Nevada
Environmental
Restoration
Project

DOE/NV--1350

National Nuclear Security Administration

Closure Report for Corrective Action Unit 166: Storage Yards and Contaminated Materials, Nevada Test Site, Nevada

Controlled Copy No.:_____

Revision: 0

August 2009

Environmental Restoration
Project

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

DISCLAIMER

DOE/NV--1350

CLOSURE REPORT FOR CORRECTIVE ACTION UNIT 166: STORAGE YARDS AND CONTAMINATED MATERIALS, NEVADA TEST SITE, NEVADA

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

Controlled Copy No.____
Revision: 0
August 2009

THIS PAGE INTENTIONALLY LEFT BLANK

CLOSURE REPORT FOR CORRECTIVE ACTION UNIT 166: STORAGE YARDS AND CONTAMINATED MATERIALS, NEVADA TEST SITE, NEVADA

Approved By: /S/: Kevin J. Cabble Date: 8-25-09

Kevin J. Cabble,
Federal Sub-Project Director
Industrial Sites Sub-Project

Approved By: /S/: Robert F. Boehlecke Date: 8/25/09

Robert F. Boehlecke
Federal Project Director
Environmental Restoration Project

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF TABLES

APPENDICES

ACRONYMS AND ABBREVIATIONS

ALLW	asbestiform low-level waste
Am	americium
BMP	best management practice
CAIP	Corrective Action Investigation Plan
CAP	Corrective Action Plan
CAS	Corrective Action Site
CAU	Corrective Action Unit
COC	contaminant of concern
CR	Closure Report
CSM	conceptual site model
DU	depleted uranium
EPA	U.S. Environmental Protection Agency
FFACO	*Federal Facility Agreement and Consent Order*
ft^3	cubic foot (feet)
gal	gallon(s)
HW	hazardous waste
LLW	low-level waste
mg/kg	milligram(s) per kilogram
MW	mixed waste
NDEP	Nevada Division of Environmental Protection
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NNSA/NV	U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office
NTS	Nevada Test Site
pCi/g	picocurie(s) per gram
QA	quality assurance
QAPP	*Industrial Sites Quality Assurance Project Plan*
QC	quality control
RWMS	Radioactive Waste Management Site
yd^3	cubic yard(s)

THIS PAGE INTENTIONALLY LEFT BLANK

EXECUTIVE SUMMARY

Corrective Action Unit (CAU) 166 is identified in the *Federal Facility Agreement and Consent Order* (FFACO) as "Storage Yards and Contaminated Materials" and consists of the following seven Corrective Action Sites (CASs), located in Areas 2, 3, 5, and 18 of the Nevada Test Site:

- CAS 02-42-01, Cond. Release Storage Yd - North
- CAS 02-42-02, Cond. Release Storage Yd - South
- CAS 02-99-10, D-38 Storage Area
- CAS 03-42-01, Conditional Release Storage Yard
- CAS 05-19-02, Contaminated Soil and Drum
- CAS 18-01-01, Aboveground Storage Tank
- CAS 18-99-03, Wax Piles/Oil Stain

Closure activities were conducted from March to July 2009 according to the FFACO (1996, as amended February 2008) and the Corrective Action Plan for CAU 166 (U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office, 2007b). The corrective action alternatives included No Further Action and Clean Closure. Closure activities are summarized in Table 1.

TABLE 1. SUMMARY OF CORRECTIVE ACTION UNIT 166 CLOSURE ACTIVITIES

CAS	CAS NAME	CLOSURE METHOD	COC	CLOSURE ACTIVITIES
02-42-01	Cond. Release Storage Yd - North	No Further Action	None	None
02-42-02	Cond. Release Storage Yd - South	No Further Action	None	None
02-99-10	D-38 Storage Area	Clean Closure	Lead and arsenic	• Lead shot and DU were removed for disposal.
03-42-01	Conditional Release Storage Yard	Clean Closure	Lead and Am-241	• Soil impacted with lead and Am-241 was removed for disposal. • Verification samples were collected. • As a BMP, asbestos tile was removed from a portable building, oil was drained from accumulators, and the portable building, accumulators, gas cylinders, and associated debris were removed for disposal.
05-19-02	Contaminated Soil and Drum	No Further Action	None	• As a BMP, an empty drum was removed for disposal.
18-01-01	Aboveground Storage Tank	Clean Closure	Lead	• Lead-impacted liquid was removed for disposal. • Lead shot and wax embedded with lead shot were removed for disposal. • As a BMP, wax and non-impacted liquid were removed for disposal, and two metal containers were grouted in place.
18-99-03	Wax Piles/Oil Stain	No Further Action	None	• As a BMP, wax was removed for disposal, and one metal container was grouted in place.

Am: americium
BMP: best management practice
CAS: Corrective Action Site
COC: contaminant of concern
DU: depleted uranium

1.0 INTRODUCTION

This Closure Report (CR) documents closure activities for Corrective Action Unit (CAU) 166, Storage Yards and Contaminated Materials, according to the *Federal Facility Agreement and Consent Order* (FFACO) (1996, as amended February 2008) and the Corrective Action Plan (CAP) for CAU 166 (U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office [NNSA/NSO], 2007b). CAU 166 consists of the following seven Corrective Action Sites (CASs), located in Areas 2, 3, 5, and 18 of the Nevada Test Site (NTS) (Figure 1):

- CAS 02-42-01, Cond. Release Storage Yd - North
- CAS 02-42-02, Cond. Release Storage Yd - South
- CAS 02-99-10, D-38 Storage Area
- CAS 03-42-01, Conditional Release Storage Yard
- CAS 05-19-02, Contaminated Soil and Drum
- CAS 18-01-01, Aboveground Storage Tank
- CAS 18-99-03, Wax Piles/Oil Stain

1.1 PURPOSE

CAU 166, Storage Yards and Contaminated Materials, consists of seven CASs in Areas 2, 3, 5, and 18 of the NTS. The closure alternatives included No Further Action and Clean Closure. This CR provides a summary of completed closure activities, documentation of waste disposal, and confirmation that remediation goals were met.

1.2 SCOPE

The closure strategy for CAU 166 included the following activities:

- At CAS 02-42-01, Cond. Release Storage Yd - North, no work was performed.
- At CAS 02-42-02, Cond. Release Storage Yd - South, no work was performed.
- At CAS 02-99-10, D-38 Storage Area, approximately 40 gallons (gal) of lead shot were removed and are currently pending treatment and disposal as mixed waste (MW), and approximately 50 small pieces of depleted uranium (DU) were removed and disposed as low-level waste (LLW).
- At CAS 03-42-01, Conditional Release Storage Yard, approximately 7.5 cubic yards (yd^3) of soil impacted with lead and americium (Am)-241 were removed and disposed as LLW. As a best management practice (BMP), approximately 22 cubic feet (ft^3) of asbestos tile were removed from a portable building and disposed as asbestiform low-level waste (ALLW); approximately 55 gal of oil were drained from accumulators and are currently pending disposal as hazardous waste (HW); the portable building was demolished, size-reduced, and disposed as LLW; and accumulators, gas cylinders, and associated debris were removed and are currently pending treatment and disposal as MW.
- At CAS 05-19-02, Contaminated Soil and Drum, as a BMP, an empty drum was removed and disposed as sanitary waste.

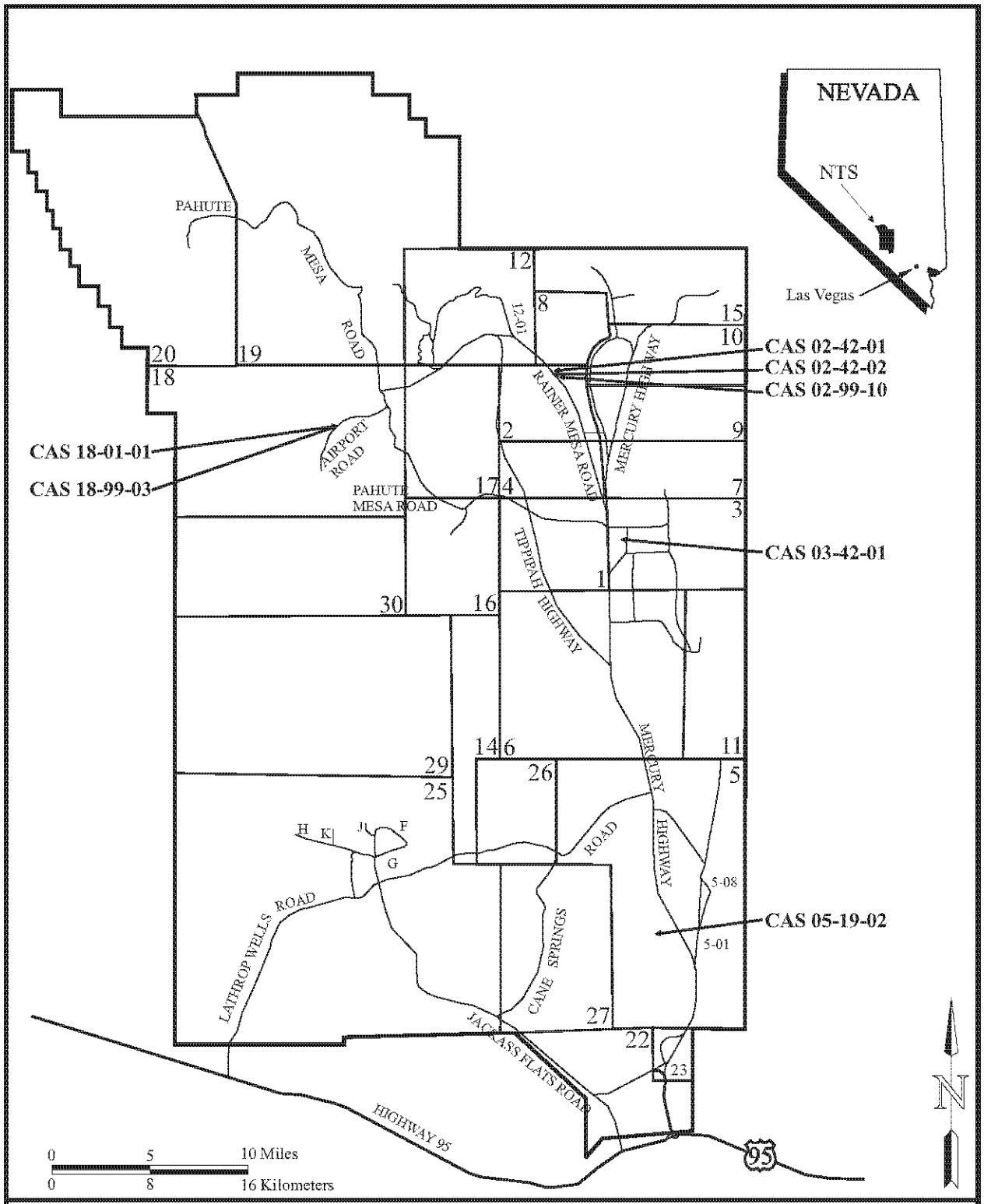

FIGURE 1. CORRECTIVE ACTION UNIT 166 SITE LOCATION MAP

- At CAS 18-01-01, Aboveground Storage Tank, approximately 165 gal of lead-impacted liquid were removed and are currently pending disposal as HW, and approximately 10 gal of lead shot and 6 yd^3 of wax embedded with lead shot were removed and are currently pending treatment and disposal as MW. As a BMP, approximately 0.5 yd^3 of wax were removed and disposed as hydrocarbon waste, approximately 55 gal of liquid were removed and disposed as sanitary waste, and two metal containers were grouted in place.
- At CAS 18-99-03, Wax Piles/Oil Stain, no further action was required; however, as a BMP, approximately 1.5 yd^3 of wax were removed and disposed as hydrocarbon waste, and one metal container was grouted in place.

1.3 CLOSURE REPORT CONTENTS

This CR includes the following sections:

- Section 1.0 – Introduction
- Section 2.0 – Closure Activities
- Section 3.0 – Waste Disposition
- Section 4.0 – Closure Verification Results
- Section 5.0 – Conclusions and Recommendations
- Section 6.0 – References
- Appendix A – Data Quality Objectives
- Appendix B – Sample Analytical Results
- Appendix C – Waste Disposition Documentation
- Appendix D – Site Closure Photographs
- Library Distribution List

This report was developed using information and guidance from the following documents:

- Corrective Action Investigation Plan (CAIP) for CAU 166 (NNSA/NSO, 2006)
- Corrective Action Decision Document for CAU 166 (NNSA/NSO, 2007a)
- CAP for CAU 166 (NNSA/NSO, 2007b)
- *Industrial Sites Quality Assurance Project Plan* (QAPP) (U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office [NNSA/NV], 2002)

Data quality objectives developed for site characterization of CAU 166 were presented in Appendix A of the CAIP for CAU 166 (NNSA/NSO, 2006) and are included as Appendix A of this report. Conceptual site models (CSMs) were developed based on process knowledge, historical information, and personnel interviews. No variations to the CSMs were identified, and the CSMs were confirmed by soil sample results and verified during closure activities.

THIS PAGE INTENTIONALLY LEFT BLANK

2.0 CLOSURE ACTIVITIES

This section describes closure activities, deviations from the CAP, and schedule.

2.1 DESCRIPTION OF CORRECTIVE ACTION ACTIVITIES

The following sections describe the closure activities completed for CAU 166.

2.1.1 Preplanning and Site Preparation

Prior to closure activities, the following documents were prepared:

- *National Environmental Policy Act* Checklist
- Site-Specific Health and Safety Plan
- Field Management Plan
- NNSA/NSO Real Estate/Operations Permit
- Work control packages

2.1.2 Closure Activities

The following sections detail the closure activities completed at each CAS.

2.1.2.1 Corrective Action Site 02-42-01, Cond. Release Storage Yd - North

No contaminants of concern (COCs) are present; therefore, no further action was required, and no work was performed.

2.1.2.2 Corrective Action Site 02-42-02, Cond. Release Storage Yd - South

No COCs are present; therefore, no further action was required, and no work was performed.

2.1.2.3 Corrective Action Site 02-99-10, D-38 Storage Area

This site was clean closed by removing approximately 40 gal of lead shot for treatment and disposal as MW. During closure activities, approximately 50 small pieces of DU not previously identified were discovered at the site. The DU was removed and disposed as LLW.

2.1.2.4 Corrective Action Site 03-42-01, Conditional Release Storage Yard

This site was clean closed by removing approximately 7.5 yd^3 of soil impacted with Am-241 and lead for disposal as LLW. Although lead was present in the soil above the action level requiring removal, Toxicity Characterization Leaching Procedure results for lead were below the *Resource Conservation and Recovery Act* limit that would require disposal as MW. Five verification samples and one blind duplicate sample were collected from the excavation. Am-241 and lead were not present in the verification samples at concentrations above action levels; therefore, the excavation was backfilled with clean soil.

As a BMP, approximately 22 ft^3 of asbestos tile were removed from a portable building and disposed as ALLW; approximately 55 gal of oil were drained from accumulators for disposal as HW; the portable building was demolished, size-reduced, and disposed as LLW; and accumulators, gas cylinders, and other debris were removed for treatment and disposal as MW.

2.1.2.5 Corrective Action Site 05-19-02, Contaminated Soil and Drum

No COCs are present, and no further action was required. However, as a BMP, an empty drum was removed and disposed as sanitary waste.

2.1.2.6 Corrective Action Site 18-01-01, Aboveground Storage Tank

This site consisted of two metal containers located in a Contamination Area. The site was clean closed by removing approximately 165 gal of lead-impacted liquid from one of the metal containers for disposal as HW. During closure activities, lead shot that was not identified during corrective action investigation activities was discovered on the lids and within the two metal containers. In addition, lead shot was embedded in some of the wax present in the metal containers. Approximately 10 gal of lead shot and 6 yd^3 of wax embedded with lead shot were removed from the metal containers for treatment and disposal as MW. In addition, residual sludge located in the pipes beneath the metal containers was removed for treatment and disposal as MW.

As a BMP, approximately 0.5 yd^3 of wax were removed from the metal containers and disposed as hydrocarbon waste, approximately 55 gal of liquid were removed from the second metal container and disposed as sanitary waste, and the two metal containers were grouted in place.

2.1.2.7 Corrective Action Site 18-99-03, Wax Piles/Oil Stain

No COCs are present, and no further action was required. However, as a BMP, approximately 1.5 yd^3 of wax were removed and disposed as hydrocarbon waste, and one metal container was grouted in place.

2.2 DEVIATIONS FROM THE CORRECTIVE ACTION PLAN AS APPROVED

Deviations from the CAP (NNSA/NSO, 2007b) included the following:

- During closure activities at CAS 02-99-10, approximately 50 small pieces of DU not previously identified were discovered at the site. The DU was removed and disposed as LLW.
- During closure activities at CAS 18-01-01, lead shot that was not identified during corrective action investigation activities was discovered on the lids and within the two metal containers at the site. In addition, lead shot was embedded in some of the wax present in the metal containers. Approximately 10 gal of lead shot and 6 yd^3 of wax embedded with lead shot were removed from the metal containers for treatment and disposal as MW. In addition, residual sludge located in the pipes beneath the metal containers was removed for treatment and disposal as MW.

- An additional metal container not previously identified was discovered in Area 18 near CASs 18-01-01 and 18-99-03. The lid was removed to inspect the interior of the container. The container was found to be empty, and no further action was required.

2.3 CORRECTIVE ACTION SCHEDULE AS COMPLETED

Closure activities were conducted from March to July 2009. Details of the schedule are provided in Table 2.

TABLE 2. CORRECTIVE ACTION UNIT 166 CLOSURE ACTIVITIES SCHEDULE

CORRECTIVE ACTION SITE	START DATE	END DATE
02-99-10, D-38 Storage Area	March 18, 2009	April 20, 2009
03-42-01, Conditional Release Storage Yard	March 10, 2009	June 3, 2009
05-19-02, Contaminated Soil and Drum	March 24, 2009	March 24, 2009
18-01-01, Aboveground Storage Tank	March 10, 2009	July 2, 2009
18-99-03, Wax Piles/Oil Stain	March 12, 2009	June 25, 2009

2.4 SITE PLAN/SURVEY PLAT

As-built drawings were not required for CAU 166 closure activities.

THIS PAGE INTENTIONALLY LEFT BLANK

3.0 WASTE DISPOSITION

This section describes the waste generated during closure activities. The waste streams are summarized in Table 3. Waste disposition documentation is included as Appendix C.

3.1 SANITARY WASTE

Sanitary waste included an empty drum from CAS 05-19-02, which was transported in an end-dump truck to the Area 9 U10c Sanitary Landfill for disposal, and approximately 55 gal of liquid from CAS 18-01-01, which was packaged in a drum and transported to the Area 23 Sewage Lagoons for disposal.

3.2 HYDROCARBON WASTE

Hydrocarbon waste included approximately 0.5 yd^3 of wax from CAS 18-01-01 and approximately 1.5 yd^3 of wax from CAS 18-99-03. Hydrocarbon waste was transported in end-dump trucks to the Area 9 U10c Sanitary Landfill for disposal.

3.3 HAZARDOUS WASTE

HW included approximately 55 gal of oil drained from accumulators at CAS 03-42-01 and approximately 165 gal of lead-impacted liquid from CAS 18-01-01. The oil was packaged in a drum, and lead-impacted liquid was packaged in three drums. All HW is currently being managed on site pending transport for offsite treatment and disposal.

3.4 LOW-LEVEL WASTE

LLW included approximately 50 small pieces of DU from CAS 02-99-10, approximately 7.5 yd^3 of soil impacted with Am-241 and lead from CAS 03-42-01, and approximately 157 yd^3 of debris from demolition of the portable building at CAS 03-42-01. The DU from CAS 02-99-10 was packaged with the soil from CAS 03-42-01 in two B-25 boxes that were transported to the Area 5 Radioactive Waste Management Site (RWMS) for disposal. The portable building was demolished and size reduced, and the demolition debris was packaged in three transportainers and four B-25 boxes and transported to the Area 5 RWMS for disposal.

3.5 MIXED WASTE

MW included approximately 40 gal of lead shot from CAS 02-99-10, approximately 20 yd^3 of debris (i.e., accumulators, gas cylinders, and other debris) from CAS 03-42-01, approximately 10 gal of lead shot from CAS 18-01-01, and approximately 6 yd^3 of wax with lead shot embedded in it from CAS 18-01-01. All MW was packaged in macroencapsulation boxes and is currently being managed on site pending treatment and disposal at the Area 5 RWMS.

3.6 ASBESTIFORM LOW-LEVEL WASTE

ALLW included approximately 22 ft^3 of asbestos tile from CAS 03-42-01, which was packaged in three drums and transported to the Area 5 RWMS for disposal.

TABLE 3. CORRECTIVE ACTION UNIT 166 WASTE DISPOSITION SUMMARY

WASTE STREAM	CORRECTIVE ACTION SITE	DESCRIPTION OF WASTE	VOLUME	WASTE CONTAINER	DISPOSITION
Sanitary Waste	05-19-02, Contaminated Soil and Drum	Empty drum	55 gal	None	Disposed at the Area 9 U10c Sanitary Landfill
	18-01-01, Aboveground Storage Tank	Liquid	55 gal	1 drum	Disposed at the Area 23 Sewage Lagoon
Hydrocarbon Waste	18-01-01, Aboveground Storage Tank	Wax	0.5 yd^3	None	Disposed at the Area 9 U10c Sanitary Landfill
	18-99-03, Wax Piles/Oil Stain	Wax	1.5 yd^3	None	
HW	03-42-01, Conditional Release Storage Yard	Oil	55 gal	1 drum	Currently staged on site pending transport to an offsite treatment and disposal facility
	18-01-01, Aboveground Storage Tank	Liquid	165 gal	3 drums	
LLW	02-99-10, D-38 Storage Area	DU	0.1 ft^3	1 B-25 Box	Disposed at the Area 5 RWMS
	03-42-01, Conditional Release Storage Yard	Soil	7.5 yd^3	2 B-25 Boxes	
		Building debris	157 yd^3	3 Transportainers and 4 B-25 Boxes	
MW	02-99-10, D-38 Storage Area	Lead shot	40 gal	5 Macroencapsulation Boxes	Currently staged on site pending treatment and disposal at the Area 5 RWMS
	03-42-01, Conditional Release Storage Yard	Accumulators, gas cylinders, and other debris	20 yd^3		
	18-01-01, Aboveground Storage Tank	Lead shot	10 gal	2 Macroencapsulation Boxes	
		Wax embedded with lead shot	6 yd^3		
ALLW	03-42-01, Conditional Release Storage Yard	Asbestos tiles	22 ft^3	3 drums	Disposed at the Area 5 RWMS

ALLW: asbestiform low-level waste
DU: depleted uranium
ft^3: cubic foot (feet)
gal: gallon(s)
HW: hazardous waste
LLW: low-level waste
MW: mixed waste
RWMS: Radioactive Waste Management Site
yd^3: cubic yard(s)

4.0 CLOSURE VERIFICATION RESULTS

Site closure was verified by visual observations and by collecting and analyzing soil verification samples. Soil verification samples were collected from the excavation at CAS 03-42-01 and analyzed for Am-241 and lead to verify that the remaining soil did not contain contamination above action levels. The results showed that no COCs above the action levels were remaining at the site. Sample results are summarized in Table 3, and the laboratory summary data reports are included in Appendix B. Photographs documenting site conditions before and after closure activities are included as Appendix D.

TABLE 4. VERIFICATION SAMPLE RESULTS FOR CORRECTIVE ACTION SITE 03-42-01

ANALYTE	ACTION LEVEL	SAMPLE RESULTS					
		V1	V2	V3	V4	V5	V6
Americium-241	12.7 pCi/g	0.7163	2.913	0.04118*	0.06174*	0.1064*	1.116
Lead	800 mg/kg	87.0	66.3	10.9	14.1	27.7	19.2

mg/kg: milligram(s) per kilogram
pCi/g: picocurie(s) per gram
*not detected above the laboratory's minimum detectable concentration

4.1 DATA QUALITY ASSESSMENT

Accurate and defensible analytical data were collected to verify that the closure objectives were met. Analytical data results are included as Appendix C. The following sections describe the quality assurance (QA) and quality control (QC) procedures, data validation process, and a reconciliation of the CSM with actual findings during closure activities. More detail on the QA/QC procedures can be found in the CAP for CAU 166 (NNSA/NSO, 2007b) and the QAPP (NNSA/NV, 2002).

4.1.1 Quality Assurance and Quality Control Procedures

Verification samples were collected with disposable sampling equipment, placed in appropriately labeled containers secured with custody seals, labeled with unique sample numbers, placed on ice, and transported under strict chain of custody. Standard QA/QC samples were collected (i.e., one blind duplicate per batch). Samples were analyzed by certified contract laboratories. Analytical results were validated at the laboratory using stringent QA/QC procedures, including matrix spike/matrix spike duplicates, spiked surrogate recovery analysis, verification of analytical results, and data quality indicator requirements.

4.1.2 Data Validation

Data validation was performed according to the QAPP (NNSA/NV, 2002), which is based on the U.S. Environmental Protection Agency (EPA) functional guidelines for data quality (EPA, 1994; 1999). Data were reviewed to ensure that samples were appropriately processed and analyzed and that the results are valid. All sample data were validated at the Tier I level.

No anomalies were discovered in the data that would discredit any of the sample results. Data met the required data quality indicators (i.e., precision, accuracy, sensitivity, completeness, comparability, and representativeness). The complete datasets, including validation reports, are maintained in the project files and available upon request.

4.1.3 Conceptual Site Models

CSMs were developed and presented in the approved CAIP for CAU 166 (NNSA/NSO, 2006). The CSMs were confirmed by soil sample results and verified during closure activities.

4.2 USE RESTRICTION

Use restrictions were not implemented for CAU 166.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

The following site closure activities were performed at CAU 166 as documented in this CR:

- At CAS 02-99-10, D-38 Storage Area, approximately 40 gal of lead shot were removed and are currently pending treatment and disposal as MW, and approximately 50 small pieces of DU were removed and disposed as LLW.
- At CAS 03-42-01, Conditional Release Storage Yard, approximately 7.5 yd^3 of soil impacted with lead and Am-241 were removed and disposed as LLW. As a BMP, approximately 22 ft^3 of asbestos tile were removed from a portable building and disposed as ALLW, approximately 55 gal of oil were drained from accumulators and are currently pending disposal as HW, the portable building was removed and disposed as LLW, and accumulators, gas cylinders, and associated debris were removed and are currently pending treatment and disposal as MW.
- At CAS 05-19-02, Contaminated Soil and Drum, as a BMP, an empty drum was removed and disposed as sanitary waste.
- At CAS 18-01-01, Aboveground Storage Tank, approximately 165 gal of lead-impacted liquid were removed and are currently pending disposal as HW, and approximately 10 gal of lead shot and 6 yd^3 of wax embedded with lead shot were removed and are currently pending treatment and disposal as MW. As a BMP, approximately 0.5 yd^3 of wax were removed and disposed as hydrocarbon waste, approximately 55 gal of liquid were removed and disposed as sanitary waste, and two metal containers were grouted in place.
- At CAS 18-99-03, Wax Piles/Oil Stain, no further action was required; however, as a BMP, approximately 1.5 yd^3 of wax were removed and disposed as hydrocarbon waste, and one metal container was grouted in place.

5.2 POST-CLOSURE REQUIREMENTS

No use restrictions were implemented, and there are no post-closure requirements.

5.3 RECOMMENDATIONS

Since closure activities for CAU 166 have been completed following the Nevada Division of Environmental Protection (NDEP)-approved CAP for CAU 166 (NNSA/NSO, 2007b) as documented in this report, NNSA/NSO requests the following:

- A Notice of Completion from NDEP to NNSA/NSO for closure of CAU 166
- The transfer of CAU 166 from Appendix III to Appendix IV, Closed Corrective Action Units, of the FFACO (1996, as amended February 2008)

THIS PAGE INTENTIONALLY LEFT BLANK

6.0 REFERENCES

EPA, see U.S. Environmental Protection Agency.

Federal Facility Agreement and Consent Order, 1996 (as amended February 2008). Agreed to by the State of Nevada; U.S. Department of Energy, Environmental Management; U.S. Department of Defense; and U.S. Department of Energy, Legacy Management.

FFACO, see *Federal Facility Agreement and Consent Order*.

NNSA/NSO, see U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office.

NNSA/NV, see U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office.

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office, 2002. *Nevada Environmental Restoration Project Industrial Sites Quality Assurance Project Plan, Nevada Test Site, Nevada.* DOE/NV--372-REV.3. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office, 2006. *Corrective Action Investigation Plan for Corrective Action Unit 166: Storage Yards and Contaminated Materials, Nevada Test Site, Nevada.* DOE/NV--1127. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office, 2007a. *Corrective Action Decision Document for Corrective Action Unit 166: Storage Yards and Contaminated Materials, Nevada Test Site, Nevada.* DOE/NV--1188. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office, 2007b. *Corrective Action Plan for Corrective Action Unit 166: Storage Yards and Contaminated Materials, Nevada Test Site, Nevada.* DOE/NV--1229. Las Vegas, NV.

U.S. Environmental Protection Agency, 1994. *Guidance for the Data Quality Objectives Process.* EPA QA/G-4. Washington, D.C.

U.S. Environmental Protection Agency, 1999. *Contract Laboratory Program National Functional Guidelines for Organic Data Review.* EPA540/R-99/008. Washington, D.C.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A*

DATA QUALITY OBJECTIVES

*As presented and published in Appendix A of the approved *Corrective Action Investigation Plan for Corrective Action Unit 166: Storage Yards and Contaminated Materials, Nevada Test Site, Nevada*, 2006, DOE/NV--1127. Las Vegas, NV.

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix A

Data Quality Objectives

A.1.0 Introduction

The DQO process described in this appendix is a seven-step strategic systematic planning method based on the scientific method that was used to plan data collection activities and define performance criteria for the CAU 166, Storage Yards and Contaminated Materials field investigation. The DQOs are designed to ensure that the data collected will provide sufficient and reliable information to identify, evaluate, and technically defend recommended corrective actions (i.e., no further action, closure in place, or clean closure). Existing information about the nature and extent of contamination at the CASs in CAU 166 is insufficient to evaluate and select preferred corrective actions; therefore, CAI will be conducted.

The CAU 166 investigation will be based on the DQOs presented in this appendix as developed by representatives of the NDEP and the NNSA/NSO. The seven steps of the DQO process presented in Sections A.3.0 through A.9.0 were developed in accordance with EPA *Guidance for the Data Quality Objectives Process* (EPA, 2000b) and EPA *Guidance for Quality Assurance Project Plans* (EPA, 2002). The DQO process presented herein is based on the EPA Quality System Document for DQOs entitled *Data Quality Objectives Process for Hazardous Waste Site Investigations* (EPA, 2000a), and the CAS-specific information presented in Section A.2.0.

The DQO process presents a combination of judgmental and probabilistic sampling approaches. In general, the procedures used in the DQO process provide:

- A scientific basis for making inferences about a site (or portion of a site) based on environmental data or process knowledge.
- A basis for defining decision performance criteria and assessing the achieved decision quality of the data collection design.
- Criteria for knowing when site investigators should stop data collection (i.e., when sufficient information is available to support decisions).
- A basis for demonstrating an acceptable level of confidence in the sampling approach to generate the appropriate quantity and quality of information necessary to minimize the potential for making decision errors.

A.2.0 Background Information

The following 7 CASs that comprise CAU 166 are located in NTS Areas 2, 3, 5, and 18, as shown in Figure A.2-1:

- CAS 02-42-01, Cond. Release Storage Yd - North
- CAS 02-42-02, Cond. Release Storage Yd - South
- CAS 02-99-10, D-38 Storage Area
- CAS 03-42-01, Conditional Release Storage Yard
- CAS 05-19-02, Contaminated Soil and Drum
- CAS 18-01-01, Aboveground Storage Tank
- CAS 18-99-03, Wax Piles/Oil Stain

The following sections (Sections A.2.1 through A.2.3) provide a CAS description, physical setting and operational history, release information, and previous investigation results for each CAS in CAU 166. The CAS-specific COPCs are provided in the following sections. Many of the COPCs are based on a conservative evaluation of possible site activities considering the incomplete site histories of the CASs and considering contaminants found at similar NTS sites. Targeted contaminants are defined as those contaminants that are known or that could be reasonably suspected to be present within the CAS based on previous sampling or process knowledge.

A.2.1 Corrective Action Site 02-42-01, Cond. Release Storage Yd - North

Corrective Action Site 02-42-01 consists of potential releases of contaminants to the soil in the yard from various machinery and equipment that were stored at the site. The storage yard is located northeast of the intersection of Rainier Mesa and 2-07 Roads in the Area 2 Camp. Figure A.2-2 shows a site sketch of the CAS.

Physical Setting – CAS 02-42-01 is located on Yucca Flat in Area 2. The average annual precipitation for the area, as measured at Station UCC located approximately 14.5 mi south of CAS 02-42-01 on Yucca Flat dry lake, is 6.62 in. per year (ARL/SORD, 2005). Vegetations consists of sparsely distributed brush. The surrounding undisturbed soil consists of mostly fine soil particles, but includes some coarse, pebble sized rock. The thickness of the local alluvium layer is unknown. The area is relatively flat with no nearby drainage channels. The USGS WW-2 well is located

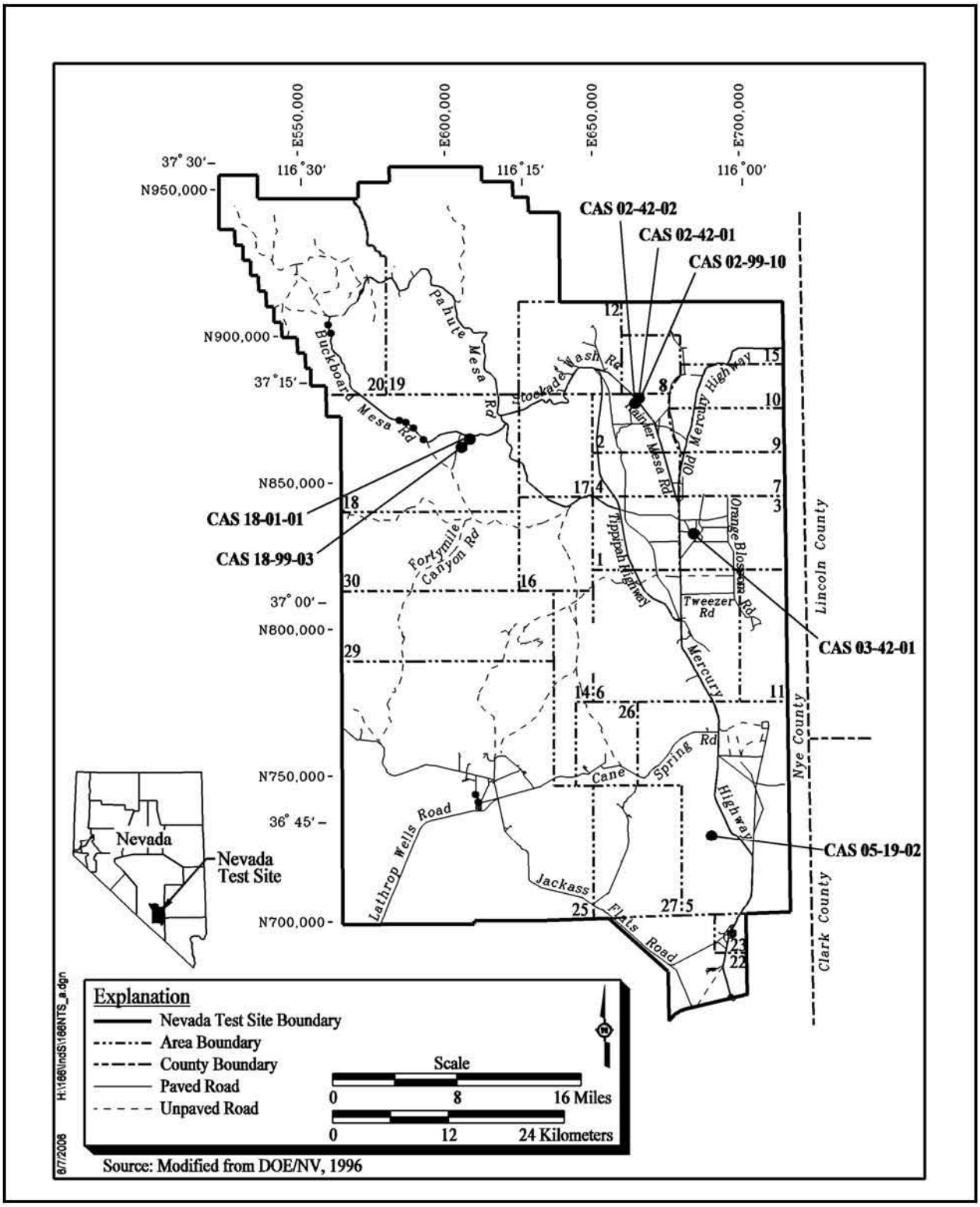

Figure A.2-1
Corrective Action Unit 166, CAS Location Map

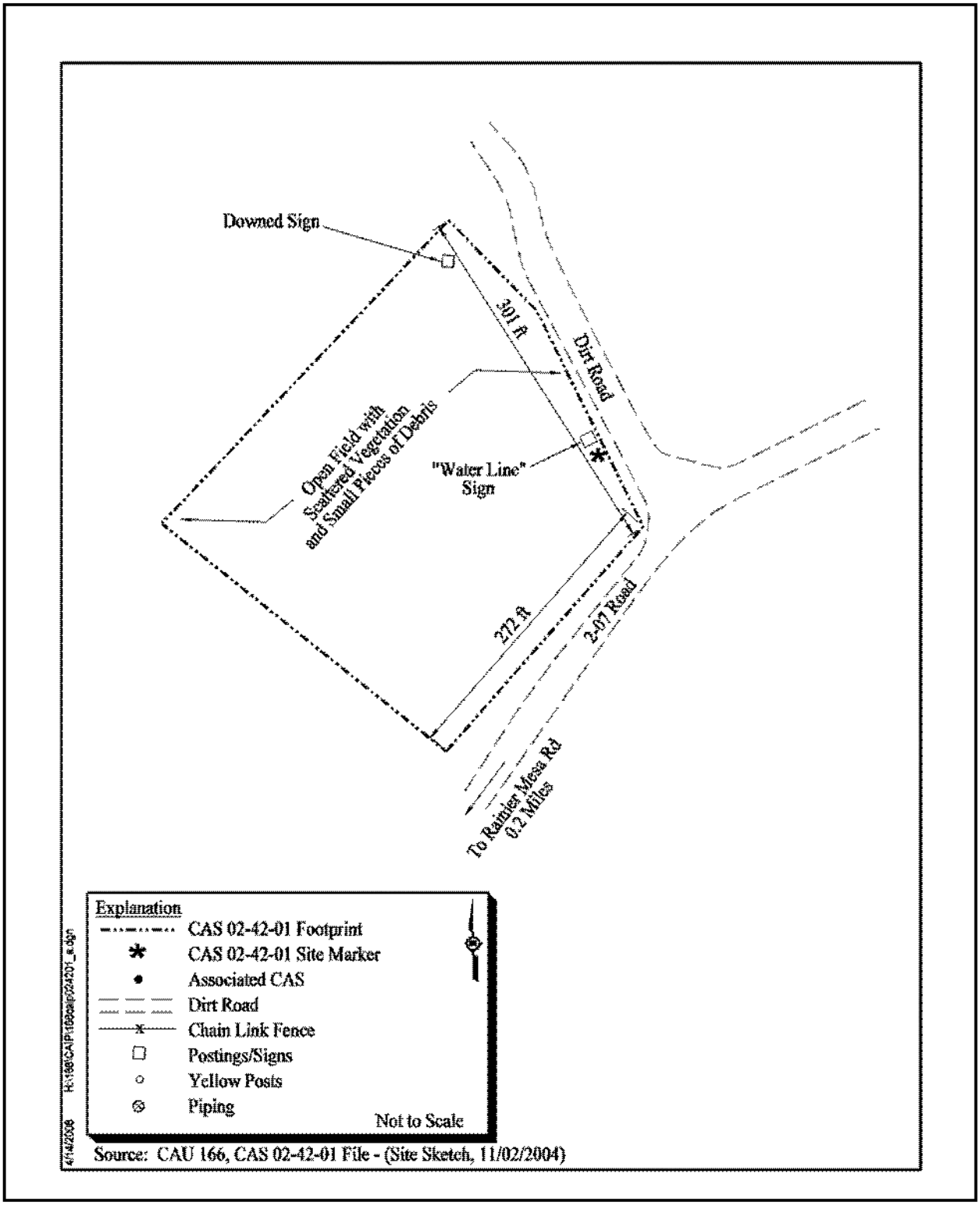

Figure A.2-2
Site Sketch of CAS 02-42-01, Cond. Release Storage Yd - North

3,640 ft northeast of the CAS. The depth to groundwater on September 21, 2005 was measured at 2,052 ft bgs (USGS/DOE, 2006).

Operational History – The storage yard was used to store equipment and piping associated with LLNL construction and drilling operations in the Yucca Flat area. The storage yard was previously posted "Caution - Possible Inaccessible and/or Fixed Radioactive Contamination Present." However, the postings along with the former equipment were removed prior to 2001.

Release Information – There is the potential that contaminants were released to the soil because equipment associated with underground nuclear testing was stored at this site. Although staining is not currently visible, radioisotopes, hydrocarbons, and metals may have been released to the soil from equipment stored at the site.

Previous Investigation Results – Previous investigations of CAS 02-42-01 include site visits and a radiological survey. There is debris at the site including pieces of metal, wire, cable, wood, plastic, and broken glass. Other than small pieces of drill pipe, there is no evidence of the material that was once stored at this yard. There is nothing to suggest that there is buried material at this site. The yard measures aproximately 272 by 301 ft. The area appears to have been previously graded but vegetation has regrown in the yard. There are overhead power lines approximately 100 ft north of the site. According to the radiological survey, gamma radiation is at or near background at this site. Therefore, the site does not pose a risk to individuals from residual radiological contamination when performing non-intrusive activities (Nicosia, 2006). There are no known sampling results from this site.

A.2.2 Corrective Action Site 02-42-02, Cond. Release Storage Yd - South

Corrective Action Site 02-42-02 consists of potential release of contaminants to the soil in the storage yard from various machinery and equipment that were stored at the site. The storage yard is located southwest of the intersection of Rainier Mesa and 2-07 Roads in the Area 2 Camp. Figure A.2-3 shows a site sketch of the CAS.

Physical Setting – CAS 02-42-02 is located on Yucca Flat in Area 2. The average annual precipitation for the area, as measured at Station UCC located approximately 14.5 mi south of

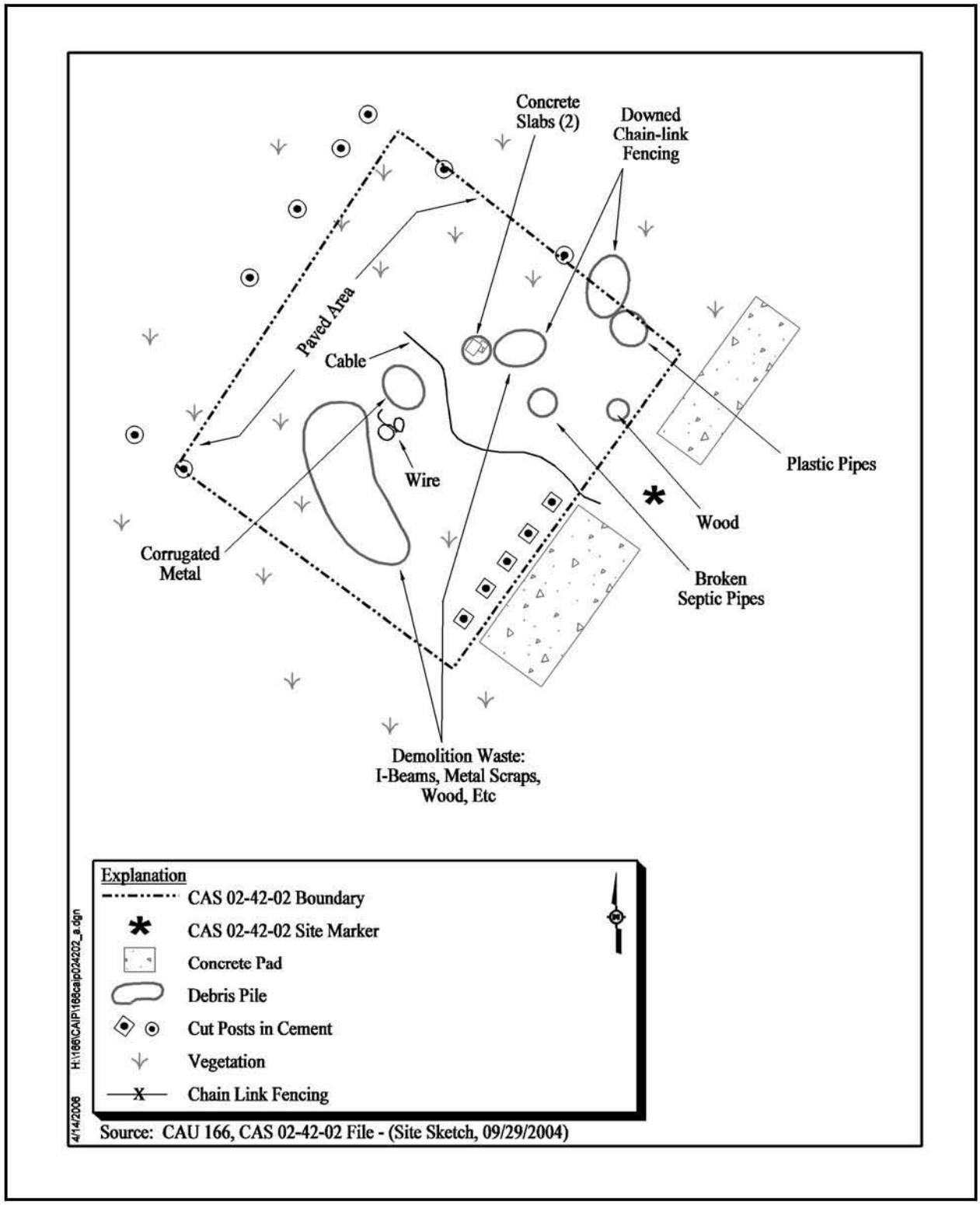

Figure A.2-3
Site Sketch of CAS 02-42-02, Cond. Release Storage Yd - South

CAS 02-42-02 on Yucca Flat dry lake, is 6.62 in. per year (ARL/SORD, 2005). Vegetation consists of sparsely distributed brush. The surrounding undisturbed soil consists of mostly fine soil particles, but includes some coarse, pebble sized rock. The thickness of the local alluvium layer is unknown.

The area is relatively flat with no nearby drainage channels. The USGS WW-2 well is located 4,750 ft northeast of the CAS. The depth to groundwater on September 21, 2005, was measured at 2,052 ft bgs (USGS/DOE, 2006).

Operational History – The storage yard was used to store equipment and piping associated with LLNL construction and drilling operations in the Yucca Flat area. It has been speculated that gas sampling tanks may have been temporarily stored at this site. The former equipment and/or tanks were removed prior to 1995. The storage yard was previously posted "Caution - Possible Inaccessible and/or Fixed Radioactive Contamination Present." However, the postings along with the former equipment was removed.

Release Information – There is the potential that contaminants were released to the soil because equipment and gas sampling tanks associated with underground testing were stored at this site. Although staining is not currently visible, radioisotopes, hydrocarbons, and metals may have been released to the soil from equipment stored at the site.

Previous Investigation Results – Previous investigations of CAS 02-42-02 include site visits and a radiological survey. There is various debris at the site including demolition debris (I-beams, wood, corrugated metal, etc.), chain-link fencing, cables, concrete slabs, and broken septic and PVC piping. There is nothing to suggest that there is buried material at this site. The yard measures aproximately 167 by 193 ft. The area appears to have been previously graded and covered with imported gravel but vegetation has regrown in the yard. According to the radiological survey, gamma radiation is at or near background at this site. Therefore, the site does not pose a risk to individuals from residual radiological contamination when performing non-intrusive activities (Nicosia, 2004). There are no known sampling results from this site.

A.2.3 Corrective Action Site 02-99-10, D-38 Storage Area

Corrective Action Site 02-99-10 consists of potential release of contaminants to the soil in the storage yard from various machinery, equipment, and drums containing depleted uranium that were stored at the site. The storage yard is located southeast of the intersection of Rainier Mesa and 2-07 Roads in the Area 2 Camp. Figure A.2-4 shows a site sketch of the CAS.

Physical Setting – CAS 02-99-10 is located on Yucca Flat in Area 2. The average annual precipitation for the area, as measured at Station UCC located approximately 14.5 mi south of CAS 02-99-10 on Yucca Flat dry lake, is 6.62 in. per year (ARL/SORD, 2005). Vegetation consists of sparsely distributed brush. The surrounding undisturbed soil consists of mostly fine soil particles, but includes some coarse, pebble-sized rock. The thickness of the local alluvium layer is unknown. The area is relatively flat with no nearby drainage channels. The USGS WW-2 well is located 3,280 ft northeast of the CAS. The depth to groundwater on September 21, 2005, was measured at 2,052 ft bgs (USGS/DOE, 2006).

Operational History – The storage yard was used to store various equipment associated with LLNL construction and drilling operations in the Yucca Flat area. Additionally, a portion of the yard was used to store approximately 190 drums containing depleted uranium. The depleted uranium was stored in the drums and used as counterweights of large cranes used in Project Heavyweight. When the project was over, the drums containing solid depleted uranium were stored at CAS 02-99-10 until the material was repackaged and properly disposed. The storage yard was previously posted "Caution Radioactive Contamination Area" and "Caution Radioactive Material." However, the postings along with the drums and equipment have been removed.

Release Information – There is the potential that radioisotopes were released to the soil since drilling equipment associated with underground testing and drums containing depleted uranium were previously stored at this site. Additionally, although staining is not currently visible, hydrocarbons and metals may have been released to the soil from equipment stored at the site. A separate release may be present within the storage yard as a result of discharge from a french drain that is adjacent to the yard. This potential release is being investigated for potential inclusion in the FFACO; therefore, any contamination found associated with the french drain will not be covered in this CAIP.

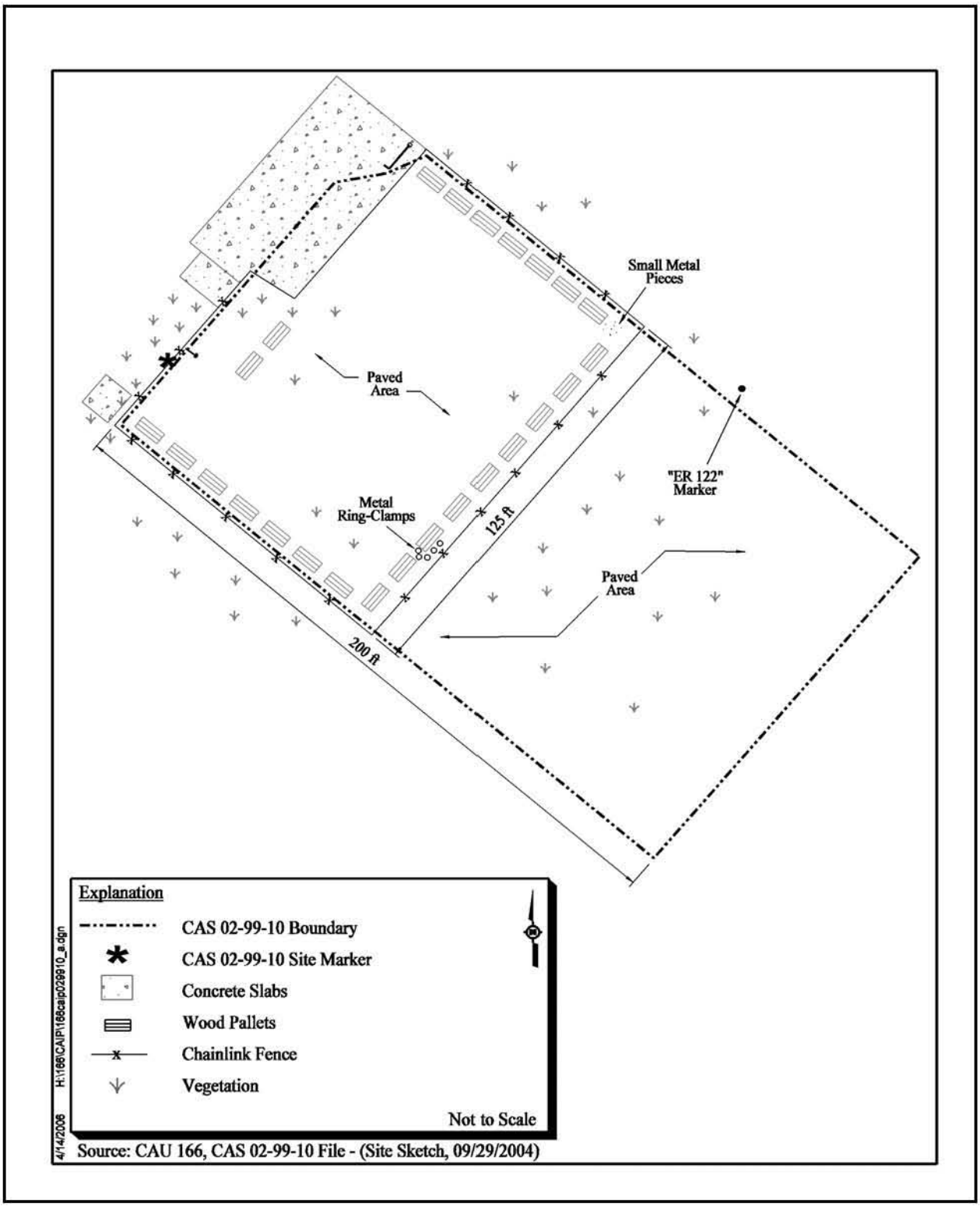

Figure A.2-4
Site Sketch of CAS 02-99-10, D-38 Storage Area

Previous Investigation Results – Previous investigations of CAS 02-99-10 include sites visits and a radiological survey. There is various debris at the site such as metal drum clamps, cables, and wooden pallets that once held the drums. There is some staining on the pallets that resembles rust. There was no soil staining observed and there is nothing to suggest that there is buried material at this site. The yard is rectangular and fenced, measuring aproximately 200 by 125 ft. The area appears to have been previously graded, paved, and covered with imported gravel but the paving has begun to deteriorate. According to the radiological survey, gamma radiation is at or near background at this site. Therefore, the site does not pose a risk to individuals from residual radiological contamination when performing non-intrusive activities (Nicosia, 2004). There are no known sampling results from this site.

A.2.4 Corrective Action Site 03-42-01, Conditional Release Storage Yard

Corrective Action Site 03-42-01 consists of potential release of contaminants to the soil in the storage yard from various machinery and equipment that were stored at the site. The storage yard is located south of the Postshot Shop in the Area 3 Camp. Figures A.2-5 and A.2-6 are site sketches of this CAS.

Physical Setting – CAS 03-42-01 is located on Yucca Flat in Area 3. The average annual precipitation for the area, as measured at the Area 3 Camp, is 6.31 in. per year (ARL/SORD, 2005). Vegetation consists of sparsely distributed brush. The surrounding undisturbed soil consists of mostly fine soil particles, but includes some coarse, pebble-sized rock. The thickness of the local alluvium layer is unknown. The USGS Water Well A is located approximately 500 ft north of the CAS. The depth to groundwater on September 21, 2005, was measured at 1,600 ft bgs (USGS/DOE, 2006).

Operational History – The storage yard was used to store machinery, equipment, and piping associated with LANL construction and drilling operations in the Yucca Flat area (Figure A.2-7). The useable equipment was relocated after 1993; however, there are numerous items remaining in the yard. The northwest corner of the storage yard is posted "Caution Radioactive Material."

Release Information – There is the potential that contaminants were released to the soil from equipment, tanks, portable buildings, and other miscellaneous equipment/objects associated with

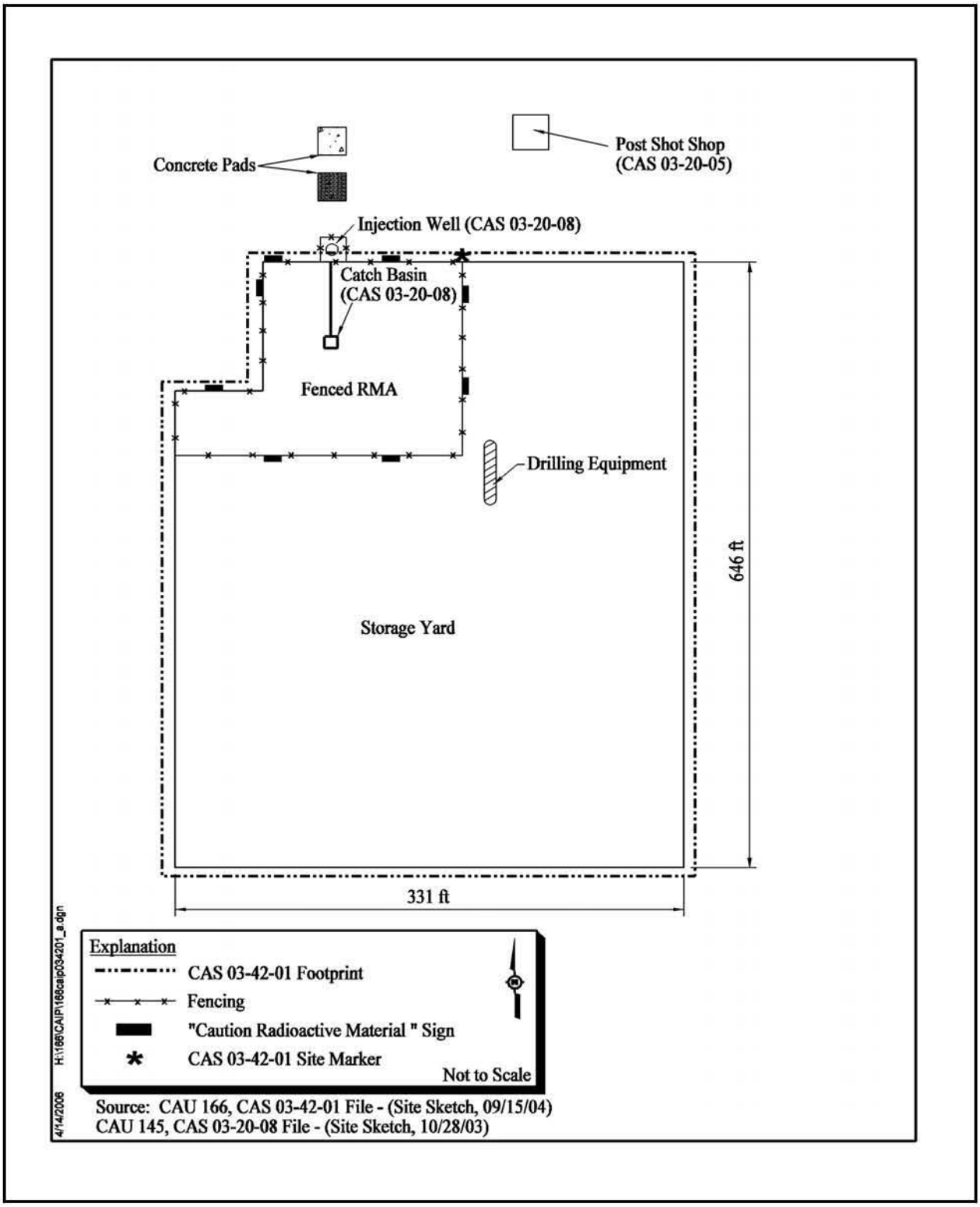

Figure A.2-5
Site Sketch of CAS 03-42-01, Conditional Release Storage Yard

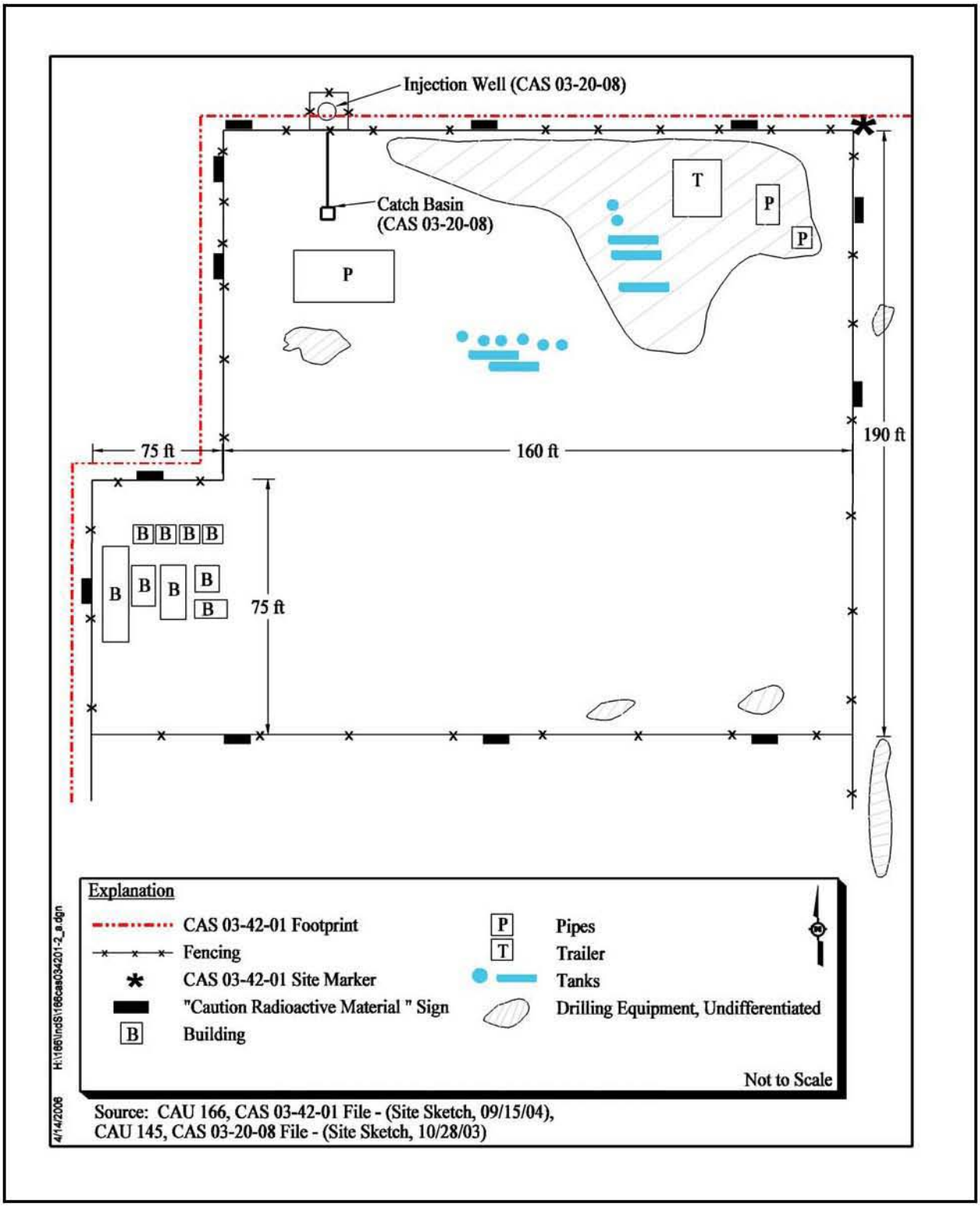

Figure A.2-6
Site Sketch of Radioactive Material Area in CAS 03-42-01, Conditional Release Storage Yard

Figure A.2-7
Historical Photograph of CAS 03-42-01,
Conditional Release Storage Yard

underground testing that were stored at this site. There is visible staining in many of the areas within the posted radioactive material area where equipment was and continues to be stored. There is no visible staining in the unposted area of the storage yard. However, radioisotopes, hydrocarbons, and metals may have been released to the soil from equipment stored in both portions of the storage yard. CAU 145, CAS 03-20-08, Injection Well is also located within the posted area of the storage yard. The site consists of several components outside of the fenced yard and a catch basin and piping that is located within the storage yard. A decontamination pad located just outside the posted area discharged effluent to the injection well and catch basin.

Previous Investigation Results – Previous investigations of CAS 03-42-01 include site visits, radiological surveys, and sampling of adjacent CASs. There are portable buildings, heavy equipment, tanks, piping, and miscellaneous debris present in the storage yard. The northwest corner of the storage yard is fenced and posted. The majority of the equipment, tanks, and buildings are stored in this posted area. Figures A.2-8 and A.2-9 are photographs of some of the material still present in this portion of the yard. There is nothing to suggest that there is buried material at this site. The fenced yard is nearly square, measuring aproximately 646 by 331 ft. The storage yard is paved with some areas of minor deterioration. According to radiological surveys completed in both portions of the storage yard, the gamma radiation is at or near background. No removable contamination was encountered, so the site will not require radiological support for future activities (Alderson, 2004; Nicosia, 2006). Diesel-range organics were detected at a level of 500 mg/kg in a sample taken adjacent to the CAS 03-20-08 former catch basin. The sample was taken at an interval of 5 to 6 ft bgs, approximately 5 ft west of the former catch basin (25 ft from its center). This contaminant is most likely a result of activities that took place in the storage yard.

A.2.5 Corrective Action Site 05-19-02, Contaminated Soil and Drum

Corrective Action Site 05-19-02 consists of potential release of contaminants to the soil from vehicles and materials within the storage yard, drums stored adjacent to the storage yard, and the drum in the wash. The storage yard and drum are located approximately 1.4 miles west of Mercury Highway in Area 5. The site includes a fenced storage yard along with a contiguous area outside of the fenced yard where drums were stored. Additionally, a drum is located in an active wash, approximately

Figure A.2-8
Material Remaining in CAS 03-42-01, Conditional Release Storage Yard

Figure A.2-9
Material Remaining in CAS 03-42-01, Conditional Release Storage Yard

126 ft east of the yard and an area of drum remnants is present outside of the fenced yard. Figure A.2-10 shows a site sketch of the CAS.

Physical Setting – CAS 05-19-02 is located on Frenchman Flat in Area 5. The average annual precipitation for the area, as measured at the station Cane Springs, is 7.49 in. per year (ARL/SORD, 2005). Vegetations consists of sparsely distributed brush. The surrounding undisturbed soil consists of very fine soil particles. The thickness of the local alluvium layer is unknown; however, Test Hole #5, located approximately 1 mi north of CAS 05-19-02, penetrated approximately 1,300 ft of alluvium (USGS, 1967). The area is relatively flat with a nearby drainage channel. The USGS WW-5A is located approximately 3.7 mi northeast of the CAS. The depth to groundwater on September 1, 2005, was measured at 709 ft bgs (USGS/DOE, 2006).

Operational History – Vehicles and steel were stored in the fenced yard to permit induced radioactivity to decay out. Additional items may have been stored in the yard but have since been removed. The vehicles and steel have been determined to have historical significance. These vehicles are not part of the CAS 05-19-02 work scope.

There were 17 drums stored in the area adjacent to the fenced yard. Although documentation states that the drums were removed in 1991 (along with three car batteries), one drum is visible in the wash located to the east of the storage yard. According to notes from a site visit in 1990, many of the drums were rusted through and the contents had solidified (REECo, 1991). An area of drum remnants was identified on the outside of the southeastern portion of the yard. This is not in the area of the identified drum storage location.

Release Information – There is the potential that contaminants were released to the soil from the vehicles, steel, and drums stored at this site. Radioisotopes, hydrocarbons, and metals may have been released to the soil if there was leaking from the vehicles, materials, or drums stored at the site.

Previous Investigation Results – Previous investigations of CAS 05-19-02 include site visits, a radiological survey, and a geophysical survey. Vehicles and steel remain at the site although they are not part of the CAS 05-19-02 work scope. There is additional debris at the site including wood and metal pieces that have rusted off of the vehicles or were from items previously stored in the yard. The

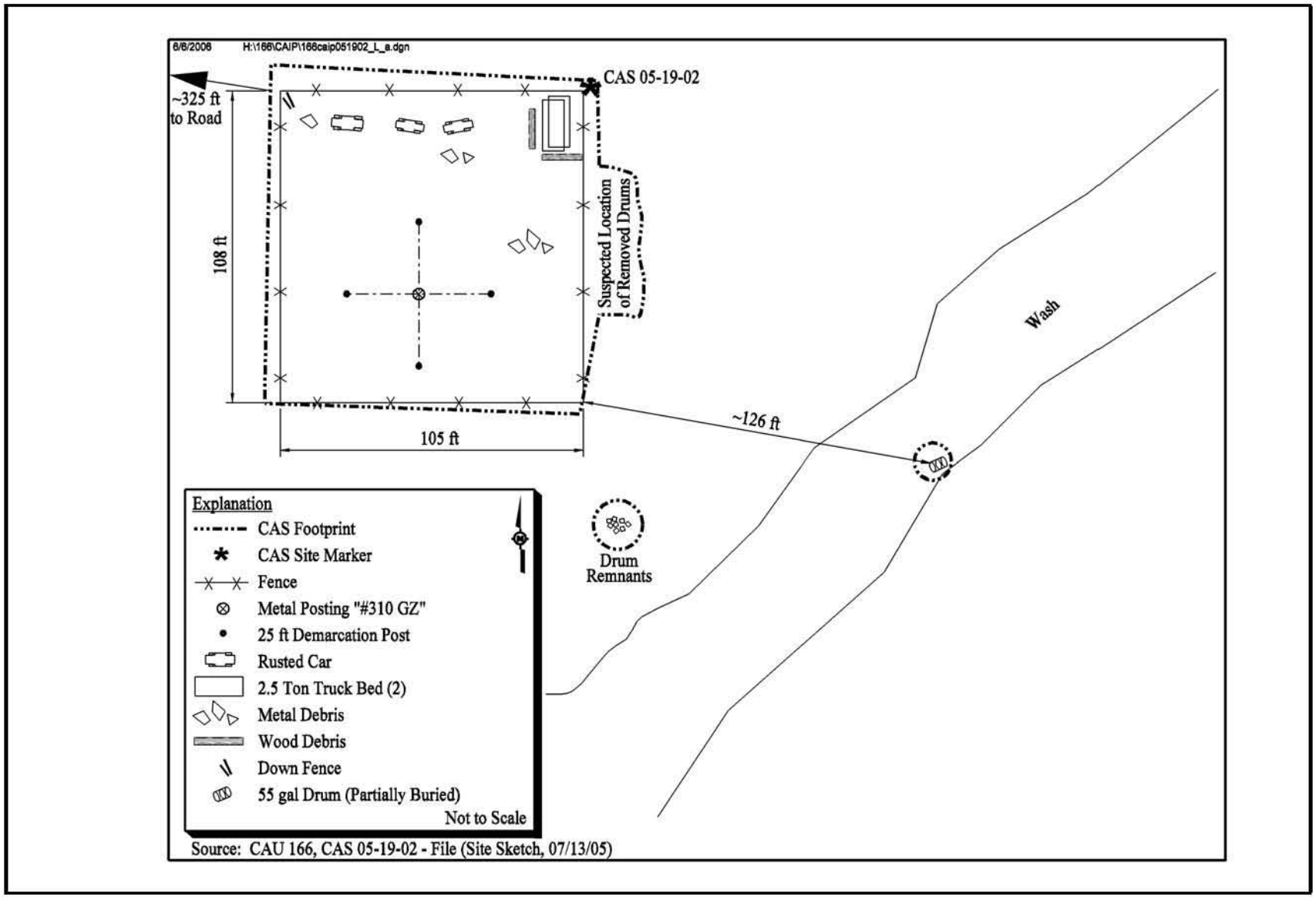

Figure A.2-10
Site Sketch of CAS 05-19-02, Contaminated Soil and Drum

entire yard is fenced and measures approximately 105 by 108 ft. The drums identified in 1990 were located on the east side of the yard, outside of the fence line. Two drums were surveyed that had readings of 600 counts per minute at the surface (Trump, 1991). One drum remains approximately 126 ft east of the yard in the wash. The drum is partially buried with sediment as a result of being located in an active wash. The top and bottom of the drum appears to be intact but there is a crack in one portion of the drum. Sediment is present inside the drum but the remainder of the contents of the drum are unknown. Geophysical surveys indicate that there are no other buried drums or material in the wash. There is nothing to suggest that there is other material buried in the remainder of the footprint. In March 2006, a radiological survey was performed in the remainder of the yard. It was determined that the site poses no risk to individuals from residual radiological contamination for non-intrusive activities (Nicosia, 2006).

A.2.6 Corrective Action Site 18-01-01, Aboveground Storage Tank

Corrective Action Site 18-01-01 consists of potential release of contaminants to the soil from metal containers and whatever may have been stored in them. The two metal containers are located southeast of the Little Feller II site in Area 18. Figures A.2-11 and A.2-12 shows a site sketch of the CAS.

Physical Setting – CAS 18-01-01 is located in the Alkali Flat Furnace Creek Ranch Subbasin in Area 18. The average annual precipitation for the area, as measured at the rain gauge station at Little Feller II, averaged 7.99 in. for the years 1976 to 2006 (ARL/SORD, 2006). Vegetations consists of sparsely distributed brush. The surrounding undisturbed soil consists of mostly fine soil particles. The thickness of alluvium of the local alluvium layer is unknown. The area is relatively flat but there are rolling hills in the distance. There are no known nearby drainage channels. Well UE-18t is located approximately 1.5 mi northwest of the CAS. The depth to groundwater on September 13, 2005, was measured at 913 ft bgs (USGS/DOE, 2006).

Operational History – It is believed that the area of concern was a neutron flux detector station that measured neutron and gamma absorptions from the Little Feller II atmospheric test that took place in 1962. The material referred to as wax may actually be what documentation calls tissue-equivalent plastic or gel used in the experiment. However, since this is speculation and the FFACO name of the

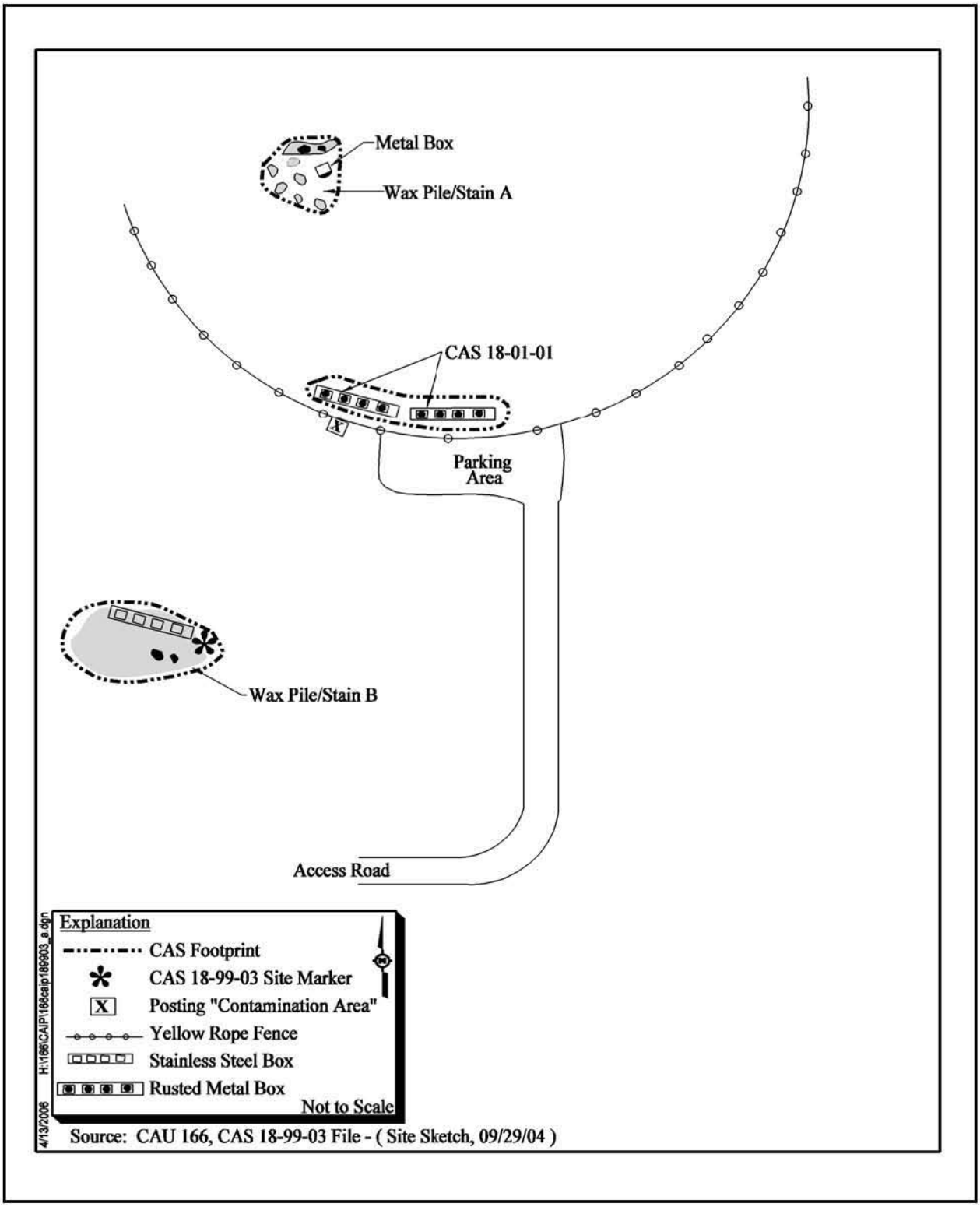

Figure A.2-11
Overview Sketch of CAS 18-01-01, Aboveground Storage Tank and CAS 18-99-03, Wax Piles/Oil Stain

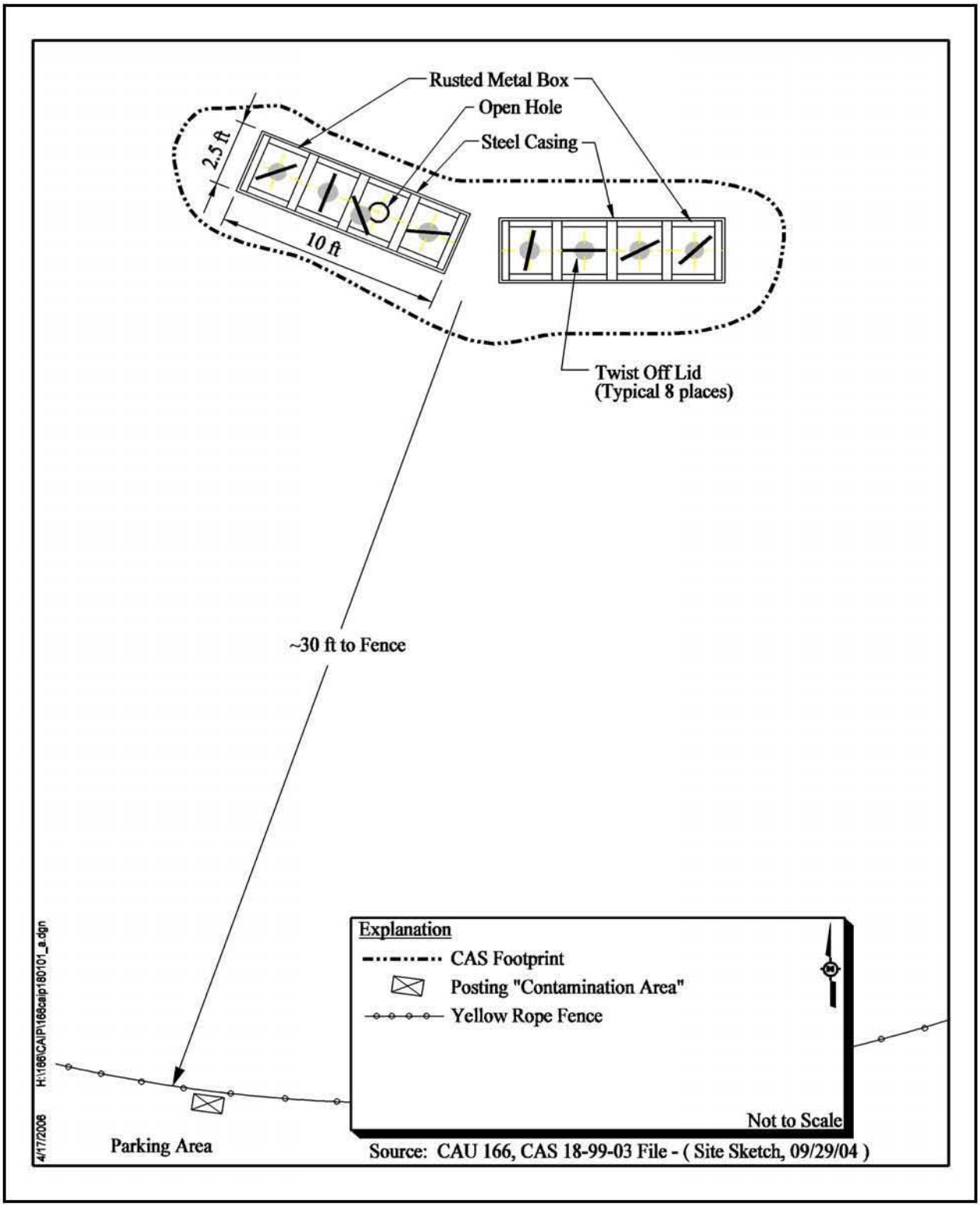

Figure A.2-12
Site Sketch of CAS 18-01-01, Aboveground Storage Tank

associated CAS 18-99-03 is Wax Piles/Oil Stain, this material will be referred to as wax throughout the rest of this document. It appears that the metal containers were used to hold this material, as there is wax present inside at least one of the metal containers.

Release Information – There are no known releases associated with this CAS.

Previous Investigation Results – Previous investigations of CAS 18-01-01 include site visits and a radiological survey. The site consists of two metal containers located within a posted contamination area. The containers sit on a steel casing that is buried to an unknown depth. There are four circular, twist-off lids on each of the metal containers, with one open lid on the westernmost metal container. There are wax and wood visible within this section of the metal container. Additionally, a hole is visible in the bottom of the box that extends beyond the plane of the box bottom to an unknown depth. It is unknown if this is a pipe that extends beyond the steel casing into the subsurface or if it is merely an extension of the metal container. In March 2006, a radiological survey was performed, and it was determined that the site poses no risk to individuals from residual radiological contamination for non-intrusive activities (Nicosia, 2006). Figures 3-2 and A.2-13 show the metal containers present at this site.

A.2.7 Corrective Action Site 18-99-03, Wax Piles/Oil Stain

Corrective Action Site 18-99-03 consists of potential release of contaminants to the soil from several wax piles, a metal box, and a metal container. The site is located southeast of the Little Feller II testing area in Area 18. Figures A.2-11, A.2-14, and A.2-15 are site sketches of the CAS.

Physical Setting – CAS 18-99-03 is located in the Alkali Flat Furnace Creek Ranch Subbasin in Area 18. The average annual precipitation for the area, as measured at the rain gauge station at Little Feller II, averaged 7.99 in. for the years 1976 to 2006 (ARL/SORD, 2006). Vegetation consists of sparsely distributed brush. The surrounding undisturbed soil consists of mostly fine soil particles. The thickness of alluvium of the local alluvium layer is unknown. The area is relatively flat but there are rolling hills in the distance. There are no known nearby drainage channels. Well UE-18t is located approximately 1.5 mi northwest of the CAS. The depth to groundwater on September 13, 2005, was measured at 913 ft bgs (USGS/DOE, 2006).

Figure A.2-13
Photograph of CAS 18-01-01, Aboveground Storage Tank

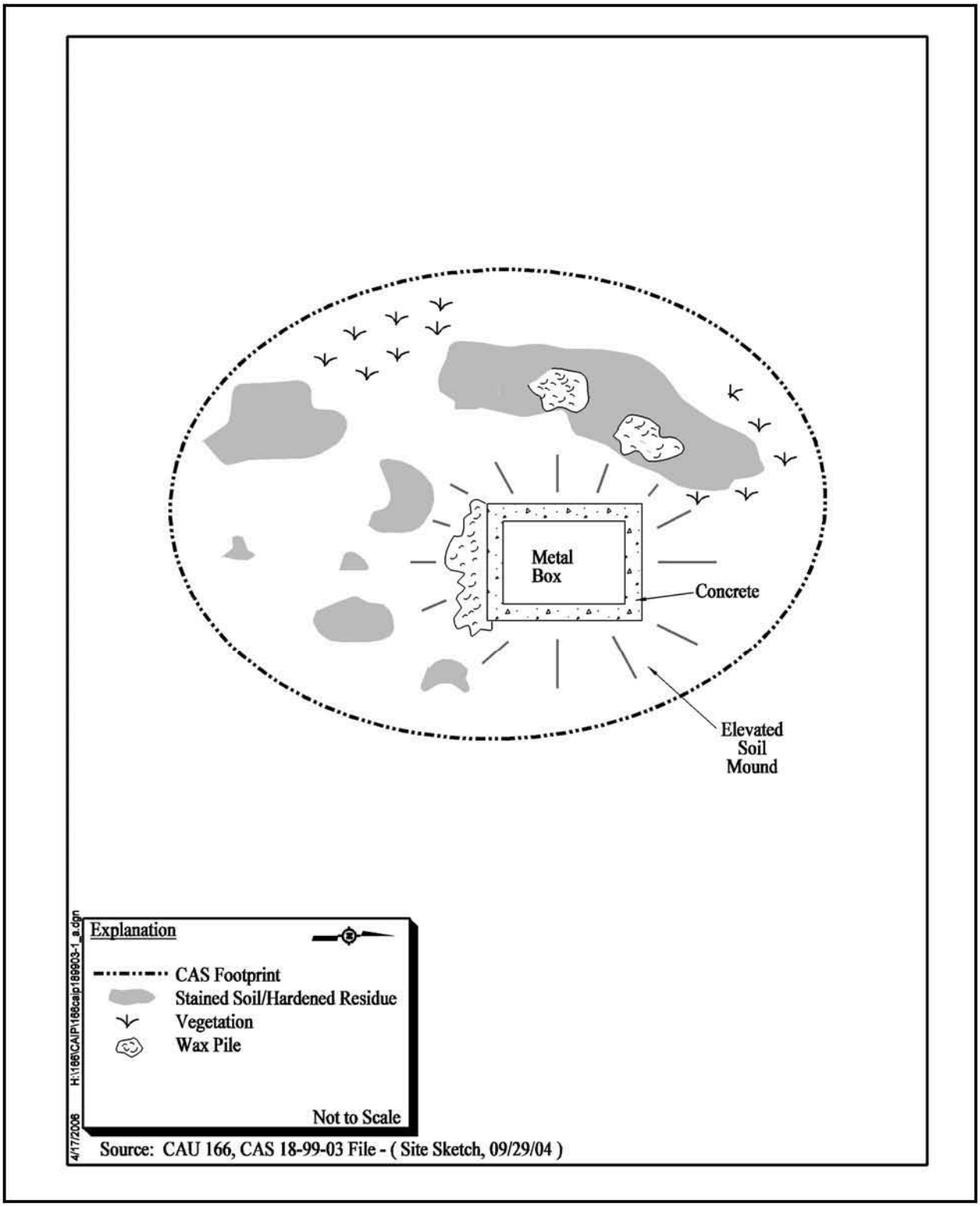

Figure A.2-14
Site Sketch of Site A in CAS 18-99-03, Wax Piles/Oil Stain

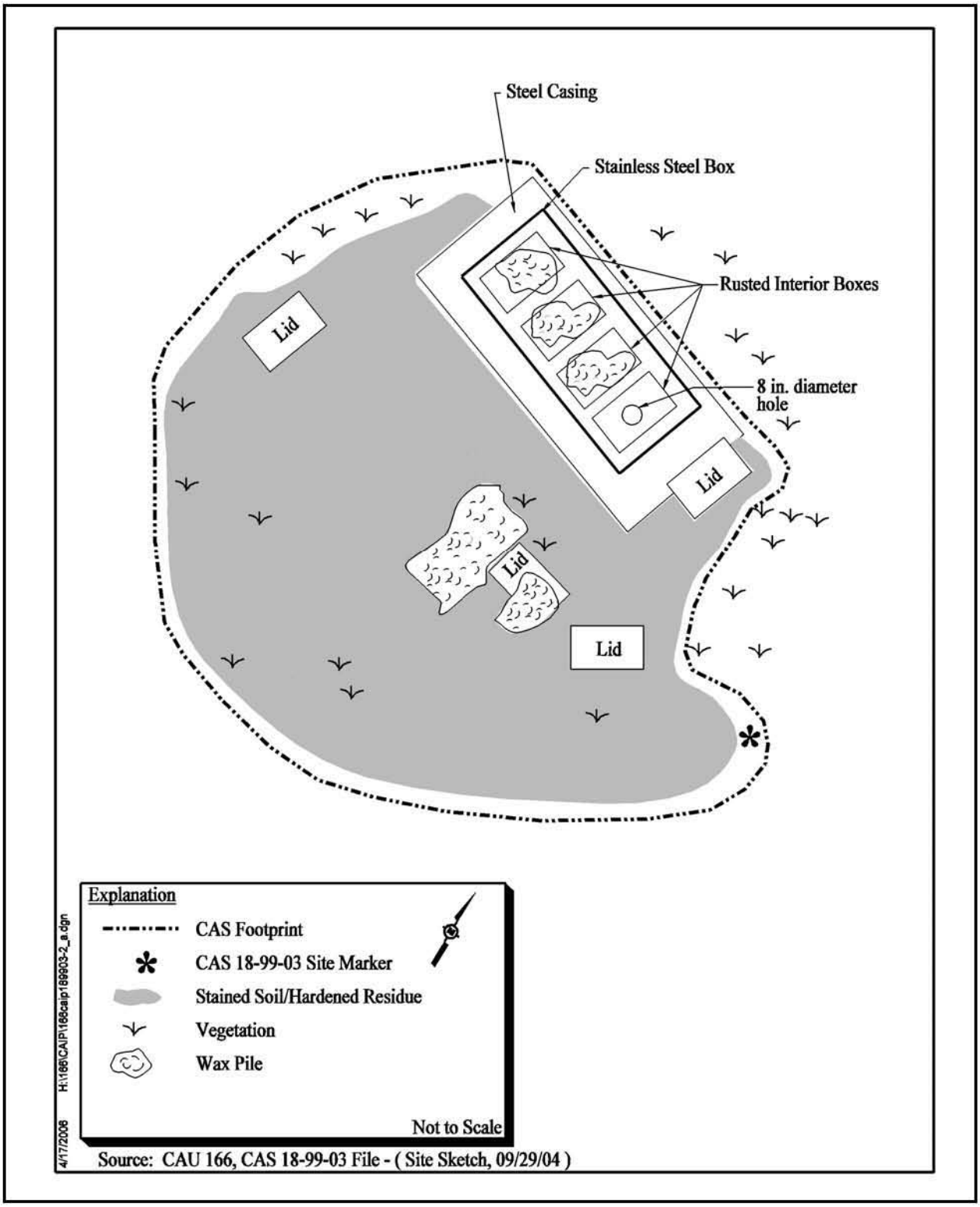

Figure A.2-15
Site Sketch of Site B in CAS 18-99-03, Wax Piles/Oil Stain

Operational History – It is believed that the area of concern was a neutron flux detector station that measured neutron and gamma absorptions from the Little Feller II atmospheric test that took place in 1962. The material referred to as wax may actually be what documentation calls tissue-equivalent plastic or gel used in the experiment. However, since this is speculation and the FFACO name is Wax Piles/Oil Stain, this material will be referred to as wax throughout the rest of this document. It appears that the metal boxes and containers were used to hold this material as a lot of the wax is still in and on the boxes.

Release Information – There are no known releases associated with this CAS.

Previous Investigation Results – Previous investigations of CAS 18-99-03 include sites visits and a radiological survey. The site consists of Wax Piles/Stains A & B. Wax Piles/Stains A is located within the posted contamination area, on and around a 3-ft high soil mound. There is a single metal box, approximately 3 by 3 ft, on top of the soil mound. There is wax on and adjacent to the south side of this box. There are eight visible soil stains associated with Wax Piles/Stains A that cover an area measuring approximately 10 by 15 ft. There is a large pile of wax within the largest stained area, northwest of the box and soil mound. Wax Piles/Stains B is located outside of the fenced contamination area. There is a 10 by 3 ft stainless steel container. This container is sitting on a steel casing that is buried to an unknown depth. Within the container are four smaller, rusted metal boxes; three of which contain wax, while the fourth is empty. The empty box has an 8-in. diameter hole in the bottom of it that appears to extend beyond the plane of the box (Figure A.2-16). It is unknown if this is a pipe that extends beyond the steel casing into the subsurface or if it is merely an extension of the rusted metal box. The boxes have latches to attach lids although the lids have been scattered about the site. Adjacent to the stainless steel box is a wax pile/stain that is irregularly shaped but measures approximately 22 by 15 ft (Figure A.2-17). According to the radiological survey, there are elevated readings within the posted contamination area and radiation services support will be required for future activities (Nicosia, 2006).

Figure A.2-16
Photograph of the Metal Container at Site B (CAS 18-99-03)

Figure A.2-17
Photograph of the Wax Pile/Hardened Residue at Site B (CAS 18-99-03)

A.3.0 Step 1 - State the Problem

The problem statement for CAU 166 is: "Existing information on the nature and extent of potential contamination is insufficient to evaluate and recommend corrective action alternatives for the CASs in CAU 166."

A.3.1 Planning Team Members

The DQO planning team consists of representatives from NDEP, NNSA/NSO, SNJV, and BN. The primary decision-makers are the NDEP and NNSA/NSO representatives. Table A.3-1 lists representatives from each organization in attendance for the February 28, 2006, DQO meeting.

Table A.3-1
Final DQO Meeting Participants for CAU 166
February 28, 2006

Affiliation	Department/Project Team Function
NDEP	NDEP Representative
NNSA/NSO	Environmental Restoration Project Federal Industrial Sites Sub-Project Task Manager
BN	Environmental Restoration Task Manager
BN	Environmental Restoration Technical Group Supervisor
SNJV	Industrial Sites Project Manager
SNJV	Industrial Sites Task Manager
SNJV	Industrial Sites Technical Coordinator
SNJV	Industrial Sites CAU Lead
SNJV	*Federal Facility Agreement and Consent Order* Representative
SNJV	Quality Assurance Representative
SNJV	Health and Safety Group Representative
SNJV	Environmental Compliance and Waste Management Manager
SNJV	Environmental Compliance and Waste Management Representative
SNJV	Radiation Services Health Physicist

BN = Bechtel Nevada
NDEP = Nevada Division of Environmental Protection
NNSA/NSO = U.S. Department of Energy, National Security Administration Nevada Site Office
SNJV = Stoller-Navarro Joint Venture

A.3.2 Conceptual Site Model

The CSM is used to organize and communicate information about site characteristics. It reflects the best interpretation of available information at any point in time. The CSM is a primary vehicle for communicating assumptions about release mechanisms, potential migration pathways, or specific constraints. It provides a good summary of how and where contaminants are expected to move and what impacts such movement may have. It is the basis for assessing how contaminants could reach receptors both in the present and future. The CSM describes the most probable scenario for current conditions at each site and define the assumptions that are the basis for identifying appropriate sampling strategy and data collection methods. Accurate CSMs are important, as they serve as the basis for all subsequent inputs and decisions throughout the DQO process.

The CSM was developed for CAU 166 using information from the physical setting, potential contaminant sources, release information, historical background information, knowledge from similar sites, and physical and chemical properties of the potentially affected media and COPCs.

The CSM represents contamination of the surrounding environment due to migration of contaminants from drilling equipment, tanks, debris, vehicles, drums, and/or wax material that are currently or were formerly present at each of the CASs. Migration of contaminants to areas not presently impacted can occur through either dissolution or suspension of the contaminant in water, followed either by infiltration and percolation into the soil profile, or overland flow from higher to lower elevations. The presence of the wash near one of the CASs could provide an enhanced route for contamination transportation.

The CAU 166, Storage Yards and Contaminated Materials CSM consists of:

- Potential contaminant releases including media subsequently affected.
- Release mechanisms (the conditions associated with the release).
- Potential contaminant source characteristics including contaminants suspected to be present and contaminant-specific properties.
- Site characteristics including physical, topographical, and meteorological information.

- Migration pathways and transport mechanisms that describe the potential for migration and where the contamination may be transported.
- The locations of points of exposure where individuals or populations may come in contact with a COC associated with a CAS.
- Routes of exposure where contaminants may enter the receptor.

If additional elements are identified during the investigation that are outside the scope of the CSM, the situation will be reviewed and a recommendation will be made as to how to proceed. In such cases, NDEP and NNSA/NSO will be notified and given the opportunity to comment, or concur with, the recommendation.

The applicability of the CSM to each CAS is summarized in Table A.3-2 and discussed below. Table A.3-2 provides information on CSM elements that will be used throughout the remaining steps of the DQO process. Figure A.3-1 represents site conditions applicable to the CSM.

A.3.2.1 Contaminant Release

All CAU 166 CASs either presently or formerly stored materials associated with testing at the NTS. The native soil interface below and adjacent to any locations that held materials or discharges from these materials is a likely location for soil contamination. The CSM accounts for potential releases resulting from drilling equipment, tanks, debris, vehicles, drums, and/or wax material that are present at the ground surface. Any contaminants migrating from CASs, regardless of physical or chemical characteristics, are expected to exist at interfaces and in the soil adjacent to the storage yards and wax piles in lateral and vertical directions. Concentrations are expected to decrease with horizontal and vertical distance from the source.

A.3.2.2 Potential Contaminants

The COPCs were identified during the planning process through the review of site history, process knowledge, personal interviews, past investigation efforts (where available), and inferred activities associated with the CASs. Because complete information regarding activities performed at the CAU 166 sites is not available, contaminants detected at similar NTS sites were included in the contaminant lists to reduce uncertainty. The list of COPCs is intended to encompass all of the

Table A.3-2
Conceptual Site Model Description of Elements for Each CAS in CAU 166
(Page 1 of 2)

CAS Identifier	02-42-01	02-42-02	02-99-10	03-42-01	05-19-02	18-01-01	18-99-03
CAS Description	**Cond. Release Storage Yd - North**	**Cond. Release Storage Yd - South**	**D-38 Storage Area**	**Conditional Release Storage Yard**	**Contaminated Soil and Drum**	**Aboveground Storage Tank**	**Wax Piles/Oil Stain**
Site Status	Sites are inactive and/or abandoned						
Future Land Use	Nuclear and High Explosives Test Zone				Reserved (within NTS) Zone		
Sources of Potential Soil Contamination	Drilling equipment and debris		Drums containing DU and drilling equipment	Drilling equipment, tanks, portable buildings, and debris	Drums and vehicles	Wax within two metal containers	Wax piles on the ground and in the metal containers
Location of Contamination/ Release Point	Surface soil at or near location(s) of stored equipment/materials		Surface soil at or near location(s) of stored equipment/ materials and DU containing drums	Surface soil at or near location(s) of stored equipment/ materials	Surface soil at or near location(s) of former and present drums and debris/vehicles	Surface soil at or near location(s) of the metal containers	Surface soil at or near location(s) of the wax piles/stains and metal containers
Amount Released	Unknown						
Affected Media	Surface and shallow subsurface soil					Surface and shallow subsurface soil	
Targeted Contaminants	Unknown		Uranium-238	DRO	Unknown		

Table A.3-2
Conceptual Site Model Description of Elements for Each CAS in CAU 166
(Page 2 of 2)

CAS Identifier	02-42-01	02-42-02	02-99-10	03-42-01	05-19-02	18-01-01	18-99-03
CAS Description	Cond. Release Storage Yd - North	Cond. Release Storage Yd - South	D-38 Storage Area	Conditional Release Storage Yard	Contaminated Soil and Drum	Aboveground Storage Tank	Wax Piles/Oil Stain
Transport Mechanisms	Surface water runoff of dissolved or suspended contaminants is the most likely potential transport mechanism for waste materials placed on soils within or outside of the footprints of the CASs. The potential for overland migration of contaminants increases with slope gradient and precipitation amount. Infiltration and percolation of precipitation through subsurface media could serve as a major driving force for migration of contaminants. However, due to the arid environment of the Nevada Test Site, percolation of precipitation is very small and migration of contaminants has been shown to be limited. Evaporation potentials significantly exceed available soil moisture from precipitation (i.e., 3 to 10 inches) (USGS, 1995a).						
Migration Pathways	Lateral transport expected to dominate over vertical transport						
Lateral and Vertical Extent of Contamination	Unknown. Contamination, if present, is expected to be contiguous to the release points. Concentrations are expected to decrease with distance and depth from the source. Groundwater contamination is not expected. Depth to groundwater near the CASs in Areas 2 and 3 ranges from approximately 1,600 to 2,050 ft bgs (USGS, 1995b). Depth to groundwater near the Area 5 CAS is approximately 710 ft bgs while the depth to groundwater near the Area 18 CASs is approximately 910 ft bgs (USGS/DOE, 2006). Surface migration may occur as a result of runoff.						
Exposure Scenario	The CAU 166 CASs meet the criteria of Occasional Use Areas. The potential for contamination exposure is limited to industrial and construction workers, and military personnel conducting training.						

CAS = Corrective Action Site
DRO = Diesel-range organics
DU = Depleted uranium
ft bgs = Foot below ground surface

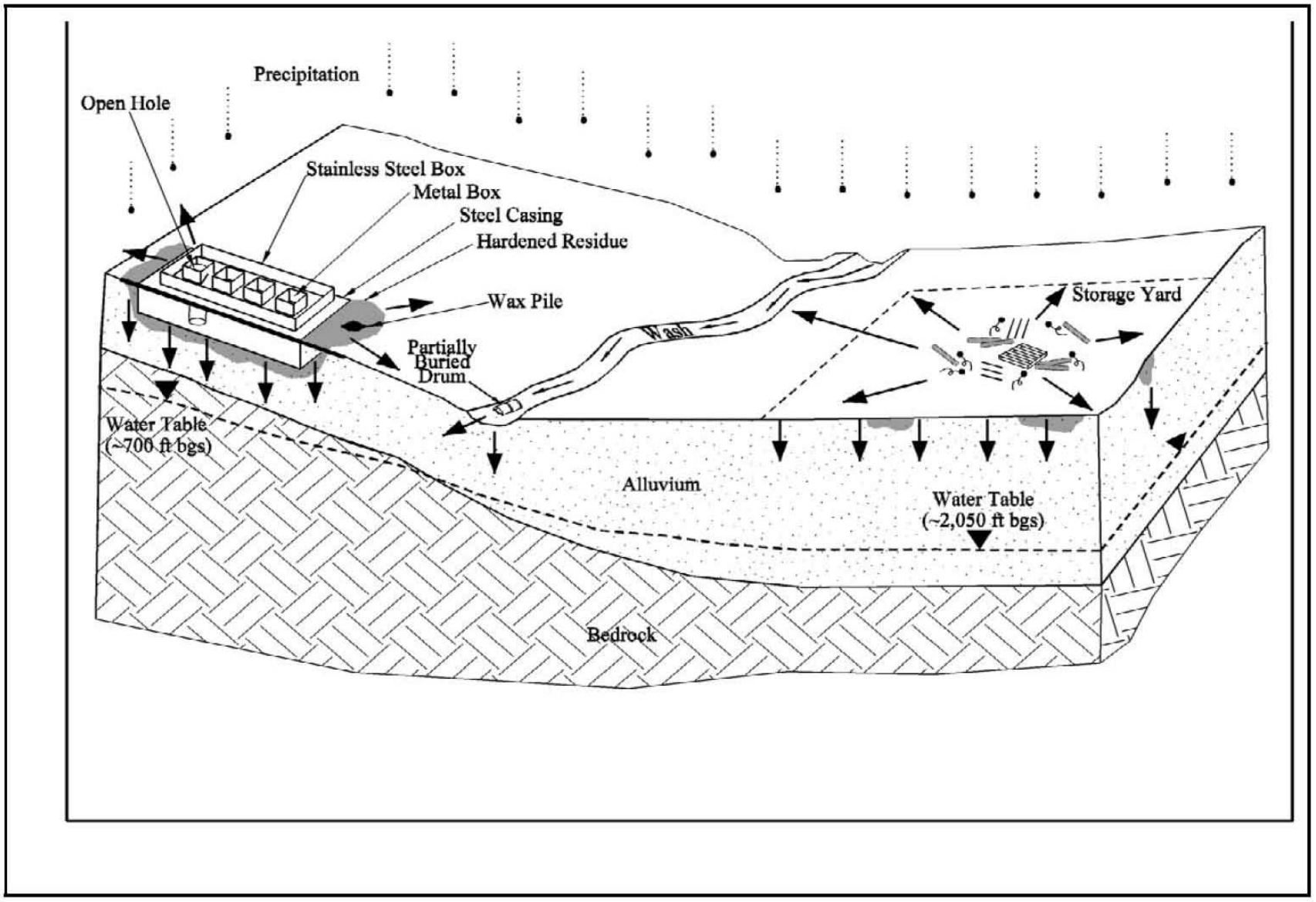

Figure A.3-1
Conceptual Site Model for CAU 166

contaminants that could potentially be present at each CAS. The COPCs applicable to Decision I environmental samples from each of the CASs of CAU 166 are defined as the constituents reported from the analytical methods stipulated in Table 3-1.

A.3.2.3 Contaminant Characteristics

Contaminant characteristics include, but are not limited to: solubility, density, and adsorption potential. In general, contaminants with low solubility, high affinity for media, and high density can be expected to be found relatively close to release points. Contaminants with small particle size, high solubility, low density, and/or low affinity for media are found further from release points or in low areas where evaporation of ponding will concentrate dissolved contaminants.

A.3.2.4 Site Characteristics

Site characteristics are defined by the interaction of physical, topographical, and meteorological attributes and properties. Physical properties include permeability, porosity, hydraulic conductivity, degree of saturation, sorting, chemical composition, and organic content. Topographical and meteorological properties and attributes include slope stability, precipitation frequency and amounts, precipitation runoff pathways, drainage channels and ephemeral streams, and evapotranspiration potential.

Corrective Action Sites 02-42-01, 02-42-02, and 02-99-10 are located adjacent to each other near the Area 2 Camp in NTS Area 2. The area around the site is generally flat, with washes in the area draining southeast towards Yucca Flat. There are several craters and test holes in the vicinity of the CASs. The nearest crater and test hole is approximately 2,500 ft southeast of CAS 02-99-10, 3,000 ft southeast of CAS 02-42-01, and 3,300 ft east of CAS 02-42-02. Transport of contaminants at this site would occur through erosion/mass transport in surface waters (see Figure 3-1) into nearby washes leaving the area, test holes, or craters (Figure A.3-1).

Corrective Action Site 03-42-01 is located in the Area 3 Camp in NTS Area 3. The area around the site is relatively flat, with washes in the area draining southeast towards Yucca Flat (closest wash is in a different drainage basin than the CAS). There are several craters and test holes in the vicinity of the site. The nearest test hole is approximately 1,470 ft east of the CAS while the nearest test hole that

cratered is 2,260 ft southwest of the site. Transport of contaminants at this site would occur through erosion/mass transport in surface waters (see Figure 3-1) into nearby washes leaving the area, test holes, or craters (Figure A.3-1).

Corrective Action Site 05-19-02 is located 1.4 miles east of Mercury Highway. The area around the site is generally flat. A wash runs through the CAS footprint that drains west toward Frenchman Lake drainage basin. There are no test holes or craters in the vicinity of the CAS. Transport of contaminants at this site would occur through erosion/mass transport in surface waters (see Figure 3-1) into the adjacent wash (Figure A.3-1).

Corrective Action Sites 18-01-01 and 18-99-03 are located southwest of the Little Feller II test area in NTS Area 18. The area around the site is slightly hilly with washes in the area draining north within the Forty Mile Wash drainage basin. There are no test holes or craters in the vicinity of the CAS. Transport of contaminants at this site would occur through erosion/mass transport in surface waters (see Figure 3-1) into nearby washes leaving the area (Figure A.3-1).

A.3.2.5 Migration Pathways and Transport Mechanisms

Movement of liquid or solid contaminants away from the point of release at the CAU 166 CASs are mainly related to the movement of water by percolation into subsurface media or by overland migration with flowing water. Infiltration and percolation of precipitation serves as a driving force for downward migration of contaminants. However, due to high potential evapotranspiration (annual potential evapotranspiration at the Area 3 Radiological Waste Management Site has been estimated at 62.6 in. [Shott et al., 1997]) and limited precipitation for this region (6 to 8 in. per year [Winograd and Thordarson, 1975]), percolation of infiltrated precipitation at the NTS does not provide a significant mechanism for vertical migration of contaminants to groundwater (DOE/NV, 1992).

Airborne migration of contaminants is considered a minor transport mechanism for CAU 166. If migration of contaminants at the seven CASs in CAU 166 were to have occurred, the dominant transport mechanism would be erosion/mass transport by surface runoff of precipitation (Figure A.3-1). Flowing water has the potential to carry dissolved and suspended contaminants. The migration pathway through which the contamination from the CASs in CAU 166 might migrate is

surface water (see Figure 3-1). Washes, such as those that lie on or near the footprints of CASs 05-19-02, can carry runoff water and possible contaminants away from the original site of release. Other land features such as craters and test holes could receive runoff water and possible contaminants (Figure A.3-1). This transport mechanism is depicted in the CSM as the means for contamination to move from the point of release to other areas, impacting sediments and surface soils that become potential exposure points, including areas outside the CAS boundaries.

A.3.2.6 Exposure Scenarios

Human receptors may be exposed to COPCs through oral ingestion, inhalation, dermal contact (absorption) of soil or debris due to inadvertent disturbance of these materials or exposure to radioactive materials. The land use and exposure scenarios for the CAU 166 CASs are listed in Table A.3-3. These are based on NTS current and future land use. All seven CASs in CAU 166 are at remote locations without any site improvements and where no regular work is performed. There is still the possibility, however, that site workers could occupy these locations on an occasional and temporary basis such as a military exercise. Therefore, these sites are classified as occasional work areas.

Table A.3-3
Future Land-Use Zones and Exposure Scenarios

CAS	Record of Decision Land-Use Zone	Exposure Scenario
02-42-01, 02-42-02, 02-99-10, 03-42-01	Nuclear and High Explosives Test This area is designated within the Nuclear Test Zone for additional underground nuclear weapons tests and outdoor high-explosive tests. This zone includes compatible defense and nondefense research, development, and testing activities.	Occasional Use Area Remote area with no active improvements and the future land use designation is for outdoor tests and/or military training exercises.
05-19-02, 18-01-01, 18-99-03,	Reserved (within NTS area) This area includes land and facilities that provide widespread flexible support for diverse short-term testing and experimentation. The reserved zone is also used for short duration exercises and training such as nuclear emergency response and Federal Radiological Monitoring and Assessment Canter training and U.S. Department of Defense land-navigation exercises and training.	

The future land-use scenarios for all seven CASs in CAU 166 support these exposure scenarios (DOE/NV, 1998). The nature of these future land-use zones precludes the presence of the site workers except on a temporary basis during the various activities.

A.4.0 Step 2 - Identify the Decisions

Step 2 of the DQO process identifies the decision statements and defines appropriate alternative actions that may be taken, depending on the answer to the decision statements.

A.4.1 Decision Statements

The Decision I statement is: "Is any COC present in environmental media within the CAS?" For judgmental sampling design, any analytical result for a COPC above the FAL will result in that COPC being designated as a COC. For probability (random) sampling design, any COPC that has a 95 percent UCL of the average concentration above the FAL will result in that COPC being designated as a COC. A COC may also be defined as a contaminant that, in combination with other like contaminants, is determined to jointly pose an unacceptable risk based on a multiple constituent analysis (NNSA/NSO, 2006). If a COC is detected, then Decision II must be resolved.

The Decision II statement is: "If a COC is present, is sufficient information available to evaluate potential corrective action alternatives?" Sufficient information is defined to include:

- Identification of the volume of media containing any COC bounded by analytical sample results in lateral and vertical directions.
- Characterization of IDW for disposal.
- Determination of potential remediation waste types.
- Evaluation of the feasibility of potential corrective actions.

A corrective action will be determined for any site containing a COC. The evaluation of the need for corrective action will include the potential for wastes that are present at a site to cause the future contamination of site environmental media if the wastes were to be released. To evaluate the potential for a release from site wastes to result in the introduction of a COC to the surrounding environmental media, the following conservative assumptions were made:

- All containment would fail at some point and the contents would be released to the surrounding media.

- Resulting concentration of contaminants in the surrounding media would be equal to the concentration of contaminants in any non-liquid waste.

- Any liquid waste contaminant concentrations exceeding the RCRA toxicity characteristic concentration can result in COC introduction to the surrounding media.

Non-liquid wastes containing a contaminant exceeding an equivalent FAL concentration would be considered to be potential source material and would require a corrective action. Liquid wastes with contaminant concentrations exceeding an equivalent toxicity characteristic action level would be considered to be potential source material and would require a corrective action.

If sufficient information is not available to evaluate potential corrective action alternatives, then site conditions will be re-evaluated and additional samples will be collected (as long as the scope of the investigation is not exceeded and any CSM assumption has not been shown to be incorrect).

A.4.2 Alternative Actions to the Decisions

In this section, the actions that may be taken to solve the problem are identified depending on the possible outcomes of the investigation.

A.4.2.1 Alternative Actions to Decision I

If no COC associated with a release from the CAS is detected, then further assessment of the CAS is not required. If a COC associated with a release from the CAS is detected, then the extent of COC contamination will be determined and additional information required to evaluate potential corrective action alternatives will be collected.

A.4.2.2 Alternative Actions to Decision II

If sufficient information is available to evaluate potential corrective action alternatives, then further assessment of the CAS is not required. If sufficient information is not available to evaluate potential corrective action alternatives, then additional samples will be collected.

A.5.0 Step 3 - Identify the Inputs to the Decision

This step identifies the information needed, determines information sources, and identifies sampling and analysis methods that will allow reliable comparisons with FALs.

A.5.1 Information Needs

To resolve Decision I (determine whether a COC is present at a given CAS), samples shall be collected and analyzed following these criteria:

- Samples must be (a) collected in areas most likely to contain a COC (judgmental sampling) or (b) properly represent contamination at the CAS (probabilistic sampling)
- The analytical suite selected must be sufficient to identify any COCs present in the samples.

To resolve Decision II (determine whether sufficient information is available to evaluate potential corrective action alternatives at each CAS), samples need to be collected and analyzed to meet the following criteria:

- Samples must be collected in areas contiguous to the contamination but where contaminant concentrations are below FALs.
- Samples of the waste or environmental media must provide sufficient information to characterize the IDW for disposal.
- Samples of the waste or environmental media must provide sufficient information to determine potential remediation waste types.
- Appropriate samples must be submitted to evaluate the feasibility of potential corrective actions.
- The analytical suites selected must be sufficient to detect contaminants at concentrations equal to or less than their corresponding FALs.

A.5.2 Sources of Information

Information to satisfy Decision I and Decision II will be generated by collecting environmental samples using grab sampling, hand augering, direct push, backhoe excavation, or other appropriate

sampling methods. These samples will be submitted to analytical laboratories meeting the quality criteria stipulated in the Industrial Sites QAPP (NNSA/NV, 2002a). Only validated data from analytical laboratories will be used to make DQO decisions. Sample collection and handling activities will follow standard procedures.

A.5.2.1 Sample Locations

Design of the sampling approaches for the CAU 166 CASs must ensure that the data collected are sufficient for selection of the corrective action alternatives (EPA, 2002). To meet this objective, the samples collected from each site should either be from locations that most likely contain a COC, if present (judgmental), properly represent any contamination at the CAS. These sample locations, therefore, can be selected by means of (a) biasing factors used in judgmental sampling (e.g., a stain, likely containing a spilled substance) or (b) a probabilistic sampling design. Because the information available to develop judgmental sampling varies in scope among the CAU 166 CASs, both judgmental and probabilistic sampling approaches are used for the CAI. A judgmental sampling design has been developed for CASs 18-01-01 and 18-99-03, due to the presence and significance of biasing factors. A probabilistic sampling design has been developed for CASs 02-42-01, 02-42-02, and 02-99-10, due to the lack of significant biasing factors. A combination of biasing factors and probabilistic sampling will be applied at CASs 03-42-01 and 05-19-02

The implementation of judgmental and probabilistic approach for sample location selection for CAU 166 are discussed in the following sections. Appendix C provides the methodology and computational approach for probabilistic sampling, and lists the sample size and locations as calculated by the VSP software program, including the values established as input for selecting sample size (PNNL, 2005).

A.5.2.1.1 Judgmental Approach for Sampling Location Selection

Decision I sample locations at CASs 18-01-01, 18-99-03, and portions of CASs 03-42-01 and 05-19-02, will be determined based upon the likelihood of the soil containing a COC, if present at the CAS. These locations will be selected based on field-screening techniques, biasing factors, the CSM,

and existing information. Analytical suites for Decision I samples will include all COPCs identified in Table A.3-3.

Field-screening techniques may be used to select appropriate sampling locations by providing semiquantitative data that can be used to comparatively select samples to be submitted for laboratory analyses from several screening locations. Field screening may also be used for health and safety monitoring and to assist in making certain health and safety decisions. The following field-screening methods may be used to select analytical samples at CAU 166:

- Walkover surface area radiological surveys – A radiological survey instrument will be used over approximately 100 percent of the CAS boundaries, as permitted by terrain and field conditions, to detect hot spots of radiological contamination.
- Alpha and beta/gamma radiation – A radiological survey instrument will be used.
- Gamma emitting radionuclides – A radiological dose rate measurement instrument will be used.

Biasing factors may also be used to select samples to be submitted for laboratory analyses based on existing site information and site conditions discovered during the investigation. The following factors will also be considered in selecting locations for analytical samples at CAU 166:

- Documented process knowledge on source and location of release (e.g., volume of release).
- Stains: Any spot or area on the soil surface that may indicate the presence of a potentially hazardous liquid. Typically, stains indicate an organic liquid such as an oil has reached the soil, and may have spread out vertically and horizontally.
- Elevated radiation: Any location identified during radiological surveys that had alpha/beta/gamma levels significantly higher than surrounding background soil.
- Geophysical anomalies: Any location identified during geophysical surveys that had results indicating surface or subsurface materials existed, and were not consistent with the natural surroundings (e.g., buried concrete or metal, surface metallic objects).
- Drums, containers, equipment or debris: Materials of interest that may have been used at, or added to, a location, and that may have contained or come in contact with hazardous or radioactive substances at some point during their use.

- Lithology: Locations where variations in lithology (soil or rock) indicate that different conditions or materials exist.

- Preselected areas based on process knowledge of the site: Locations for which evidence such as historical photographs, experience from previous investigations, or interviewee input, exists that a release of hazardous or radioactive substances may have occurred.

- Preselected areas based on process knowledge of the contaminant(s): Locations that may reasonably have received contamination, selected on the basis of the chemical and/or physical properties of the contaminant(s) in that environmental setting.

- Previous sample results: Locations that may reasonably have been contaminated based upon the results of previous field investigations.

- Experience and data from investigations of similar sites.

- Visual indicators such as discoloration, textural discontinuities, disturbance of native soils, or other indication of potential contamination.

- Presence of debris, waste, or equipment.

- Odor.

- Physical and chemical characteristics of contaminants.

- Other biasing factors: Factors not previously defined for the CAI, but become evident once the investigation of the site is under way; previous sample or screening results.

Decision II sample step-out locations will be selected based on the CSM, biasing factors, and existing data. Analytical suites will include those parameters that exceeded FALs (i.e., COCs) in prior samples. Biasing factors to support Decision II sample locations include Decision I biasing factors plus available analytical results.

A.5.2.1.2 Probabilistic Approach for Sample Location Selection

The number and location of Decision I samples at CASs 02-42-01, 02-42-02, 02-99-10, and portions of CASs 03-42-01 and 05-19-02 were selected during the DQO meeting. Several parameters must be established to determine the number of samples required to be collected for each significant COPC. A significant COPC is defined as any constituent that is detected in any sample at a concentration greater than the PAL. The input parameters that will be used to determine the number of samples

required to make DQO decisions are summarized in Table A.5-1 and are presented in Appendix C. Individual CAS probabilistic sampling and analysis designs are discussed in Section A.9.1 (CASs 02-42-01, 02-42-02, and 02-99-10), Section A.9.2 (CAS 03-42-01), and Section A.9.3 (CAS 05-19-02).

Table A.5-1
Parameter Values for Calculating Sample Size

Parameter	Description
Sampling Goal	Compare average to fixed threshold
Distribution	Data not assumed to be normally distributed Ordinary sampling of symmetric distribution
Hypothesis	Assume site is dirty
False Rejection Rate	5%
False Acceptance Rate	20%
Standard Deviation	Actual significant COPC standard deviation
Average	Actual significant COPC average concentration
Gray Region Width	Average concentration

The sufficiency of the number of samples collected will be evaluated following the CAI based on a recalculation of the sample size based on the actual data. For COC analytical results reported as not detected, one-half of the detection limit values will be used to calculate statistical parameters (EPA, 1989). All calculations for the determination of sample size sufficiency will be provided in the investigation report.

A.5.2.2 Analytical Methods

Analytical methods are available to provide the data needed to resolve the decision statements. The analytical methods and laboratory requirements (e.g., detection limits, precision, and accuracy) are provided in Tables 3-4 and 3-5 along with specific analyses required for the disposal of IDW.

A.6.0 Step 4 - Define the Boundaries of the Study

The purpose of this step is to define the population of interest, define the spatial boundaries, determine practical constraints on data collection, and define the scale of decision making.

A.6.1 Populations of Interest

The population of interest to resolve Decision I ("Is any COC present in environmental media within the CAS?") is (a) any location within the site that is contaminated with any contaminant above a FAL (judgmental sampling) or (b) locations representative of total site contamination (probabilistic sampling). The populations of interest to resolve Decision II ("If a COC is present, is sufficient information available to evaluate potential corrective action alternatives?") are:

- Each one of a set of locations bounding contamination in lateral and vertical directions.
- Investigation-derived waste or environmental media that must be characterized for disposal.
- Potential remediation waste.
- Environmental media where natural attenuation or biodegradation or construction/evaluation of barriers is considered.

A.6.2 Spatial Boundaries

Spatial boundaries are the maximum lateral and vertical extent of expected contamination at each CAS, as shown in Table A.6-1. Contamination found beyond these boundaries may indicate a flaw in the CSM and may require re-evaluation of the CSM before the investigation could continue. Each CAS is considered geographically independent and intrusive activities are not intended to extend into the boundaries of neighboring CASs.

A.6.3 Practical Constraints

Investigation of these CASs may be impacted by physical constraints and activities at the NTS. Underground utilities, shallow bedrock, equipment in the storage yards, overhead power lines, and bordering CASs can limit intrusive sampling locations. Other practical constraints include soft

Table A.6-1
Spatial Boundaries of CAU 166 CASs

Corrective Action Site	Spatial Boundaries
02-42-01, 02-42-02, 02-99-10, 03-42-01	The footprint of the storage yard plus a 20-foot (ft) lateral and 15-ft vertical buffer.
05-19-02	The footprint of the storage yard plus a 20-ft lateral and 15-ft vertical buffer. The footprint of the drum plus 50 ft laterally down stream of the wash and 15 ft vertically.
18-01-01, 18-99-03	The area around the metal boxes and stained soil containing wax plus a 20-ft lateral and 15-ft vertical buffer.

sediment terrain and access restrictions. Access restrictions include scheduling conflicts on the NTS with other entities, areas posted as contamination areas requiring appropriate work controls, physical barriers (e.g., fences), and areas requiring authorized access. Underground utilities surveys will be conducted at each CAS prior to the start of investigation activities to determine whether utilities exist, and, if so, determine the limit of spatial boundaries for intrusive activities. Sample locations at CASs 18-01-01 and 18-99-03 within the contamination area may need to be revised due to as-low-as-reasonably-achievable goals.

A.6.4 Define the Scale of Decision Making

The scale of decision making for CASs 02-42-01, 02-42-02, 02-99-10, 18-01-01, and 18-99-03 is defined as the CAS. At CAS 03-42-01, separate decisions may be made for the posted RMA and the unposted (unfenced) portion of the storage yard. A CAS 05-19-02, separate decisions may be made for the storage yard, the drum location, drum storage area, and drum remnants location. Any COC detected within any potential decision-making area will cause the determination that the area is contaminated and needs further evaluation. The scale of decision making for Decision II is defined as the contiguous area contaminated with any COC. Resolution and Decision II requires this contiguous area to be bounded laterally and vertically.

A.7.0 Step 5 - Develop a Decision Rule

This step develops a decision rule ("If..., then...") statement that defines the conditions under which possible alternative actions will be chosen. In this step, we specify the statistical parameters that characterizes the population of interest, specify the FALs, confirm that detection limits are capable of detecting FALs, and present decision rules.

A.7.1 Population Parameters

For judgmental sampling results, the population parameter is the observed concentration of each contaminant from each individual analytical sample. Each sample result will be compared to the FALs to determine the appropriate resolution to Decision I and Decision II. For Decision I, a single sample result for any contaminant exceeding a FAL would cause a determination that a COC is present within the CAS.

For probabilistic sampling results, the population parameter is the 95 percent UCL of the average sample concentration of each detected contaminant from all analytical samples from an individual release. The population parameter will be compared to the corresponding FALs to determine the appropriate resolution to Decision I and Decision II. For Decision I, a UCL of the average concentration for any contaminant exceeding a FAL would cause a determination that a COC is present within the CAS.

The Decision II population parameter is an individual analytical result from a bounding sample. For Decision II, a single bounding sample result for any contaminant exceeding a FAL would cause a determination that the contamination is not bounded.

A.7.2 Decision Rules

The decision rules applicable to both Decision I and Decision II are:

- If COC contamination is inconsistent with the CSM or extends beyond the spatial boundaries identified in Section A.6.2, then work will be suspended and the investigation strategy will be reconsidered.

- If a COC is present, is consistent with the CSM, and is within spatial boundaries, then the decision will be to continue sampling to define the extent.

The decision rules for Decision I are:

- If the population parameter of any COPC in the Decision I population of interest (defined in Step 4) exceeds the corresponding FAL, then that contaminant is identified as a COC, and Decision II samples will be collected.
- If a COC exists at any CAS, a corrective action will be determined.
- If a waste is present that, if released, has the potential to cause the future contamination of site environmental media, a corrective action will be determined.
- If all COPC concentrations are less than the corresponding FALs, then the decision will be no further action.

The decision rules for Decision II are:

- If the population parameter (the observed concentration of any COC) in the Decision II population of interest (defined in Step 4) exceeds the corresponding FAL, then additional samples will be collected to complete the Decision II evaluation.
- If all bounding COC concentrations are less than the corresponding FALs, then the decision will be that the extent of contamination has been defined in the corresponding lateral and/or vertical direction.

If valid analytical results are available for the waste characterization, bioassessment, and geotechnical samples defined in Section A.9.0, then the decision will be that sufficient information exists to characterize the IDW for disposal, determine potential remediation waste types, and to evaluate the feasibility of remediation alternatives.

A.7.3 Action Levels

The PALs presented in this section are to be used for site screening purposes. They are not necessarily intended to be used as cleanup action levels or FALs. However, they are useful in screening out contaminants that are not present in sufficient concentrations to warrant further evaluation and, therefore, streamline the consideration of remedial alternatives. The RBCA process used to establish FALs is described in the Industrial Sites Project Establishment of Final Action

Levels (NNSA/NSO, 2006). This process conforms with NAC Section 445A.227 which lists the requirements for sites with soil contamination. For the evaluation of corrective actions, NAC Section 445A.22705 requires the use of ASTM Method E1739-95 to "conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards (i.e., FALs) or to establish that corrective action is not necessary" (ASTM, 1995).

This RBCA process defines three tiers (or levels) of evaluation involving increasingly sophisticated analyses:

- Tier 1 Evaluation – Sample results from source areas (highest concentrations) are compared to action levels based on generic (non-site-specific) conditions (i.e., the PALs established in the CAIP). The FALs may then be established as the Tier 1 action levels or the FALs may be calculated using a Tier 2 evaluation.
- Tier 2 Evaluation – Conducted by calculating Tier 2 SSTLs using site-specific information as inputs to the same or similar methodology used to calculate Tier 1 action levels. The Tier 2 SSTLs are then compared to individual sample results from reasonable points of exposure (as opposed to the source areas as is done in Tier 1) on a point by point basis. Total TPH concentrations will not be used for risk-based decisions under Tier 2 or Tier 3. Rather, the individual chemicals of concern will be compared to the SSTLs.
- Tier 3 Evaluation – Conducted by calculating Tier 3 SSTLs on the basis of more sophisticated risk analyses using methodologies described in Method E1739-95 that consider site-, pathway-, and receptor-specific parameters.

The comparison of laboratory results to FALs and the evaluation of potential corrective actions will be included in the investigation report. The FALs will be defined (along with the basis for their definition) in the investigation report.

A.7.3.1 Chemical PALs

Except as noted herein, the chemical PALs are defined as the EPA *Region 9 Preliminary Remediation Goals (PRGs)* for chemical contaminants in industrial soils (EPA, 2004). Background concentrations for RCRA metals and zinc will be used instead of PRGs when natural background concentrations exceed the PRG, as is often the case with arsenic on the NTS. Background is considered the average concentration plus two standard deviations of the average for sediment samples collected by the

Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (formerly the Nellis Air Force Range) (NBMG, 1998; Moore, 1999). For detected chemical COPCs without established PRGs, the protocol used by the EPA Region 9 in establishing PRGs (or similar) will be used to establish PALs. If used, this process will be documented in the investigation report.

A.7.3.2 Total Petroleum Hydrocarbon PALs

The PAL for TPH is 100 ppm as listed in NAC 445A.2272 (NAC, 2004).

A.7.3.3 Radionuclide PALs

The PALs for radiological contaminants (other than tritium) are based on the NCRP Report No. 129 recommended screening limits for construction, commercial, industrial land-use scenarios (NCRP, 1999) scaled to 25 mrem/yr dose constraint (Murphy, 2004) and the generic guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993). These PALs are based on the construction, commercial, and industrial land-use scenario provided in the guidance and are appropriate for the NTS based on future land use scenarios as presented in Section A.3.2. The PAL for tritium is based on the UGTA Project limit of 400,000 pCi/L for discharge of water containing tritium (NNSA/NV, 2002b).

Solid media such as concrete and/or structures may pose a potential radiological exposure risk to site workers if contaminated. The radiological PAL for solid media will be defined as the unrestricted-release criteria defined in the *NV/YMP Radiological Control Manual* (DOE/NV, 2000).

A.7.4 Measurement and Analysis Sensitivity

The measurement and analysis methods listed in Section A.5.2.2 and in the Industrial Sites QAPP (NNSA/NV, 2002a) are capable of measuring contaminant concentrations at or below the corresponding FALs for each COPC. See Section 6.2.8 for additional details.

A.8.0 Step 6 - Tolerable Limits on Decision Errors

The purpose of this step is to specify performance criteria for the decision rule. Setting tolerable limits on decision errors is neither obvious nor easy. It requires the planning team to weigh the relative effects of threat to human health and the environment, expenditure of resources, and consequences of an incorrect decision.

Section 7.1 of the EPA QA/G-4HW guidance states that if judgmental sampling approaches are used, quantitative statements about data quality will be limited to measurement error (EPA, 2000a). Measurement error is influenced by imperfections in the measurement and analysis system. Random and systematic measurement errors are introduced in the measurement process during physical sample collection, handling, preparation, analysis, and data reduction. If measurement errors are not controlled, they may lead to errors in making the DQO decisions.

Limits in decision errors for probabilistic sampling designs are quantitatively set and readily measurable. Hypothesis, therefore, can be tested to ascertain whether a site is contaminated. The use of probabilistic design provides the ability to optimize resources while meeting DQOs.

This section provides an assessment of the possible outcomes of DQO decisions and the impact of those outcomes if the decisions are in error.

The baseline condition (i.e., null hypothesis) and alternative condition for Decision I are:

- Baseline condition – A COC is present.
- Alternative condition – A COC is not present.

The baseline condition (i.e., null hypothesis) and alternative condition for Decision II are as follows:

- Baseline condition – The extent of a COC has not been defined.
- Alternative condition – The extent of a COC has been defined.

Decisions and/or criteria have false negative or false positive errors associated with their determination. The impact of these decision errors and the methods that will be used to control these

errors are discussed in the following subsections. In general terms, confidence in DQO decisions based on judgmental sampling results will be established qualitatively by:

- The development of and concurrence of CSM (based on process knowledge) by stakeholder participants during the DQO process.
- Testing the validity of the CSM based on investigation results.
- Evaluating the quality of the data based on DQI parameters.

A.8.1 False Negative Decision Error

The false negative decision error would mean deciding that a COC is not present when it actually is (Decision I) or deciding that the extent of a COC has been defined when it has not (Decision II). In both cases the potential consequence is an increased risk to human health and environment.

A.8.1.1 False Negative Decision Error for Judgmental Sampling

The false negative decision error (where consequences are more severe) is controlled by meeting these criteria:

- For Decision I, a high degree of confidence that the sample locations selected will identify COCs if present anywhere within the CAS. For Decision II, a high degree of confidence that the sample locations selected will identify the extent of COCs.
- A high degree of confidence that analyses conducted will be sufficient to detect any COCs present in the samples.
- A high degree of confidence that the dataset is of sufficient quality and completeness.

To satisfy the first criterion, Decision I samples must be collected in areas most likely to be contaminated by COCs (supplemented by random samples where appropriate). Decision II samples must be collected in areas that represent the lateral and vertical extent of contamination (above FALs). The following characteristics must be considered to control decision errors for the first criterion:

- Source and location of release
- Chemical nature and fate properties

- Physical transport pathways and properties
- Hydrologic drivers

These characteristics were considered during the development of the CSMs and selection of sampling locations. The field-screening methods and biasing factors listed in Section A.5.2.1 will be used to further ensure that appropriate sampling locations are selected to meet these criteria. Radiological survey instruments and field-screening equipment will be calibrated and checked according to manufacturer instructions and approved procedures. The investigation report will present an assessment on the DQI of representativeness that samples were collected from those locations that best represent the populations of interest as defined in Section A.6.1.

To satisfy the second criterion, Decision I samples will be analyzed for the chemical and radiological parameters listed in Section 3.2. Decision II samples will be analyzed for those chemical and radiological parameters that identified unbounded COCs. The DQI of sensitivity will be assessed for all analytical results to ensure that all sample analyses had measurement sensitivities (detection limits) that were less than or equal to the corresponding FALs. If this criterion is not achieved, the affected data will be assessed (for usability and potential impacts on meeting site characterization objectives) in the investigation report.

To satisfy the third criterion, the entire dataset, as well as individual sample results, will be assessed against the DQIs of precision, accuracy, comparability, and completeness as defined in the Industrial Sites QAPP (NNSA/NV, 2002a) and in Section 6.2.2. The DQIs of precision and accuracy will be used to assess overall analytical method performance as well as to assess the need to potentially "flag" (qualify) individual contaminant results when corresponding QC sample results are not within the established control limits for precision and accuracy. Data qualified as estimated for reasons of precision or accuracy may be considered to meet the constituent performance criteria based on an assessment of the data. The DQI of completeness will be assessed to ensure that all data needs identified in the DQO have been met. The DQI of comparability will be assessed to ensure that all analytical methods used are equivalent to standard EPA methods so that results will be comparable to regulatory action levels that have been established using those procedures. Strict adherence to established procedures and QA/QC protocol protects against false negatives. To provide information

for the assessment of the DQIs of precision and accuracy, the following quality control samples will be collected as required by the Industrial Sites QAPP (DOE/NV, 2002):

- Field duplicates (minimum of 1 per matrix per 20 environmental samples)
- Laboratory QC samples (minimum of 1 per matrix per 20 environmental samples or 1 per CAS per matrix, if less than 20 collected)

A.8.1.2 False Negative Decision Error for Probabilistic Sampling

The false negative error rate for CASs 02-42-01, 02-42-02, 02-99-10, and portions of CASs 03-42-01 and 05-19-02 was established by the DQO meeting participants at 0.05 (or 5 percent probability). Upon validation of the analytical results, statistical parameters will be calculated for each COC identified at each site. Maintenance of a false negative error rate of 0.05 is contingent upon:

- Population distribution
- Sample size
- Actual variability
- Measurement error

Control of the false negative decision error, therefore, for probabilistic sampling designs is accomplished by ensuring that:

- Population distributions of the major contaminants fit the applied UCL determination method.
- A sufficient sample size was collected.
- The actual standard deviation of each major contaminant is calculated.
- Analyses conducted were sufficient to detect any COCs present in samples.

Calculation of sample size is described in Section C.1.2.2, Sample Size.

A.8.2 False Positive Decision Error

The false positive decision error would mean deciding that a COC is present when it is not, or a COC is unbounded when it is not, resulting in increased costs for unnecessary sampling and analysis.

A.8.2.1 False Positive Decision Error for Judgmental Sampling

The false positive decision error is controlled by implementing all the controls that protect against false negative decision errors. False positive results are typically attributed to laboratory and/or sampling/handling errors that could cause cross-contamination. To control against cross-contamination, decontamination of sampling equipment will be conducted according to established and approved procedures and only clean sample containers will be used. To determine whether a false positive analytical result may have occurred, the following quality control samples will be collected as required by the IS QAPP (DOE/NV, 2002):

- Trip blanks (1 per sample cooler containing VOC environmental samples)
- Equipment blanks (1 per sampling event for each type of decontamination procedure)
- Source blanks (1 per source lot per sampling event)
- Field blanks (minimum of 1 per CAS – additional if field conditions change)

A.8.2.2 False Positive Decision Error for Probabilistic Sampling

For probabilistic sampling, false positive decision error was established by the DQO meeting participants at 0.20 (or 20 percent probability). The false acceptance rate of 20 percent will be used to calculate minimum sample size. The decision to use this rate was based on two factors:

1. To control sampling costs (results in a lower number of required samples)

2. Acceptable knowledge that the risk of a false positive decision is very low based on years of environmental sampling at similar sites that have not resulted in any detectable false positive decisions.

The only effect the false acceptance rate of 20 percent versus a less-conservative rate could potentially have on the decision is to increase the chance of identifying a COC when it does not exist. This could potentially result in an overly conservative decision and would be more (not less) protective of the environment.

This decision error will also be controlled by implementing the controls listed in Section A.8.1 for probabilistic sampling designs.

A.9.0 Step 7 - Optimize the Design for Obtaining Data

This section provides the general approach for obtaining the information necessary to resolve Decision I and Decision II. Judgmental and probabilistic sampling schemes will be implemented to select sample locations and evaluate analytical results for CAU 166. Sections A.9.1 through A.9.3 contain general information about collecting Decision I and Decision II samples under judgmental and probabilistic sampling designs, while the subsequent sections provide CAS-specific sampling activities, including proposed sample locations.

A.9.1 Judgmental Sampling

A judgmental sampling design will be implemented for CASs 18-01-01 and 18-99-03 as well as portions of CASs 03-42-01 and 05-19-02. Because individual sample results, rather than an average concentration, will be used to compare to FALs at the CASs undergoing judgmental sampling, statistical methods to generate site characteristics will not be used. Section 0.4.4 of the EPA *Data Quality Objectives Process for Hazardous Waste Site Investigations* (EPA, 2000a) guidance states that the use of statistical methods may not be warranted by program guidelines or site-specific sampling objectives. The need for statistical methods is dependent upon the decisions being made. Section 7.1 of the EPA QA/G-4HW guidance states that a nonprobabilistic (judgmental) sampling design is developed when there is sufficient information on the contamination sources and history to develop a valid CSM and to select specific sampling locations. This design is used to confirm the existence of contamination at specific locations and provide information (such as extent of contamination) about specific areas of the site.

All sample locations will be selected to satisfy the DQI of representativeness in that samples collected from selected locations will best represent the populations of interest as defined in Section A.6.1. To meet this criterion for judgmentally sampled sites, a biased sampling strategy will be used for Decision I samples to target areas with the highest potential for contamination, if it is present anywhere in the CAS. Sample locations will be determined based on process knowledge, previously acquired data, or the field-screening and biasing factors listed in Section A.5.2.1. If biasing factors are present in soils below locations where Decision I samples were removed, additional Decision I soil samples will be collected at depth intervals selected by the Site Supervisor based on biasing

factors to a depth where the biasing factors are no longer present. The Site Supervisor has the discretion to modify the judgmental sample locations, but only if the modified locations meet the decision needs and criteria stipulated in this DQO.

A.9.2 Probabilistic Sampling

A probabilistic sampling scheme will be implemented to select sample locations and evaluate analytical results at CASs 02-42-01, 02-42-02, 02-99-10, as well as portions of CASs 03-42-01 and 05-19-02. For probabilistically sampled sites, randomly selected sample locations will be chosen, with locations specified by the VSP software (PNNL, 2005). If a location contains a shallow, hard object (e.g., rock, caliche or buried concrete), the Site Supervisor will establish the location at the nearest place that a surface sample can be obtained.

Statistical methods that generate site characteristics will be used at these CASs. The information provided from probabilistic sampling allows for establishing contaminant concentrations that represent the site as a whole.

A.9.3 Decision II Sampling

To meet the DQI of representativeness for Decision II samples (that Decision II sample locations represent the population of interest as defined in Section A.6.1), judgmental sampling locations at each CAS will be selected based on the outer boundary sample locations where COCs were detected, the CSM, and other field-screening and biasing factors listed in Section A.5.2. In general, sample locations will be arranged in a triangular pattern around the Decision I location or area at distances based on site conditions, process knowledge, and biasing factors. If COCs extend beyond the initial step-outs, Decision II samples will be collected from incremental step-outs. Initial step-outs will be at least as deep as the vertical extent of contamination defined at the Decision I location and the depth of the incremental step-outs will be based on the deepest contamination observed at all locations. A clean sample (i.e., COCs less than FALs) collected from each step-out direction (lateral or vertical) will define extent of contamination in that direction. The number, location, and spacing of step-outs may be modified by the Site Supervisor, as warranted by site conditions.

A.9.4 Corrective Action Sites 02-42-01, Cond. Release Storage Yd - North; 02-42-02, Cond. Release Storage Yd - South; 02-99-10, D-38 Storage Area

This section discusses the sampling and analysis design for the following CASs located in Area 2:

- CAS 02-42-01, Cond. Release Storage Yd - North
- CAS 02-42-01, Cond. Release Storage Yd - South
- CAS 02-99-10, D-38 Storage Area

These CASs are combined for discussion of investigation activities because all the CASs are storage yards that no longer have equipment/material present and do not have biasing factors. A probabilistic sampling design will be applied to the CAI for each of these CASs.

Corrective Action Site 02-42-01 covers approximately 81,872 square feet (ft^2) or 1.88 acres of land. The site is not fenced or posted. Corrective Action Site 02-42-02 covers approximately 32,231 ft^2 or 0.73 acres of land. The site is not fenced or posted. Corrective Action Site 02-99-10 covers approximately 25,000 ft^2 or 0.57 acres of land. A portion of the storage yard is chain-link fenced; however, the storage yard is not posted. All CASs have been radiologically surveyed but there were no elevated readings identified.

Proposed Decision I sample locations were determined and are shown in Figures A.9-1 through A.9-3. Determination of the number and location of samples is presented in Appendix C. The preliminary estimate of the number of samples for each CAS established by the DQO participants required to be taken at each CAS is 10. All samples will be taken from the surface (0 to 0.5 ft bgs).

At CAS 02-99-10, the area is paved, however, in many places the paving has deteriorated. Because this site is paved, samples will be collected below the asphalt. If asphalt is not present, surface samples will be collected (surface 0 to 0.5 ft bgs). The Site Supervisor will use professional judgment to determine if biasing factors (e.g., stains, elevated screening levels) are found during Decision I sampling that might indicate the need to take subsurface Decision II samples.

Sanitary, hazardous, radioactive, and/or mixed waste, if generated, will be managed and disposed of in accordance with DOE orders, DOT regulations, state and federal waste regulations, and agreements and permits between DOE and NDEP.

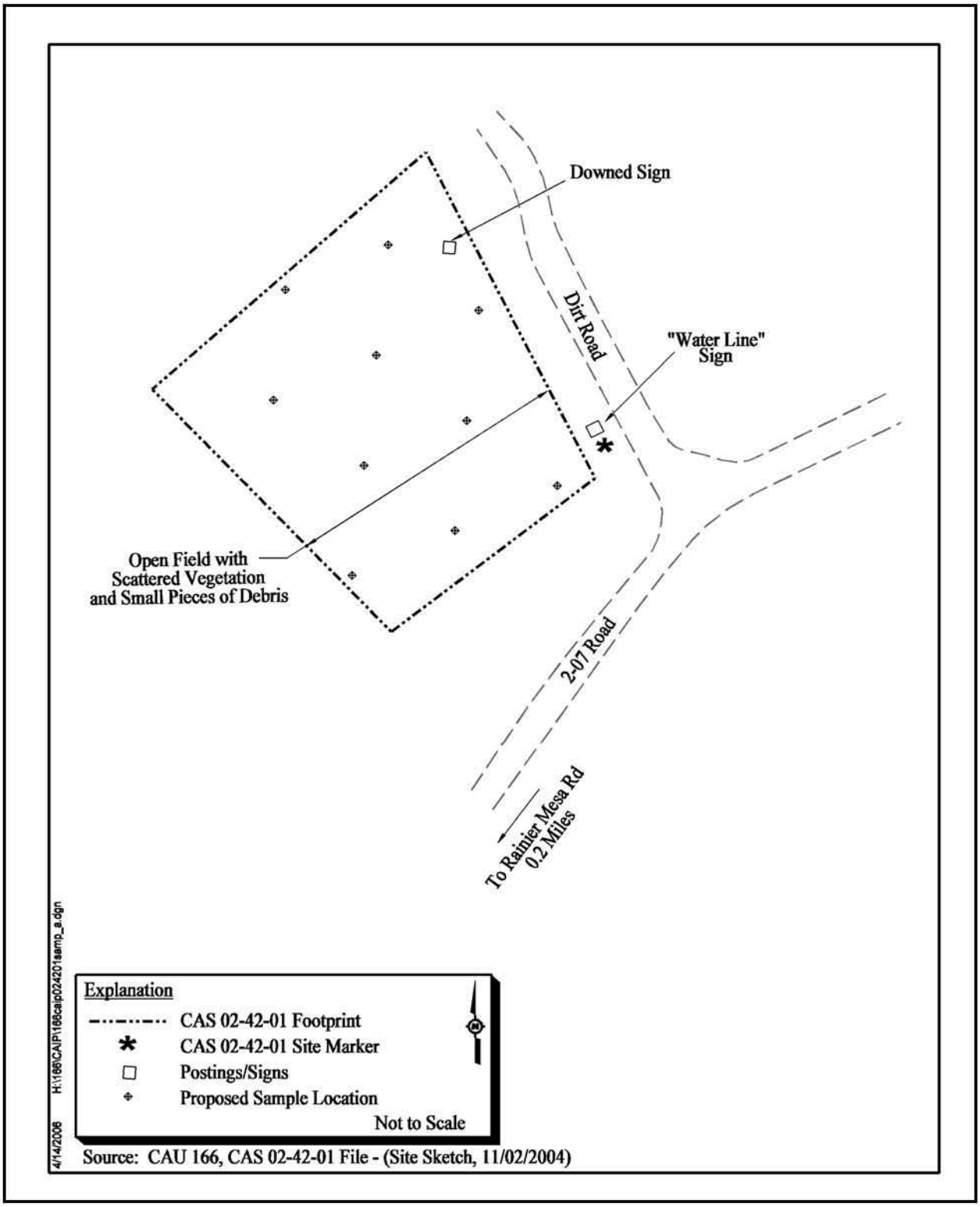

Figure A.9-1
Proposed Sample Locations at CAS 02-42-01

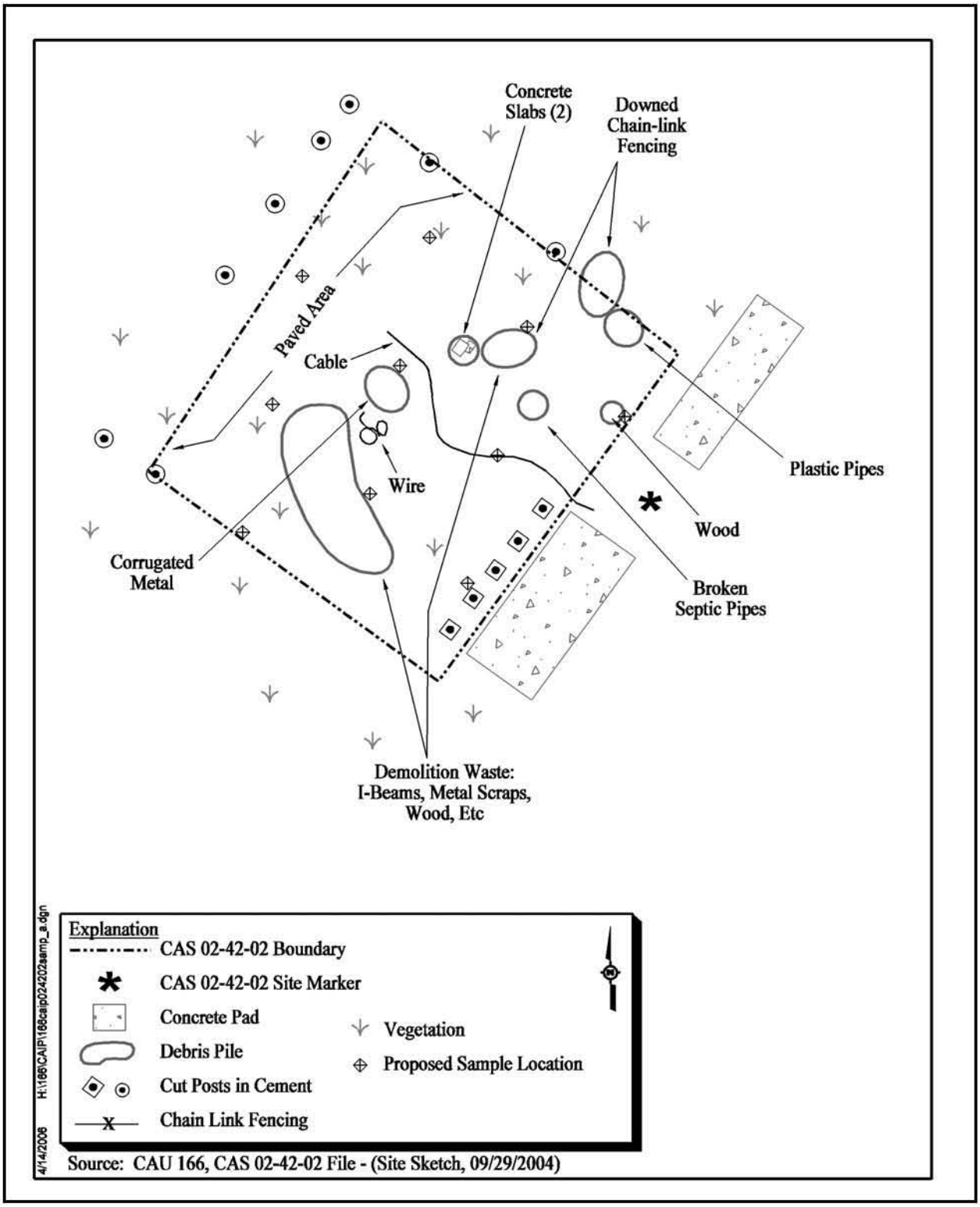

Figure A.9-2
Proposed Sample Locations at CAS 02-42-02

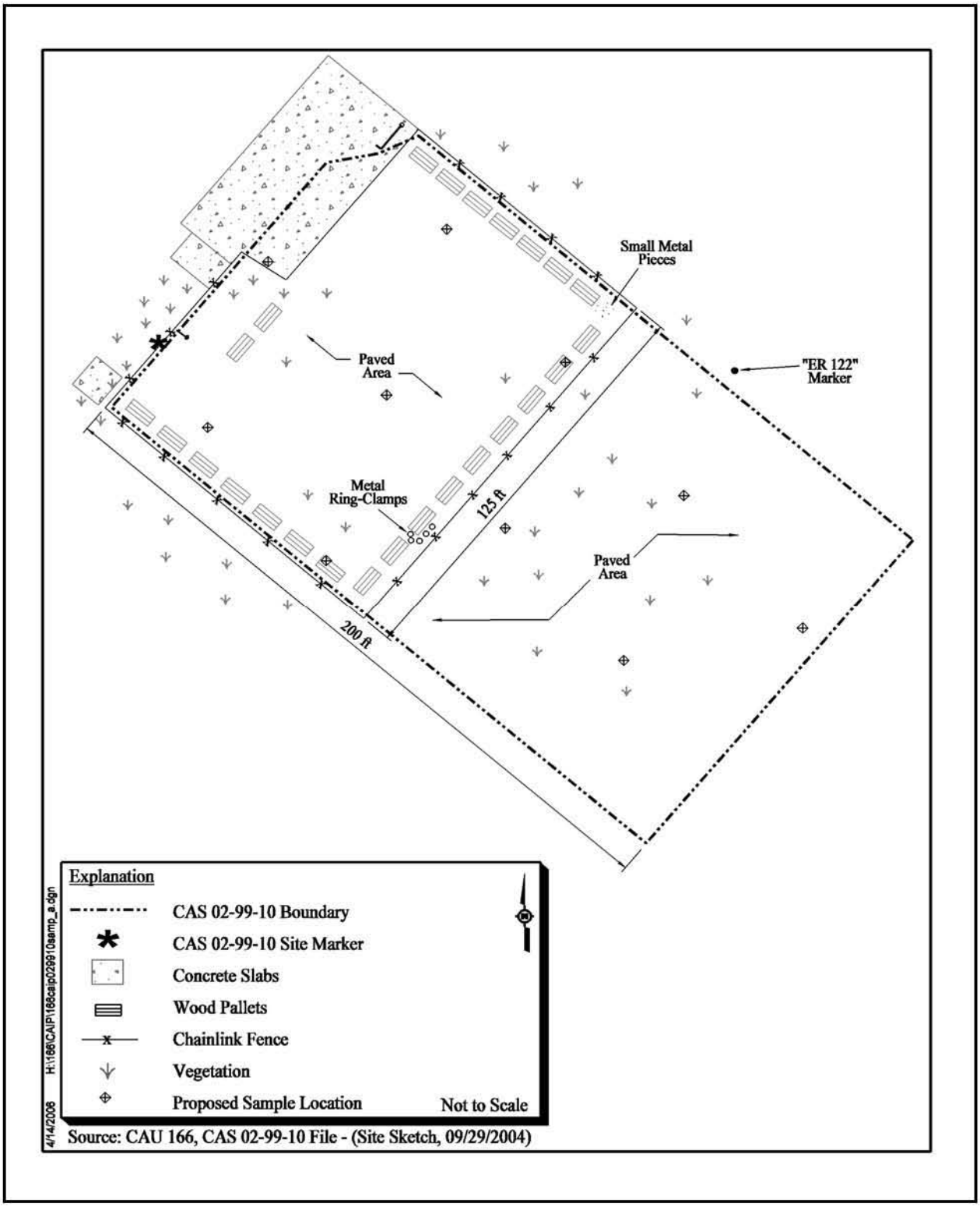

Figure A.9-3
Proposed Sample Locations at CAS 02-99-10

If Decision II sample step-out locations are required, step-out locations will be established along the CAS boundary.

A.9.5 Corrective Action Site 03-42-01, Conditional Release Storage Yard

Corrective Action Site 03-42-01 covers approximately 213,826 ft^2 or 4.91 acres of land. A portion of this site is fenced and posted "Caution Radioactive Material." The entire storage yard has been radiologically surveyed; there were no elevated readings identified.

Sampling at this CAS will combine judgmental and probabilistic sampling designs. The portion of the yard that is posted has many biasing factors; therefore, a judgmental sampling design will be implemented. The biasing factors include staining and the presence of potentially radioactive equipment, materials, tanks, portable buildings, and debris. A probabilistic sampling design will be applied to the CAI for the remainder of the storage yard. Although there is a small amount of drilling equipment in this part of the yard, there is no reason to believe there are radiological issues as the equipment is not in the posted area and there is no indication of staining or other biasing factors.

Proposed Decision I sample locations were determined and are shown in Figure A.9-4. Determination of the number and location of samples for the unposted portion of the yard is presented in Appendix C. The biased sampling locations for the posted portion of the yard will be determined during the CAI since there are still a lot of items that need to be moved from the storage yard prior to sampling the site. The preliminary estimate of sample size established by the DQO participants (Table A.5-1) for the unposted portion of the yard was fifteen samples.

Since this site is paved, samples will be collected below the asphalt. If asphalt is not present, surface samples will be collected (surface 0 to 0.5 ft bgs). The Site Supervisor will use professional judgment to determine if biasing factors (e.g., stains, elevated screening levels) are found during Decision I sampling that might indicate the need to take subsurface Decision II samples.

Sanitary, hazardous, radioactive, and/or mixed waste, if generated, will be managed and disposed of in accordance with DOE orders, DOT regulations, state and federal waste regulations, and agreements and permits between DOE and NDEP.

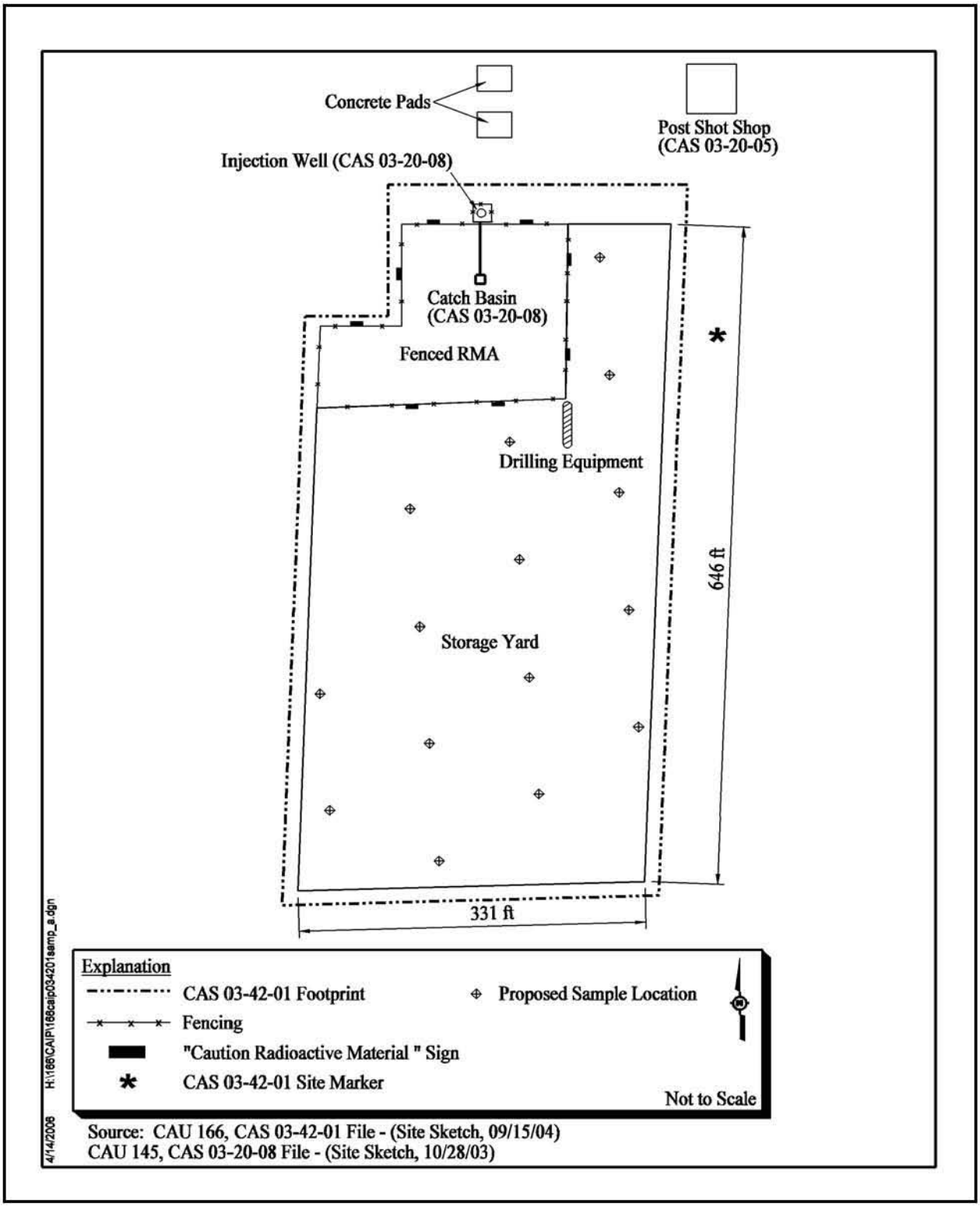

Figure A.9-4
Proposed Sample Locations at CAS 03-42-01

If Decision II sample step-out locations are required, step-out locations will be established along the CAS boundary.

A.9.6 Corrective Action Site 05-19-02, Contaminated Soil and Drum

Corrective Action Site 05-19-02 covers approximately 11,340 ft^2 or 0.26 acres of land. The storage yard is fenced with barbed wire while the drum is outside of the fenced area in a wash. The yard is not posted. The storage yard and adjacent areas have been radiologically surveyed; there were no elevated readings (Nicosia, 2006).

Sampling at this CAS will involve both judgmental and probabilistic sampling designs. A judgmental sampling design will be conducted in the wash where the drum is located, in the area adjacent to the storage yard where drums were formally stored, and in the area where deteriorated drum remnants are located. A probabilistic sampling design will be applied to the CAI for the storage yard. Although there are vehicles and steel remaining in the yard, there are no biasing factors that indicate where sampling should take place.

Proposed Decision I sample locations were determined and are shown in Figure A.9-5. Determination of the number and location of samples is presented in Appendix C. The following features will determine the judgmental sampling locations:

- The drum located in the wash will be sampled at two locations. A sample will be collected beneath the drum and a surface sample (0 to 0.5 ft bgs) will be collected immediately down gradient (1 to 2 ft) from the drum.
- The area adjacent to the storage yards where drums were formerly stored will be sampled at two locations. Surface samples (0 to 0.5 ft bgs) will be collected in the suspected area to ensure that an area most likely to contain a COC, if present, will be sampled.
- The area where deteriorated drum remnants remain will be sampled in two locations. Surface samples (0 to 0.5 ft bgs) will be collected in the suspected area to ensure that an area most likely to contain a COC, if present, will be sampled.

The preliminary estimate of sample size established by the DQO participants (Table A.5-1) for the storage yard was six samples. If no randomly selected sampling locations fall near the vehicles, a biased sample will be collected in the area of one of the vehicles. The Site Supervisor will use

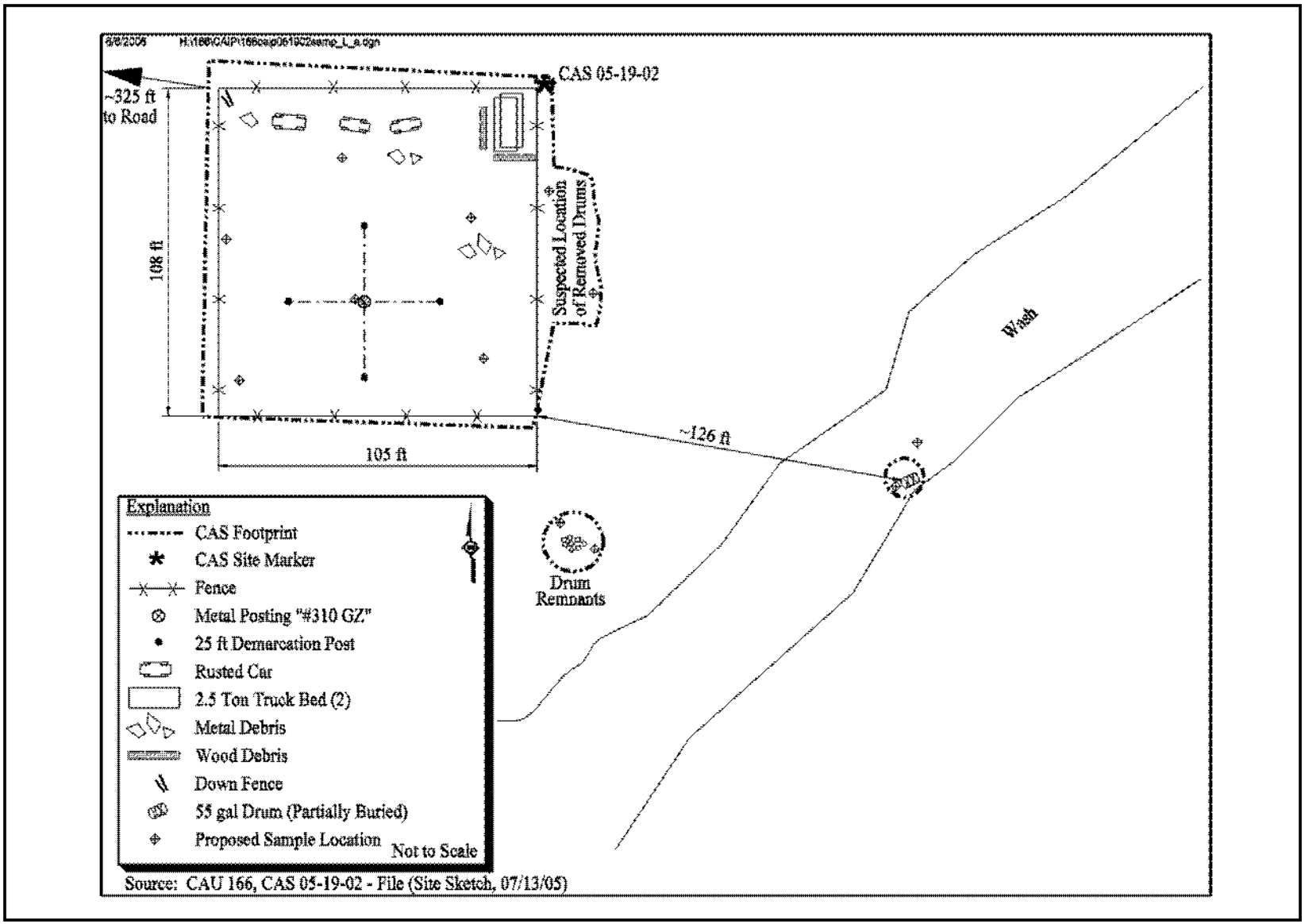

Figure A.9-5
Proposed Sample Locations at CAS 05-19-02

professional judgment to determine if biasing factors (e.g., stains, elevated screening levels) are found during Decision I sampling that might indicate the need to take subsurface Decision II samples.

Sanitary, hazardous, radioactive, and/or mixed waste, if generated, will be managed and disposed of in accordance with DOE orders, DOT regulations, state and federal waste regulations, and agreements and permits between DOE and NDEP.

If Decision II sample step-out locations are required, step-out locations will be established along the CAS boundary.

A.9.7 Corrective Action Sites 18-01-01, Aboveground Storage Tank, and 18-99-03, Wax Piles/Oil Stain

This section discusses the sampling and analysis design for the following CASs located in Area 18:

- CAS 18-01-01, Aboveground Storage Tank
- CAS 18-99-03, Wax Piles/Oil Stain

These CASs are combined for discussion of investigation activities because both CASs consists of the same components and have biasing factors. A judgmental sampling design will be applied to the CAI for each of these CASs.

The CASs consist of several features that are considered biasing factors. These features include three metal containers, one metal box, and various wax piles surrounded by hardened residue. The area that the CASs cover is minimal but difficult to determine due to the scattered nature of the components in these CASs. A portion of each of the CASs are within a yellow roped, posted contamination area. The CASs have been radiologically surveyed. A portion of the sites surveyed within the contamination area has elevated gamma radiation. The rest of the areas surveyed did not have elevated readings (Nicosia, 2006).

Proposed Decision I sample locations were determined and are shown in Figures A.9-6 through A.9-8. Determination of the number and location of samples is presented in Appendix C. Four environmental samples will be collected from underneath the metal containers and from underneath the metal box. Two environmental samples will be collected from underneath the wax piles/hardened

residue; one within and one outside the contamination area. Samples inside the containers and of the wax piles/hardened residue will be collected to determine the potential source of contamination.

Sanitary, hazardous, radioactive, and/or mixed waste, if generated, will be managed and disposed of in accordance with DOE orders, DOT regulations, state and federal waste regulations, and agreements and permits between DOE and NDEP.

If Decision II sample step-out locations are required, step-out locations will be established along the CAS boundary.

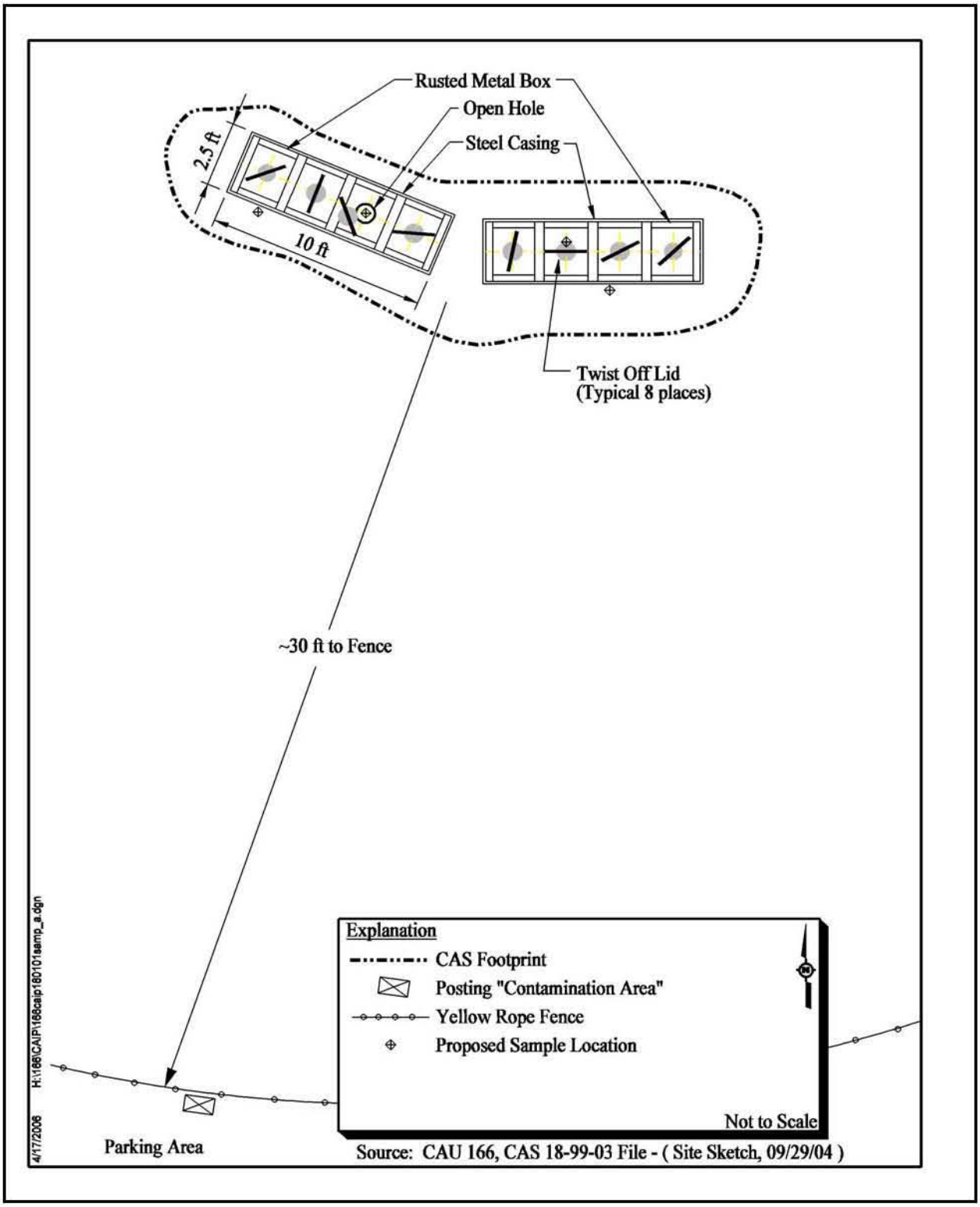

Figure A.9-6
Proposed Sample Locations at CAS 18-01-01

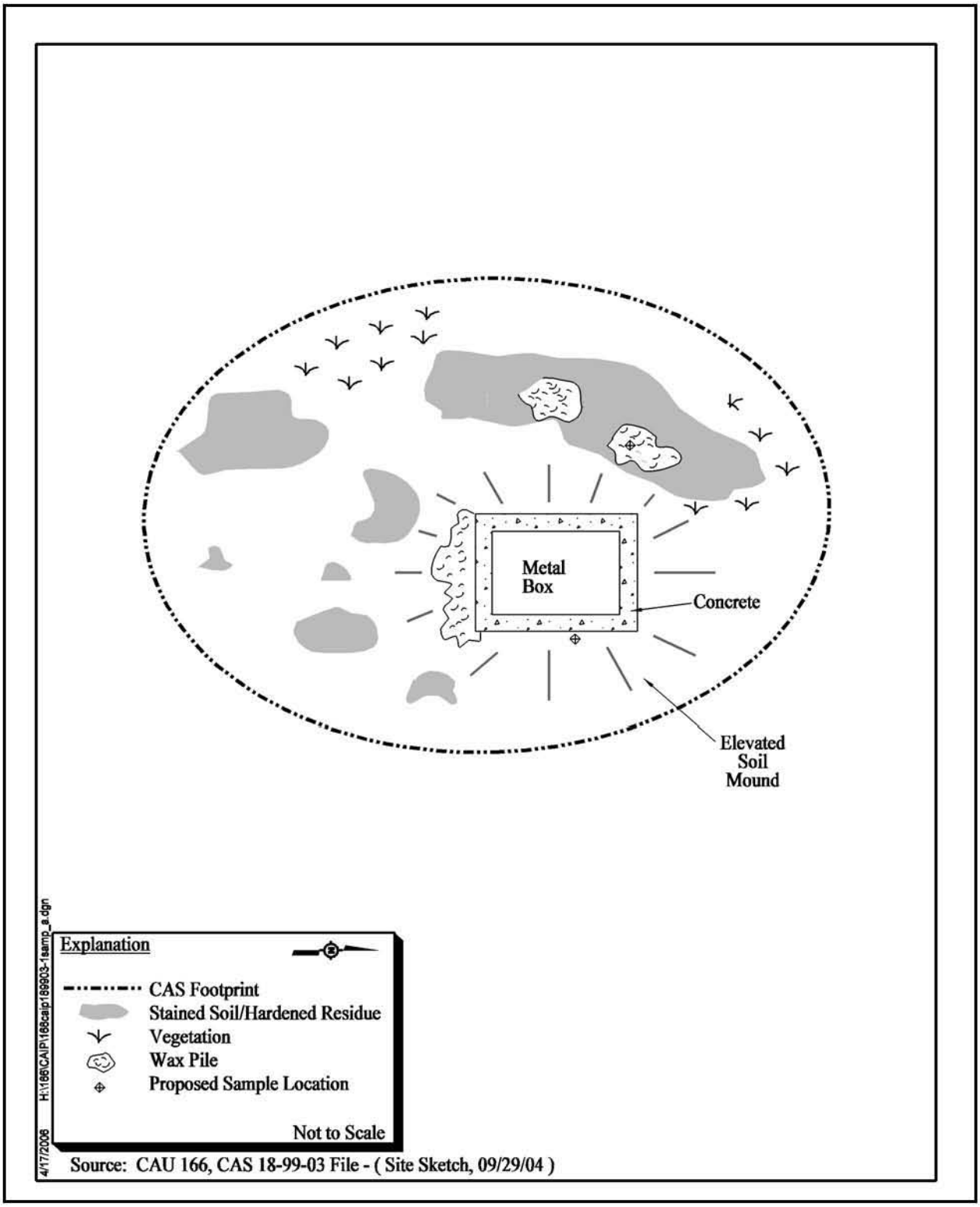

Figure A.9-7
Proposed Sample Locations at Site A, CAS 18-99-03

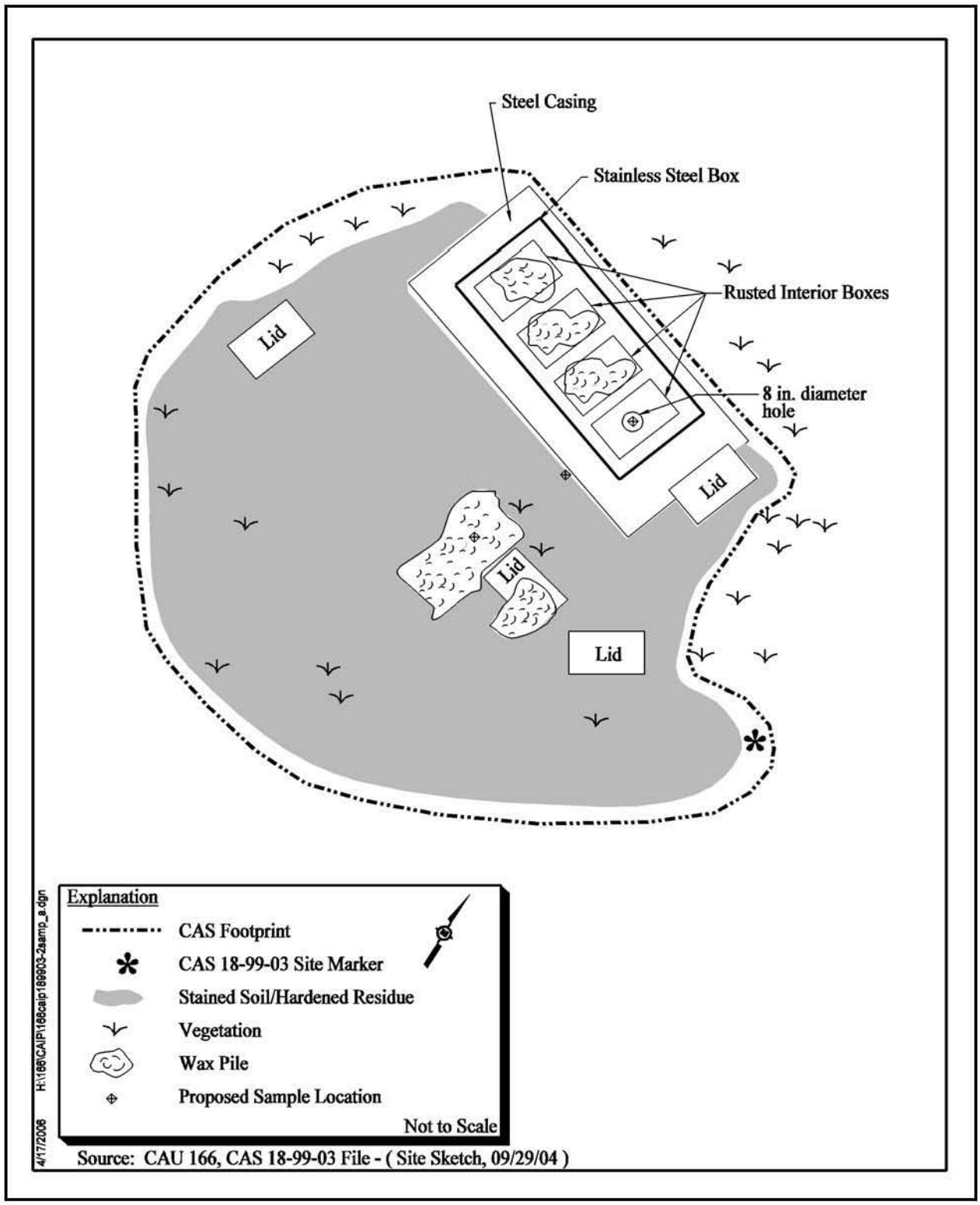

Figure A.9-8
Proposed Sample Locations at Site B, CAS 18-99-03

A.10.0 References

ARL/SORD, see Air Resources Laboratory/Special Operations and Research Division.

Air Resources Laboratory/Special Operations and Research Division. 2006. NTS Climatological Rain Gauge Data website. As accessed at http://sord.nv.doe/home_climate_rain.htm on 15 March.

Alderson, S., Stoller-Navarro Joint Venture. 2004. Memorandum to B. Bailey (SNJV) entitled, "Preliminary Assessments Radiological Survey 2004," 17 February. Las Vegas, NV.

American Society for Testing and Materials. 1995. *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites/American Society for Testing and Materials,* ASTM E 1739-95 (Reapproved 2002). Philadelphia, PA.

DOE, see U.S. Department of Energy.

DOE/NV, see U.S. Department of Energy, Nevada Operations Office.

EG&G Energy Measurements. 1989. Aerial photograph 6612-170 of Area 3 Camp. 23 September. Nellis Air Force Base, NV: Remote Sensing Laboratory Photo Library.

EPA, see U.S. Environmental Protection Agency.

Moore, J., Science Applications International Corporation 1999. Memorandum to M. Todd (SAIC) entitled, "Background Concentrations for NTS and TTR Soils Samples," 3 February. Las Vegas, NV: IT Corporation.

Murphy, T., Bureau of Federal Facilities. 2004. Letter to R. Bangerter (NNSA/NSO) entitled, "Review of Industrial Sites Project Document *Guidance for Calculating Industrial Sites Project Remediation Goals for Radionuclides in Soil Using the Residual Radiation (RESRAD) Computer Code.*" 19 November. Las Vegas, NV.

NAC, see Nevada Administrative Code.

NBMG, see Nevada Bureau of Mines and Geology.

NCRP, see National Council on Radiation Protection and Measurements.

National Council on Radiation Protection and Measurements. 1999. *Recommended Screening Limits for Contaminated Surface Soil and Review of Factors Relevant to Site-Specific Studies/National Council on Radiation Protection and Measurements,* NCRP Report No. 129. Bethesda, MD.

Nevada Administrative Code. 2004. NAC 445A, "Water Controls." Carson City, NV. As accessed at http://www.leg.state.nv.us/nac on 15 March 2006.

Nevada Bureau of Mines and Geology. 1998. *Mineral and Energy Resource Assessment of the Nellis Air Force Range*, Open-File Report 98-1. Reno, NV.

Nicosia, W., Stoller-Navarro Joint Venture. 2004. Memorandum to B. Bailey (SNJV) entitled, "Radiological Land Area Surveys of Corrective Action Unit (CAU) 166: Area 2 Storage Yards and Contaminated Materials (Corrective Action Sites [CASs] 02-42-02 and 02-99-10) at the Nevada Test Site," 17 November. Las Vegas, NV.

Nicosia, W., Stoller-Navarro Joint Venture. 2006. Email to B. Bailey (SNJV) entitled, "CAU 166 Rad Surveys," 6 April. Las Vegas, NV.

NNSA/NV, see U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office.

Pacific Northwest National Laboratory. 2005. *Visual Sample Plan Version 4.0 User's Guide*. PNNL-14002. Richland, WA.

PNNL, see Pacific Northwest National Laboratory.

REECo, see Reynolds Electrical & Engineering Co., Inc.

Reynolds Electrical & Engineering Co., Inc. 1991. *Nevada Test Site Inventory of Inactive and Abandoned Facilities and Waste Sites, Area 5*, DOE/NV/10630-18. Las Vegas, NV.

Shott, G.J., V. Yucel, M.J. Sully, L.E. Barker, S.E. Rawlinson, and B.A. Moore. 1997. *Performance Assessment/Composite Analysis for the Area 3 Radioactive Waste Management Site at the Nevada Test Site, Nye County, Nevada*, Rev. 2.0. Las Vegas, NV.

Stoller-Navarro Joint Venture. 2004. Digital Photography for CAU 166, CAS 03-42-01. Las Vegas, NV.

Trump, D., Reynolds Electrical & Engineering Co., Inc. 1991. Memorandum to J.R. Roberts (REECo) entitled, "Master Listing of Cleanup Points from the Inventory of Inactive and Abandoned Facilities and Waste Sites." June. Las Vegas, NV.

U.S. Department of Energy. 1993. *Radiation Protection of the Public and the Environment*, DOE Order 5400.5, chg. 2. Washington, DC: U.S. Government Printing Office.

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002a. *Industrial Sites Quality Assurance Project Plan, Nevada Test Site, Nevada*, Rev. 3, DOE/NV--372. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002b. *Underground Test Area Project Waste Management Plan,* DOE/NV--343-Rev. 2. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1992. *Remedial Investigation and Feasibility Study for the Plutonium Contaminated Soils at Nevada Test Site, Nellis Air Force Range and Tonopah Test Range*, April. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1996. *Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada*, DOE/EIS-0243. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1998. *Nevada Test Site Resource Management Plan*, DOE/NV-518. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2004. *NV/YMP Radiological Control Manual*, Rev. 4, DOE/NV/11718-079. Prepared by Bechtel Nevada. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2006. *Industrial Sites Project Establishment of Final Action Levels*, Rev. 0, DOE/NV--1107. Prepared by Stoller-Navarro Joint Venture. Las Vegas, NV.

U.S. Environmental Protection Agency. 1989. *Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A, Interim Final)*. Washington, DC: Office of Emergency and Remedial Response.

U.S. Environmental Protection Agency. 2000a. *Data Quality Objectives Process for Hazardous Waste Site Investigations*. EPA QA/G-4HW. Washington, DC.

U.S. Environmental Protection Agency. 2000b. *Guidance for the Data Quality Objective Process,* EPA QA/G4. Washington, DC.

U.S. Environmental Protection Agency. 2002. *Guidance for Quality Assurance Project Plans,* EPA QA/G5. Washington, DC.

U.S. Environmental Protection Agency. 2004. *Region 9 Preliminary Remediation Goals (PRGs)*. As accessed at http://www.epa.gov/region09/waste/sfund/prg/index.htm on 30 March 2006. Prepared by S.J. Smucker. San Francisco, CA.

USGS, see U.S. Geological Survey.

USGS/DOE, see U.S. Geological Survey and U.S. Department of Energy.

U.S. Geological Survey. 1967. *Geology of Northern Frenchman Flat, Nevada Test Site*, Technical Letter NTS-188, 2 June. Prepared by W.J. Carr, G.D. Bath, D.L. Healy, and R.M. Hazelwood. Denver, CO.

U.S. Geological Survey. 1995a. *Precipitation Data for Water Years 1992 and 1993 from a Network on Nonrecording Gauges at Yucca Mountain, Nevada.* USGS-OFR-95-146. Prepared by D.S. Ambos and A.L. Flint, and J.A. Hevesi for the U.S. Department of Energy, Nevada Operations Office. Las Vegas, NV.

U.S. Geological Survey. 1995b. *Selected Ground-Water Data for Yucca Mountain Region, Southern Nevada and Eastern California, Calendar Year 1993*. USGS-OFR-158. Prepared by G.S. Hale and C.L. Westenburg. Denver, CO.

U.S. Geological Survey. 2006 and U.S. Department of Energy. "Water Levels" As accessed at http://nwis.waterdata.usgs.gov/nv/nwis/gwlevels on 15 March.

Winograd, I.J., and W. Thordarson. 1975. *Hydrology and Hydrochemical Framework, South-Central Great Basin, Nevada-California, with Special Reference to the Nevada Test Site*, USGS Professional Paper 712-C. Denver, CO.

APPENDIX B

SAMPLE ANALYTICAL RESULTS

THIS PAGE INTENTIONALLY LEFT BLANK

ARS
AMERICAN RADIATION
SERVICES, INC.

2609 North River Road • Port Allen, Louisiana 70767
1 (800) 401-4277 • Fax (225) 381-2996

American Radiation Services Analytical Reports

for

National Security Technologies

SDG Number: V3232

NSTec

ANALYTICAL LABORATORY

SERVICES REQUEST AND CHAIN OF CUSTODY RECORD

Page ____ of ____

PROJECT / CLIENT INFORMATION

Project: CAU 166 | BN Org#: 4300

Charge Number: ~~5B1B56~~ ~~56~~ 5B1B56D5

Project Manager: Tom Thiele

Phone: 295-5290 | Fax: 295-7761 | M/S: NTS 306

REPORT & TURNAROUND INFORMATION

Send Report to: Glenn Richardson

Phone: 295-5361 | Fax: 295-7761 | M/S: NTS 306

Turnaround: ( ) Standard – 14 days IH, 28 days Non-rad Env, 45 days Rad Env
( ) RUSH Preliminary by: _____ (IH)
___ 1 ___ 2 ___ 7 ___ 14 (non-Rad Env)
___ 1 X 7 ___ 14 ___ 28 (Radiological Env)

SAMPLE INFORMATION

Sampling Site: CAS 03-42-01

The samples submitted contain (check);
( ) **Hazardous** - *(list)* _____
( ) **Radioactive** - *(list)* _____
( ) **Unknown** contamination. If known, identify contaminants. This information will ensure compliance with applicable regulations and allow for the safe handling of the sample materials.

SAMPLE MANAGEMENT INFORMATION

SDG: _____ (IH) _____ (Non-Rad Env) V3232 (Rad Env)

Samples submitted are associated with a signed Project SOW. (X) YES ( ) NO

Analyses entered here agree with the SOW. (X) YES ( ) NO ( ) N/A

If not, identify the variation: _____

Subcontract Lab(s) used for this work: APS - Release # 104125-5

Pay Item, Analysis, Method

ID/DESCRIPTION	SAMPLING DATE	SAMPLING TIME	MATRIX	CONTAINER #	CONTAINER Est. Vol	QC MD	QC MS	QC MSD	Pres – Analysis eg. HCl - VOCs	MES-A-002 AMERICIUM 241	MES-A-002 TOTAL LEAD	ISO Pu	ISOU	SR-89/90	GAMMA SPEC	TRITIUM
034201-V1	3-26-09	0930	Soil	1 4A	500 mL					X	X					
034201-V2		0935								X	X					
034201-V3		0940								X	X					
034201-V4		0945								X	X					
034201-V5		0950								X	X					
034201-VC		0955								X	X					
~~034201-D-1~~		1030	Oil	1 4A	1 L				CSM 3-26-09			X	X	X	X	X
~~034201-D-2~~		1045	Oil	1 4A	1 L							X	X	X	X	X
LAST ITEM																

CUSTODY TRANSFER

Sampled/Relinquished (print)	Signature	DATE / TIME	Received by (print)	Signature	DATE / TIME
Michael Flynn		4/09 1230	Refga		4/09 1230
Dudley Fort		3/30/09 07:30	Dudley Emer		09 07:45
Dudley Emer		3/30/09 15:35	Reeder		
Reeder		4-21-09 0745	Christopher McGavin		4-21-09 0745
Christopher McGavin		4-21-09 0758	CD CASTANEDA		
C.D. CASTANEDA		4-21-09 @ 1300	FED EX #		4-21-09 @ 0758
			Patti Marcelle		4-21-09 @ 1300
					4-22-09 09:45

FRM-0732 (11/06)

National Security Technologies LLC

GENERAL SHIPPING ORDER

NO. 2091851

OFF-SITE

4/21/2009 10:18AM

SHIP FROM	SHIPMENT INFORMATION	SHIP TO
NSTec FOR USDOE NEVADA TEST SITE RECEIVING WAREHOUSE 160 MERCURY, NV 89023, USA C CASTANEDA at 702/295-7884 NTS AREA 23 652 1	REASON: LAB ANALYSIS (SAMPLES) REQUIRED AT DESTINATION: 04/22/2009 CHARGES: PREPAID CARRIER: FEDEX PRIORITY OVERNIGHT PIECE(S): 1 WEIGHT: 21 LBS SHIP DATE: 04/21/2009 ARRIVAL DATE: 04/22/2009 CHARGE/ORG NO: 5B1B56D5/H300	AMERICAN RADIATION SERVICES 2609 NORTH RIVER ROAD PORT ALLEN, LA 70767, USA LINDSAY ROUSSEL at 225/381-2991 REFERENCE NO.: N/A

LI	PROPERTY NO.	SERIAL NO.	MATERIAL DESCRIPTION	QUANTITY	U/M
1			SOIL SAMPLES	6.00	EA
			FEDERAL EXPRESS TRACKING# 7975 2528 8530		

4

FRM-0947

ARS
AMERICAN RADIATION SERVICES, INC.

2609 North River Road • Port Allen, Louisiana 70767
1 (800) 401-4277 • Fax (225) 381-2996

American Radiation Services Analytical Reports

for

National Security Technologies SDG Number: V3232

Case Narrative

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

May 8, 2009

National Security Technologies
Theodore Redding
NSTec NTS/ Mailstop NTS273
Building 23-652
Mercury, NV 89023

SDG: V3232
Sample ID: 034201-V1, 034201-V2, 034201-V3, 034201-V4, 034201-V5, 034201-V6

Dear Mr. Redding;

On April 22, 2009, American Radiation Services (ARS) received 6 Soil Samples to be analyzed for Isotopic Americium (NGS-A-002) and Total Lead (NMET-A-008). **The report due date is *5/1/2009.***

The samples were processed and counted using the appropriate counting equipment and QA/QC for the Americium analysis. The samples were subcontracted to Test America for the Total Lead analysis. Results of the analysis and QA/QC are attached in the data package.

The samples and QA/QC's were counted with a count time sufficient to meet a statistical sound detection limits.

Counting equipment Quality Assurance was with in acceptance criteria when the above referenced samples were processed.

If you have any questions please do not hesitate to call at 225.381.2991 or email ProjectManagers@amrad.com.

Sincerely,

Tony Byrd
Acting Laboratory Manager
ARS International

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

COVER PAGE

**PROJECT SAMPLE IDENTIFICATION
CROSS-REFERENCE
TO ARS SAMPLE LABORATORY IDs**

Subcontract (Agreement Number) 104125

SDG NUMBER	SAMPLE ID	American Radiation Services SAMPLE ID NUMBER(S)
V3232	034201-V1	ARS1-09-01283-001
V3232	034201-V2	ARS1-09-01283-002
V3232	034201-V3	ARS1-09-01283-003
V3232	034201-V4	ARS1-09-01283-004
V3232	034201-V5	ARS1-09-01283-005
V3232	034201-V6	ARS1-09-01283-006

SAMPLE RECEIPT

The samples were received in good condition. The samples were screened for radioactive contamination as per procedure **ARS-062 "Sample Receiving"**. The results are reported on a "dry basis."

ID:	Sample size received:	Sample aliquot:
034201-V1	500mL (749g)	316.58g
034201-V2	500mL (801g)	303.58g
034201-V3	500mL (790g)	317.01g
034201-V4	500mL (739g)	297.01g
034201-V5	500mL (846g)	299.52g
034201-V6	500mL (809g)	324.02g

ANALYTICAL METHODS

The Americium determinations were performed using American Radiation Services procedure **ARS-007/EPA 901.1M, "Gamma Emitting Radionuclides in Soils."**

ANALYTICAL RESULTS

The result data that are flagged with "U" indicates that the activity is below the MDC.

ARS-01, -03, -05, and -06 was used in the gamma spec analysis and the calibrations were verified on 01/08/2009 and 01/05/2009.

ARS INTERNATIONAL

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

American Radiation Services Project Manager/Laboratory Manager's Comments:
"I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this sample data package and the computer-readable EDD, as applicable, submitted on diskette or by modem, has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature."

"I certify that this electronic image, and all hardcopies produced from this image, accurately represents the data and is in compliance with the National Security Technologies specific requirements, both technically and for completeness, other than the conditions detailed above or in the sample data package narrative. Release, by submission through email, the data contained in this electronic image and the computer-readable EDD (as applicable), has been authorized by the laboratory Manager/Technical Director or the Manager's designee."

	Acting Lab Manager, ARS International	5-8-09
Signature	**Title**	**Date**

Case Narrative
Lot Number: **F9D240327**

This report contains the analytical results for the six samples received under chain of custody by TestAmerica St. Louis on April 24, 2009. These samples are associated with your NTS project.

The analytical results included in this report meet all applicable quality control procedure requirements except as noted below.

The test results in this report meet all NELAP requirements for parameters in which accreditations are held by TestAmerica St. Louis. Any exceptions to NELAP requirements are noted in the case narrative. The case narrative is an integral part of this report.

All chemical analysis results are based upon sample as received, wet weight, unless noted otherwise. All radiochemistry results are based upon sample as dried and ground with the exception of tritium, unless requested wet weight by the client.

Observations/Nonconformances
Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

ICP Metals by SW846 6010B

The MS/MSD recoveries for lead are outside the established QC limits. The RPD is within method acceptance criteria indicating a possible matrix interference. Method performance is demonstrated by acceptable LCS recovery.

The associated samples were analyzed at a dilution due to high concentrations of interfering elements. The reporting limit has been adjusted for the dilution.
Affected Samples:
F9D240327 (1): ARS1-09-01283-001
F9D240327 (2): ARS1-09-01283-002
F9D240327 (3): ARS1-09-01283-003
F9D240327 (4): ARS1-09-01283-004
F9D240327 (5): ARS1-09-01283-005
F9D240327 (6): ARS1-09-01283-006

ARS
AMERICAN RADIATION SERVICES, INC.

2609 North River Road • Port Allen, Louisiana 70767
1 (800) 401-4277 • Fax (225) 381-2996

American Radiation Services Analytical Reports

for

National Security Technologies

Gamma Spectroscopy Report

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-09-01283	**Request or PO Number:**	N/A
Client Sample ID:	034201-V1	**ARS Sample ID:**	ARS1-09-01283-001
Sample Collection Date:	03/26/09 09:30	**Date Received:**	4/22/2009
Sample Matrix:	Soil/Solid	**Report Date:**	05/04/09 14:31

Analysis Description	Analysis Results	TPU (2s)	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
AM-241	7.163E-01	1.611E-01	1.730E-01	8.650E-02		pCi/g	ARS-007/EPA 901.1M	5/4/09 10:39	JLA	N/A

NOTES: V3232

Project Manager Review

LELAP Certificate# 30658 NELAP Certificate # E87558

2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-09-01283
Client Sample ID: 034201-V2
Sample Collection Date: 03/26/09 09:35
Sample Matrix: Soil/Solid

Request or PO Number: N/A
ARS Sample ID: ARS1-09-01283-002
Date Received: 4/22/2009
Report Date: 05/04/09 14:31

Analysis Description	Analysis Results	TPU (2s)	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
AM-241	2.913E+00	2.949E-01	1.870E-01	9.350E-02		pCi/g	ARS-007/EPA 901.1M	5/4/09 11:04	JLA	N/A

NOTES: V3232

Project Manager Review

LELAP Certificate# 30658 NELAP Certificate # E87558

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-09-01283	**Request or PO Number:**	N/A
Client Sample ID:	034201-V3	**ARS Sample ID:**	ARS1-09-01283-003
Sample Collection Date:	03/26/09 09:40	**Date Received:**	4/22/2009
Sample Matrix:	Soil/Solid	**Report Date:**	05/04/09 14:32

Analysis Description	Analysis Results	TPU (2s)	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
AM-241	4.118E-02	9.462E-02	1.580E-01	7.900E-02	U	pCi/g	ARS-007/EPA 901.1M	5/4/09 11:17	JLA	N/A

NOTES: V3232

Project Manager Review

LELAP Certificate# 30658 NELAP Certificate # E87558

ARS INTERNATIONAL
2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-09-01283
Client Sample ID: 034201-V4
Sample Collection Date: 03/26/09 09:45
Sample Matrix: Soil/Solid

Request or PO Number: N/A
ARS Sample ID: ARS1-09-01283-004
Date Received: 4/22/2009
Report Date: 05/04/09 14:32

Analysis Description	Analysis Results	TPU (2s)	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
AM-241	6.174E-02	1.002E-01	1.660E-01	8.300E-02	U	pCi/g	ARS-007/EPA 901.1M	5/4/09 11:42	JLA	N/A

NOTES: V3232

Project Manager Review

LELAP Certificate# 30658 NELAP Certificate # E87558

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-09-01283	**Request or PO Number:**	N/A
Client Sample ID:	034201-V5	**ARS Sample ID:**	ARS1-09-01283-005
Sample Collection Date:	03/26/09 09:50	**Date Received:**	4/22/2009
Sample Matrix:	Soil/Solid	**Report Date:**	05/04/09 14:32

Analysis Description	Analysis Results	TPU (2s)	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
AM-241	1.064E-01	1.123E-01	1.840E-01	9.200E-02	U	pCi/g	ARS-007/EPA 901.1M	5/4/09 11:44	JLA	N/A

NOTES: V3232

Project Manager Review

LELAP Certificate# 30658 NELAP Certificate # E87558

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-09-01283	**Request or PO Number:**	N/A
Client Sample ID:	034201-V6	**ARS Sample ID:**	ARS1-09-01283-006
Sample Collection Date:	03/26/09 09:55	**Date Received:**	4/22/2009
Sample Matrix:	Soil/Solid	**Report Date:**	05/04/09 14:32

Analysis Description	Analysis Results	TPU (2s)	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
AM-241	1.116E+00	1.971E-01	1.850E-01	9.250E-02		pCi/g	ARS-007/EPA 901.1M	5/4/09 13:06	JLA	N/A

NOTES: V3232

Project Manager Review

LELAP Certificate# 30658 NELAP Certificate # E87558

AMERICAN RADIATION SERVICES, INC.

2609 North River Road • Port Allen, Louisiana 70767

1 (800) 401-4277 • Fax (225) 381-2996

American Radiation Services Analytical Reports

for

Los Alamos National Laboratory

Total Lead Report

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-09-01283	**Request or PO Number:**	N/A
Client Sample ID:	034201-V1	**ARS Sample ID:**	ARS1-09-01283-001
Sample Collection Date:	03/26/09 09:30	**Date Received:**	4/22/2009
Sample Matrix:	Soil/Solid	**Report Date:**	05/04/09 14:31

Analysis Description	Analysis Results	Analysis Error +/- 2 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Total Lead	87.0	N/A	2.2	N/A		mg/kg	SW846 6010B	N/A	N/A	N/A

NOTES: V3232; Percent Moisture = 9.4%

Project Manager Review

LELAP Certificate# 30658 NELAP Certificate # E87558

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-09-01283	**Request or PO Number:**	N/A
Client Sample ID:	034201-V2	**ARS Sample ID:**	ARS1-09-01283-002
Sample Collection Date:	03/26/09 09:35	**Date Received:**	4/22/2009
Sample Matrix:	Soil/Solid	**Report Date:**	05/04/09 14:31

Analysis Description	Analysis Results	Analysis Error +/- 2 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Total Lead	66.3	N/A	2.2	N/A		mg/kg	SW846 6010B	N/A	N/A	N/A

NOTES: V3232; Percent Moisture = 10.8%

Project Manager Review

LELAP Certificate# 30658 NELAP Certificate # E87558

2609 North River Road, Port Allen, Louisiana 70767
1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group: ARS1-09-01283
Client Sample ID: 034201-V3
Sample Collection Date: 03/26/09 09:40
Sample Matrix: Soil/Solid

Request or PO Number: N/A
ARS Sample ID: ARS1-09-01283-003
Date Received: 4/22/2009
Report Date: 05/04/09 14:32

Analysis Description	Analysis Results	Analysis Error +/- 2 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Total Lead	10.9	N/A	2.2	N/A		mg/kg	SW846 6010B	N/A	N/A	N/A

NOTES: V3232; Percent Moisture = 10.7%

Project Manager Review

LELAP Certificate# 30658 NELAP Certificate # E87558

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-09-01283	**Request or PO Number:**	N/A
Client Sample ID:	034201-V4	**ARS Sample ID:**	ARS1-09-01283-004
Sample Collection Date:	03/26/09 09:45	**Date Received:**	4/22/2009
Sample Matrix:	Soil/Solid	**Report Date:**	05/04/09 14:32

Analysis Description	Analysis Results	Analysis Error +/- 2 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Total Lead	14.1	N/A	2.4	N/A		mg/kg	SW846 6010B	N/A	N/A	N/A

NOTES: V3232; Percent Moisture = 17.6%

Project Manager Review

LELAP Certificate# 30658 NELAP Certificate # E87558

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-09-01283	**Request or PO Number:**	N/A
Client Sample ID:	034201-V5	**ARS Sample ID:**	ARS1-09-01283-005
Sample Collection Date:	03/26/09 09:50	**Date Received:**	4/22/2009
Sample Matrix:	Soil/Solid	**Report Date:**	05/04/09 14:32

Analysis Description	Analysis Results	Analysis Error +/- 2 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Total Lead	27.7	N/A	2.3	N/A		mg/kg	SW846 6010B	N/A	N/A	N/A

NOTES: V3232; Percent Moisture = 11.1%

Project Manager Review

LELAP Certificate# 30658 NELAP Certificate # E87558

ARS INTERNATIONAL

2609 North River Road, Port Allen, Louisiana 70767

1 (800) 401-4277 FAX (225) 381-2996

ARS Sample Delivery Group:	ARS1-09-01283	**Request or PO Number:**	N/A
Client Sample ID:	034201-V6	**ARS Sample ID:**	ARS1-09-01283-006
Sample Collection Date:	03/26/09 09:55	**Date Received:**	4/22/2009
Sample Matrix:	Soil/Solid	**Report Date:**	05/04/09 14:32

Analysis Description	Analysis Results	Analysis Error +/- 2 s	MDC	DLC	Qual	Analysis Units	Analysis Test Method	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Total Lead	19.2	N/A	2.2	N/A		mg/kg	SW846 6010B	N/A	N/A	N/A
NOTES: V3232; Percent Moisture = 10.9%										

Project Manager Review

LELAP Certificate# 30658 NELAP Certificate # E87558

APPENDIX C

WASTE DISPOSITION DOCUMENTATION

THIS PAGE INTENTIONALLY LEFT BLANK

Certificate of Disposal

This is to certify that the Waste Stream Nos. LRY5LLFY00018 and LRY5LLFY07002, package number 100000 (QG002985), was shipped and received at the Nevada Test Site, Area 5 Radioactive Waste Management Complex for disposal as stated below.

Ken Courville	WGS	Waste Inspector
Shipped by	Organization	Title

Signature

5-20-09
Date

Burton Ford Sr	NSTec	Tech Staff
Received by	Organization	Title

Signature

Date 5/20/09

Certificate of Disposal

This is to certify that Waste Stream No., LRY5LLFY07002, package numbers 143591 and 130357 were shipped and received at the Nevada Test Site Radioactive Waste Management Complex in Area 5 for disposal as stated below.

Theresa Hale	Waste Generator Services	Senior Technical Staff
Shipped by	Organization	Title
		4-13-09
Signature		Date
LAUREN KINSTAD	Area 5 RWMC	Waste Handler
Received by	Organization	Title
		4.13.09
Signature		Date

Certificate of Disposal

This is to certify that the Waste Stream No. LRY5LLFY07003, package numbers 09L010 (QG002885), 09L011 (QG002888), 09L012 (QG002866) were shipped and received at the Nevada Test Site, Area 5 Radioactive Waste Management Complex for disposal as stated below.

Ken Courville	WGS	Waste Inspector
Shipped by	Organization	Title

Signature

5-20-09
Date

BURTON FORD SR	N.S.T.E.C	TECH STAFF
Received by	Organization	Title

Signature

Date 5/20/09

NSTec
Form
FRM-0918

NTS LANDFILL LOAD VERIFICATION

SWO USE (Select One) AREA ☐ 23 ☐ 6 ☒ 9 ☒ LANDFILL

For waste characterization, approval, and/or assistance, contact Solid Waste Operation (SWO) at 5-7898.

REQUIRED: WASTE GERERATOR INFORMATION

(This form is for rolloffs, dump trucks, and other onsite disposal of materials.)

Waste Generator: Kevin Olsen Phone Number: 5-2941

Location / Origin: Area 18 CAU 166 CAS 18-99-03

Waste Category: (check one)		☐ Commercial	☒ Industrial	
Waste Type: (check one)	☐ NTS	☐ Putrescrible	☒ FFACO-onsite	☐ WAC Exception
	☐ Non-Putrescible	☐ Asbestos Containing Material	☐ FFACO-offsite	☐ Historic DOE/NV
Pollution Prevention Category: (check one)		☒ Environmental management	☐ Defense Projects	☐ YMP
Pollution Prevention Category: (check one)		☒ Clean-Up	☐ Routine	
Method of Characterization: (check one)		☒ Sampling & Analysis	☐ Process Knowledge	☐ Contents
Prohibited Waste at all three NTS landfills:	Radioactive waste; RCRA waste; Hazardous waste; Free liquids, PCBs above TSCA regulatory levels, and Medical wastes (needles, sharps, bloody clothing)			
Additional Prohibited Waste at the Area 9 U10C Landfill:	Sewage Sludge, Animal carcasses, Wet garbage (food waste); and Friable asbestos			

REQUIRED: WASTE CONTENTS ALLOWABLE WASTES

Check all allowable wastes that are contained within this load:

NOTE: Waste disposal at the Area 6 Hydrocarbon Landfill must have come into contact with petroleum hydrocarbons or coolants, such as: gasoline (no benzene, lead); jet fuel; diesel fuel; lubricants and hydraulics; kerosene; asphaltic petroleum hydrocarbon; and ethylene glycol.

Acceptable waste at any NTS landfill:

☐ Paper	☐ Rocks / unaltered geologic materials	☐ Empty containers	☐ Asphalt	☐ Metal	☐ Wood
☒ Soil	☐ Rubber (excluding tires)	☐ Demolition debris	☐ Plastic	☐ Wire	☐ Cable
☐ Cloth	☐ Insulation (non-Asbestosform)	☐ Cement & concrete			

☐ Manufactured items: (swamp coolers, furniture, rugs, carpet, electronic components, PPE, etc.)

Additional waste accepted at the Area 23 Mercury Landfill: ☐ Office Waste ☐ Food Waste ☐ Animal Carcasses

☐ Asbestos ☐ Friable ☐ Non-Friable (contact SWO if regulated load) Quantity: _____

Additional waste accepted at the Area 9 U10c Landfill:

☐ Non-friable asbestos	☐ Drained automobiles and military vehicles	☐ Solid fractions from sand/oil/water
☐ Light ballasts (contact SWO)	☐ Drained fuel filters (gas & diesel)	☐ Deconned Underground and Above Ground Tanks
☒ Hydrocarbons (contact SWO)	☐ Other _____	

Additional waste accepted at the Area 6 Hydrocarbon Landfill: ☐ _____

☐ Septic sludge	☐ Rags	☐ Drained fuel filters (gas & diesel)	☐ Crushed non-terne plated oil filters
☐ Plants	☐ Soil	☐ Sludge from sand/oil/water separators	☐ PCBs below 50 parts per million

REQUIRED: WASTE GENERATOR SIGNATURE

Initials: _____ (If initialed, no radiological clearance is necessary.)

The above mentioned waste was generated outside of a Controlled Waste Management Area (CWMA) and to the best of my knowledge, does not contain radiological materials.

To the best of my knowledge, the waste described above contains only those mat site. I have verified this through the waste characterization method identified abo prohibited and allowable waste items. I have contacted Property Management an is approved for disposal in the landfill.

Print Name: Kevin Olsen

Signature: _____ Date: _____

Note: "Food waste, office trash and animal carcasses do not require a radiological must have signed removal certification statement with Load Verification."

Radiological Survey Release for Waste Disposal

RCT Initials

PAP — **This container/load meets the criteria for no added man-made radioactive material**

This container/load meets the criteria for Radcon Manual Table 4.2 release limits.

This container/load is exempt from survey due to process knowledge and origin.

SIGNATUR _____ **DATE:** 3-11-09

FRM-0846 (08/06)

SWO USE ONLY

Load Weight (net from scale or estimate): 42,180 3-16-09 Signature of Certifi

NSTec
Form
FRM-0918

NTS LANDFILL LOAD VERIFICATION

SWO USE (Select One) AREA ☐ 23 ☐ 6 ☒ 9 ☐ LANDFILL

For waste characterization, approval, and/or assistance, contact Solid Waste Operation (SWO) at 5-7898.

REQUIRED: WASTE GERERATOR INFORMATION

(This form is for rolloffs, dump trucks, and other onsite disposal of materials.)

Waste Generator: Kevin Olsen Phone Number: 5-2941

Location / Origin: Area 5 CAU 166 CAS 05-19-02

Waste Category: (check one)		☐ Commercial	☒ Industrial	
Waste Type: (check one)	☐ NTS	☐ Putrescible	☒ FFACO-onsite	☐ WAC Exception
	☐ Non-Putrescible	☐ Asbestos Containing Material	☐ FFACO-offsite	☐ Historic DOE/NV
Pollution Prevention Category: (check one)		☒ Environmental management	☐ Defense Projects	☐ YMP
Pollution Prevention Category: (check one)		☒ Clean-Up	☐ Routine	
Method of Characterization: (check one)		☒ Sampling & Analysis	☐ Process Knowledge	☐ Contents
Prohibited Waste at all three NTS landfills:	Radioactive waste; RCRA waste; Hazardous waste; Free liquids, PCBs above TSCA regulatory levels, and Medical wastes (needles, sharps, bloody clothing).			
Additional Prohibited Waste at the Area 9 U10C Landfill:	Sewage Sludge, Animal carcasses, Wet garbage (food waste); and Friable asbestos			

REQUIRED: WASTE CONTENTS ALLOWABLE WASTES

Check all allowable wastes that are contained within this load:

NOTE: Waste disposal at the Area 6 Hydrocarbon Landfill must have come into contact with petroleum hydrocarbons or coolants, such as: gasoline (no benzene, lead); jet fuel; diesel fuel; lubricants and hydraulics; kerosene; asphaltic petroleum hydrocarbon; and ethylene glycol.

Acceptable waste at any NTS landfill:

☐ Paper ☒ Rocks / unaltered geologic materials ☒ Empty containers
☐ Asphalt ☐ Metal ☐ Wood ☒ Soil ☐ Rubber (excluding tires) ☐ Demolition debris
☐ Plastic ☐ Wire ☐ Cable ☐ Cloth ☐ Insulation (non-Asbestosform) ☐ Cement & concrete
☐ Manufactured items: (swamp coolers, furniture, rugs, carpet, electronic components, PPE, etc.)

Additional waste accepted at the Area 23 Mercury Landfill: ☐ Office Waste ☐ Food Waste ☐ Animal Carcasses
☐ Asbestos ☐ Friable ☐ Non-Friable (contact SWO if regulated load) Quantity: _____

Additional waste accepted at the Area 9 U10c Landfill:

☐ Non-friable asbestos ☐ Drained automobiles and military vehicles ☐ Solid fractions from sand/oil/water
☐ Light ballasts (contact SWO) ☐ Drained fuel filters (gas & diesel) ☐ Deconned Underground and Above
☐ Hydrocarbons (contact SWO) ☐ Other _____ Ground Tanks

Additional waste accepted at the Area 6 Hydrocarbon Landfill: ☐ _____

☐ Septic sludge ☐ Rags ☐ Drained fuel filters (gas & diesel) ☐ Crushed non-terne plated oil filters
☐ Plants ☐ Soil ☐ Sludge from sand/oil/water separators ☐ PCBs below 50 parts per million

REQUIRED: WASTE GENERATOR SIGNATURE

Initials: _____ (if initialed, no radiological clearance is necessary.)

The above mentioned waste was generated outside of a Controlled Waste Management Area (CWMA) and to the best of my knowledge, does not contain radiological materials.

To the best of my knowledge, the waste described above contains only those materials site. I have verified this through the waste characterization method identified above an prohibited and allowable waste items. I have contacted Property Management and hav is approved for disposal in the landfill.

Print Name: Kevin Olsen

Signature: _____ Date: 3/24/09

Note: "Food waste, office trash and animal carcasses do not require a radiological clear must have signed removal certification statement with Load Verification."

Radiological Survey Release for Waste Disposal

RCT Initials

SAL This container/load meets the criteria for no added man-made radioactive material

SAL This container/load meets the criteria for Radcon Manual Table 4.2 release limits.

SAL This container/load is exempt from survey due to process knowledge and origin.

SIGNATUR _____ DATE 3/24/09

SWO USE ONLY

Load Weight (net from scale or estimate): 40 LBS 400 3/24/09 Signature of Certifi

FRM-0648 (08/06)

Form
FRM-0918

NTS LANDFILL LOAD VERIFICATION

SWO USE (Select One) AREA ☐ 23 ☐ 6 ☒ 9 ☐ LANDFILL

For waste characterization, approval, and/or assistance, contact Solid Waste Operation (SWO) at 5-7898.

REQUIRED: WASTE GERERATOR INFORMATION

(This form is for rolloffs, dump trucks, and other onsite disposal of materials.)

Waste Generator: Kevin Olsen Phone Number: 5-2941

Location / Origin: Area 3 CAU 166

Waste Category: (check one)		☐ Commercial	☒ Industrial	
Waste Type: (check one)	☐ NTS	☐ Putrescrible	☒ FFACO-onsite	☐ WAC Exception
	☐ Non-Putrescible	☐ Asbestos Containing Material	☐ FFACO-offsite	☐ Historic DOE/NV
Pollution Prevention Category: (check one)		☒ Environmental management	☐ Defense Projects	☐ YMP
Pollution Prevention Category: (check one)		☒ Clean-Up	☐ Routine	
Method of Characterization: (check one)		☒ Sampling & Analysis	☐ Process Knowledge	☐ Contents

Prohibited Waste at all three NTS landfills: Radioactive waste; RCRA waste; Hazardous waste; Free liquids, PCBs above TSCA regulatory levels, and Medical wastes (needles, sharps, bloody clothing).

Additional Prohibited Waste at the Area 9 U10C Landfill: Sewage Sludge, Animal carcasses, Wet garbage (food waste); and Friable asbestos

REQUIRED: WASTE CONTENTS ALLOWABLE WASTES

Check all allowable wastes that are contained within this load:

NOTE: Waste disposal at the Area 6 Hydrocarbon Landfill must have come into contact with petroleum hydrocarbons or coolants, such as: gasoline (no benzene, lead); jet fuel; diesel fuel; lubricants and hydraulics; kerosene; asphaltic petroleum hydrocarbon; and ethylene glycol.

Acceptable waste at any NTS landfill:

☐ Paper	☐ Rocks / unaltered geologic materials	☐ Empty containers	☐ Asphalt	☒ Metal	☐ Wood	☐ Soil
☒ Rubber (excluding tires)	☒ Demolition debris	☐ Plastic	☐ Wire	☐ Cable	☐ Cloth	☐ Insulation (non-Asbestosform)
☐ Cement & concrete	☐ Manufactured items: (swamp coolers, furniture, rugs, carpet, electronic components, PPE, etc.)					

Additional waste accepted at the Area 23 Mercury Landfill: ☐ Office Waste ☐ Food Waste ☐ Animal Carcasses

☐ Asbestos ☐ Friable ☐ Non-Friable (contact SWO if regulated load) Quantity: _____

Additional waste accepted at the Area 9 U10c Landfill:

☐ Non-friable asbestos	☐ Drained automobiles and military vehicles	☐ Solid fractions from sand/oil/water
☐ Light ballasts (contact SWO)	☐ Drained fuel filters (gas & diesel)	☐ Deconned Underground and Above Ground Tanks
☐ Hydrocarbons (contact SWO)	☐ Other _____	

Additional waste accepted at the Area 6 Hydrocarbon Landfill: ☐ _____

☐ Septic sludge	☐ Rags	☐ Drained fuel filters (gas & diesel)	☐ Crushed non-terne plated oil filters
☐ Plants	☐ Soil	☐ Sludge from sand/oil/water separators	☐ PCBs below 50 parts per million

REQUIRED: WASTE GENERATOR SIGNATURE

Initials: KEO (if initialed, no radiological clearance is necessary.)

The above mentioned waste was generated outside of a Controlled Waste Management Area (CWMA) and to the best of my knowledge, does not contain radiological materials.

To the best of my knowledge, the waste described above contains only those materials that are allowed for disposal at this site. I have verified this through the waste characterization method identified above and a review of the above-mentioned prohibited and allowable waste items. I have contacted Property Management and have verified that this material/equipment is approved for disposal in the landfill.

Print Name: Kevin Olsen

Signature: _____ Date: 6/2/09

If applicable, place FRM-0646, "Radiological Release Sticker" here. Onsite use only.

Note: "Food waste, office trash and animal carcasses do not require a radiological clearance. Freon-containing appliances must have signed removal certification statement with Load Verification."

SWO USE ONLY

Load Weight (net from scale or estimate): 1180 6-2-09 Signature of Certifier: _____

NSTec
Form
FRM-0918

NTS LANDFILL LOAD VERIFICATION

SWO USE (Select One) AREA ☐ 23 ☐ 6 ☒ 9 ☒ LANDFILL

For waste characterization, approval, and/or assistance, contact Solid Waste Operation (SWO) at 5-7898.

REQUIRED: WASTE GERERATOR INFORMATION

(This form is for rolloffs, dump trucks, and other onsite disposal of materials.)

Waste Generator: Kevin Olsen Phone Number: 5-2941

Location / Origin: Area 18 CAU 166 CAS 18-99-03

Waste Category: (check one)		☐ Commercial	☒ Industrial	
Waste Type: (check one)	☐ NTS	☐ Putrescible	☒ FFACO-onsite	☐ WAC Exception
	☐ Non-Putrescible	☐ Asbestos Containing Material	☐ FFACO-offsite	☐ Historic DOE/NV
Pollution Prevention Category: (check one)		☒ Environmental management	☐ Defense Projects	☐ YMP
Pollution Prevention Category: (check one)		☒ Clean-Up	☐ Routine	
Method of Characterization: (check one)		☒ Sampling & Analysis	☐ Process Knowledge	☐ Contents

Prohibited Waste at all three NTS landfills: Radioactive waste; RCRA waste; Hazardous waste; Free liquids, PCBs above TSCA regulatory levels, and Medical wastes (needles, sharps, bloody clothing).

Additional Prohibited Waste at the Area 9 U10C Landfill: Sewage Sludge, Animal carcasses, Wet garbage (food waste), and Friable asbestos

REQUIRED: WASTE CONTENTS ALLOWABLE WASTES

Check all allowable wastes that are contained within this load.

NOTE: Waste disposal at the Area 6 Hydrocarbon Landfill must have come into contact with petroleum hydrocarbons or coolants, such as: gasoline (no benzene, lead); jet fuel; diesel fuel; lubricants and hydraulics; kerosene; asphaltic petroleum hydrocarbon; and ethylene glycol.

Acceptable waste at any NTS landfill:

☐ Asphalt ☐ Metal ☐ Wood ☐ Paper ☐ Soil ☐ Rocks / unaltered geologic materials ☐ Rubber (excluding tires) ☐ Empty containers ☒ Demolition debris ☒ Plastic ☐ Wire ☐ Cable ☐ Cloth ☐ Insulation (non-Asbestosform) ☐ Cement & concrete

☐ Manufactured items: (swamp coolers, furniture, rugs, carpet, electronic components, PPE, etc.)

Additional waste accepted at the Area 23 Mercury Landfill: ☐ Office Waste ☐ Food Waste ☐ Animal Carcasses

☐ Asbestos ☐ Friable ☐ Non-Friable (contact SWO if regulated load) Quantity: _____

Additional waste accepted at the Area 9 U10c Landfill:

☐ Non-friable asbestos ☐ Drained automobiles and military vehicles ☐ Solid fractions from sand/oil/water

☐ Light ballasts (contact SWO) ☐ Drained fuel filters (gas & diesel) ☐ Deconned Underground and Above Ground Tanks

☒ Hydrocarbons (contact SWO) ☒ Other Wax

Additional waste accepted at the Area 6 Hydrocarbon Landfill: ☐ _____

☐ Septic sludge ☐ Rags ☐ Drained fuel filters (gas & diesel) ☐ Crushed non-terne plated oil filters

☐ Plants ☐ Soil ☐ Sludge from sand/oil/water separators ☐ PCBs below 50 parts per million

REQUIRED: WASTE GENERATOR SIGNATURE

Initials: _____ **(if initialed, no radiological clearance is necessary.)**

The above mentioned waste was generated outside of a Controlled Waste Manage knowledge, does not contain radiological materials.

To the best of my knowledge, the waste described above contains only those mat site. I have verified this through the waste characterization method identified abo prohibited and allowable waste items. I have contacted Property Management an is approved for disposal in the landfill.

Print Name: Kevin Olsen

Signature: _____ Date: 6/3/09

Radiological Survey Release for Waste Disposal
RCT Initials

_____ This container/load meets the criteria for no added man-made radioactive material

_____ This container/load meets the criteria for Radcon Manual Table 4.2 release limits.

_____ This container/load is exempt from survey due to proces

SIGNATURE: _____ 6-4-09

FRM-0646 (08/08)

Note: "Food waste, office trash and animal carcasses do not require a radiological clearance. Freon-containing appliances must have signed removal certification statement with Load Verification."

SWO USE ONLY

Load Weight (net from scale or estimate): 2400 6-4-09 Signature of Certifie

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D

SITE CLOSURE PHOTOGRAPHS

THIS PAGE INTENTIONALLY LEFT BLANK

PHOTOGRAPH LOG

PHOTOGRAPH NUMBER	DATE	CORRECTIVE ACTION SITE	DESCRIPTION
1	01/12/2009	03-42-01	Accumulators before Closure Activities
2	01/20/2009	03-42-01	Asbestos Tiles in Portable Building
3	02/25/2009	02-99-10	Depleted Uranium Discovered during Closure Activities
4	02/25/2009	02-99-10	Locations of Depleted Uranium Discovered during Closure Activities
5	03/16/2009	03-42-01	Demolition of Portable Building
6	03/17/2009	18-01-01	Metal Containers
7	03/18/2009	03-42-01	Demolition of Portable Building
8	03/18/2009	18-01-01	Liquid in Metal Container
9	03/18/2009	18-01-01	Lead Shot Discovered on Lid of Metal Container during Closure Activities
10	03/18/2009	18-01-01	Lead Shot Discovered within Metal Container during Closure Activities
11	03/19/2009	03-42-01	Portable Building Debris
12	03/23/2009	03-42-01	Packaging Portable Building Debris in Transportainer
13	03/24/2009	05-19-02	Drum before Removal
14	03/24/2009	05-19-02	Drum during Removal
15	03/25/2009	03-42-01	Excavation of Soil
16	03/30/2009	03-42-01	Accumulators and Debris
17	03/30/2009	03-42-01	Draining Oil from Accumulators
18	03/30/2009	03-42-01	Cylinders before Removal
19	03/31/2009	03-42-01	Size Reduction of Accumulators and Debris
20	03/31/2009	03-42-01	Size Reduction of Cylinders
21	04/02/2009	02-99-10	Lead Shot before Removal
22	04/02/2009	02-99-10	Lead Shot Packaged for Disposal
23	04/02/2009	02-99-10	Depleted Uranium Packaged for Disposal
24	04/06/2009	03-42-01	Draining Oil from Accumulators
25	04/13/2009	03-42-01	Accumulators, Cylinders, and Debris in Macroencapsulation Box
26	04/14/2009	03-42-01	Debris in Macroencapsulation Box
27	04/21/2009	03-42-01	Packaged Waste after Closure Activities
28	04/21/2009	03-42-01	Site after Closure Activities
29	04/27/2009	18-01-01	Wax in Metal Containers

PHOTOGRAPH NUMBER	DATE	CORRECTIVE ACTION SITE	DESCRIPTION
30	05/06/2009	03-42-01	Backfilled Soil Excavation
31	06/03/2009	18-01-01	Removal of Wax from Metal Containers for Disposal as Hydrocarbon Waste
32	06/03/2009	18-01-01	Lead Shot Embedded in Wax
33	06/08/2009	18-01-01	Removal of Wax from Metal Containers for Disposal as Mixed Waste
34	06/09/2009	18-01-01	Metal Container after Removal of Liquid, Wax, and Lead Shot
35	06/16/2009	18-01-01	Removal of Residual Sludge from Pipes beneath Metal Containers
36	06/16/2009	18-01-01	Lead Shot and Residual Sludge Removed from Metal Containers
37	06/25/2009	18-01-01	Grouting Metal Containers
38	06/25/2009	18-99-03	Grouting Metal Container
39	06/25/2009	18-01-01	Metal Containers after Grouting
40	06/25/2009	18-99-03	Metal Container after Grouting
41	07/02/2009	18-01-01	Replacing Lids on Metal Containers
42	07/02/2009	18-01-01	Replacing Lids on Metal Containers
43	07/02/2009	18-01-01	Metal Containers with Lids in Place

Photograph 1: CAS 03-42-01, Accumulators before Closure Activities, 01/12/2009

Photograph 2: CAS 03-42-01, Asbestos Tiles in Portable Building, 01/20/2009

Photograph 3: CAS 02-99-10, Depleted Uranium Discovered during Closure Activities, 02/25/2009

Photograph 4: CAS 02-99-10, Locations of Depleted Uranium Discovered during Closure Activities, 02/25/2009

Photograph 5: CAS 03-42-01, Demolition of Portable Building, 03/16/2009

Photograph 6: CAS 18-01-01, Metal Containers, 03/17/2009

Photograph 7: CAS 03-42-01, Demolition of Portable Building, 03/18/2009

Photograph 8: CAS 18-01-01, Liquid in Metal Container, 03/18/2009

Photograph 9: CAS 18-01-01, Lead Shot Discovered on Lid of Metal Container during Closure Activities, 03/18/2009

Photograph 10: CAS 18-01-01, Lead Shot Discovered within Metal Container during Closure Activities, 03/18/2009

Photograph 11: CAS 03-42-01, Portable Building Debris, 03/19/2009

Photograph 12: CAS 03-42-01, Packaging Portable Building Debris in Transportainer, 03/23/2009

Photograph 13: CAS 05-19-02, Drum before Removal, 03/24/2009

Photograph 14: CAS 05-19-02, Drum during Removal, 03/24/2009

Photograph 15: CAS 03-42-01, Excavation of Soil, 03/25/2009

Photograph 16: CAS 03-42-01, Accumulators and Debris, 03/30/2009

Photograph 17: CAS 03-42-01, Draining Oil from Accumulators, 03/30/2009

Photograph 18: CAS 03-42-01, Cylinders before Removal, 03/30/2009

Photograph 19: CAS 03-42-01, Size Reduction of Accumulators and Debris, 03/31/2009

Photograph 20: CAS 03-42-01, Size Reduction of Cylinders, 03/31/2009

Photograph 21: CAS 02-99-10, Lead Shot before Removal, 04/02/2009

Photograph 22: CAS 02-99-10, Lead Shot Packaged for Disposal, 04/02/2009

Photograph 23: CAS 02-99-10, Depleted Uranium Packaged for Disposal, 04/02/2009

Photograph 24: CAS 03-42-01, Draining Oil from Accumulators, 04/06/2009

Photograph 25: CAS 03-42-01, Accumulators, Cylinders, and Debris in Macroencapsulation Box, 04/13/2009

Photograph 26: CAS 03-42-01, Debris in Macroencapsulation Box, 04/14/2009

Photograph 27: CAS 03-42-01, Packaged Waste after Closure Activities, 04/21/2009

Photograph 28: CAS 03-42-01, Site after Closure Activities, 04/21/2009

Photograph 29: CAS 18-01-01, Wax in Metal Containers, 04/27/2009

Photograph 30: CAS 03-42-01, Backfilled Soil Excavation, 05/06/2009

Photograph 31: CAS 18-01-01, Removal of Wax from Metal Containers for Disposal as Hydrocarbon Waste, 06/03/2009

Photograph 32: CAS 18-01-01, Lead Shot Embedded in Wax, 06/03/2009

Photograph 33: CAS 18-01-01, Removal of Wax from Metal Containers for Disposal as Mixed Waste, 06/08/2009

Photograph 34: CAS 18-01-01, Metal Container after Removal of Liquid, Wax, and Lead Shot, 06/09/2009

Photograph 35: CAS 18-01-01, Removal of Residual Sludge from Pipes beneath Metal Containers, 06/16/2009

Photograph 36: CAS 18-01-01, Lead Shot and Residual Sludge Removed from Metal Containers, 06/16/2009

Photograph 37: CAS 18-01-01, Grouting Metal Containers, 06/25/2009

Photograph 38: CAS 18-99-03, Grouting Metal Container, 06/25/2009

Photograph 39: CAS 18-01-01, Metal Containers after Grouting, 06/25/2009

Photograph 40: CAS 18-99-03, Metal Container after Grouting, 06/25/2009

Photograph 41: CAS 18-01-01, Replacing Lids on Metal Containers, 07/02/2009

Photograph 42: CAS 18-01-01, Replacing Lids on Metal Containers, 07/02/2009

Photograph 43: CAS 18-01-01, Metal Containers with Lids in Place, 07/02/2009

LIBRARY DISTRIBUTION LIST

THIS PAGE INTENTIONALLY LEFT BLANK

LIBRARY DISTRIBUTION LIST

U.S. Department of Energy National Nuclear Security Administration Nevada Site Office Technical Library P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled, electronic copy)
U.S. Department of Energy Office of Scientific and Technical Information P.O. Box 62 Oak Ridge, TN 37831-0062	1 (Uncontrolled, electronic copy)
Southern Nevada Public Reading Facility c/o Nuclear Testing Archive P.O. Box 98521, M/S 400 Las Vegas, NV 89193-8521	2 (Uncontrolled, electronic copies)
Manager, Northern Nevada FFACO Public Reading Facility c/o Nevada State Library & Archives Carson City, NV 89701-4285	1 (Uncontrolled, electronic copy)

THIS PAGE INTENTIONALLY LEFT BLANK