium	48	100,000	EPA PRGs	mg/kg		10	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
WARB0506	Barium	46	100,000	EPA PRGs	mg/kg		10	RCRAMetals
DECT0708	Barium	520	100,000	EPA PRGs	mg/kg		11	RCRAMetals
DSAC0101	Barium	51	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SRN7A0708	Barium	18	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN7B1920	Barium	33	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN7C1920	Barium	1,500	100,000	EPA PRGs	mg/kg		21	RCRAMetals
WARZ0101	Barium	45	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SRN8A1617	Barium	340	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN8B1718	Barium	34	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN8C1213	Barium	420	100,000	EPA PRGs	mg/kg		11	RCRAMetals
WARH0506	Barium	58	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SRN9A0101	Barium	260	100,000	EPA PRGs	mg/kg		10	RCRAMetals
WARG0506	Barium	76	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SRN9A1112	Barium	250	100,000	EPA PRGs	mg/kg		11	RCRAMetals
SRN9B1112	Barium	820	100,000	EPA PRGs	mg/kg		11	RCRAMetals
USG1A1112	Barium	47	100,000	EPA PRGs	mg/kg		10	RCRAMetals
WARE0506	Barium	61	100,000	EPA PRGs	mg/kg		11	RCRAMetals
WARF0506	Barium	43	100,000	EPA PRGs	mg/kg		10	RCRAMetals
WARD0506	Barium	48	100,000	EPA PRGs	mg/kg		11	RCRAMetals
USG1A0001	Barium	31	100,000	EPA PRGs	mg/kg		10	RCRAMetals
SRN9C1112	Barium	240	100,000	EPA PRGs	mg/kg		10	RCRAMetals
BKGA0001	Cadmium	0.066	810	EPA PRGs	mg/kg	B	0.5	RCRAMetals
LRL8B1112	Cadmium	0.15	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
BKGD0001	Cadmium	0.088	810	EPA PRGs	mg/kg	B	0.5	RCRAMetals
LRL8C1112	Cadmium	0.12	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
USG5B0203	Cadmium	0.018	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
USG7B1112	Cadmium	0.084	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
BKGD0101	Cadmium	0.088	810	EPA PRGs	mg/kg	B	0.5	RCRAMetals
USG7A1112	Cadmium	0.12	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
USG4L1112	Cadmium	0.16	810	EPA PRGs	mg/kg	B	0.54	RCRAMetals
BKGA0101	Cadmium	0.067	810	EPA PRGs	mg/kg	B	0.5	RCRAMetals
BKGA0304	Cadmium	0.034	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
BKGC0708	Cadmium	0.029	810	EPA PRGs	mg/kg	B	0.5	RCRAMetals
BKGB0304	Cadmium	0.034	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
LRL8A1112	Cadmium	0.18	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
LRL1B1112	Cadmium	0.12	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
LRL7D0809	Cadmium	0.12	810	EPA PRGs	mg/kg	B	0.55	RCRAMetals
LRL2A1112	Cadmium	0.12	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
LRL2B1112	Cadmium	0.29	810	EPA PRGs	mg/kg	B	0.54	RCRAMetals
LRL1C1112	Cadmium	0.15	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
LRL1A1112	Cadmium	0.24	810	EPA PRGs	mg/kg	B	0.55	RCRAMetals
BKGC0304	Cadmium	0.039	810	EPA PRGs	mg/kg	B	0.5	RCRAMetals
BKGC0001	Cadmium	0.068	810	EPA PRGs	mg/kg	B	0.5	RCRAMetals
LRL7A0809	Cadmium	0.092	810	EPA PRGs	mg/kg	B	0.55	RCRAMetals
USG7D1112	Cadmium	0.1	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
LRL2C1011	Cadmium	0.29	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
BKGB0001	Cadmium	0.064	810	EPA PRGs	mg/kg	B	0.5	RCRAMetals
SRN2B0101	Cadmium	0.19	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
SHFD1112	Cadmium	0.13	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
USG1C0607	Cadmium	0.036	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
USG1B0607	Cadmium	0.035	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
USG1A1112	Cadmium	0.048	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SRN1A1011	Cadmium	0.22	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
USG1A0001	Cadmium	0.059	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
SRN1B1112	Cadmium	0.14	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
BKGD0304	Cadmium	0.075	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SRN9C1112	Cadmium	0.14	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SAN3C1011	Cadmium	0.19	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SRN9B1112	Cadmium	0.25	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
USG2A1011	Cadmium	0.066	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
SRN2B0809	Cadmium	0.23	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SRN9A1112	Cadmium	0.22	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
SRN2C1011	Cadmium	0.095	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SRN9A0101	Cadmium	0.13	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SRN8C1213	Cadmium	0.28	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
SRN3D0506	Cadmium	0.17	810	EPA PRGs	mg/kg	B	0.54	RCRAMetals
SRN5A1112	Cadmium	0.11	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SRN5B1011	Cadmium	0.16	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
SRN5C0809	Cadmium	0.11	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
SRN2A0910	Cadmium	0.12	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
USG4F0910	Cadmium	0.024	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
USG4J0910	Cadmium	0.063	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
USG4I0910	Cadmium	0.13	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
SAN1A1011	Cadmium	0.12	810	EPA PRGs	mg/kg	B	0.56	RCRAMetals
DECQ0102	Cadmium	0.21	810	EPA PRGs	mg/kg	B	0.6	RCRAMetals
SAN1B1112	Cadmium	0.2	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
SAN1B1415	Cadmium	0.19	810	EPA PRGs	mg/kg	B	0.54	RCRAMetals
USG4H0910	Cadmium	0.14	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SAN1C1112	Cadmium	0.19	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SRN1C0910	Cadmium	0.27	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
USG1D0607	Cadmium	0.055	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SAN3D1112	Cadmium	0.11	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SHFB1112	Cadmium	0.11	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SAN3E0101	Cadmium	0.17	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SAN3E1112	Cadmium	0.1	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SGZA0304	Cadmium	0.058	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SGZB0304	Cadmium	0.065	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
USG2C0910	Cadmium	0.025	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
SGZC0304	Cadmium	0.079	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
USG2B0910	Cadmium	0.019	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
SGZD0304	Cadmium	0.07	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SHFA1112	Cadmium	0.13	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
USG4K1011	Cadmium	0.11	810	EPA PRGs	mg/kg	B	0.54	RCRAMetals
USG4G1011	Cadmium	0.027	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
DECG0304	Cadmium	0.092	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
CPTBF1214	Cadmium	0.072	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
BKGL0708	Cadmium	0.62	810	EPA PRGs	mg/kg		0.51	RCRAMetals
CPTBG0507	Cadmium	0.71	810	EPA PRGs	mg/kg		0.52	RCRAMetals
DECS0708	Cadmium	0.039	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
CPTBH0608	Cadmium	0.38	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
DSAB0405	Cadmium	0.06	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
DSAE0405	Cadmium	0.056	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
DECH0304	Cadmium	0.13	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
CPTBE0305	Cadmium	0.16	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
DECC0304	Cadmium	0.11	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
BKGI0708	Cadmium	0.11	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
CPTBD1012	Cadmium	0.092	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
GENA0304	Cadmium	0.056	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
DECT0708	Cadmium	0.18	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
DSAC0101	Cadmium	0.049	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
DECF0304	Cadmium	0.065	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
BKGF0304	Cadmium	0.094	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
BKGK0708	Cadmium	0.1	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
DSAD0405	Cadmium	0.059	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
DECE0304	Cadmium	0.078	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
DSAA0405	Cadmium	0.045	810	EPA PRGs	mg/kg	B	0.52	RCRAMetals
DECD0304	Cadmium	0.071	810	EPA PRGs	mg/kg	B	0.54	RCRAMetals
BKGE0001	Cadmium	0.085	810	EPA PRGs	mg/kg	B	0.5	RCRAMetals
CPTBI0811	Cadmium	0.36	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
CPTBA0708	Cadmium	0.24	810	EPA PRGs	mg/kg	B	0.55	RCRAMetals
BKGJ0708	Cadmium	0.12	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
GENG0304	Cadmium	0.026	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
DECA0304	Cadmium	0.084	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
DECM0506	Cadmium	0.22	810	EPA PRGs	mg/kg	B	0.53	RCRAMetals
CPTBB0608	Cadmium	0.28	810	EPA PRGs	mg/kg	B	0.54	RCRAMetals
BKGJ1112	Cadmium	0.11	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
DECB0405	Cadmium	0.17	810	EPA PRGs	mg/kg	B	0.55	RCRAMetals
CPTBC1012	Cadmium	0.077	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
BKGI1112	Cadmium	0.13	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
DSAC0405	Cadmium	0.11	810	EPA PRGs	mg/kg	B	0.54	RCRAMetals
CPTBI0101	Cadmium	0.39	810	EPA PRGs	mg/kg	B	0.51	RCRAMetals
DECR0708	Cadmium	0.12	810	EPA PRGs	mg/kg	B	0.54	RCRAMetals
SRN3C0506	Chromium	2.5	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN5A1112	Chromium	3.3	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN7A0708	Chromium	4.4	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN6C0910	Chromium	5	450	EPA PRGs	mg/kg		1	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
DSAC0405	Chromium	5.6	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN2C1011	Chromium	8.2	450	EPA PRGs	mg/kg		1	RCRAMetals
CPTBG0507	Chromium	7.1	450	EPA PRGs	mg/kg		1	RCRAMetals
CPTBI0101	Chromium	4.1	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN3B0506	Chromium	9.5	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN6B0910	Chromium	2.7	450	EPA PRGs	mg/kg		1	RCRAMetals
CPTBH0608	Chromium	5.5	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN5C0809	Chromium	4.2	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN5B1011	Chromium	3.2	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN6A1920	Chromium	3.1	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN3D0506	Chromium	6.7	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN3A0304	Chromium	7	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SHFG1112	Chromium	5.1	450	EPA PRGs	mg/kg		1	RCRAMetals
SGZA0304	Chromium	4	450	EPA PRGs	mg/kg		1	RCRAMetals
DSAG0405	Chromium	3.5	450	EPA PRGs	mg/kg		1	RCRAMetals
SGZB0304	Chromium	6.2	450	EPA PRGs	mg/kg		1.1	RCRAMetals
CPTBA0708	Chromium	6.9	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SGZC0304	Chromium	6.9	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SGZD0304	Chromium	5.1	450	EPA PRGs	mg/kg		1	RCRAMetals
DSAF0405	Chromium	6.4	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SHFA1112	Chromium	4	450	EPA PRGs	mg/kg		1	RCRAMetals
CPTBB0608	Chromium	6.7	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SHFB1112	Chromium	3.3	450	EPA PRGs	mg/kg		1	RCRAMetals
SHFC0304	Chromium	4.1	450	EPA PRGs	mg/kg		1	RCRAMetals
SHFD1112	Chromium	3.1	450	EPA PRGs	mg/kg		1	RCRAMetals
CPTBC1012	Chromium	5.6	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGD0304	Chromium	4.4	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN1A1011	Chromium	3.8	450	EPA PRGs	mg/kg		1	RCRAMetals
DSAD0405	Chromium	7.4	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN2B0101	Chromium	8.3	450	EPA PRGs	mg/kg		1.1	RCRAMetals
CPTBF1214	Chromium	5.3	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN7B1920	Chromium	3.8	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN1C0910	Chromium	4.7	450	EPA PRGs	mg/kg		1	RCRAMetals
SHFE1112	Chromium	4	450	EPA PRGs	mg/kg		1	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
CPTBE0305	Chromium	3.6	450	EPA PRGs	mg/kg		1	RCRAMetals
SHFF1112	Chromium	4.7	450	EPA PRGs	mg/kg		1	RCRAMetals
SHFJ0506	Chromium	5.6	450	EPA PRGs	mg/kg		1	RCRAMetals
CPTBD1012	Chromium	3.9	450	EPA PRGs	mg/kg		1	RCRAMetals
SHFI0506	Chromium	6.8	450	EPA PRGs	mg/kg		1	RCRAMetals
SHFH0506	Chromium	8.1	450	EPA PRGs	mg/kg		1	RCRAMetals
DSAE0405	Chromium	5.9	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN2B0809	Chromium	19	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN1B1112	Chromium	4.7	450	EPA PRGs	mg/kg		1	RCRAMetals
DECI0304	Chromium	5.5	450	EPA PRGs	mg/kg		1	RCRAMetals
DECA0304	Chromium	6	450	EPA PRGs	mg/kg		1.1	RCRAMetals
DECR0708	Chromium	3.7	450	EPA PRGs	mg/kg		1.1	RCRAMetals
USG5C0203	Chromium	3.4	450	EPA PRGs	mg/kg		1	RCRAMetals
USG5B0203	Chromium	3	450	EPA PRGs	mg/kg		1	RCRAMetals
DECJ0304	Chromium	5.7	450	EPA PRGs	mg/kg		1.1	RCRAMetals
DECK0304	Chromium	4.2	450	EPA PRGs	mg/kg		1	RCRAMetals
USG4L1112	Chromium	3.6	450	EPA PRGs	mg/kg		1.1	RCRAMetals
USG7B1112	Chromium	3.4	450	EPA PRGs	mg/kg		1	RCRAMetals
USG4K1011	Chromium	3.9	450	EPA PRGs	mg/kg		1.1	RCRAMetals
DECS0708	Chromium	3.4	450	EPA PRGs	mg/kg		1	RCRAMetals
USG4J0910	Chromium	3.2	450	EPA PRGs	mg/kg		1.1	RCRAMetals
DECH0304	Chromium	5	450	EPA PRGs	mg/kg		1	RCRAMetals
USG4I0910	Chromium	3.2	450	EPA PRGs	mg/kg		1.1	RCRAMetals
USG4H0910	Chromium	3.2	450	EPA PRGs	mg/kg		1	RCRAMetals
USG5A0304	Chromium	3.5	450	EPA PRGs	mg/kg		1	RCRAMetals
WARD0506	Chromium	4.9	450	EPA PRGs	mg/kg		1.1	RCRAMetals
WARZ0101	Chromium	4.7	450	EPA PRGs	mg/kg		1.1	RCRAMetals
DECQ0102	Chromium	9.8	450	EPA PRGs	mg/kg		1.2	RCRAMetals
WARH0506	Chromium	5.2	450	EPA PRGs	mg/kg		1.1	RCRAMetals
WARG0506	Chromium	5.7	450	EPA PRGs	mg/kg		1.1	RCRAMetals
WARF0506	Chromium	5.3	450	EPA PRGs	mg/kg		1	RCRAMetals
USG7A1112	Chromium	3	450	EPA PRGs	mg/kg		1	RCRAMetals
WARE0506	Chromium	7.1	450	EPA PRGs	mg/kg		1.1	RCRAMetals
DECT0708	Chromium	3.2	450	EPA PRGs	mg/kg		1.1	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
WARC0506	Chromium	5.1	450	EPA PRGs	mg/kg		1	RCRAMetals
DECQ0708	Chromium	1.7	450	EPA PRGs	mg/kg		1.1	RCRAMetals
WARB0506	Chromium	3.8	450	EPA PRGs	mg/kg		1	RCRAMetals
WARA0506	Chromium	3.8	450	EPA PRGs	mg/kg		1	RCRAMetals
DECL0304	Chromium	4.8	450	EPA PRGs	mg/kg		1	RCRAMetals
USG7D1112	Chromium	2.9	450	EPA PRGs	mg/kg		1	RCRAMetals
DECM0506	Chromium	2.7	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN9A0101	Chromium	3.5	450	EPA PRGs	mg/kg		1	RCRAMetals
DECC0304	Chromium	4.6	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN9C1112	Chromium	3.6	450	EPA PRGs	mg/kg		1	RCRAMetals
DSAB0405	Chromium	5.3	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN9B1112	Chromium	3.4	450	EPA PRGs	mg/kg		1.1	RCRAMetals
DECB0405	Chromium	3.6	450	EPA PRGs	mg/kg		1.1	RCRAMetals
DECG0304	Chromium	5.5	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN2A0910	Chromium	8.4	450	EPA PRGs	mg/kg		1	RCRAMetals
DECD0304	Chromium	5.8	450	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGO1112	Chromium	4.8	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN8C1213	Chromium	4.9	450	EPA PRGs	mg/kg		1.1	RCRAMetals
DSAC0101	Chromium	5.7	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN8B1718	Chromium	4.5	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN8A1617	Chromium	4.5	450	EPA PRGs	mg/kg		1	RCRAMetals
SRN7C1920	Chromium	3.9	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SRN9A1112	Chromium	4	450	EPA PRGs	mg/kg		1.1	RCRAMetals
USG2A1011	Chromium	2.7	450	EPA PRGs	mg/kg		1	RCRAMetals
CPTBI0811	Chromium	3.6	450	EPA PRGs	mg/kg		1	RCRAMetals
USG4F0910	Chromium	4.9	450	EPA PRGs	mg/kg		1	RCRAMetals
DECF0304	Chromium	5.3	450	EPA PRGs	mg/kg		1	RCRAMetals
USG4E0910	Chromium	3.8	450	EPA PRGs	mg/kg		1	RCRAMetals
USG4D0101	Chromium	3.8	450	EPA PRGs	mg/kg		1	RCRAMetals
USG2C0910	Chromium	1.5	450	EPA PRGs	mg/kg		1	RCRAMetals
USG1A0001	Chromium	3	450	EPA PRGs	mg/kg		1	RCRAMetals
USG2B0910	Chromium	2.1	450	EPA PRGs	mg/kg		1	RCRAMetals
USG1A1112	Chromium	3.7	450	EPA PRGs	mg/kg		1	RCRAMetals
DSAA0405	Chromium	3.9	450	EPA PRGs	mg/kg		1	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
USG1D0607	Chromium	4.9	450	EPA PRGs	mg/kg		1	RCRAMetals
DECE0101	Chromium	4.1	450	EPA PRGs	mg/kg		1	RCRAMetals
USG1C0607	Chromium	5	450	EPA PRGs	mg/kg		1	RCRAMetals
USG1B0607	Chromium	4.2	450	EPA PRGs	mg/kg		1	RCRAMetals
USG4G1011	Chromium	3.8	450	EPA PRGs	mg/kg		1	RCRAMetals
DECE0304	Chromium	4.4	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGJ1112	Chromium	3.1	450	EPA PRGs	mg/kg		1	RCRAMetals
SAN1B1112	Chromium	4.1	450	EPA PRGs	mg/kg		1	RCRAMetals
LRL7A0809	Chromium	3.2	450	EPA PRGs	mg/kg		1.1	RCRAMetals
LRL7C0910	Chromium	4.6	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGI1112	Chromium	3.8	450	EPA PRGs	mg/kg		1	RCRAMetals
GENC0304	Chromium	3.3	450	EPA PRGs	mg/kg		1	RCRAMetals
LRL8A1112	Chromium	4.2	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGJ0708	Chromium	3	450	EPA PRGs	mg/kg		1.1	RCRAMetals
LRL8B1112	Chromium	4	450	EPA PRGs	mg/kg		1.1	RCRAMetals
LRL8C1112	Chromium	3.6	450	EPA PRGs	mg/kg		1	RCRAMetals
GENB0304	Chromium	3.2	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGI0708	Chromium	3.2	450	EPA PRGs	mg/kg		1	RCRAMetals
NEWB0101	Chromium	3.1	450	EPA PRGs	mg/kg		1.1	RCRAMetals
LRL2B1112	Chromium	7.1	450	EPA PRGs	mg/kg		1.1	RCRAMetals
NEWB0708	Chromium	4	450	EPA PRGs	mg/kg		1	RCRAMetals
NEWC0708	Chromium	3.9	450	EPA PRGs	mg/kg		1	RCRAMetals
NEWD0708	Chromium	3.6	450	EPA PRGs	mg/kg		1	RCRAMetals
NEWE0708	Chromium	3.3	450	EPA PRGs	mg/kg		1.1	RCRAMetals
NEWF0708	Chromium	4.1	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGK0708	Chromium	3.3	450	EPA PRGs	mg/kg		1.1	RCRAMetals
NEWG0708	Chromium	4	450	EPA PRGs	mg/kg		1	RCRAMetals
NEWH0708	Chromium	3.6	450	EPA PRGs	mg/kg		1	RCRAMetals
GENA0304	Chromium	3.9	450	EPA PRGs	mg/kg		1	RCRAMetals
SAN1A1011	Chromium	9.1	450	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGK1112	Chromium	3.1	450	EPA PRGs	mg/kg		1	RCRAMetals
NEWA0708	Chromium	3.9	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGE0708	Chromium	4.8	450	EPA PRGs	mg/kg		1	RCRAMetals
GENG0304	Chromium	3.3	450	EPA PRGs	mg/kg		1	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
BKGD0101	Chromium	3.9	450	EPA PRGs	mg/kg		1	RCRAMetals
GENH0304	Chromium	3.3	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGD0001	Chromium	3.7	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGE0001	Chromium	3.5	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGC0708	Chromium	6.2	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGC0304	Chromium	3.3	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGE0304	Chromium	5.2	450	EPA PRGs	mg/kg		1	RCRAMetals
LRL1A1112	Chromium	6.7	450	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGC0001	Chromium	2.8	450	EPA PRGs	mg/kg		1	RCRAMetals
LRL2C1011	Chromium	3.3	450	EPA PRGs	mg/kg		1	RCRAMetals
GENF0304	Chromium	3.4	450	EPA PRGs	mg/kg		1	RCRAMetals
LRL7D0809	Chromium	3.1	450	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGB0001	Chromium	3.2	450	EPA PRGs	mg/kg		1	RCRAMetals
LRL1B1112	Chromium	2.8	450	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGA0304	Chromium	3.4	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGF0001	Chromium	3.4	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGA0101	Chromium	3.2	450	EPA PRGs	mg/kg		1	RCRAMetals
GENE0304	Chromium	3.3	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGA0001	Chromium	2.9	450	EPA PRGs	mg/kg		1	RCRAMetals
LRL1C1112	Chromium	2.9	450	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGF0304	Chromium	6.2	450	EPA PRGs	mg/kg		1	RCRAMetals
LRL2A1112	Chromium	4.2	450	EPA PRGs	mg/kg		1	RCRAMetals
GEND0304	Chromium	3.6	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGB0304	Chromium	3.3	450	EPA PRGs	mg/kg		1	RCRAMetals
SAN1B1415	Chromium	6.4	450	EPA PRGs	mg/kg		1.1	RCRAMetals
SAN1C1112	Chromium	4.6	450	EPA PRGs	mg/kg		1	RCRAMetals
SAN3E1112	Chromium	3.3	450	EPA PRGs	mg/kg		1	RCRAMetals
SAN3C1011	Chromium	3.2	450	EPA PRGs	mg/kg		1	RCRAMetals
SAN3D1112	Chromium	3.4	450	EPA PRGs	mg/kg		1	RCRAMetals
DSAH0405	Chromium	7	450	EPA PRGs	mg/kg		1.1	RCRAMetals
DSAI0405	Chromium	7.6	450	EPA PRGs	mg/kg		1.1	RCRAMetals
BKGL0708	Chromium	3.8	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGN1112	Chromium	3.8	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGM1112	Chromium	4.1	450	EPA PRGs	mg/kg		1	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
SAN3E0101	Chromium	3.2	450	EPA PRGs	mg/kg		1	RCRAMetals
BKGA0001	Lead	3.3	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
DECF0304	Lead	4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
USG4D0101	Lead	2.7	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
USG4E0910	Lead	3	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
BKGF0001	Lead	3.3	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
SAN3D1112	Lead	2.7	1,000	EPA PRGs	mg/kg		0.62	RCRAMetals
DECT0708	Lead	3.5	1,000	EPA PRGs	mg/kg		0.96	RCRAMetals
DSAH0405	Lead	4.9	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
BKGA0101	Lead	3.1	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
SGZD0304	Lead	3.9	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
GENE0304	Lead	2.5	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
USG4G1011	Lead	3.1	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
BKGA0304	Lead	2.6	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
LRL1B1112	Lead	2.3	1,000	EPA PRGs	mg/kg		0.96	RCRAMetals
USG4H0910	Lead	2.2	1,000	EPA PRGs	mg/kg		1.6	RCRAMetals
DECG0304	Lead	4.2	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
DECS0708	Lead	2.7	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
DSAF0405	Lead	4.6	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
USG4F0910	Lead	4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
CPTBB0608	Lead	6	1,000	EPA PRGs	mg/kg		0.33	RCRAMetals
USG1A0001	Lead	2.5	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
DECC0304	Lead	3.6	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
LRL2C1011	Lead	4.3	1,000	EPA PRGs	mg/kg		0.61	RCRAMetals
USG1A1112	Lead	2.9	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SHFB1112	Lead	3	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
LRL2B1112	Lead	7.8	1,000	EPA PRGs	mg/kg		0.65	RCRAMetals
USG1B0607	Lead	3	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SAN1B1112	Lead	4.4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
BKGM1112	Lead	3.4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
LRL7D0809	Lead	1.9	1,000	EPA PRGs	mg/kg		1	RCRAMetals
SHFA1112	Lead	3	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
DSAA0405	Lead	3.1	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
USG2C0910	Lead	1.8	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals

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Investigative Soil Sample Results
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
GEND0304	Lead	2.3	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
USG1D0607	Lead	3.5	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
DECE0101	Lead	2.7	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
LRL2A1112	Lead	4.2	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
USG2A1011	Lead	2	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
BKGF0304	Lead	4.6	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
USG2B0910	Lead	1.8	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
LRL1C1112	Lead	2.2	1,000	EPA PRGs	mg/kg		0.96	RCRAMetals
USG4J0910	Lead	2.1	1,000	EPA PRGs	mg/kg		0.96	RCRAMetals
DECE0304	Lead	3.4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
USG4I0910	Lead	2.9	1,000	EPA PRGs	mg/kg		1.6	RCRAMetals
USG1C0607	Lead	3.4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SGZA0304	Lead	3	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
CPTBA0708	Lead	6.6	1,000	EPA PRGs	mg/kg		0.33	RCRAMetals
DECL0304	Lead	3.4	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
BKGN1112	Lead	2.8	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
WARA0506	Lead	3	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
BKGC0708	Lead	2.5	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
WARB0506	Lead	2.9	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
WARC0506	Lead	3.5	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
BKGO1112	Lead	2.8	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
WARD0506	Lead	3.8	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
BKGD0001	Lead	3.9	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
USG7D1112	Lead	3.2	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
WARE0506	Lead	4.9	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
DECQ0708	Lead	1	1,000	EPA PRGs	mg/kg	B	1.6	RCRAMetals
SAN3E1112	Lead	3	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
WARF0506	Lead	4.5	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
DECM0506	Lead	2.7	1,000	EPA PRGs	mg/kg		1.6	RCRAMetals
BKGD0101	Lead	4.2	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
WARG0506	Lead	4.1	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
DECQ0102	Lead	23	1,000	EPA PRGs	mg/kg		0.36	RCRAMetals
WARH0506	Lead	4.4	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
GENG0304	Lead	2.5	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
BKGD0304	Lead	3.8	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
WARZ0101	Lead	3.6	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
GENH0304	Lead	2.2	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
SAN3E0101	Lead	3.3	1,000	EPA PRGs	mg/kg		0.62	RCRAMetals
BKGI0708	Lead	2.3	1,000	EPA PRGs	mg/kg		0.62	RCRAMetals
BKGB0001	Lead	2.9	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
DECD0304	Lead	4.3	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
DECH0304	Lead	4.1	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SGZC0304	Lead	4.7	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
USG4K1011	Lead	2.5	1,000	EPA PRGs	mg/kg		0.65	RCRAMetals
GENF0304	Lead	2.3	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
BKGB0304	Lead	2.6	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
USG4L1112	Lead	2.7	1,000	EPA PRGs	mg/kg		0.96	RCRAMetals
DECR0708	Lead	1.7	1,000	EPA PRGs	mg/kg		0.97	RCRAMetals
BKGE0001	Lead	3.6	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
BKGE0304	Lead	3.8	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
BKGE0708	Lead	3.1	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
USG5B0203	Lead	2.3	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
DECJ0304	Lead	4.4	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
BKGC0001	Lead	2.8	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
USG5C0203	Lead	2.6	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
LRL1A1112	Lead	5.1	1,000	EPA PRGs	mg/kg		0.66	RCRAMetals
USG7A1112	Lead	3.3	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SGZB0304	Lead	4.7	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
BKGC0304	Lead	2.4	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
USG7B1112	Lead	2.8	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
DECK0304	Lead	3.1	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
USG5A0304	Lead	2.4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SRN5A1112	Lead	2.4	1,000	EPA PRGs	mg/kg		0.63	RCRAMetals
SRN6B0910	Lead	3.1	1,000	EPA PRGs	mg/kg		0.62	RCRAMetals
GENA0304	Lead	2.8	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SRN3A0304	Lead	7.5	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
CPTBG0507	Lead	86	1,000	EPA PRGs	mg/kg		0.94	RCRAMetals
NEWD0708	Lead	2.9	1,000	EPA PRGs	mg/kg		0.62	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
SRN3B0506	Lead	6.5	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
DSAE0405	Lead	4.7	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
SRN3C0506	Lead	1.9	1,000	EPA PRGs	mg/kg		1.6	RCRAMetals
DSAC0405	Lead	3.7	1,000	EPA PRGs	mg/kg		0.33	RCRAMetals
NEWE0708	Lead	3.9	1,000	EPA PRGs	mg/kg		3.2	RCRAMetals
SHFF1112	Lead	3.5	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SHFG1112	Lead	3.7	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
CPTBH0608	Lead	36	1,000	EPA PRGs	mg/kg		0.62	RCRAMetals
NEWB0708	Lead	2.8	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SRN5B1011	Lead	2.7	1,000	EPA PRGs	mg/kg		0.63	RCRAMetals
SAN1C1112	Lead	4.2	1,000	EPA PRGs	mg/kg		0.62	RCRAMetals
CPTBC1012	Lead	3.4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
NEWB0101	Lead	3.5	1,000	EPA PRGs	mg/kg		3.2	RCRAMetals
SRN5C0809	Lead	3.1	1,000	EPA PRGs	mg/kg		0.63	RCRAMetals
NEWA0708	Lead	3.1	1,000	EPA PRGs	mg/kg		0.63	RCRAMetals
SRN6A1920	Lead	2.8	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SHFE1112	Lead	3	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SRN3D0506	Lead	4.9	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
DSAD0405	Lead	5.4	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
SHFJ0506	Lead	3.8	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
CPTBD1012	Lead	2.9	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
DSAI0405	Lead	5.3	1,000	EPA PRGs	mg/kg		0.33	RCRAMetals
DECI0304	Lead	4.1	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SRN1A1011	Lead	4.1	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
BKGK1112	Lead	3.1	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SHFI0506	Lead	8	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SRN1B1112	Lead	3.6	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
CPTBE0305	Lead	4.4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SRN2C1011	Lead	3.4	1,000	EPA PRGs	mg/kg		0.63	RCRAMetals
SRN1C0910	Lead	4.9	1,000	EPA PRGs	mg/kg		0.62	RCRAMetals
BKGJ1112	Lead	3	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
NEWH0708	Lead	2.3	1,000	EPA PRGs	mg/kg		0.62	RCRAMetals
SHFH0506	Lead	4.4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
BKGK0708	Lead	2.6	1,000	EPA PRGs	mg/kg		0.95	RCRAMetals

Table E.1-2
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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
SAN1A1011	Lead	6.6	1,000	EPA PRGs	mg/kg		0.33	RCRAMetals
CPTBF1214	Lead	3.2	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
NEWG0708	Lead	2.9	1,000	EPA PRGs	mg/kg		0.62	RCRAMetals
SRN2B0101	Lead	3.6	1,000	EPA PRGs	mg/kg		0.63	RCRAMetals
BKGL0708	Lead	9.8	1,000	EPA PRGs	mg/kg		1.5	RCRAMetals
SRN2B0809	Lead	6	1,000	EPA PRGs	mg/kg		0.63	RCRAMetals
NEWF0708	Lead	3.1	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SAN1B1415	Lead	5.1	1,000	EPA PRGs	mg/kg		0.65	RCRAMetals
DECB0405	Lead	2	1,000	EPA PRGs	mg/kg		1.7	RCRAMetals
SRN7C1920	Lead	3.7	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
SRN9B1112	Lead	3.7	1,000	EPA PRGs	mg/kg		1.6	RCRAMetals
CPTBI0811	Lead	7.5	1,000	EPA PRGs	mg/kg		0.61	RCRAMetals
SHFC0304	Lead	3.6	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SAN3C1011	Lead	3.5	1,000	EPA PRGs	mg/kg		0.62	RCRAMetals
SHFD1112	Lead	2.9	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
DSAG0405	Lead	3.4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
CPTBI0101	Lead	8.5	1,000	EPA PRGs	mg/kg		0.61	RCRAMetals
SRN8A1617	Lead	4.6	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
LRL7C0910	Lead	3.6	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SRN9A1112	Lead	6.2	1,000	EPA PRGs	mg/kg		0.63	RCRAMetals
SRN2A0910	Lead	3.8	1,000	EPA PRGs	mg/kg		0.63	RCRAMetals
DSAC0101	Lead	4.4	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
SRN8B1718	Lead	3.8	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
LRL8A1112	Lead	3.7	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
GENB0304	Lead	2.4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SRN9C1112	Lead	3.5	1,000	EPA PRGs	mg/kg		0.63	RCRAMetals
LRL7A0809	Lead	2.3	1,000	EPA PRGs	mg/kg		0.99	RCRAMetals
SRN6C0910	Lead	4	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
GENC0304	Lead	2.3	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
DECA0304	Lead	4.4	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
SRN8C1213	Lead	5	1,000	EPA PRGs	mg/kg		0.63	RCRAMetals
SRN7A0708	Lead	3.3	1,000	EPA PRGs	mg/kg		0.3	RCRAMetals
LRL8B1112	Lead	3.4	1,000	EPA PRGs	mg/kg		0.32	RCRAMetals
SRN7B1920	Lead	3.2	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals

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Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
BKGI1112	Lead	3.2	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
BKGJ0708	Lead	2.3	1,000	EPA PRGs	mg/kg		0.95	RCRAMetals
NEWC0708	Lead	3	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
DSAB0405	Lead	3.7	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
SRN9A0101	Lead	3	1,000	EPA PRGs	mg/kg		0.63	RCRAMetals
LRL8C1112	Lead	2.9	1,000	EPA PRGs	mg/kg		0.31	RCRAMetals
GENH0304	Selenium	0.5	10,000	EPA PRGs	mg/kg	B	0.51	RCRAMetals
SHFC0304	Selenium	0.49	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals
DECQ0102	Selenium	0.5	10,000	EPA PRGs	mg/kg	B	0.6	RCRAMetals
USG1C0607	Selenium	0.37	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals
DECL0304	Selenium	0.54	10,000	EPA PRGs	mg/kg		0.51	RCRAMetals
DSAD0405	Selenium	0.49	10,000	EPA PRGs	mg/kg	B	0.53	RCRAMetals
DSAE0405	Selenium	0.39	10,000	EPA PRGs	mg/kg	B	0.53	RCRAMetals
LRL2B1112	Selenium	0.45	10,000	EPA PRGs	mg/kg	B	0.54	RCRAMetals
SRN9B1112	Selenium	0.5	10,000	EPA PRGs	mg/kg	B	0.53	RCRAMetals
WARG0506	Selenium	0.51	10,000	EPA PRGs	mg/kg	B	0.53	RCRAMetals
SAN3E1112	Selenium	0.4	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals
CPTBB0608	Selenium	0.44	10,000	EPA PRGs	mg/kg	B	0.54	RCRAMetals
WARH0506	Selenium	0.48	10,000	EPA PRGs	mg/kg	B	0.54	RCRAMetals
USG1B0607	Selenium	0.3	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals
DSAA0405	Selenium	0.42	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals
BKGL0708	Selenium	0.33	10,000	EPA PRGs	mg/kg	B	0.51	RCRAMetals
LRL8C1112	Selenium	0.64	10,000	EPA PRGs	mg/kg		0.51	RCRAMetals
DSAC0101	Selenium	0.53	10,000	EPA PRGs	mg/kg		0.53	RCRAMetals
SHFE1112	Selenium	0.57	10,000	EPA PRGs	mg/kg		0.52	RCRAMetals
SRN7B1920	Selenium	0.3	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SGZC0304	Selenium	0.33	10,000	EPA PRGs	mg/kg	B	0.53	RCRAMetals
LRL2A1112	Selenium	0.55	10,000	EPA PRGs	mg/kg		0.52	RCRAMetals
BKGI0708	Selenium	0.31	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals
CPTBF1214	Selenium	0.3	10,000	EPA PRGs	mg/kg	B	0.51	RCRAMetals
USG4L1112	Selenium	0.39	10,000	EPA PRGs	mg/kg	B	0.54	RCRAMetals
LRL1A1112	Selenium	0.34	10,000	EPA PRGs	mg/kg	B	0.55	RCRAMetals
BKGJ1112	Selenium	0.33	10,000	EPA PRGs	mg/kg	B	0.51	RCRAMetals
SHFA1112	Selenium	0.44	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
(Page 36 of 37)

Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
USG1D0607	Selenium	0.78	10,000	EPA PRGs	mg/kg		0.52	RCRAMetals
SAN3D1112	Selenium	0.42	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals
GENF0304	Selenium	0.37	10,000	EPA PRGs	mg/kg	B	0.51	RCRAMetals
SGZB0304	Selenium	0.43	10,000	EPA PRGs	mg/kg	B	0.53	RCRAMetals
USG7A1112	Selenium	0.44	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals
DECJ0304	Selenium	0.37	10,000	EPA PRGs	mg/kg	B	0.53	RCRAMetals
SRN3B0506	Selenium	0.35	10,000	EPA PRGs	mg/kg	B	0.54	RCRAMetals
CPTBG0507	Selenium	0.6	10,000	EPA PRGs	mg/kg		0.52	RCRAMetals
SRN8A1617	Selenium	0.37	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals
LRL8A1112	Selenium	0.46	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals
SRN2B0809	Selenium	0.48	10,000	EPA PRGs	mg/kg	B	0.52	RCRAMetals
CPTBG0507	Silver	0.17	10,000	EPA PRGs	mg/kg	B	1	RCRAMetals
CPTBH0608	Silver	0.19	10,000	EPA PRGs	mg/kg	B	1	RCRAMetals
USGIE0108	Barium	0.66	100	RCRA	mg/L	B	1	TCLPMetals
DECU0109	Barium	0.65	100	RCRA	mg/L	B	1	TCLPMetals
GNMH009	Barium	0.72	100	RCRA	mg/L	B	1	TCLPMetals
USGIE0108	Chromium	0.011	5.0	RCRA	mg/L	B	0.1	TCLPMetals
USGIE0108	Selenium	0.029	1.0	RCRA	mg/L		0.05	TCLPMetals
ESAA0001	Plutonium-238	0.339 ± 0.055	12.7	NCRP	pCi/g		0.012	UGTAISOPU
SAYB0001	Plutonium-239	0.028 ± 0.013	12.7	NCRP	pCi/g	LT	0.0098	UGTAISOPU
A57A0001	Plutonium-239	0.06 ± 0.017	12.7	NCRP	pCi/g		0.008	UGTAISOPU

Table E.1-2
Investigative Soil Sample Results
Summary of Positive Detects and Screening Values
(Page 37 of 37)

Sample Number	Parameter	Result	Screening Value	Source	Units	Validation Qualifier	Detect Limit	User Test Panel
ESAA0001	Plutonium-239	2.22 ± 0.29	12.7	NCRP	pCi/g		0.0029	UGTAISOPU

[a]Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05.
[b]Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05. Continuing calibration verification percent >25%.
[c]Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05. Surrogate recovery exceeded the upper limits.
[d]Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits. Matrix effects may exist. Average relative response factor <0.05. Relative response factor <0.05.
[e]Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits. Matrix effects may exist. Surrogate recovery exceeded the upper limits. Average relative response factor <0.05.
[f]Qualifier added to laboratory data; record accepted. Surrogate recovery exceeded the upper limits.
[g]Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits.
[h]Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits. Surrogate recovery exceeded the upper limits. Matrix effects may exist.
[i]Qualifier added to laboratory data; record accepted. Surrogate recovery exceeded the lower limits. Matrix effects may exist.

B = Value less than the instrument detection limit, but greater than or equal to the contract required detection limit.
J = Estimated value
LT = Results is less than requested minimum detectable concentration, greater than sample specific minimum detectable concentration.
TI = Nuclide identification is tentative
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
pCi/g = Picocuries per gram
μg/kg = Micrograms per kilogram

Table E.1-3
Investigative On-Site Gamma Spectrum Analysis Sample Results
Summary of Positive Detects
(Page 1 of 6)

Sample Number	Parameter	Result (pCi/g)	Uncertainty (pCi/g)
VSA2B	BE-7	8.17	7.15
VSA1B	BE-7	5.73	5.31
A57A0001	BI-211	2.28	2.86
CPTBC0102	BI-211	0.66	5.75
CPTBE0102	BI-211	1.77	1.60
CPTBF1214	BI-211	0.78	5.48
CPTBG0004	BI-211	0.78	2.69
CPTBK0002	BI-211	1.17	11.49
CPTEC0304	BI-211	0.84	0.88
CPTEE0608	BI-211	1.07	3.73
CPTEI0204	BI-211	0.83	0.83
CPTEJ0204	BI-211	0.49	0.67
CPTFG0406	BI-211	0.59	0.73
CPTFK0305	BI-211	1.07	2.94
CPTID0608	BI-211	1.14	1.11
CPTMC0001	BI-211	0.88	0.89
CPTMC0001 DUP	BI-211	1.10	4.55
CPTMD0406	BI-211	0.55	11.47
DSAC0101	BI-211	0.86	1.16
ESAA0001	BI-211	0.88	1.53
ESAA0001 DUP	BI-211	1.50	2.75
FALC0001	BI-211	2.56	3.16
FALD0001	BI-211	0.94	12.26
FALE0001	BI-211	1.04	3.71
FALF0001	BI-211	1.09	4.28
ROADA 0001	BI-211	1.88	7.68
ROADC 0001	BI-211	0.84	1.65
ROADD 0001	BI-211	0.98	1.69
SHFA0001	BI-211	0.96	1.61
SHFB0001	BI-211	0.70	0.98
SHFC0001	BI-211	1.71	2.23
SHFC0001 DUP	BI-211	2.79	4.70

Table E.1-3
Investigative On-Site Gamma Spectrum Analysis Sample Results
Summary of Positive Detects
(Page 2 of 6)

Sample Number	Parameter	Result (pCi/g)	Uncertainty (pCi/g)
FALB0001	BI-214	0.53	0.71
SAYA0001	BI-214	0.25	0.65
A57A0001	CS-137	10.47	1.02
CPTBE0102	CS-137	0.08	0.96
CPTBG0004	CS-137	5.69	25.62
CPTBH0305	CS-137	3.36	1.70
CPTBI0204	CS-137	5.56	0.67
CPTBK0002	CS-137	2.10	0.35
CPTFE0709	CS-137	0.93	2.03
CPTFG0406	CS-137	1.70	1.02
CPTFK0305	CS-137	2.10	2.99
CPTMC0001	CS-137	1.32	0.23
CPTMC0001 DUP	CS-137	1.15	1.22
DSAC0101	CS-137	0.08	0.10
ESAA0001	CS-137	14.34	1.26
ESAA0001 DUP	CS-137	14.26	7.44
FALA0001	CS-137	67.47	5.12
FALB0001	CS-137	58.69	4.51
FALC0001	CS-137	6.95	0.79
FALD0001	CS-137	3.70	1.12
FALE0001	CS-137	16.30	1.45
FALF0001	CS-137	5.25	3.83
ROADA 0001	CS-137	9.01	1.09
ROADB 0001	CS-137	6.20	5.33
ROADC 0001	CS-137	11.08	1.03
ROADD 0001	CS-137	15.56	4.75
ROADE 0001	CS-137	8.93	0.93
ROADF0001	CS-137	15.91	1.71
ROADG 0001	CS-137	5.34	0.66
ROADH0001	CS-137	79.67	19.23
ROADI0001	CS-137	12.22	1.12
SAYA0001	CS-137	95.41	7.16

Table E.1-3
Investigative On-Site Gamma Spectrum Analysis Sample Results
Summary of Positive Detects
(Page 3 of 6)

Sample Number	Parameter	Result (pCi/g)	Uncertainty (pCi/g)
SAYB0001	CS-137	6.97	1.02
SHFA0001	CS-137	9.40	0.93
SHFB0001	CS-137	1.56	0.27
SHFC0001	CS-137	32.80	2.52
SHFC0001 DUP	CS-137	33.09	2.56
ROADC 0001	I-131	0.07	0.43
A57A0001	K-40	8.82	3.61
CPTBA0708	K-40	10.89	3.57
CPTBB0608	K-40	7.59	2.22
CPTBC0102	K-40	4.87	2.31
LRL1A1112	K-40	4.71	3.05
CPTBD1012	K-40	5.64	6.67
CPTBE0102	K-40	6.86	10.23
CPTBF1214	K-40	6.73	0.95
CPTBG0004	K-40	4.36	2.82
CPTBH0305	K-40	4.55	2.06
CPTBI0204	K-40	3.73	2.62
CPTBJ0507	K-40	9.98	3.11
CPTBK0002	K-40	5.49	2.39
CPTEJ0204	K-40	7.10	2.51
CPTFJ0305	K-40	4.31	1.95
CPTMC0001	K-40	6.37	2.42
DECB0405	K-40	3.13	3.04
DECC0304	K-40	5.03	2.30
DECE0304	K-40	5.33	5.33
DECG0304	K-40	5.05	2.52
DSAA0405	K-40	5.15	2.70
DSAB0405	K-40	5.33	2.38
DSAC0101	K-40	8.70	2.82
DSAC0405	K-40	5.36	33.97
ESAA0001	K-40	7.29	2.82
ESAA0001 DUP	K-40	7.81	2.95

Table E.1-3
Investigative On-Site Gamma Spectrum Analysis Sample Results
Summary of Positive Detects
(Page 4 of 6)

Sample Number	Parameter	Result (pCi/g)	Uncertainty (pCi/g)
FALA0001	K-40	6.98	2.52
FALB0001	K-40	6.56	2.45
FALC0001	K-40	8.77	2.99
FALD0001	K-40	6.09	2.72
FALE0001	K-40	6.98	2.72
FALF0001	K-40	4.18	2.21
LRL1B1112	K-40	3.43	3.39
LRL1C1112	K-40	2.31	3.05
ROADA 0001	K-40	9.35	3.26
ROADB 0001	K-40	10.25	3.73
ROADC 0001	K-40	5.31	2.37
ROADD 0001	K-40	5.92	2.80
ROADE 0001	K-40	3.88	2.25
ROADF0001	K-40	5.28	2.64
ROADG 0001	K-40	4.56	3.17
ROADH0001	K-40	4.85	4.69
ROADI0001	K-40	4.87	2.51
SAN1B1112	K-40	4.73	2.66
SAN1B1415	K-40	3.73	2.22
SAN1D1112	K-40	5.25	2.20
SAN1E1112	K-40	3.90	1.22
SAYA0001	K-40	8.61	8.05
SAYB0001	K-40	9.55	4.50
SGZA0304	K-40	4.61	3.45
SGZB0304	K-40	7.07	3.43
SGZC0304	K-40	7.42	2.81
SGZD0304	K-40	4.75	2.56
SHFA0001	K-40	6.57	9.48
SHFB0001	K-40	5.20	2.19
SHFC0001	K-40	5.39	1.98
SHFC0001 DUP	K-40	4.23	2.99
A57A0001	PB-212	0.59	1.00

Table E.1-3
Investigative On-Site Gamma Spectrum Analysis Sample Results
Summary of Positive Detects
(Page 5 of 6)

Sample Number	Parameter	Result (pCi/g)	Uncertainty (pCi/g)
CPTBA0708	PB-212	0.49	0.28
CPTBB0608	PB-212	1.03	0.41
CPTBC0102	PB-212	0.20	0.15
CPTIC0305	PB-212	0.21	0.96
CPTBD1012	PB-212	0.23	21.29
CPTBE0102	PB-212	0.26	1.66
CPTBF1214	PB-212	0.30	0.48
CPTBG0004	PB-212	0.12	0.21
CPTBH0305	PB-212	0.17	0.57
CPTBJ0507	PB-212	0.52	0.28
CPTBK0002	PB-212	0.19	1.19
CPTEC0304	PB-212	0.26	0.15
CPTEE0608	PB-212	0.25	0.56
CPTEI0204	PB-212	0.34	0.18
CPTEJ0204	PB-212	0.21	0.15
CPTFE0709	PB-212	0.25	0.22
CPTFG0406	PB-212	0.23	0.22
CPTFJ0305	PB-212	0.16	0.35
CPTID0608	PB-212	0.26	0.18
CPTMC0001	PB-212	0.28	0.18
CPTMC0001 DUP	PB-212	0.31	4.89
CPTMD0406	PB-212	0.16	0.13
DSAC0101	PB-212	0.32	0.23
DSAC0405	PB-212	0.23	0.23
ESAA0001 DUP	PB-212	0.30	0.53
FALC0001	PB-212	0.38	0.60
FALD0001	PB-212	0.25	1.54
FALE0001	PB-212	0.21	0.42
FALF0001	PB-212	0.22	0.38
ROADA 0001	PB-212	0.38	0.64
ROADB 0001	PB-212	0.45	2.20
ROADC 0001	PB-212	0.29	0.52

Table E.1-3
Investigative On-Site Gamma Spectrum Analysis Sample Results
Summary of Positive Detects
(Page 6 of 6)

Sample Number	Parameter	Result (pCi/g)	Uncertainty (pCi/g)
ROADD 0001	PB-212	0.26	0.84
ROADF0001	PB-212	0.30	6.50
ROADG 0001	PB-212	0.14	0.27
ROADI0001	PB-212	0.28	0.52
SAN1B1112	PB-212	0.19	0.11
SAYB0001	PB-212	0.56	0.86
SHFA0001	PB-212	0.19	0.36
SHFB0001	PB-212	0.26	0.44
SHFC0001 DUP	PB-212	0.17	0.34
CPTBA0708	PB-214	0.58	0.31
CPTBD1012	PB-214	0.19	0.16
CPTIC0305	PB-214	0.40	0.38
ROADB 0001	PB-214	0.46	0.46
SAN1B1112	PB-214	0.31	0.18
SAYB0001	PB-214	0.85	0.84
CPTMC0001	RA-226	0.64	1.64
FALC0001	RA-226	1.41	3.99
CPTEC0304	SR-85	0.10	0.42

Notes:
BE-7 = Beryllium-7
BI-211 = Bismuth-211
BI-214 = Bismuth-214
CS-137 = Cesium-137
I-131 = Iodine-131
K-40 = Potassium-40
PB-212 = Lead-212
PB-214 = Lead-214
RA-226 = Radon-226
SR-85 = Strontium-85
pCi/g = Picocuries per gram

Table E.1-4
Investigative Water Sample Results
Summary of Positive Detects
(Page 1 of 4)

Sample Number	Parameter	Result	Units	Validation Qualifier	Detection Limit	Test Method
SRN6B0101	2-Butanone	7.3	µg/L	J	20	EPA8260
DSAB0101	2-Butanone	8.6	µg/L	J	20	EPA8260
DECA0101	2-Butanone	6.1	µg/L	J	20	EPA8260
USG5B0101	2-Butanone	6.9	µg/L	J	20	EPA8260
SAN3B0101	2-Butanone	8.4	µg/L	J	20	EPA8260
LRL7B0101	2-Butanone	6.1	µg/L	J	20	EPA8260
WARF0101	Acetone	14	µg/L	J[a]	20	EPA8260
WARE0101	Acetone	11	µg/L	J[b]	20	EPA8260
SRN6B0101	Acetone	8.3	µg/L	J[b]	20	EPA8260
GNMF011	Acetone	2,600	µg/L	J[b]	100	EPA8260
GNMC0101	Acetone	4,500	µg/L	J[b]	100	EPA8260
GNMC004	Acetone	4,800	µg/L	J[b]	100	EPA8260
GNME008	Acetone	13,000	µg/L	J[c]	100	EPA8260
GNMB003	Acetone	20,000	µg/L	J[c]	100	EPA8260
GNMD007	Acetone	6,700	µg/L	J[c]	100	EPA8260
GNMA002	Acetone	21,000	µg/L	J[c]	100	EPA8260
WARE0101	Bromoform	5	µg/L		5	EPA8260
WARE0101	Dibromochloromethane	2.2	µg/L	J	5	EPA8260
SAN3B0101	Dichlorodifluoromethane	1.7	µg/L	J	10	EPA8260
USG4C0101	Methylene Chloride	17	µg/L	J[d]	5	EPA8260
USG4B0101	Methylene Chloride	14	µg/L		5	EPA8260
GNMA0101	Methylene Chloride	36	µg/L		5	EPA8260
WARG0101	Methylene Chloride	13	µg/L		5	EPA8260
SRN3B0101	Methylene Chloride	12	µg/L		5	EPA8260
USG5A0101	Methylene Chloride	14	µg/L		5	EPA8260
WARH0101	Methylene Chloride	13	µg/L		5	EPA8260
GENB0101	Methylene Chloride	12	µg/L		5	EPA8260
GNMI0101	Methylene Chloride	41	µg/L		5	EPA8260
GNME008	Methylene Chloride	14	µg/L	J	25	EPA8260
GNMD007	Methylene Chloride	26	µg/L		25	EPA8260
USG4A0101	Methylene Chloride	14	µg/L		5	EPA8260
SAN1A0101	Methylene Chloride	40	µg/L		5	EPA8260
SAN1B0101	Methylene Chloride	19	µg/L	J[d]	5	EPA8260

Table E.1-4
Investigative Water Sample Results
Summary of Positive Detects
(Page 2 of 4)

Sample Number	Parameter	Result	Units	Validation Qualifier	Detection Limit	Test Method
SRN1A0101	Methylene Chloride	13	µg/L		5	EPA8260
SRN2A0101	Methylene Chloride	15	µg/L		5	EPA8260
SRN3A0101	Methylene Chloride	13	µg/L		5	EPA8260
SAN3B0101	Trichlorofluoromethane	1.5	µg/L	J	5	EPA8260
SAN3B0101	Trichlorotrifluoroethane	2	µg/L	J	5	EPA8260
GNMC004RR1	4-Methylphenol	2.4	µg/L	J	9.8	EPA8270
GNMB003RR1	4-Methylphenol	1.8	µg/L	J	9.7	EPA8270
GNMC004	4-Methylphenol	2.5	µg/L	J	9.8	EPA8270
GNMB003	4-Methylphenol	2.1	µg/L	J	9.7	EPA8270
GNMA002	Benzoic Acid	8.1	µg/L	J	49	EPA8270
GNMA002RR1	Benzoic Acid	6.6	µg/L	J	49	EPA8270
SRN3B0101	Benzyl Alcohol	5.9	µg/L	J	9.5	EPA8270
GNMA002RR1	Benzyl Alcohol	3.3	µg/L	J	9.7	EPA8270
GNMA002	Benzyl Alcohol	3.7	µg/L	J	9.7	EPA8270
GNMA002	Bis(2-Ethylhexyl)Phthalate	8.6	µg/L	J	9.7	EPA8270
GNMA002RR1	Bis(2-Ethylhexyl)Phthalate	7.5	µg/L	J	9.7	EPA8270
GNMB003	Bis(2-Ethylhexyl)Phthalate	3.2	µg/L	J	9.7	EPA8270
WARE0101	Bis(2-Ethylhexyl)Phthalate	5.2	µg/L	J	9.8	EPA8270
USG5B0101	Bis(2-Ethylhexyl)Phthalate	23	µg/L		9.6	EPA8270
GNMF011	Bis(2-Ethylhexyl)Phthalate	1.7	µg/L	J	9.6	EPA8270
GNMB003RR1	Bis(2-Ethylhexyl)Phthalate	2.9	µg/L	J	9.7	EPA8270
GNME008RR1	Bis(2-Ethylhexyl)Phthalate	9.9	µg/L	J	9.9	EPA8270
GNME008	Bis(2-Ethylhexyl)Phthalate	13	µg/L		9.9	EPA8270
GNMD007	Carbazole	1.4	µg/L	J	9.7	EPA8270
GNMA002RR1	Di-N-Butyl Phthalate	5.4	µg/L	J	9.7	EPA8270
GNMA002	Di-N-Butyl Phthalate	5.9	µg/L	J	9.7	EPA8270
GNMD007	Diethyl Phthalate	1.5	µg/L	J	9.7	EPA8270
GNMC004	Diethyl Phthalate	1.8	µg/L	J	9.8	EPA8270
GNMA002	Diethyl Phthalate	8.2	µg/L	J	9.7	EPA8270
GNMB003RR1	Diethyl Phthalate	3.2	µg/L	J	9.7	EPA8270
GNMA002RR1	Diethyl Phthalate	7.3	µg/L	J	9.7	EPA8270
GNMB003	Diethyl Phthalate	3.5	µg/L	J	9.7	EPA8270
GNMC004RR1	Diethyl Phthalate	1.6	µg/L	J	9.8	EPA8270

Table E.1-4
Investigative Water Sample Results
Summary of Positive Detects
(Page 3 of 4)

Sample Number	Parameter	Result	Units	Validation Qualifier	Detection Limit	Test Method
GNMD007	N-Nitrosodiphenylamine	2.4	µg/L	J	9.7	EPA8270
GNMD007RR1	N-Nitrosodiphenylamine	2	µg/L	J[e]	9.7	EPA8270
GNME008	N-Nitrosodiphenylamine	1.7	µg/L	J	9.9	EPA8270
WARE0101RR1	Phenol	260	µg/L		29	EPA8270
GNMB003RR1	Phenol	1.7	µg/L	J[f]	9.7	EPA8270
GNMA002RR1	Phenol	21	µg/L	J[f]	9.7	EPA8270
GNMA002	Phenol	23	µg/L		9.7	EPA8270
GNMB003	Phenol	1.8	µg/L	J	9.7	EPA8270
WARE0101	Phenol	230	µg/L	J[g]	9.8	EPA8270
WARE0101	Gasoline Range Organics	0.059	mg/L	J	0.1	EPAG8015
USG5B0101	Gasoline Range Organics	0.048	mg/L	J	0.1	EPAG8015
WARE0101	Bismuth-214	21.2 ± 9.0	pCi/L	TI	12	HASL300
SAYC0101	Arsenic	0.0042	mg/L	B	0.01	RCRA Metals
WARD0101	Arsenic	0.0027	mg/L	B	0.01	RCRA Metals
WARB0101	Barium	0.00094	mg/L	B	0.1	RCRA Metals
GNME008	Barium	0.05	mg/L	B	0.1	RCRA Metals
GNMD007	Barium	0.017	mg/L	B	0.1	RCRA Metals
LRL7C0101	Barium	0.0038	mg/L	B	0.1	RCRA Metals
GNMC0101	Barium	0.21	mg/L		0.1	RCRA Metals
GNMF011	Barium	0.22	mg/L		0.1	RCRA Metals
GNMB003	Barium	0.098	mg/L	B	0.1	RCRA Metals
WARD0101	Barium	0.0018	mg/L	B	0.1	RCRA Metals
WARE0101	Barium	0.066	mg/L	B	0.1	RCRA Metals
SAYC0101	Barium	0.0012	mg/L	B	0.1	RCRA Metals
GNMA002	Cadmium	0.00064	mg/L	B	0.005	RCRA Metals
LRL7C0101	Chromium	0.0012	mg/L	B	0.01	RCRA Metals
GNME008	Chromium	0.0034	mg/L	B	0.01	RCRA Metals
GNMC0101	Chromium	0.0084	mg/L	B	0.01	RCRA Metals
GNMB003	Chromium	0.0094	mg/L	B	0.01	RCRA Metals
GNMA002	Chromium	0.0055	mg/L	B	0.01	RCRA Metals

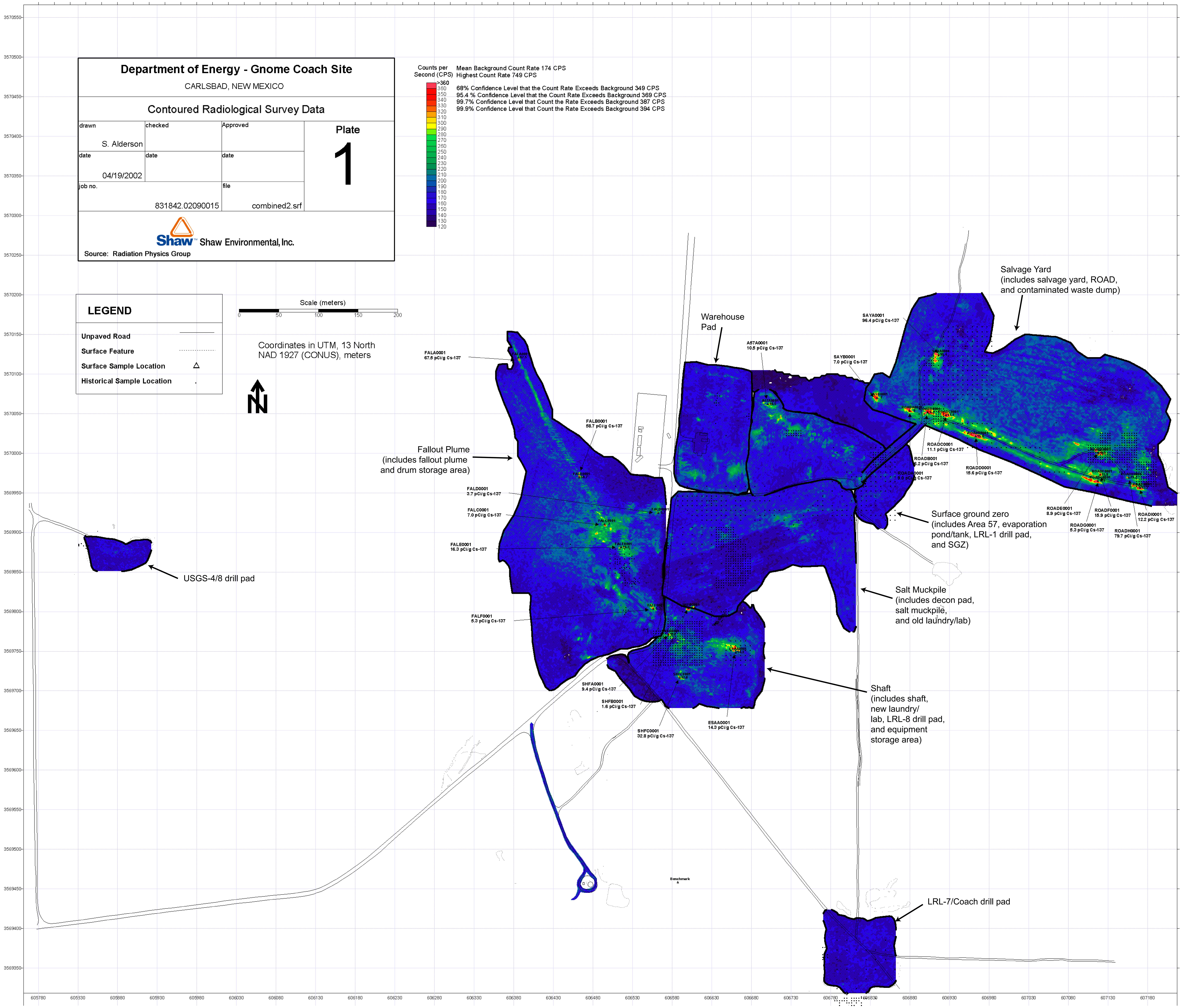
Table E.1-4
Investigative Water Sample Results
Summary of Positive Detects
(Page 4 of 4)

Sample Number	Parameter	Result	Units	Validation Qualifier	Detection Limit	Test Method
GNMF011	Chromium	0.0086	mg/L	B	0.01	RCRA Metals
WARB0101	Lead	0.0014	mg/L	B	0.003	RCRA Metals
WARE0101	Lead	0.0082	mg/L		0.003	RCRA Metals
GNMB003	Selenium	0.0043	mg/L	B	0.005	RCRA Metals
SAYC0101	Silver	0.0016	mg/L	B	0.01	RCRA Metals

[a]Qualifier added to laboratory data; record accepted. Volatile/reactive sample vial contained headspace. Average relative response factor <0.05. Relative response factor <0.05.
[b]Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05.
[c]Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05. Value exceeded linear range of instrument.
[d]Qualifier added to laboratory data; record accepted. Volatile/reactive sample vial contained headspace.
[e]Qualifier added to laboratory data; record accepted. Continuing calibration verification percent >25%.
[f]Qualifier added to laboratory data; record accepted. Laboratory control sample/laboratory control sample duplicate recovery was below the control limits.
[g]Qualifier added to laboratory data; record accepted. Value exceeded linear range of instrument.

B = Value less than the instrument detection limit, but greater than or equal to the contract required detection limit.
TI = Nuclide identification is tentative
J = Estimated value.
µg/L = Micrograms per liter
mg/L = Milligram per liter
pCi/L = Picocuries per liter

Plates



Department of Energy - Gnome Coach Site
CARLSBAD, NEW MEXICO
Contoured Radiological Survey Data
drawn
S. Alderson
checked
Approved
date
04/19/2002
date
date
job no.
831842.02090015
file
combined2.srf
Plate
1
Shaw Environmental, Inc.
Source: Radiation Physics Group
Counts per Second (CPS)
>360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
Mean Background Count Rate 174 CPS
Highest Count Rate 749 CPS
68% Confidence Level that the Count Rate Exceeds Background 349 CPS
95.4 % Confidence Level that the Count Rate Exceeds Background 369 CPS
99.7% Confidence Level that Count the Rate Exceeds Background 387 CPS
99.9% Confidence Level that Count the Rate Exceeds Background 394 CPS
LEGEND
Unpaved Road
Surface Feature
Surface Sample Location
Historical Sample Location
Scale (meters)
0
50
100
150
200
Coordinates in UTM, 13 North
NAD 1927 (CONUS), meters
N
Salvage Yard
(includes salvage yard, ROAD, and contaminated waste dump)
Warehouse Pad
Fallout Plume
(includes fallout plume and drum storage area)
Surface ground zero
(includes Area 57, evaporation pond/tank, LRL-1 drill pad, and SGZ)
USGS-4/8 drill pad
Salt Muckpile
(includes decon pad, salt muckpile, and old laundry/lab)
Shaft
(includes shaft, new laundry/ lab, LRL-8 drill pad, and equipment storage area)
LRL-7/Coach drill pad
Benchmark
FALA0001 67.5 pCi/g Cs-137
FALB0001 58.7 pCi/g Cs-137
FALD0001 3.7 pCi/g Cs-137
FALC0001 7.0 pCi/g Cs-137
FALE0001 16.3 pCi/g Cs-137
FALF0001 5.3 pCi/g Cs-137
A57A0001 10.5 pCi/g Cs-137
SAYA0001 96.4 pCi/g Cs-137
SAYB0001 7.0 pCi/g Cs-137
ROADC0001 11.1 pCi/g Cs-137
ROADB0001 6.2 pCi/g Cs-137
ROADA0001 9.6 pCi/g Cs-137
ROADD0001 15.6 pCi/g Cs-137
ROADE0001 8.9 pCi/g Cs-137
ROADF0001 15.9 pCi/g Cs-137
ROADG0001 5.3 pCi/g Cs-137
ROADH0001 79.7 pCi/g Cs-137
ROADI0001 12.2 pCi/g Cs-137
SHFA0001 9.4 pCi/g Cs-137
SHFB0001 1.6 pCi/g Cs-137
SHFC0001 32.8 pCi/g Cs-137
ESAA0001 14.3 pCi/g Cs-137

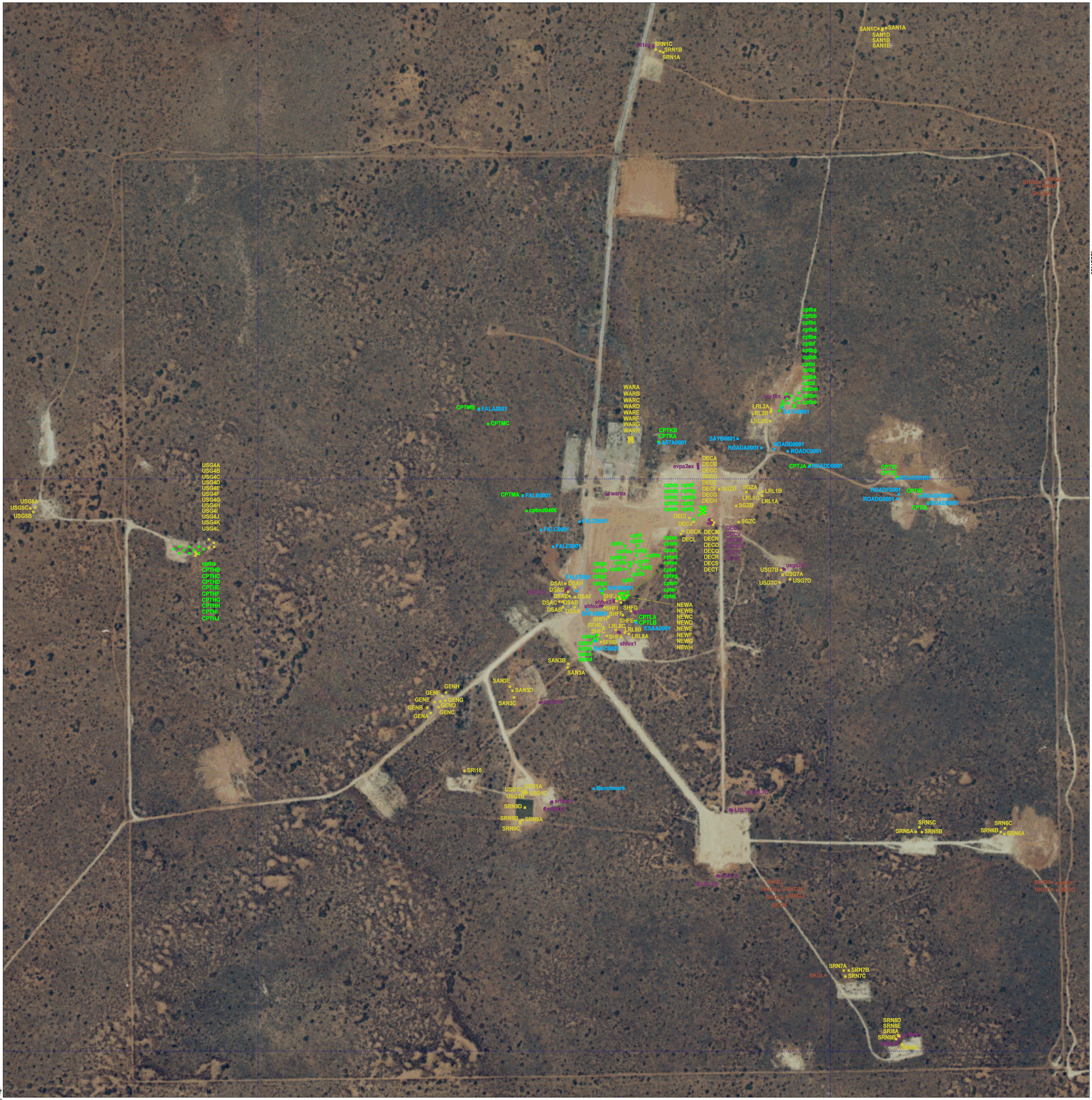


PLATE 2, SURFACE AND SHALLOW SUBSURFACE INVESTIGATION LOCATIONS
GNOME-COACH SITE, EDDY COUNTY, NEW MEXICO

EXPLANATION

- GEOPROBE BORING LOCATION
- CPT BORING LOCATION
- SURFACE SAMPLE LOCATION
- BACKGROUND SAMPLE LOCATION
- EXCAVATION LOCATION

NOTES

1. FOR BORDERS OF INDIVIDUAL AOCs SEE PLATE 1 IN THE GNOME-COACH WORK PLAN (NNSA/NV, 2002)
2. CPT DENOTES A CPT LOCATION, SEE TABLE 5-3 FOR AOC DESIGNATION.
3. FOR ALL OTHER INVESTIGATION LOCATIONS SEE TABLE E.1-1 FOR AOC DESIGNATION (e.g., DEC - DECONTAMINATION PAD)

PROJECTION AND GRID: UNIVERSAL TRANSVERSE MERCATOR, ZONE 13, 1927 NORTH AMERICAN DATUM, METERS

NEW MEXICO COORDINATE SYSTEM, EAST ZONE, 1927 NORTH AMERICAN DATUM, FEET IS SHOWN FOR REFERENCE ONLY

GEOGRAPHIC (LONGITUDE, LATITUDE) IS SHOWN FOR REFERENCE ONLY

SCALE

100 0 200 400 600
FEET

25 0 50 100 150 200
METERS

h:\Gnome\CAIR\GCaerial_P.dgn
12-MAY-2004

Source: 1979 Aerial photo obtained from Bechtel Nevada Remote Sensing Lab; Field Investigation GPS Data, 2002

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