Nevada
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Project

DOE/NV--1317

National Nuclear Security Administration

Corrective Action Investigation Plan for Corrective Action Unit 562: Waste Systems Nevada Test Site, Nevada

Controlled Copy No.: ___
Revision No.: 0

April 2009

Environmental Restoration
Project

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

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CORRECTIVE ACTION INVESTIGATION PLAN FOR CORRECTIVE ACTION UNIT 562: WASTE SYSTEMS NEVADA TEST SITE, NEVADA

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

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CORRECTIVE ACTION INVESTIGATION PLAN FOR CORRECTIVE ACTION UNIT 562: WASTE SYSTEMS NEVADA TEST SITE, NEVADA

Approved by: /s/ Kevin J. Cabble Date: 04/07/2009

Kevin J. Cabble
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Federal Project Director
Environmental Restoration Project

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List of Acronyms and Abbreviations

Ac	Actinium
Am	Americium
amsl	Above mean sea level
ASTM	American Society for Testing and Materials
bgs	Below ground surface
BJY	Buster Jangle Wye
CADD	Corrective action decision document
CAI	Corrective action investigation
CAIP	Corrective action investigation plan
CAS	Corrective action site
CAU	Corrective action unit
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CFR	*Code of Federal Regulations*
Co	Cobalt
COC	Contaminant of concern
COLIWASA	Composite liquid waste sampler
COPC	Contaminant of potential concern
Cs	Cesium
CSM	Conceptual site model
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DQI	Data quality indicator
DQO	Data quality objective

List of Acronyms and Abbreviations (Continued)

DNA	Defense Nuclear Agency
DRO	Diesel-range organics
EPA	U.S. Environmental Protection Agency
Eu	Europium
FAL	Final action level
FFACO	*Federal Facility Agreement and Consent Order*
FSR	Field-screening result
ft	Foot
GPS	Global Positioning System
IDW	Investigation-derived waste
in.	Inch
in./yr	Inches per year
ISMS	Integrated Safety Management System
K	Potassium
LCS	Laboratory control sample
LLNL	Lawrence Livermore National Laboratory
MDC	Minimum detectable concentration
mg/kg	Milligrams per kilogram
mi	Mile
mm/yr	Millimeters per year
mrem/yr	Millirem per year
MS	Matrix spike
MSD	Matrix spike duplicate
N/A	Not applicable
NAC	*Nevada Administrative Code*

List of Acronyms and Abbreviations *(Continued)*

NAD	North American Datum
Nb	Niobium
NCRP	National Council on Radiation Protection and Measurement
ND	Normalized difference
NDEP	Nevada Division of Environmental Protection
NEPA	*National Environmental Policy Act*
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NRS	*Nevada Revised Statutes*
NSTec	National Security Technologies, LLC
NTS	Nevada Test Site
NTSWAC	*Nevada Test Site Waste Acceptance Criteria*
NV/YMP	Nevada Yucca Mountain Project
PAL	Preliminary action level
Pb	Lead
PCB	Polychlorinated biphenyl
PET	Potential evapotranspiration
POC	Performance Objective for the Certification of Nonradioactive Hazardous Waste
PPE	Personal protective equipment
PRG	Preliminary remediation goal
PSM	Potential source material
Pu	Plutonium
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control

List of Acronyms and Abbreviations *(Continued)*

RadCon	Radiological control
RBCA	Risk-based corrective action
RBSL	Risk-based screening level
RCRA	*Resource Conservation and Recovery Act*
RCP	Reactor Control Point
REOP	Real Estate/Operations Permit
RL	Reporting limit
RPD	Relative percent difference
RWMS	Radioactive Waste Management Site
SNJV	Stoller-Navarro Joint Venture
Sr	Strontium
SSTL	Site-specific target level
SVOC	Semivolatile organic compound
Th	Thorium
Tl	Thallium
TPH	Total petroleum hydrocarbons
TSCA	*Toxic Substances Control Act*
U	Uranium
UCL	Upper confidence limit
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VOC	Volatile organic compound
yr	Year
%R	Percent recovery

Executive Summary

Corrective Action Unit 562 is located in Areas 2, 23, and 25 of the Nevada Test Site, which is approximately 65 miles northwest of Las Vegas, Nevada. Corrective Action Unit 562 is comprised of the 13 corrective action sites (CASs) listed below:

- 02-26-11, Lead Shot
- 02-44-02, Paint Spills and French Drain
- 02-59-01, Septic System
- 02-60-01, Concrete Drain
- 02-60-02, French Drain
- 02-60-03, Steam Cleaning Drain
- 02-60-04, French Drain
- 02-60-05, French Drain
- 02-60-06, French Drain
- 02-60-07, French Drain
- 23-60-01, Mud Trap Drain and Outfall
- 23-99-06, Grease Trap
- 25-60-04, Building 3123 Outfalls

These sites are being investigated because existing information on the nature and extent of potential contamination is insufficient to evaluate and recommend corrective action alternatives. Additional information will be obtained by conducting a corrective action investigation before evaluating corrective action alternatives and selecting the appropriate corrective action for each CAS. The results of the field investigation will support a defensible evaluation of viable corrective action alternatives that will be presented in the Corrective Action Decision Document.

The sites will be investigated based on the data quality objectives (DQOs) developed on December 11, 2008, by representatives of the Nevada Division of Environmental Protection; U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office; Stoller-Navarro Joint Venture; and National Security Technologies, LLC. The DQO process was used to identify and define the type, amount, and quality of data needed to develop and evaluate appropriate corrective actions for CAU 562.

Appendix A provides a detailed discussion of the DQO methodology and the DQOs specific to each CAS.

The scope of the corrective action investigation for CAU 562 includes the following activities:

- Move surface debris and/or materials, as needed, to facilitate sampling.
- Conduct radiological surveys.
- Perform field screening.
- Collect and submit environmental samples for laboratory analysis to determine the nature and extent of any contamination released by each CAS.
- Collect samples of source material to determine the potential for a release.
- Collect samples of potential remediation wastes.
- Collect quality control samples.

This Corrective Action Investigation Plan has been developed in accordance with the *Federal Facility Agreement and Consent Order* that was agreed to by the State of Nevada; DOE, Environmental Management; U.S. Department of Defense; and DOE, Legacy Management (FFACO, 1996; as amended February 2008). Under the *Federal Facility Agreement and Consent Order*, this Corrective Action Investigation Plan will be submitted to the Nevada Division of Environmental Protection for approval. Fieldwork will be conducted following approval of the plan.

1.0 Introduction

This Corrective Action Investigation Plan (CAIP) contains project-specific information including facility descriptions, environmental sample collection objectives, and criteria for conducting site investigation activities at Corrective Action Unit (CAU) 562: Waste Systems, Nevada Test Site (NTS), Nevada.

This CAIP has been developed in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) that was agreed to by the State of Nevada; U.S. Department of Energy (DOE), Environmental Management; U.S. Department of Defense (DoD); and DOE, Legacy Management (FFACO, 1996; as amended February 2008).

Corrective Action Unit 562 is located in Areas 2, 23, and 25 of the NTS, which is approximately 65 miles (mi) northwest of Las Vegas, Nevada (Figure 1-1). Corrective Action Unit 562 is comprised of the 13 corrective action sites (CASs) shown on Figure 1-2 and listed below:

- 02-26-11, Lead Shot
- 02-44-02, Paint Spills and French Drain
- 02-59-01, Septic System
- 02-60-01, Concrete Drain
- 02-60-02, French Drain
- 02-60-03, Steam Cleaning Drain
- 02-60-04, French Drain
- 02-60-05, French Drain
- 02-60-06, French Drain
- 02-60-07, French Drain
- 23-60-01, Mud Trap Drain and Outfall
- 23-99-06, Grease Trap
- 25-60-04, Building 3123 Outfalls

The Corrective Action Investigation (CAI) will include field inspections, radiological surveys, sampling of environmental media, analysis of samples, and assessment of investigation results, where appropriate. Data will be obtained to support corrective action alternative evaluations and waste management decisions.

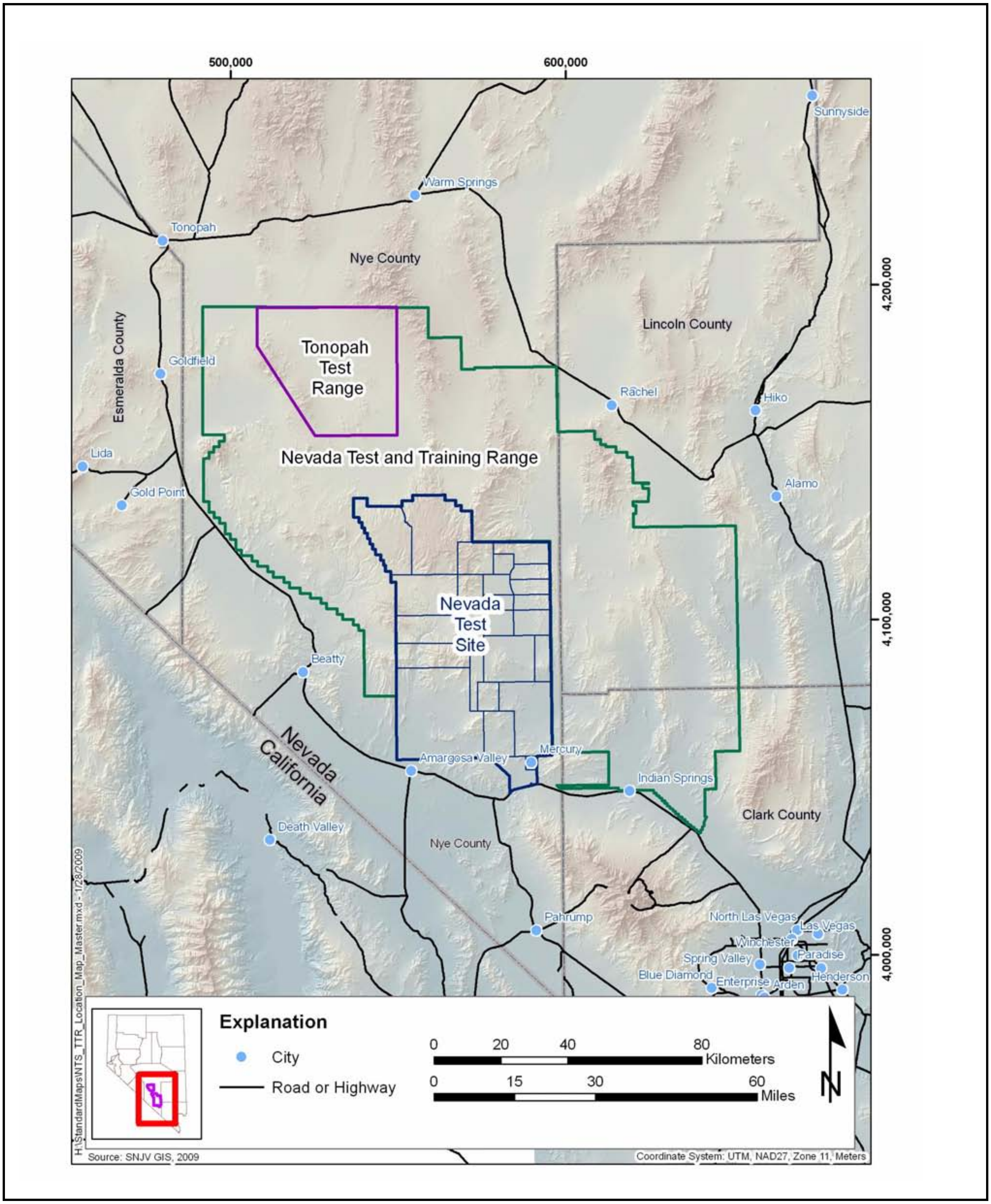

Figure 1-1
Nevada Test Site

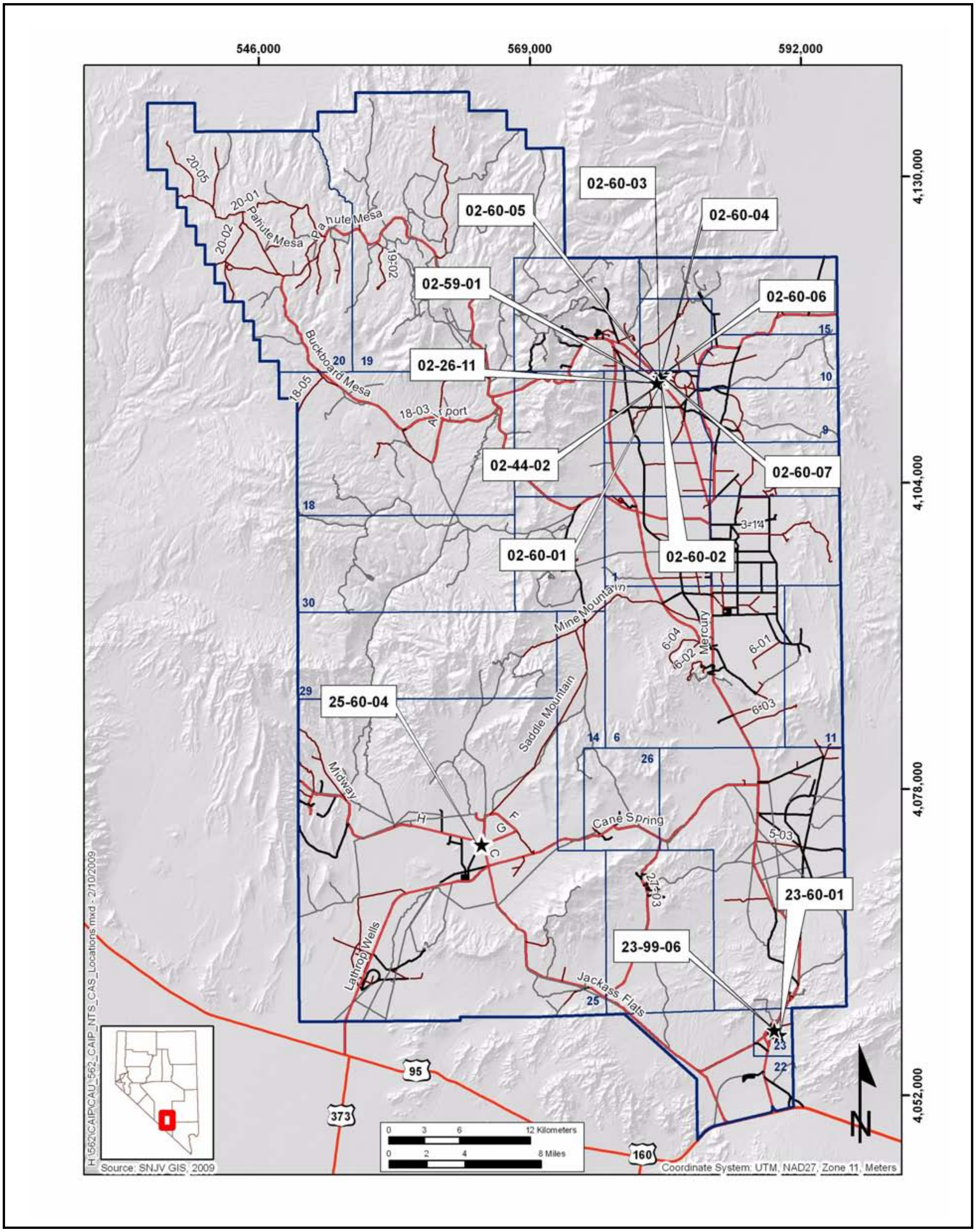

Figure 1-2
CAU 562, CAS Location Map

1.1 Purpose

The CASs in CAU 562 are being investigated because hazardous and/or radioactive contaminants may be present at concentrations that could potentially pose an unacceptable threat to human health and the environment. Existing information on the nature and extent of potential contamination is insufficient to evaluate and recommend corrective action alternatives for the CASs. Additional information will be generated by conducting a CAI before evaluating and selecting corrective action alternatives.

1.1.1 CAU 562 History and Description

Corrective Action Unit 562, Waste Systems, consists of 13 inactive sites located in Areas 2, 23, and 25. The 13 CAU 562 sites consist of lead shot, paint/historical spills, a septic system, a concrete drain, french drains, a steam cleaning drain, a mud trap, grease trap, and outfalls. The CAU 562 sites were used to support nuclear testing conducted in the Yucca Flat area or the nuclear rocket development program in Area 25. Operational histories for each CAU 562 CAS are detailed in Section 2.2.

1.1.2 Data Quality Objective Summary

The sites will be investigated based on data quality objectives (DQOs) developed by representatives of the Nevada Division of Environmental Protection (NDEP); DOE, National Nuclear Security Administration Nevada Site Office (NNSA/NSO); Stoller-Navarro Joint Venture (SNJV); and National Security Technologies, LLC (NSTec). The DQOs are used to identify and define the type, amount, and quality of data needed to develop and evaluate appropriate corrective actions for CAU 562. This CAIP describes the investigative approach developed to collect the data needs identified in the DQO process. While a detailed discussion of the DQO methodology and the DQOs specific to each CAS are presented in Appendix A, a summary of the DQO process is provided below and in Section 3.4.

The DQO problem statement for CAU 562 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 562." To address this question, the resolution of two decisions statements is required:

- Decision I: "Is any contaminant of potential concern (COPC) associated with the CAS present in environmental media at a concentration exceeding its corresponding final action level (FAL)?" For judgmental sampling, any contaminant associated with a CAS activity that is present at concentrations exceeding its corresponding FAL will be defined as a contaminant of concern (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. If a COC is not detected, the investigation for that CAS is complete.

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

  - The lateral and vertical extent of COC contamination

  - The information needed to determine potential remediation waste types

  - The information needed to evaluate the feasibility of remediation alternatives

The informational inputs and data needs to resolve the problem statement and the decision statements were generated as part of the DQO process for this CAU and are documented in Appendix A. The information necessary to resolve the DQO decisions will be generated for each CAU 562 CAS by collecting and analyzing samples generated during a field investigation. The presence of contamination at each CAS will be determined by collecting and analyzing samples collected in areas determined most likely to contain a COC.

1.2 Scope

To generate information needed to resolve the decision statements identified in the DQO process, the scope of the CAI for CAU 562 includes the following activities:

- Move surface debris and/or materials, as needed, to facilitate sampling.

- Conduct radiological surveys.

- Perform field screening.

- Collect and submit environmental samples for laboratory analysis to determine the nature and extent of any COCs released by each CAS.
- Collect samples of source material to determine the potential for a release of COCs.
- Collect samples of potential remediation wastes.
- Collect quality control (QC) samples.

Contamination of environmental media originating from activities not identified in the conceptual site model (CSM) of any CAS will not be considered as part of this CAU unless the CSM and the DQOs are modified to include the release. If not included in the CSM, contamination originating from these sources will not be considered for sample location selection and/or will not be considered COCs. If such contamination is present, the contamination will be identified as part of another CAS (either new or existing).

1.3 Corrective Action Investigation Plan Contents

Section 1.0 presents the purpose and scope of this CAIP, while Section 2.0 provides background information about CAU 562. Objectives of the investigation, including the CSM, are presented in Section 3.0. Field investigation and sampling activities are discussed in Section 4.0, and waste management issues for this project are discussed in Section 5.0. General field and laboratory quality assurance (QA) (including collection of QA samples) are presented in Section 6.0 and in the Industrial Sites Quality Assurance Project Plan (QAPP) (NNSA/NV, 2002). The project schedule and records availability are discussed in Section 7.0. Section 8.0 provides a list of references.

Appendix A provides a detailed discussion of the DQO methodology and the DQOs specific to each CAS, while Appendix B contains information on the project organization.

2.0 Facility Description

Corrective Action Unit 562 is comprised of 13 CASs that were grouped together based on the geographical location of the sites, technical similarities (drains and other discharge systems), and the agency responsible for closure. The CASs located in the Area 2 Camp are CASs 02-26-11, 02-44-02, 02-59-01, 02-60-01, 02-60-02, 02-60-03, 02-60-04, 02-60-05, 02-60-06, and 02-60-07. Corrective Action Sites 23-60-01 and 23-99-06 are located in Area 23, and CAS 25-60-04 is located in Area 25.

2.1 Physical Setting

The following sections describe the general physical settings of Areas 2, 23, and 25 of the NTS. General background information pertaining to topography, geology, hydrogeology, and climatology are provided for these specific areas of the NTS region in the *Geologic Map of the Nevada Test Site, Southern Nevada* (USGS, 1990); *CERCLA Preliminary Assessment of DOE's Nevada Operations Office Nuclear Weapons Testing Areas* (DRI, 1988); *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada* (ERDA, 1977); and the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996).

Geological and hydrological setting descriptions for each of the CASs are detailed in the following subsections based on the hydrogeographic area in which they are located.

2.1.1 Yucca Flat

Corrective Action Sites 02-26-11, 02-44-02, 02-59-01, and 02-60-01 through 02-60-07 are located within the Yucca Flat Hydrographic Area of the NTS. Yucca Flat is a closed basin, which is slowly being filled with alluvial deposits eroding from the surrounding mountains (USGS, 1996).

The direction of groundwater flow in Yucca Flat generally is from the northeast to southwest. Within the overlying alluvial and volcanic aquifers, lateral groundwater flow occurs from the margins to the center of the basin and downward into the carbonate aquifer (USGS, 1996). Precipitation for the area from 2003 through 2008, as measured at the Buster Jangle Wye (BJY) Station, ranged from 4.33 to 10.43 inches per year (in./yr), with a mean annual value of 6.73 inches (in.) (ARL/SORD, 2008). The mean annual potential evapotranspiration (PET) rate, as estimated for 2003 through 2008 at the Area

3 radioactive waste management site (RWMS), was 61.71 in. with a 95 percent upper confidence limit (UCL) of 63.07 in. The recharge rate to the Yucca Flat area is relatively low (1.76 millimeters per year [mm/yr]), and the thickness of the unsaturated zone extends to more than 600 feet (ft) below ground surface (bgs) (USGS, 1996).

The nearest groundwater well to the CASs is Water Well WW-2, an active well located between 0.5 and 1 mi northeast of the CASs. The depth to groundwater on August 21, 2008, was measured at 2,051.1 ft bgs (USGS, 2008).

2.1.2 Mercury Valley

Corrective Action Sites 23-60-01 and 23-99-06 are located within the Mercury Valley basin. Mercury Valley covers an area of approximately 70 square miles and ranges in elevation from 3,050 to 4,200 ft above mean sea level (amsl). The valley is a transition zone between the northern edge of the Mojave Desert and the southern portion of the Great Basin Desert.

Groundwater beneath Mercury Valley occurs within alluvium and lower carbonate aquifers and within the upper clastic and lower clastic aquitards (DRI, 1988). Surface drainage and groundwater flow in the Mercury Valley is in the southwest direction. Precipitation for the area from 2003 through 2008, as measured at the Mercury Gauging Station, ranged from 3.38 to 8.11 in. per year, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. The nearest groundwater well to the Area 23 CASs is U.S. Geological Survey (USGS) Well SM-23-1, an active well located approximately 1.5 mi southwest of the sites. The most recent recorded depth to the water table is approximately 1,164 ft bgs (USGS, 2008). The recharge rate to the Mercury Valley area is relatively low (0.97 mm/yr) due to the thick unsaturated zone extending to more than 1,100 ft bgs (USGS, 2003).

2.1.3 Area 25, Jackass Flats

Corrective Action Site 25-60-04 is located in Area 25 within the Jackass Flats basin. The soil surrounding the sites are typical desert alluvium composed of mostly fine soil and loose rocks. Depth to bedrock and the existence of localized caliche is unknown in these areas. Area 25 (Jackass Flats) is an intermontane valley of the NTS bordered by highlands on all sides except for a large drainage outlet to the southwest. Elevations range from 3,400 to 5,600 ft amsl. The Jackass Flats basin is underlain by alluvium, colluvium, and volcanic rocks of Cenozoic age. The alluvium and colluvium (with thickness of upwards to 1,000 ft) are above the saturated zone throughout most of Jackass Flats. Paleozoic age sedimentary rocks, limestones, and dolomites occur at greater depths (DRI, 1988; USGS, 1964). Precipitation for the area from 2003 through 2008, as measured at the Jackass Flats (4JA) Station, ranged from 3.99 to 11.04 in./yr, with a mean annual value of 7.74 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. Depths to groundwater for the three water supply wells located within Area 25 are approximately 1,039 ft, 927 ft, and 740 ft bgs (USGS, 1993). The nearest groundwater well to CAS 25-60-04 is the J-11 Water Well, which is located 1.5 mi southwest. The most recent recorded depth to the water table is approximately 1,040 ft bgs (USGS, 2008).

2.2 Operational History

The following subsections provide a description of the use and history of each CAS in CAU 562 that may have resulted in potential releases to the environment. The CAS-specific summaries are designed to describe the current definition of each CAS and illustrate all significant, known activities. All Area 2 CASs located in the Area 2 Camp supported Lawrence Livermore National Laboratory (LLNL) drilling and construction activities from the mid-1950s to mid-1990s.

2.2.1 CAS 02-26-11, Lead Shot

Corrective Action Site 02-26-11 consists of the potential release to the soil from shot that has been abandoned in the former Laborers Storage Area in the Area 2 Camp. Figure A.2-2 shows the boundary of the CAS.

Although the official FFACO name for this CAS is “Lead Shot,” initial evaluation has indicated that some of the material may not be lead; therefore, the material will be referred to as “shot” until the analytical results of the material provide an accurate composition.

2.2.2 CAS 02-44-02, Paint Spills and French Drain

Corrective Action Site 02-44-02 consists of the potential release to the soil from paint spills, a historical spill of an unknown source, and a french drain. The CAS components were identified in the vicinity of the Painters Shed, Shop, and Storage Rack in the Area 2 Camp. All of the buildings in this area have been demolished; however, the Paint Storage Rack remains. Figure A.2-3 shows a site sketch of the CAS.

2.2.3 CAS 02-59-01, Septic System

Corrective Action Site 02-59-01 consists of the potential release to the soil from the septic system. The CAS is adjacent to a cable runway in the Area 2 Camp. The LLNL Warehouse, Field Operations Support Facility, Photo Skid Trailer, Conference Room Trailer, and the Cable Fabrication Building discharged to the septic system. The buildings have been demolished, but the trailers remain on site. Figure A.2-4 shows a site sketch of the CAS.

2.2.4 CAS 02-60-01, Concrete Drain

Corrective Action Site 02-60-01 consists of the potential release to the soil from the concrete drain. The CAS is associated with the Area 2 Tank Farm and Operations Warehouse in the Area 2 Camp. The Area 2 Tank Farm and Operations Warehouse has been demolished. All that remains is the building foundation and the concrete drain located adjacent to the southern edge of the foundation. Figure A.2-5 shows a site sketch of the CAS.

2.2.5 CAS 02-60-02, French Drain

Corrective Action Site 02-60-02 consists of the potential release to the soil from the french drain and elongated drains adjacent to the former Sheet Metal and Pipefitters Shop foundation. The CAS is associated with this shop, which is located in the Area 2 Camp. The Sheet Metal and Pipefitters Shop has been demolished. All that remains is the building foundation and the drains. Figure A.2-6 shows a site sketch of the CAS.

2.2.6 CAS 02-60-03, Steam Cleaning Drain

Corrective Action Site 02-60-03 consists of the potential release to soil from the steam cleaning sump and the drain/outfall that discharges from an adjacent concrete pad. The CAS was identified adjacent to the former Linemans Shop in the Area 2 Camp. Documentation states that historical steam cleaning activities took place in the Area 2 Camp, specifically in the Linemans Yard, Mechanics Yard, and the Reefer Shop Yard. Although no specific information has been identified discussing the use of CAS 02-60-03, it is assumed that equipment and vehicles from the Linemans Yard and possibly the other yards identified above were decontaminated at this location. Figure A.2-7 shows a site sketch of the CAS.

2.2.7 CAS 02-60-04, French Drain

Corrective Action Site 02-60-04 consists of the potential release to soil from the french drain. The CAS is associated with the former Refrigeration Shop in the Area 2 Camp. Although no specific information has been identified discussing the use of the french drain, it is assumed that the french drain was used in conjunction with activities at the Refrigeration Shop (i.e., cleaning parts and equipment on the concrete pad, disposal of fluids from the shop). Figure A.2-8 shows a site sketch of the CAS.

2.2.8 CAS 02-60-05, French Drain

Corrective Action Site 02-60-05 consists of the potential release to the soil from the french drain. The CAS is associated with the former Operators Office and the D-38 Storage Yard in the Area 2 Camp. Documentation states that the french drain was used as a hand washing station, perhaps by personnel occupying the Operators Office or working in the storage yard. No other information has been identified discussing the use and details of the french drain. Figure A.2-9 shows a site sketch of the CAS.

2.2.9 CAS 02-60-06, French Drain

Corrective Action Site 02-60-06 consists of the potential release to the soil from the french drain. The CAS is associated with the former Electricians Shop in the Area 2 Camp. Documentation states that the french drain was used as a hand washing station, perhaps by personnel occupying the Electricians

Shop. No other information has been identified discussing the use and details of the french drain. Figure A.2-10 shows the CAS location.

2.2.10 CAS 02-60-07, French Drain

Corrective Action Site 02-60-07 consists of the potential release to the soil from the french drain. The CAS is associated with the former Electrical Supply Building in the Area 2 Camp. Documentation states that the french drain was used as a hand washing station, perhaps by personnel occupying the Electrical Supply Building. No other information has been identified discussing the use and details of the french drain. Figure A.2-10 shows the CAS location.

2.2.11 CAS 23-60-01, Mud Trap Drain and Outfall

Corrective Action Site 23-60-01 consists of the potential release to the soil by the mud trap, grease rack, and outfall. The CAS was identified adjacent to a wash shed in the former Defense Nuclear Agency (DNA) Compound. The DNA Compound supported various DoD activities, including offices, maintenance buildings, gasoline pumps, and a vehicle wash area. The mud trap, grease rack, and outfall were added in 1958 to support the vehicle wash area. A trench drain is present inside the wash shed; this drain collected and discharged effluent to the mud trap via piping. Overflow from the mud trap would then discharge to the outfall, which is located outside the compound fence line. No specific documentation was identified discussing the use of the grease rack, although it is assumed to have been used for vehicle maintenance. Figure A.2-11 shows a site sketch of the CAS.

2.2.12 CAS 23-99-06, Grease Trap

Corrective Action Site 23-99-06 consists of the potential release to the soil from the grease trap. The CAS is associated with Building 109, a former fuel service station. The building is currently used as the Housing/Revenues Building. Before the building was converted to its current configuration, a grease pit and drywell inside the building drained to the grease trap located on the south side of Building 109. The grease trap then drained via piping to the active sewer system. Sometime in the mid-1980s, the grease pit and drywell was made inactive and filled with concrete so that discharge to the grease trap ceased. The grease trap was not filled in during the building renovation.
Figure A.2-12 shows a site sketch of the CAS.

2.2.13 CAS 25-60-04, Building 3123 Outfalls

Corrective Action Site 25-60-04 consists of the potential release to the soil from the two outfalls. The CAS is associated with Building 3123, Technical Services, which contained a laboratory, shop, and office space. Two outfalls were identified, referred to in this document as Drain A and Drain B. Drain A received effluent from floor drains, utility trench drains, and from sinks present in the laboratories (i.e., Neutronics Lab, Radiation Lab, and Central Repair). Drain A was designed to extend 25 ft west of the building and drain to daylight. One sink and one floor drain from a room of unknown use discharged to Drain B, which was designed to extend between 33.5 and 40 ft south of the building and drain to daylight. Drains A and B consisted of 4-in. acid-resistant piping called Duriron. The building is currently being used for other purposes and as a result of these activities, effluent was inadvertently discharged to the outfalls. Drain A had been receiving effluent from the main kitchen (located in the former laboratory area), while Drain B had been receiving effluent from a smaller kitchen area. Although the building remains active, the discharge to the outfalls ceased in November 2008. Figure A.2-13 shows a site sketch of the CAS.

2.3 Waste Inventory

Available documentation, interviews with former site employees, process knowledge, and general historical NTS practices were used to identify wastes that may be present. Historical information and site visits indicate that the sites contain wastes such as shot, paint, asbestos, and other miscellaneous debris.

2.3.1 CAS 02-26-11, Lead Shot

The solid waste item identified at CAS 02-26-11 consists of shot scattered throughout the site boundary. The potential waste type is *Resource Conservation and Recovery Act* (RCRA) toxicity characteristic hazardous waste or industrial waste. This waste type may be comprised of shot.

2.3.2 CAS 02-44-02, Paint Spills and French Drain

Solid waste items identified at CAS 02-44-02 may include paint in several areas within the site boundary and asbestos tiles. Potential waste types include sanitary waste, hydrocarbon waste, RCRA toxicity characteristic hazardous waste, radioactive waste, *Toxic Substances Control Act* (TSCA) waste, and mixed waste. All waste types may be comprised of debris, investigation-derived waste (IDW), decontamination liquids, and soils.

2.3.3 CASs 02-59-01, Septic System; 02-60-01, Concrete Drain; 02-60-02, French Drain; 02-60-03, Steam Cleaning Drain; 02-60-04, French Drain; 02-60-05, French Drain; 02-60-06, French Drain; 02-60-07, French Drain; 23-60-01, Mud Trap Drain and Outfall; 23-99-06, Grease Trap; 25-60-04, Building 3123 Outfalls

No solid waste items have been identified at these CASs; however, potential waste types include sanitary waste, hydrocarbon waste, RCRA toxicity characteristic hazardous waste, radioactive waste, TSCA waste, and mixed waste. All waste types may be comprised of debris, IDW, decontamination liquids, and soils.

2.4 Release Information

Known or suspected releases from the CASs, including potential release mechanisms, and migration routes associated with each of the CASs are described in the following subsections. Potentially affected media for all CASs include surface, shallow subsurface, and subsurface soil. Exposure routes to site workers include ingestion, inhalation, and/or dermal contact (absorption) from disturbance of contaminated soils, debris, and/or structures. Site workers may also be exposed to radiation by performing activities in proximity to radiologically contaminated materials, if present.

The following subsections contain CAS-specific descriptions of known or suspected releases associated with CAU 562.

2.4.1 CAS 02-26-11, Lead Shot

A release may have occurred from the shot that is present on the ground surface. If a release occurred, it is expected that there would have been limited lateral and vertical migration.

2.4.2 CAS 02-44-02, Paint Spills and French Drain

The disposal of paint, a historical spill, and the discharge of effluent to the french drain may have resulted in a release of contamination to the soil. Based on the size of the features, contaminants would have been limited in volume and are expected to be located in the soil within close proximity to the paint, spill, and french drain.

2.4.3 CAS 02-59-01, Septic System

The septic system was designed to release effluent to the subsurface soil via the leachlines. Contaminants are expected to have been limited in volume and, if present, are expected to be located in close proximity to the septic tank and leachlines.

2.4.4 CAS 02-60-01, Concrete Drain

It is unknown whether the concrete drain was designed to release effluent to the subsurface soil. If there were releases to the environment, contaminants are expected to have been limited in volume and, if present, located in close proximity to the drain.

2.4.5 CASs 02-60-02, French Drain; 02-60-03, Steam Cleaning Drain; 02-60-04, French Drain; 02-60-05, French Drain; 02-60-06, French Drain; 02-60-07, French Drain; 23-60-01, Mud Trap Drain and Outfall; 25-60-04, Building 3123 Outfalls

The drains associated with these CASs were designed to release effluent to the subsurface soil via direct leaching into the soil, a drain casing, or outfalls. Contaminants are expected to have been limited in volume and, if present, located in close proximity to the features associated with the individual CASs.

2.4.6 CAS 23-99-06, Grease Trap

The grease trap was not designed to release material to the subsurface soil; therefore, releases are not expected to be associated with this site. However, if a release did occur, contaminants are expected to have been limited in volume and, if present, in close proximity to the grease trap and associated piping.

2.5 Investigative Background

The following subsections summarize the investigations conducted at the CAU 562 sites. More detailed discussions of these investigations are found in Appendix A. No previous investigative results have been identified for CASs 02-26-11, 02-44-02, 02-59-01, 02-60-03, 02-60-04, 02-60-05, 23-60-01, or 23-99-06.

2.5.1 CAS 02-60-01, Concrete Drain

In September 2007, a geophysical survey was conducted in the area surrounding the concrete drain to determine whether piping was present. There were no linear anomalies representing possible inlets or outlets from the concrete drain. Two subsurface anomalies were detected directly outside and adjacent to the concrete drain. It is unknown what these anomalies represent (Weston, 2007).

2.5.2 CAS 02-60-02, French Drain

In September 2007, a geophysical survey was conducted in the area surrounding the two elongated drains located adjacent to the concrete pad. The survey was completed to determine whether piping was present. There were no linear anomalies representing possible inlets or outlets from the drains (Weston, 2007). The french drain location had not been identified at the time of the survey; therefore, that feature was not surveyed.

2.5.3 CAS 02-60-06, French Drain

In September 2007, a geophysical survey was conducted in the area surrounding the 3-in. steel pipe to determine whether other piping or features were present. A linear anomaly was identified originating from the pipe. The anomaly was surveyed to the extent possible; heavy vegetation in the area did not allow for the end point of the anomaly to be identified (Weston, 2007). It is unknown whether the 3-in. pipe is associated with the french drain.

2.5.4 CAS 02-60-07, French Drain

In September 2007, a geophysical survey was conducted in the area surrounding the 4-in. steel pipe to determine whether other piping or features were present. There were no linear anomalies identified originating from the pipe (Weston, 2007). It is unknown whether the 4-in. pipe is associated with the french drain.

2.5.5 CAS 25-60-04, Building 3123 Outfalls

In November 2008, excavation was conducted to find the termination point of Drain A. The original termination point west of Building 3123, as identified on engineering drawings, was located; however, it was determined that the pipe had been previously reconfigured. An elbow had been added, and additional pipe was added to the south. Through additional excavation, the termination point was found approximately 100 ft south of the original termination point. The pipe was approximately 2 ft bgs, and a portion of the ground that covers the pipe had been paved. A video survey also was attempted on Drain B; however, the video survey was unable to be completed because the pipe angles to the subsurface. Therefore, the entire length of the pipe could not be identified, and the location of the outfall is unknown.

2.5.6 National Environmental Policy Act

The *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996) includes site investigation activities such as those proposed for CAU 562.

In accordance with the NNSA/NSO *National Environmental Policy Act* (NEPA) Compliance Program, a NEPA checklist will be completed before beginning site investigation activities at CAU 562. This checklist requires NNSA/NSO project personnel to evaluate their proposed project activities against a list of potential impacts that include, but are not limited to, air quality, chemical use, waste generation, noise level, and land use. Completion of the checklist results in a determination of the appropriate level of NEPA documentation by the NNSA/NSO NEPA Compliance Officer. This will be accomplished before mobilization for the field investigation.

3.0 Objectives

This section presents an overview of the DQOs for CAU 562 and formulation of the CSM. Also presented is a summary listing of the contaminants reasonably suspected to be present at each CAS (i.e., target contaminants), the COPCs, the preliminary action levels (PALs) for the CAU 562 CAI, and the process used to establish FALs. Additional details and figures depicting the CSM are located in Appendix A.

3.1 Conceptual Site Model

The CSM describes the most probable scenario for current conditions at each site and defines the assumptions that are the basis for identifying the future land use, contaminant sources, release mechanisms, migration pathways, exposure points, and exposure routes. The CSM was used to develop appropriate sampling strategies and data collection methods. The CSM was developed for CAU 562 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. Figure 3-1 depicts the conceptual pathways to receptors from CAU 562 sources. Figure 3-2 depicts a graphical representation of the CSM. If evidence of contamination that is not consistent with the presented CSM is identified during investigation activities, the situation will be reviewed, the CSM will be revised, the DQOs will be reassessed, and a recommendation will be made as to how best to proceed. In such cases, decision makers listed in Section A.3.1 will be notified and given the opportunity to comment on and/or concur with the recommendation.

The following sections discuss future land use and the identification of exposure pathways (i.e., combination of source, release, migration, exposure point, and receptor exposure route) for CAU 562.

3.1.1 Land Use and Exposure Scenarios

Land-use zones where the CAU 562 CASs are located dictate future land use, and restrict current and future land use to nonresidential (e.g., industrial) activities.

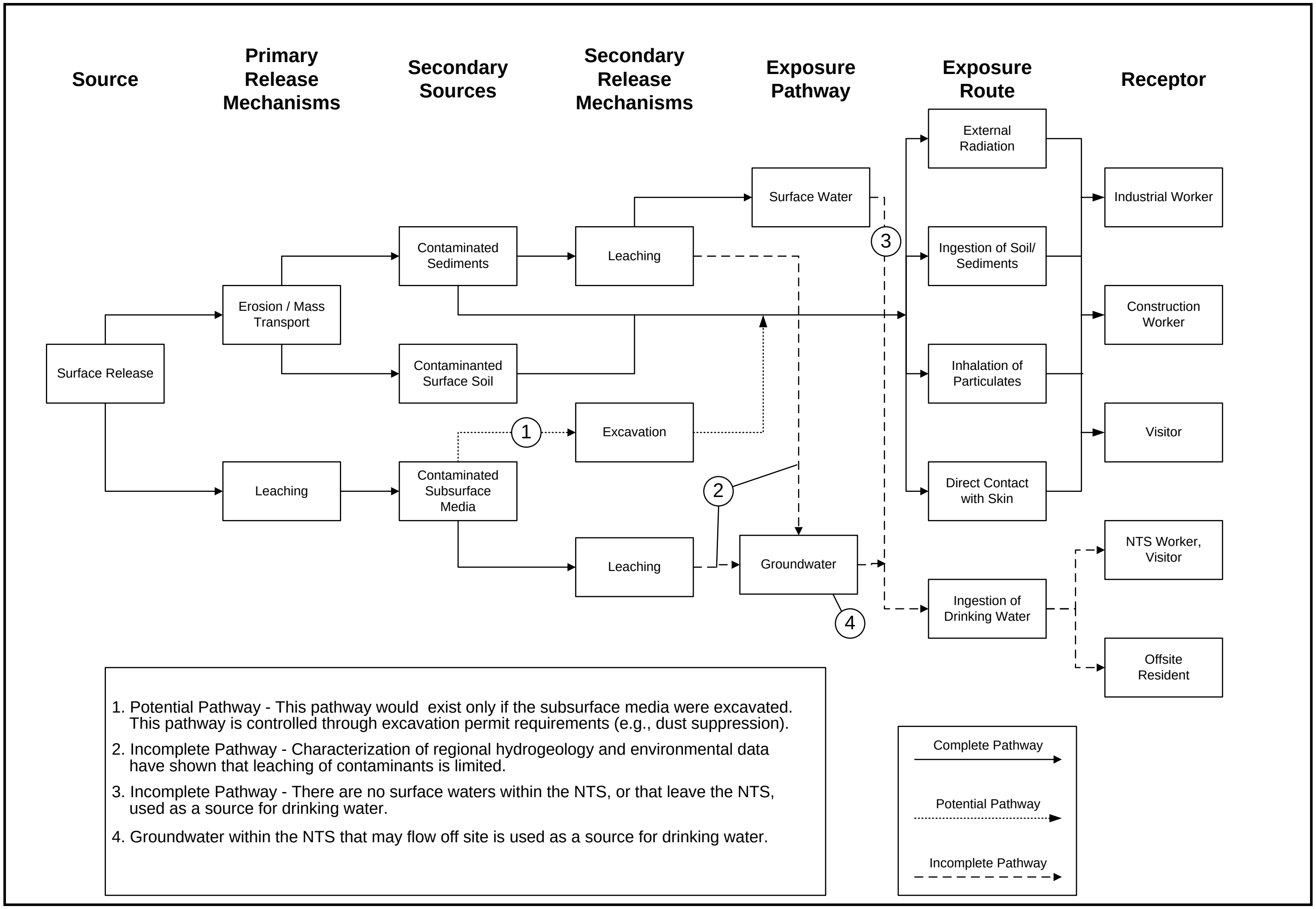

Figure 3-1
Conceptual Site Model Diagram

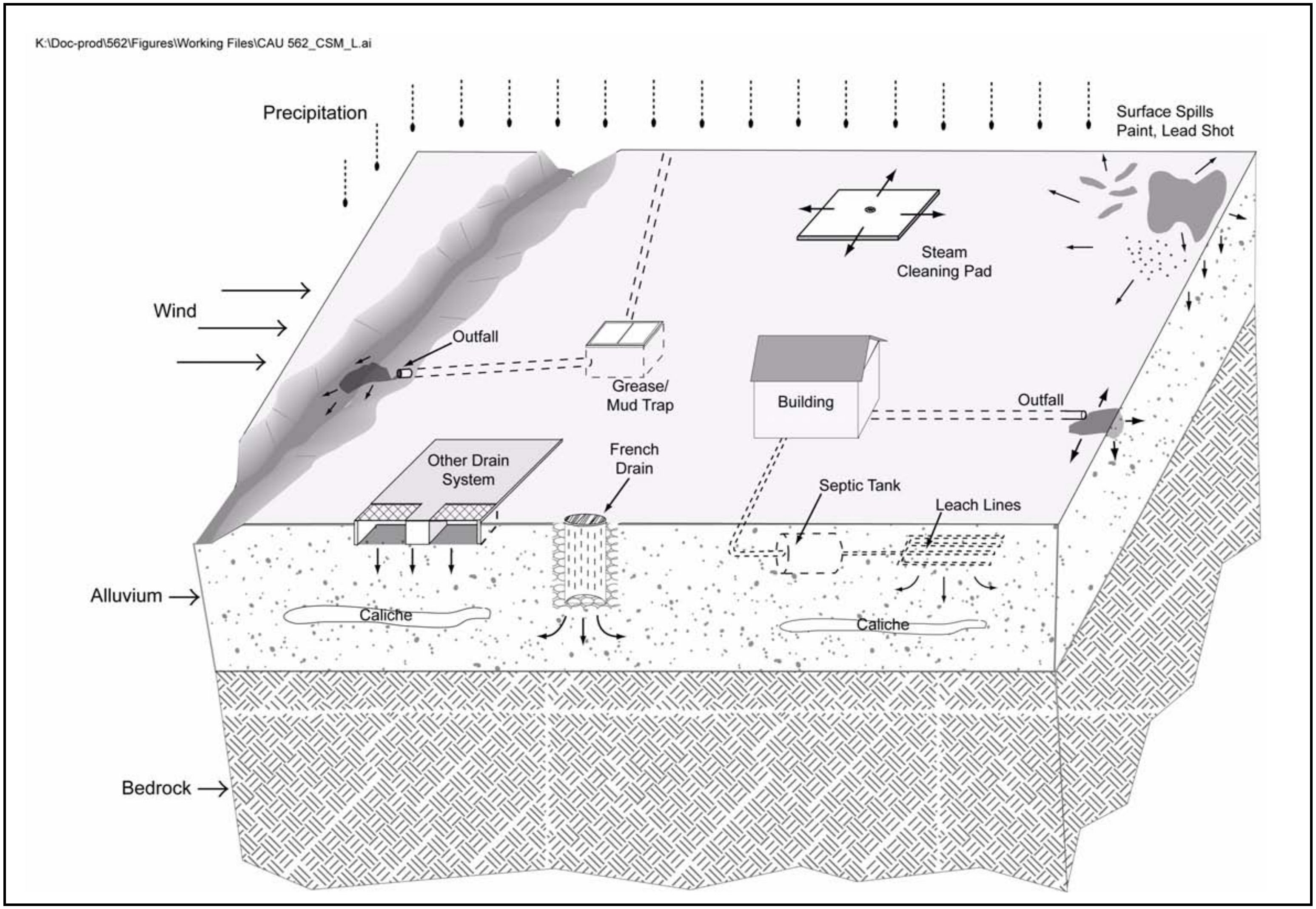

Figure 3-2
Conceptual Site Model for CAU 562

All 10 of the Area 2 CASs are located in the land-use zone described as the “Nuclear and High Explosives Test Zone.” This area is designated for additional underground nuclear weapons and high explosives tests. This zone includes compatible defense and nondefense research, development, and testing projects, and activities (DOE/NV, 1998).

Corrective Action Sites 23-60-01 and 23-99-06 are located in the land-use zone described as “Reserved” within the NTS. 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, Federal Radiological Monitoring and Assessment Center training, and DoD land-navigation exercises and training (DOE/NV, 1998).

Corrective Action Site 25-60-04 is located in the land-use zone described as “Research Test and Experiment.” The Research Test and Experiment Zone is designated for small-scale research and development projects and demonstrations; pilot projects; outdoor tests; and experiments for development, QA, or reliability of material and equipment under controlled conditions. This includes compatible nondefense research, development, and testing projects and activities.

Exposure scenarios for the CAU 562 CASs have been categorized into the following two types based on current and projected future land uses:

- Industrial Area for CASs 23-60-01, 23-99-06, and 25-60-04. This exposure scenario assumes industrial use of a site. This scenario addresses exposure to industrial workers continuously exposed to contaminants in soil during each workday for their entire careers (225 days per year, 10 hours per day, for a duration of 25 years).

- Occasional Use Area for CASs 02-26-11, 02-44-02, 02-59-01, and 02-60-01 through 02-60-07. This exposure scenario assumes exposure to industrial workers who are not assigned to the area as a regular work site but may occasionally use the site for intermittent or short-term activities. Site workers under this scenario are assumed to be on the site for an equivalent of 10 hours per day, 10 days per year, for 5 years.

3.1.2 Contaminant Sources

The contamination sources for the CAU 562 CSM are:

- Effluent discharged to shallow subsurface soil from drains, traps, outfalls, and the septic system
- Spills to surface soil from paint and other unknown sources
- Runoff to surface soil from steam cleaning decontamination activities
- Leaching to surface and possibly shallow subsurface soil from lead shot

3.1.3 Release Mechanisms

Release mechanisms for the CSM are spills and effluent discharge onto surface and subsurface soils from activities in the Area 2 Camp (e.g., paint storage, steam cleaning, discharge sources), Building 109 and a wash shed in Area 23, outfalls in Area 25, and the potentially contaminated soil from the shot.

3.1.4 Migration Pathways

Migration pathways include the lateral migration of potential contaminants away from the release point and vertical migration of potential contaminants into subsurface soil.

Subsurface migration pathways at the CASs are expected to be predominately vertical, although spills or discharge from outfalls at the ground surface may also have limited lateral migration before infiltration. The depth of infiltration (shape of the subsurface contaminant plume) will be dependent upon the type, volume, and duration of the discharge as well as the presence of relatively impermeable layers that could modify vertical or horizontal transport pathways, both on the ground surface (e.g., concrete) and in the subsurface (e.g., caliche layers).

Migration pathways include the lateral migration of potential contaminants across surface soils/sediments and vertical migration of potential contaminants through subsurface soils. Contaminants released into a wash, as in the case at CAS 23-60-01, are subject to a much higher transport than contaminants released to other surface areas. Washes are generally dry but are subject to infrequent, potentially intense, stormwater flows. Stormwater flow events provide an intermittent mechanism for both vertical and horizontal transport of contaminants. Contaminated sediments entrained by these stormwater events would be carried by the streamflow to locations where the flowing water loses energy and the sediments drop out. These locations are readily identifiable by hydrologists as sedimentation areas. Surface water from the Area 2 CASs drain to Yucca Lake, while the Area 23 and 25 surface water drains to Amargosa Valley.

Migration is influenced by physical and chemical characteristics of the contaminants and media. Contaminant characteristics include, but are not limited to, solubility, density, and adsorption potential. Media characteristics include permeability, porosity, water saturation, sorting, chemical composition, and organic content. 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 high solubility, low affinity for media, and low density can be expected to be found further from release points. These factors affect the migration pathways and potential exposure points for the contaminants in the various media under consideration.

Infiltration and percolation of precipitation serves as a driving force for downward migration of contaminants. However, due to high PET (annual PET 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 (6.35 in./yr [ARL/SORD, 2008]), percolation of infiltrated precipitation at the NTS does not provide a significant mechanism for vertical migration of contaminants to groundwater (DOE/NV, 1992).

3.1.5 Exposure Points

Exposure points for the CSM are expected to be areas of surface contamination where visitors and site workers may come in contact with contaminated surface soil. Subsurface exposure points may also exist if construction workers come in contact with contaminated media during excavation activities.

3.1.6 Exposure Routes

Exposure routes to site workers include ingestion, inhalation, and/or dermal contact (absorption) from disturbance of, or direct contact with, contaminated media. Site workers may also be exposed to ionizing radiation by performing activities in proximity to radiologically contaminated materials.

3.1.7 Additional Information

Information concerning topography, geology, climatic conditions, hydrogeology, floodplains, and infrastructure at the CAU 562 CASs is presented in Section 2.1 as it pertains to the investigation. This information has been addressed in the CSM and will be considered during the evaluation of corrective action alternatives, as applicable. Climatic and site conditions (e.g., surface and subsurface soil descriptions) as well as specific structure descriptions will be recorded during the CAI.

3.2 Contaminants of Potential Concern

The COPCs for CAU 562 are defined as the list of analytes represented by the analytical methods identified in Table 3-1 for Decision I environmental samples taken at each of the CASs. The analytes reported for each analytical method are listed in Table 3-2.

The list of COPCs is intended to encompass all contaminants that could potentially be present at each CAS. These 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. Contaminants detected at other similar NTS sites were also included in the COPC list to reduce the uncertainty about potential contamination at the CASs, because complete information regarding activities performed at the CAU 562 sites is not available. Pesticides and herbicides have been included in the analytical suite for CAS 02-59-01, as these have been found in other septic system investigations on the NTS. Available information on all other CASs suggest that pesticides were not stored, mixed, or handled at the associated facilities. The CASs within CAU 562 that are identified as french drains are associated with former shops (e.g., paint and electrical) that have no history of storing or mixing pesticides or herbicides. Antimony has been included in the analytical suite for CAS 02-26-11, because it has been historically used as a hardener for lead shot. Because CAS 25-60-04 is located near the Reactor Control Point of

Table 3-1
Analytical Program[a]

Analyses	02-26-11	02-44-02	02-59-01	02-60-01	02-60-02	02-60-03	02-60-04	02-60-05	02-60-06	02-60-07	23-60-01	23-99-06	25-60-04
Organic COPCs													
TPH-DRO	X	X	X	X	X	X	X	X	X	X	X	X	X
PCBs	X	X	X	X	X	X	X	X	X	X	X	X	X
SVOCs	X	X	X	X	X	X	X	X	X	X	X	X	X
VOCs	X	X	X	X	X	X	X	X	X	X	X	X	X
Pesticides	--	--	X	--	--	--	--	--	--	--	--	--	--
Herbicides	--	--	X	--	--	--	--	--	--	--	--	--	--
Inorganic COPCs													
RCRA Metals	X	X	X	X	X	X	X	X	X	X	X	X	X
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	X
Antimony	X	--	--	--	--	--	--	--	--	--	--	--	--
Radionuclide COPCs													
Gamma Spectroscopy[b]	X	X	X	X	X	X	X	X	X	X	X	X	X

[a]The COPCs are the constituents reported from the analytical methods listed.
[b]Results of gamma analysis will be used to determine whether further isotopic analysis is warranted.

DRO = Diesel-range organics
PCB = Polychlorinated biphenyl
SVOC = Semivolatile organic compound
TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

X = Required analytical method
-- = Not required

Table 3-2
Constituents Reported by Analytical Methods

VOCs		SVOCs		TPH	PCBs	Pesticides	Herbicides	Metals	Radionuclides
1,1,1,2-Tetrachloroethane	Carbon tetrachloride	2,3,4,6-Tetrachlorophenol	Di-n-octyl Phthalate	DRO	Aroclor 1016	4,4'-DDD	2,4,5-T	Arsenic	Pu-238
1,1,1-Trichloroethane	Chlorobenzene	2,4,5-Trichlorophenol	Dibenzo(a,h)anthracene		Aroclor 1221	4,4'-DDE	2,4,5-TP	Antimony	Pu-239/240
1,1,2,2-Tetrachloroethane	Chloroethane	2,4,6-Trichlorophenol	Dibenzofuran		Aroclor 1232	4,4'-DDT	2,4-D	Barium	Sr-90
1,1,2-Trichloroethane	Chloroform	2,4-Dimethylphenol	Diethyl Phthalate		Aroclor 1242	Aldrin	2,4,-DB	Beryllium	U-234
1,1-Dichloroethane	Chloromethane	2,4-Dinitrotoluene	Dimethyl Phthalate		Aroclor 1248	Alpha-BHC	Dalapon	Cadmium	U-235
1,1-Dichloroethene	Chloroprene	2-Chlorophenol	Fluoranthene		Aroclor 1254	Alpha-Chlordane	Dicamba	Chromium	U-238
1,2,4-Trichlorobenzene	cis-1,2-Dichloroethene	2-Methylnaphthalene	Fluorene		Aroclor 1260	Beta-BHC	Dichloroprop	Lead	
1,2,4-Trimethylbenzene	Dibromochloromethane	2-Methylphenol	Hexachlorobenzene		Aroclor 1268	Chlordane	Dinoseb	Mercury	**Gamma-Emitting**
1,2-Dibromo-3-chloropropane	Dichlorodifluoromethane	2-Nitrophenol	Hexachlorobutadiene			Delta-BHC	MCPA	Selenium	Ac-228
1,2-Dichlorobenzene	Ethyl methacrylate	3-Methylphenol[a] (m-cresol)	Hexachloroethane			Dieldrin	MCPP	Silver	Am-241
1,2-Dichloroethane	Ethylbenzene	4-Methylphenol[a] (p-cresol)	Indeno(1,2,3-cd)pyrene			Endosulfan I			Co-60
1,2-Dichloropropane	Isobutyl alcohol	4-Chloroaniline	n-Nitroso-di-n-propylamine			Endosulfan II			Cs-137
1,3,5-Trimethylbenzene	Isopropylbenzene	4-Nitrophenol	Naphthalene			Endosulfan Sulfate			Eu-152
1,3-Dichlorobenzene	Methacrylonitrile	Acenaphthene	Nitrobenzene			Endrin			Eu-154
1,4-Dichlorobenzene	Methyl methacrylate	Acenaphthylene	Pentachlorophenol			Endrin Aldehyde			Eu-155
1,4-Dioxane	Methylene chloride	Aniline	Phenanthrene			Endrin Ketone			K-40
2-Butanone	n-Butylbenzene	Anthracene	Phenol			Gamma-BHC			Nb-94
2-Chlorotoluene	n-Propylbenzene	Benzo(a)anthracene	Pyrene			Gamma-Chlordane			Pb-212
2-Hexanone	sec-Butylbenzene	Benzo(a)pyrene	Pyridine			Heptachlor			Pb-214
4-isopropyltoluene	Styrene	Benzo(b)fluoranthene				Heptachlor Epoxide			Tl-208
4-Methyl-2-pentanone	tert-Butylbenzene	Benzo(g,h,i)perylene				Methoxychlor			Th-234
Acetone	Tetrachloroethene	Benzo(k)fluoranthene				Toxaphene			U-235
Acetonitrile	Toluene	Benzoic Acid							
Allyl chloride	Total Xylenes	Benzyl Alcohol							
Benzene	Trichloroethene	Bis(2-ethylhexyl) phthalate							
Bromodichloromethane	Trichlorofluoromethane	Butyl benzyl phthalate							
Bromoform	Vinyl acetate	Carbazole							
Bromomethane	Vinyl chloride	Chrysene							
Carbon disulfide		Di-n-butyl Phthalate							

[a]May be reported as 3,4-Methylphenol or m,p-cresol.

Ac = Actinium
Am = Americium
Co = Cobalt
Cs = Cesium
Eu = Europium
K = Potassium
Nb = Niobium
Pb = Lead
Pu = Plutonium
Sr = Strontium
Th = Thorium
Tl = Thallium
U = Uranium

Area 25, and has been identified as a potential beryllium site, beryllium has been added to the analytical suite for this CAS.

During the review of site history documentation, process knowledge information, personal interviews, past investigation efforts (where available), and inferred activities associated with the CASs, some of the COPCs were identified as targeted contaminants at specific CASs. Targeted contaminants are those COPCs for which evidence in the available site and process information suggests that they may be reasonably suspected to be present at a given CAS. The targeted contaminants are required to meet a more stringent completeness criteria than other COPCs thus providing greater protection against a decision error (see Sections A.8.2 and A.8.3). Targeted contaminants for each CAU 562 CAS are identified in Table 3-3. If non-target COPCs are detected during Decision I sampling at concentrations exceeding the action levels, they will be treated as targeted contaminants for Decision II sampling, if necessary.

Table 3-3
Targeted Contaminants for CAU 562

CAS	Chemical Targeted Contaminant(s)	Radiological Targeted Contaminant(s)
02-26-11	Lead	None
02-44-02	Lead	None
02-59-01	None	None
02-60-01	None	None
02-60-02	None	None
02-60-03	None	None
02-60-04	None	None
02-60-05	None	None
02-60-06	None	None
02-60-07	None	None
23-60-01	TPH-DRO (hazardous constituents of diesel)	None
23-99-06	TPH-DRO (hazardous constituents of diesel)	None
25-60-04	None	None

3.3 Preliminary 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, therefore streamlining the consideration of remedial alternatives. The risk-based corrective action (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 *Nevada Administrative Code* (NAC) Section 445A.227, which lists the requirements for sites with soil contamination (NAC, 2006a). For the evaluation of corrective actions, NAC Section 445A.22705 (NAC, 2006b) requires the use of American Society for Testing and Materials (ASTM) Method E 1739-95 (ASTM, 1995) 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."

This RBCA process, summarized in Figure 3-3, 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 Site-Specific Target Levels (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 E 1739-95 that consider site-, pathway-, and receptor-specific parameters.

This process includes a provision for conducting an interim remedial action if necessary and appropriate. The decision to conduct an interim action may be made at any time during the investigation and at any level (tier) of analysis. Concurrence of the decision makers listed in

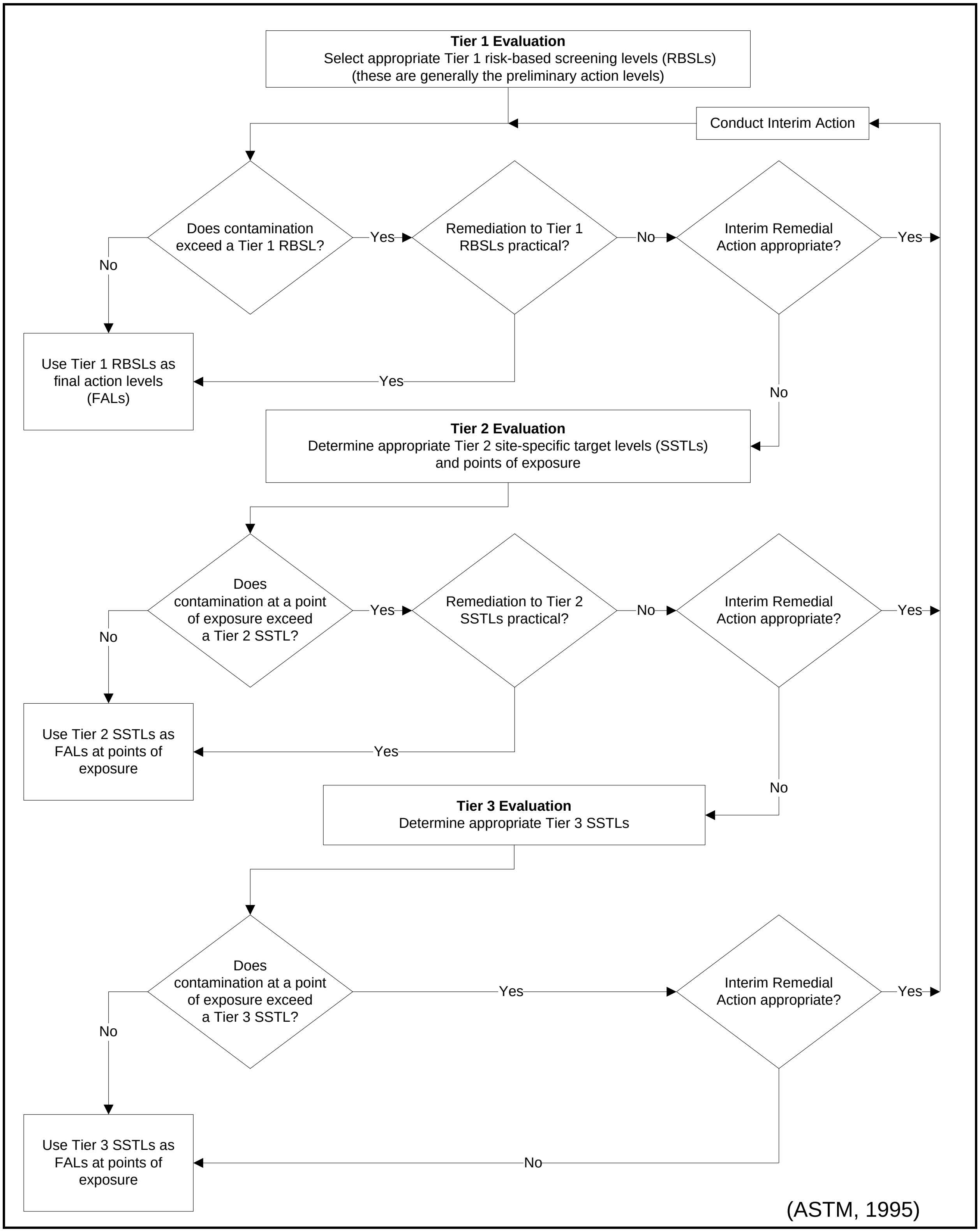

Figure 3-3
Risk-Based Corrective Action Decision Process

Section A.3.1 will be obtained before any interim action is implemented. Evaluation of DQO decisions will be based on conditions at the site following completion of any interim actions. Any interim actions conducted will be reported in the investigation report (i.e., Corrective Action Decision Document [CADD]) for CAU 562.

The FALs (along with the basis for their selection) will be proposed in the CADD for CAU 562 where they will be compared to laboratory results in the evaluation of potential corrective actions.

3.3.1 Chemical PALs

Except as noted herein, the chemical PALs are defined as the U.S. Environmental Protection Agency (EPA) *Region 9: Superfund, Preliminary Remediation Goals, Screening Levels for Chemical Contaminants* in industrial soils (EPA, 2008a). Background concentrations for RCRA metals and antimony will be used instead of preliminary remediation goals (PRGs) when natural background concentrations exceed the PRG, as is often the case with arsenic on the NTS. Background is considered the mean plus two standard deviations of the mean 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 CADD for CAU 562.

3.3.2 Total Petroleum Hydrocarbon PALs

The PAL for TPH is 100 milligrams per kilogram (mg/kg) as listed in NAC 445A.2272 (NAC, 2006c).

3.3.3 Radionuclide PALs

The PALs for radiological contaminants (other than tritium) are based on the National Council on Radiation Protection and Measurement (NCRP) Report No. 129 recommended screening limits for construction, commercial, industrial land-use scenarios (NCRP, 1999) using a 25-millirem-per-year (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 3.1.1.

3.4 Data Quality Objective Process Discussion

This section contains a summary of the DQO process that is presented in Appendix A. The DQO process is a strategic planning approach based on the scientific method that is designed to ensure that the data collected will provide sufficient and reliable information to identify, evaluate, and technically defend the recommendation of viable corrective actions (e.g., no further action, clean closure, or closure in place).

The DQO strategy for CAU 562 was developed at a meeting on December 11, 2008. Corrective Action Site 25-60-04 was not included in the DQO strategy because the site was identified as a potential site after the strategy was decided upon. The CSM and sampling strategy planned for the other CAU 562 CASs are applicable to this CAS with the detail being presented in the appropriate sections of this document. The DQOs were developed to identify data needs, clearly define the intended use of the environmental data, and design a data collection program that will satisfy these purposes. During the DQO discussions for this CAU, the informational inputs or data needs to resolve problem statements and decision statements were documented.

The problem statement for CAU 562 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 562." To address this problem statement, the resolution of two decision statements is required:

- Decision I: "Is any COC present in environmental media within the CAS?" If a COC is detected, then Decision II must be resolved. Otherwise, the investigation for that CAS is complete.
- Decision II: "If a COC is present, is sufficient information available to evaluate potential corrective action alternatives?" Sufficient information is defined to include:
    - The lateral and vertical extent of COC contamination
    - The information needed to determine potential remediation waste types

- The information needed to evaluate the feasibility of remediation alternatives

The presence of a COC would require a corrective action. A corrective action may also be necessary if there is a potential for waste(s) that are present at a site to impose a COC into site environmental media if the waste(s) were to be released (i.e., potential source material [PSM]. To evaluate the potential for site waste to result in the introduction of a COC to the surrounding environmental media, the following conservative assumptions were made:

- Any current containment of wastes would fail at some point, and the contents would be released to the surrounding media.
- For non-liquid wastes, the resulting concentration of contaminants in the surrounding media would be equal to the concentration of contaminants in the waste.
- For liquid wastes, the resulting concentration of contaminants in the surrounding soil will be calculated based on the concentration of contaminants in the waste and the liquid holding capacity of the soil.

Decision I samples will be submitted to analytical laboratories for the analyses listed in Table 3-1. Decision II samples will be submitted for the analysis of all unbounded COCs. In addition, samples will be submitted for analyses as needed to support waste management or health and safety decisions.

The data quality indicators (DQIs) of precision, accuracy, representativeness, completeness, comparability, and sensitivity needed to satisfy DQO requirements are discussed in Section 6.2. Laboratory data will be assessed in the CADD for CAU 562 to confirm or refute the CSM and determine whether the DQO data needs were met.

To satisfy the DQI of sensitivity (presented in Section 6.2.8), the analytical methods must be sufficient to detect contamination that is present in the samples at concentrations less than or equal to the corresponding FALs. Analytical methods and target minimum detectable concentrations (MDCs) for each CAU 562 COPC are provided in Tables 3-4 and 3-5. The MDC is the lowest concentration of a chemical or radionuclide parameter that can be detected in a sample within an acceptable level of error. The criteria for precision and accuracy in Tables 3-4 and 3-5 may vary from information in the QAPP as a result of the laboratory used or updated/new methods (NNSA/NV, 2002).

Table 3-4
Analytical Requirements for Radionuclides for CAU 562

Analysis[a]	Medium or Matrix	Analytical Method	MDC[b]	Laboratory Precision	Laboratory Accuracy
Gamma-Emitting Radionuclides					
Gamma Spectroscopy	Aqueous	EPA 901.1[c]	< PALs	RPD 35% (non-aqueous)[d] 20% (aqueous)[d] ND -2<ND<2[e]	LCS Recovery (%R) 80-120[f]
	Non-aqueous	GA-01-R[g]			

[a]A list of constituents reported for each method is provided in Table 3-2.
[b]The MDC is the minimum concentration of a constituent that can be measured and reported with 95% confidence (Standard Methods).
[c]*Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA, 1980).
[d]*Sampling and Analysis Plan Guidance and Template* (EPA, 2000).
[e]*Evaluation of Radiochemical Data Usability* (Paar and Porterfield, 1997).
[f]*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 2008b).
[g]*The Procedures Manual of the Environmental Measurements Laboratory* (DOE, 1997).
[h]*Standard Methods for the Examination of Water and Wastewater* (Clesceri, et al., 1998).

LCS = Laboratory control sample
ND = Normalized difference
RPD = Relative percent difference
%R = Percent recovery

Table 3-5
Analytical Requirements for Chemical COPCs for CAU 562

Analysis[a]	Medium or Matrix	Analytical Method	MDC[b]	Laboratory Precision	Laboratory Accuracy
Organics					
VOCs	All	8260[c]	< PALs	Lab-specific[d]	Lab-specific[d]
SVOCs	All	8270[c]	< PALs	Lab-specific[d]	Lab-specific[d]
PCBs	All	8082[c]	< PALs	Lab-specific[d]	Lab-specific[d]
TPH-DRO	All	8015 Modified[c]		Lab-specific[d]	Lab-specific[d]
Pesticides	All	8081[c]		Lab-specific[d]	Lab-specific[d]
Herbicides	All	8151[c]	< PALs	Lab-specific[d]	Lab-specific[d]
Inorganics					
Metals	All	6010/6020[c]	< PALs	RPD 35% (non-aqueous) 20% (aqueous)[e] Absolute Difference ±2x RL (non-aqueous)[f] ±1x RL (aqueous)[f]	MS Recovery (%R) 75-125[c] LCS Recovery (%R) 80-120[c]

[a]A list of constituents reported for each method is provided in Table 3-2.
[b]The MDC is the minimum concentration of a constituent that can be measured and reported with 99% confidence (SW-846).
[c]*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 2008b).
[d]Precision and accuracy criteria are developed in-house using approved laboratory standard operating procedures in accordance with industry standards and the SNJV Statement of Work requirements (SNJV, 2006).
[e]*Sampling and Analysis Plan Guidance and Template* (EPA, 2000).
[f]*Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA, 2004).

MS = Matrix spike
RL = Reporting limit

4.0 Field Investigation

This section contains a description of the activities to be conducted to gather and document information from the CAU 562 field investigation.

4.1 Technical Approach

The information necessary to satisfy the DQO data needs will be generated for each CAU 562 CAS by collecting and analyzing samples generated during a field investigation. The presence and nature of contamination at all of the CAU 562 CASs will be evaluated using a judgmental approach. If a waste is present that, if released, has the potential to release contamination into site environmental media, that waste will be sampled.

If it is determined that a COC is present at any CAS, that CAS will be further addressed by determining the extent of contamination before evaluating corrective action alternatives.

Because this CAIP only addresses contamination originating from the CAU, it may be necessary to distinguish overlapping contamination originating from other sources. For example, widespread surface radiological contamination originating from atmospheric tests will not be addressed in the CAU 562 investigation. To determine whether contamination is from the CAU or from other sources, soil samples may be collected from locations outside the influence of releases from the CAS at selected CASs.

Modifications to the investigative strategy may be required should unexpected field conditions be encountered at any CAS. Significant modifications shall be justified and documented before implementation. If an unexpected condition indicates that conditions are significantly different than the corresponding CSM, the activity will be rescoped and the identified decision makers will be notified.

4.2 Field Activities

Field activities at CAU 562 include site preparation, sample location selection, and sample collection activities.

4.2.1 Site Preparation Activities

Site preparation activities conducted by the NTS Management and Operating Contractor before the investigation may include relocating or removing surface debris, asbestos, and vegetation; constructing hazardous waste accumulation areas and site exclusion zones; providing sanitary facilities; constructing decontamination facilities; and temporarily moving staged equipment.

Before mobilization for collecting investigation samples, the following preparatory activities will also be conducted:

- Perform radiological surveys of the Areas 2 and 25 CASs.
- Perform visual surveys at all CASs within CAU 562 to identify any staining, discoloration, disturbance of native soils, or any other indication of potential contamination.

4.2.2 Sample Location Selection

At all of the CAU 562 CASs, biasing factors (including field-screening results [FSRs]) will be used to select the most appropriate samples from a particular location for submittal to the analytical laboratory. Biasing factors to be used for selection of sampling locations are listed in Section A.5.2.1 of Appendix A. As biasing factors are identified and used for selection of sampling locations, they will be documented in the appropriate field documents.

The CAS-specific sampling strategy and the estimated locations of biased samples for each CAS are presented in Appendix A. The Site Supervisor may modify the number, location, and spacing of step-outs as warranted by site conditions to achieve DQO criteria stipulated in Appendix A. Where sampling locations are modified by the Site Supervisor, the justification for these modifications will be documented in the CADD for CAU 562.

4.2.3 Sample Collection

The CAU 562 sampling program will consist of the following activities:

- Collect and analyze samples from locations as described in this section.
- Collect required QC samples.

- Collect waste management samples, as necessary.
- Collect soil samples from locations outside the influence of releases from the CAS, if necessary, to determine background concentrations and/or CAS boundary information for the area of contamination.
- Perform radiological characterization surveys of construction materials and debris as necessary for disposal purposes.
- Record Global Positioning System (GPS) coordinates for each environmental sample location.

Decision I surface soil samples (0 to 0.5 ft bgs) will be collected. If biasing factors are present in soils below locations where Decision I samples were collected, subsurface Decision I soil samples will also be collected by hand augering, backhoe excavation, direct-push, or drilling techniques, as appropriate. Decision I subsurface 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 contents of the septic tank, french drains (if contents are present), and traps will be sampled to characterize the potential waste for disposal.

Decision II sampling will consist of further defining the extent of contamination where COCs have been confirmed. Step-out (Decision II) sampling locations at each CAS will be selected based on the CSM, biasing factors, FSRs, existing data, and outer boundary sample locations where COCs were detected. In general, step-out sample locations will be arranged in a triangular pattern around areas containing a COC at distances based on site conditions, COC concentrations, process knowledge, and biasing factors. If COCs extend beyond step-out locations, additional Decision II samples will be collected from locations further from the source. If a spatial boundary is reached, the CSM is shown to be inadequate, or the Site Supervisor determines that extent sampling needs to be re-evaluated, then work will be temporarily suspended, NDEP will be notified, and the investigation strategy will be re-evaluated. A minimum of one analytical result less than the action level from each lateral and vertical direction will be required to define the extent of COC contamination. The lateral and vertical extent of COCs will only be established based on validated laboratory analytical results (i.e., not field screening).

4.2.4 Sample Management

The laboratory requirements (i.e., detection limits, precision, and accuracy) to be used when analyzing the COPCs are presented in Tables 3-4 and 3-5. The analytical program for each CAS is presented in Table 3-1. All sampling activities and QC requirements for field and laboratory environmental sampling will be conducted in compliance with the Industrial Sites QAPP (NNSA/NV, 2002) and other applicable, approved procedures.

4.3 Safety

A site-specific health and safety document will be prepared and approved before the field effort. As required by the DOE Integrated Safety Management System (ISMS) (DOE/NV, 1997), this document outlines the requirements for protecting the health and safety of the workers and the public. The ISMS program requires that site personnel will reduce or eliminate the possibility of injury, illness, or accidents, and will protect the environment during all project activities. The following safety issues will be taken into consideration when evaluating the hazards and associated control procedures for field activities:

- Potential hazards to site personnel and the public include, but are not limited to, radionuclides, chemicals (e.g., heavy metals, VOCs, SVOCs, and petroleum hydrocarbons), adverse and rapidly changing weather, remote location, and motor vehicle and heavy equipment operations.
- Proper training of all site personnel to recognize and mitigate the anticipated hazards.
- Work controls to reduce or eliminate the hazards, including engineering controls, substitution of less hazardous materials, and use of appropriate personal protective equipment (PPE).
- Occupational exposure monitoring to prevent overexposures to hazards such as radionuclides, chemicals, and physical agents (e.g., heat, cold, and high wind).
- Radiological surveying for alpha/beta and gamma emitters to minimize and/or control personnel exposures; use of the “as-low-as-reasonably-achievable” principle when addressing radiological hazards.
- Emergency and contingency planning to include medical care and evacuation, decontamination, spill control measures, and appropriate notification of project management. The same principles apply to emergency communications.

- If presumed asbestos-containing material is identified (CFR, 2008c; NAC, 2008), it will be inspected and/or samples collected by trained personnel.

4.4 Site Restoration

Upon completion of CAI and waste management activities, the following actions will be implemented before closure of the site Real Estate/Operations Permit (REOP):

- All equipment, wastes, debris, and materials associated with the CAI will be removed from the site.
- All signs and fencing (unless part of a corrective action) will be removed from the site.
- Site will be re-graded to pre-investigation conditions (unless changed condition is necessary under a corrective action).
- Site will be inspected and certified that restoration activities have been completed.

5.0 Waste Management

Management of IDW will be based on regulatory requirements, field observations, process knowledge, and laboratory results from CAU 562 investigation samples.

Disposable sampling equipment, PPE, and rinsate are considered potentially contaminated waste only by virtue of contact with potentially contaminated media (e.g., soil) or potentially contaminated debris (e.g., construction materials). Therefore, sampling and analysis of IDW, separate from analyses of site investigation samples, may not be necessary for all IDW. However, if associated investigation samples are found to contain contaminants above regulatory levels, conservative estimates of total waste contaminant concentrations may be made based on the mass of the waste, the amount of contaminated media contained in the waste, and the maximum concentration of contamination found in the media. Direct samples of IDW may also be taken to support waste characterization.

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

5.1 Waste Minimization

Investigation activities are planned to minimize IDW generation. This will be accomplished by incorporating the use of process knowledge, visual examination, and/or radiological survey and swipe results. When possible, disturbed media (such as soil removed during trenching) or debris will be returned to its original location. Contaminated media (e.g., soil managed as waste) as well as other IDW will be segregated to the greatest extent possible to minimize generation of hazardous, radioactive, or mixed waste. Hazardous material used at the sites will be controlled in order to limit unnecessary generation of hazardous or mixed waste. Administrative controls — including decontamination procedures, recycle/reuse, and waste characterization strategies — will minimize waste generated during investigations.

5.2 Potential Waste Streams

Waste generated during the investigation activities will include the following potential waste streams:

- Personal protective equipment and disposable sampling equipment (e.g., plastic, paper, sample containers, aluminum foil, spoons, bowls)
- Decontamination rinsate
- Environmental media (e.g., soil)
- Surface debris (e.g., shot) in investigation area

5.3 Investigation-Derived Waste Management

The onsite management and ultimate disposition of IDW will be determined based on a determination of the waste type (e.g., sanitary, low-level, hazardous, hydrocarbon, mixed), or the combination of waste types. A determination of the waste type will be guided by several factors, including, but not limited to, the analytical results of samples either directly or indirectly associated with the waste, historical site knowledge, knowledge of the waste generation process, field observations, field-monitoring results/FSRs, and/or radiological survey/swipe results.

Guidance from the *NV/YMP Radiological Control* (RadCon) *Manual* (NNSA/NSO, 2004) shall be used to determine whether such materials may be declared nonradioactive. Onsite IDW management requirements by waste type are detailed in the following sections. Applicable waste management regulations and requirements are listed in Table 5-1.

5.3.1 Sanitary Waste

Sanitary IDW generated at each CAS will be collected, managed, and disposed of in accordance with the sanitary waste management regulations and the permits for operation of the NTS U10c Industrial Waste Landfill.

Industrial IDW generated at each CAS will be placed in a roll-off box located in Mercury, or other approved roll-off box, for ultimate disposal in the U10c Industrial Waste Landfill.

Table 5-1
Waste Management Regulations and Requirements

Waste Type	Federal Regulation	Additional Requirements
Solid (nonhazardous)	N/A	NRS[a] 444.440 - 444.620 NAC[b] 444.570 - 444.7499 NTS Landfill Permit SW13-097-04[c], Rev. 5 NTS Landfill Permit SW13-097-03[d], Rev. 7
Liquid/Rinsate (nonhazardous)	N/A	Water Pollution Control General Permit, GNEV93001, Rev. iv[e]
Hazardous	RCRA[f] 40 CFR 260-282	NRS[a] 459.400 - 459.600 NAC[b] 444.850 - 444.8746 POC[g]
Low-Level Radioactive	N/A	DOE Orders and NTSWAC[h]
Mixed	RCRA[f] 40 CFR 260-282	NTSWAC[h] POC[g]
Hydrocarbon	N/A	NTS Landfill Permit SW13-097-02[i], Rev. 7 NAC[b] 445A.2272
PCBs	TSCA[j] 40 CFR 761	NRS[a] 459.400 - 459.600 NAC[b] 444.940 - 444.9555
Asbestos	TSCA[j] 40 CFR 763	NRS[a] 618.750 - 618.840 NAC[b] 444.965 - 444.976

[a]*Nevada Revised Statutes* (NRS, 2007a, b, c)
[b]*Nevada Administrative Code* (NAC, 2008 and 2006c)
[c]Area 23 Class II Solid Waste Disposal Site (NDEP, 2006a)
[d]Area 9 Class III Solid Waste Disposal Site (NDEP, 2006c)
[e]Nevada Test Site Sewage Lagoons (NDEP, 2005)
[f]*Resource Conservation and Recovery Act* (CFR, 2008a)
[g]*Nevada Test Site Performance Objective for the Certification of Nonradioactive Hazardous Waste* (BN, 1995)
[h]*Nevada Test Site Waste Acceptance Criteria,* Rev. 7 (NNSA/NSO, 2008)
[i]Area 6 Class III Solid Waste Disposal Site for hydrocarbon waste (NDEP, 2006b)
[j]*Toxic Substances Control Act* (CFR, 2008b and c)

CFR = *Code of Federal Regulations*
N/A = Not applicable
NRS = *Nevada Revised Statutes*
NTSWAC = *Nevada Test Site Waste Acceptance Criteria*
POC = Performance Objective for the Certification of Nonradioactive Hazardous Waste

5.3.2 Low-Level Radioactive Waste

Radiological swipe surveys and/or direct-scan surveys may be conducted on reusable sampling equipment, and the PPE and disposable sampling equipment waste streams exiting a radiologically posted area. This allows for the immediate segregation of radioactive waste from waste that may be unrestricted regarding radiological release. Removable contamination limits, as defined in the current version of the NV/YMP RadCon Manual (NNSA/NSO, 2004), will be used to determine whether such waste may be declared unrestricted regarding radiological release versus being declared radioactive waste. Direct sampling of the waste may be conducted to aid in determining whether a particular waste unit (e.g., drum of soil) contains low-level radioactive waste, as necessary. Waste that is determined to be below the release values, either by direct radiological survey/swipe results or through process knowledge, will not be managed as potential radioactive waste but managed in accordance with any other applicable sections of this document. Wastes with values in excess of release criteria will be managed as potential radioactive waste in accordance with this section and any other applicable sections of this document.

Low-level radioactive waste, if generated, will be managed in accordance with the contractor-specific waste certification program plan, DOE orders, and the requirements of the current version of the NTSWAC (NNSA/NSO, 2008). Potential radioactive waste drums containing soil, PPE, disposable sampling equipment, and/or rinsate may be staged and managed at a designated radioactive material area when full or at the end of an investigation phase.

5.3.3 Hazardous Waste

The CAU will have waste accumulation areas established according to the needs of the project. Hazardous waste will be managed consistent with the requirements of federal and state regulations (see Table 5-1). *Resource Conservation and Recovery Act* “listed” waste has not been identified at CAU 562.

5.3.4 Hydrocarbon Waste

Hydrocarbon soil waste containing more than 100 mg/kg of TPH will be managed on site in a drum or other appropriate container until fully characterized. Hydrocarbon waste may be disposed of at a designated hydrocarbon landfill, an appropriate hydrocarbon waste management facility (e.g., recycling facility) or other method in accordance with the State of Nevada regulations (see Table 5-1).

5.3.5 Mixed Low-Level Waste

Mixed waste, if generated, shall be managed and dispositioned according to the requirements of RCRA agreements between NNSA/NSO and the State of Nevada, and DOE requirements for radioactive waste (see Table 5-1). Mixed waste that does not meet NTSWAC will require development of a treatment and disposal plan under the requirements of the Mutual Consent Agreement between DOE and the State of Nevada (NDEP, 1995).

5.3.6 Polychlorinated Biphenyls

The management of PCBs is governed by the TSCA and implementing regulation (see Table 5-1). Polychlorinated biphenyl contamination may be found as a sole contaminant or in combination with any of the types of waste discussed in this document. For example, PCBs may be a co-contaminant in soil that contains a RCRA "characteristic" waste (PCB/hazardous waste), or in soil that contains radioactive wastes (PCB/radioactive waste), or even in mixed waste (PCB/radioactive/hazardous waste). If regulated PCB waste is generated, it will be managed according to federal and State of Nevada requirements, guidance, and agreements with the NNSA/NSO (see Table 5-1).

5.4 Management of Specific Waste Streams

5.4.1 Personal Protective Equipment

Personal protective equipment and disposable sampling equipment will be visually inspected for stains, discoloration, and gross contamination as the waste is generated, and also evaluated for radiological contamination. Staining and/discoloration will be assumed to be the result of contact with potentially contaminated media such as soil, sludge, or liquid. Gross contamination is the visible contamination of an item (e.g., clumps of soil/sludge on a sampling spoon or free liquid smeared on a glove). While gross contamination can often be removed through decontamination methods, removal of gross contamination from small items, such as gloves or booties, is not typically conducted. Investigation-derived waste that is grossly contaminated will be segregated and managed as potentially "characteristic" hazardous waste. This segregated population of waste will either: (1) be assigned the characterization of the soil/sludge that was sampled, (2) be sampled directly, or (3) undergo further evaluation using associated soil/sludge sample results to determine how much soil/sludge would need to be present in the waste to exceed regulatory levels. Waste that is determined to be hazardous will be entered into an approved waste management system, where it will be managed and dispositioned according to RCRA requirements or subject to agreements between NNSA/NSO and the State of Nevada (see Table 5-1). The PPE and equipment that is not visibly stained, discolored, or grossly contaminated, and is within the radiological free-release criteria, will be managed as nonhazardous industrial waste.

5.4.2 Management of Decontamination Rinsate

Rinsate waste may be generated from the decontamination of field sampling equipment, and may be managed as RCRA-hazardous or nonhazardous, depending on process knowledge and associated analytical data. Depending on the radiological characterization of the rinsate waste, nonhazardous rinsate may be managed for disposal at the point of generation in accordance with an approved NNSA/NSO Fluid Management Plan, or disposed of elsewhere in accordance with waste acceptance criteria of the receiving facility.

Wet or dry decontamination may be performed over the sampling site, and in such cases, decontamination rinsate waste may be generated. If it is generated, it will be containerized, characterized, and managed as noted above. When onsite equipment decontamination is performed, it will be done in such a manner as to introduce no new contaminants to the sampling site, or to cause existing contaminants to migrate from the site.

5.4.3 Management of Soil

This waste stream consists of soil removed for disposal during soil sampling, excavation, and/or drilling. This waste stream will be characterized based on laboratory analytical results from representative locations. If the soil is determined to potentially contain COCs, the material will be either managed on site or containerized for transportation to an appropriate disposal site.

Onsite management of the waste soil will be allowed only if it is managed within an area of concern and it is appropriate to defer the management of the waste until the final remediation of the site. If this option is chosen, the waste soil shall be protected from run-on and runoff using appropriate protective measures based on the type of contaminant(s) (e.g., covered with plastic and bermed).

Management of soil waste for disposal consists of placing the waste in containers, labeling the containers, temporarily storing the containers until shipped, and shipping the waste to a disposal site. The containers, labels, management of stored waste, transport to the disposal site, and disposal shall be appropriate for the type of waste (e.g., hazardous, hydrocarbon, mixed).

Note that soil placed back into a borehole, or into an excavation in the same approximate location from which it originated, is not considered to be a waste.

5.4.4 Management of Debris

This waste stream can vary depending on site conditions. Debris that requires removal for the investigation activities (soil sampling, excavation, and/or drilling) must be characterized for proper management and disposition. Historical site knowledge, knowledge of the waste generation process, field observations, field-monitoring results/FSRs, radiological survey/swipe results, and/or the analytical results of samples either directly or indirectly associated with the waste may be used to characterize the debris. Debris will be visually inspected for stains, discoloration, and gross contamination. Debris may be deemed reusable, recyclable, sanitary waste, hazardous waste, PCB waste, or low-level waste.

5.4.5 Field-Screening Waste

The use of field test kits and/or instruments may result in the generation of small quantities of hazardous wastes. If hazardous waste is produced by field screening, it will be segregated from other IDW and managed in accordance with the hazardous waste regulations (see Table 5-1). For sites where field-screening samples contain radioactivity above background levels, field-screening methods that have the potential to generate hazardous waste will not be used, thus avoiding the potential to generate mixed waste.

6.0 Quality Assurance/Quality Control

The overall objective of the characterization activities described in this CAIP is to collect accurate and defensible data to support the selection and implementation of a closure alternative for each CAS in CAU 562. Sections 6.1 and 6.2 discuss the collection of required QC samples in the field and QA requirements for laboratory/analytical data to achieve closure. Unless otherwise stated in this CAIP or required by the results of the DQO process (see Appendix A), this investigation will adhere to the Industrial Sites QAPP (NNSA/NV, 2002).

6.1 Quality Control Sampling Activities

Field QC samples will be collected in accordance with established procedures. Field QC samples are collected and analyzed to aid in determining the validity of environmental sample results. The number of required QC samples depends on the types and number of environmental samples collected. The minimum frequency of collecting and analyzing QC samples for this investigation, as determined in the DQO process, include:

- Trip blanks (1 per sample cooler containing VOC environmental samples)
- Equipment rinsate blanks (1 per sampling event for each type of decontamination procedure)
- Source blanks (1 per lot of uncharacterized source material that contacts sampled media)
- Field duplicates (1 per 20 environmental samples or 1 per CAS per matrix, if less than 20 collected)
- Field blanks (3 at the Area 2 CASs [many of these CASs are directly adjacent to each other] and 1 at each of the remaining CASs in Areas 23 and 25)
- Laboratory QC samples (1 per 20 environmental samples or 1 per CAS per matrix, if less than 20 collected)

Additional QC samples may be submitted based on site conditions at the discretion of the Site Supervisor. Field QC samples shall be analyzed using the same analytical procedures implemented for associated environmental samples. Additional details regarding field QC samples are available in the Industrial Sites QAPP (NNSA/NV, 2002).

6.2 Laboratory/Analytical Quality Assurance

Criteria for the investigation, as stated in the DQOs (Appendix A) and except where noted, require laboratory analytical quality data be used for making critical decisions. Rigorous QA/QC will be implemented for all laboratory samples, including documentation, data verification and validation of analytical results, and an assessment of DQIs as they relate to laboratory analysis.

6.2.1 Data Validation

Data verification and validation will be performed in accordance with the Industrial Sites QAPP (NNSA/NV, 2002), except where otherwise stipulated in this CAIP. All chemical and radiological laboratory data from samples that are collected and analyzed will be evaluated for data quality according to company-specific procedures. The data will be reviewed to ensure that all required samples were appropriately collected, analyzed, and the results passed data validation criteria. Validated data, including estimated data (i.e., J-qualified), will be assessed to determine whether they meet the DQO requirements of the investigation and the performance criteria for the DQIs. The results of this assessment will be documented in the CADD. If the DQOs were not met, corrective actions will be evaluated, selected, and implemented (e.g., refine CSM or resample to fill data gaps).

6.2.2 Data Quality Indicators

The DQIs are qualitative and quantitative descriptors used in interpreting the degree of acceptability or utility of data. Data quality indicators are used to evaluate the entire measurement system and laboratory measurement processes (i.e., analytical method performance) as well as to evaluate individual analytical results (i.e., parameter performance). The quality and usability of data used to make DQO decisions will be assessed based on the following DQIs:

- Precision
- Accuracy/bias
- Representativeness
- Completeness
- Comparability
- Sensitivity

Table 6-1 provides the established analytical method/measurement system performance criteria for each of the DQIs and the potential impacts to the decision if the criteria are not met. The following

Table 6-1
Laboratory and Analytical Performance Criteria for CAU 562 DQIs

DQI	Performance Metric	Potential Impact on Decision If Performance Metric Not Met
Precision	At least 80% of the sample results for each measured contaminant are not qualified for precision based on the criteria for each analytical method-specific and laboratory-specific criteria presented in Section 6.2.3.	If the performance metric is not met, the affected analytical results from each affected CAS will be assessed to determine whether there is sufficient confidence in analytical results to use the data in making DQO decisions.
Accuracy	At least 80% of the sample results for each measured contaminant are not qualified for accuracy based on the method-specific and laboratory-specific criteria presented in Section 6.2.4.	If the performance metric is not met, the affected analytical results from each affected CAS will be assessed to determine whether there is sufficient confidence in analytical results to use the data in making DQO decisions.
Representativeness	Samples contain contaminants at concentrations present in the environmental media from which they were collected.	Analytical results will not represent true site conditions. Inability to make appropriate DQO decisions.
Completeness	80% of the CAS-specific COPCs have valid results. 100% of CAS-specific targeted contaminants have valid results.	Cannot support/defend decision on whether COCs are present.
Extent Completeness	100% of COCs used to define extent have valid results.	Extent of contamination cannot be accurately determined.
Clean Closure Completeness	100% of targeted contaminants have valid results.	Cannot determine whether COCs remain in soil.
Comparability	Sampling, handling, preparation, analysis, reporting, and data validation are performed using standard methods and procedures.	Inability to combine data with data obtained from other sources and/or inability to compare data to regulatory action levels.
Sensitivity	Minimum detectable concentrations are less than or equal to respective FALs.	Cannot determine whether COCs are present or migrating at levels of concern.

subsections discuss each of the DQIs that will be used to assess the quality of laboratory data. The criteria for precision and accuracy in Tables 3-4 and 3-5 may vary from information in the QAPP as a result of the laboratory used or updated/new methods (NNSA/NV, 2002).

6.2.3 Precision

Precision is a measure of the repeatability of the analysis process from sample collection through analysis results. It is used to assess the variability between two equal samples.

Determinations of precision will be made for field duplicate samples and laboratory duplicate samples. Field duplicate samples will be collected simultaneously with samples from the same source under similar conditions in separate containers. The duplicate sample will be treated independently of the original sample in order to assess field impacts and laboratory performance on precision through a comparison of results. Laboratory precision is evaluated as part of the required laboratory internal QC program to assess performance of analytical procedures. The laboratory sample duplicates are an aliquot, or subset, of a field sample generated in the laboratory. They are not a separate sample but a split, or portion, of an existing sample. Typically, laboratory duplicate QC samples may include matrix spike duplicate (MSD) and LCS duplicate samples for organic, inorganic, and radiological analyses.

Precision is a quantitative measure used to assess overall analytical method and field-sampling performance as well as to assess the need to “flag” (qualify) individual parameter results when corresponding QC sample results are not within established control limits.

The criteria used for the assessment of inorganic chemical precision when both results are greater than or equal to 5x reporting limit (RL) is 20 percent and 35 percent for aqueous and soil samples, respectively. When either result is less than 5x RL, a control limit of ±1x RL and ±2x RL for aqueous and soil samples, respectively, is applied to the absolute difference.

The criteria used for the assessment of organic chemical precision is based on professional judgment using laboratory-derived control limits.

The criteria used for the assessment of radiological precision when both results are greater than or equal to 5x MDC is 20 percent and 35 percent for aqueous and soil samples, respectively. When either result is less than 5x MDC, the ND should be between -2 and +2 for aqueous and soil samples. The parameters to be used for assessment of precision for duplicates are listed in Table 3-5.

Any values outside the specified criteria do not necessarily result in the qualification of analytical data. It is only one factor in making an overall judgment about the quality of the reported analytical results. The performance metric for assessing the DQI of precision on DQO decisions (see Table 6-1) is that at least 80 percent of sample results for each measured contaminant are not qualified due to duplicates exceeding the criteria. If this performance is not met, an assessment will be conducted and presented in the CADD for CAU 562 on the impacts to DQO decisions specific to affected contaminants and CASs.

6.2.4 Accuracy

Accuracy is a measure of the closeness of an individual measurement to the true value. It is used to assess the performance of laboratory measurement processes.

Accuracy is determined by analyzing a reference material of known parameter concentration or by reanalyzing a sample to which a material of known concentration or amount of parameter has been added (spiked). Accuracy will be evaluated based on results from three types of spiked samples: MS, LCS, and surrogates (organics). The LCS sample is analyzed with the field samples using the same sample preparation, reagents, and analytical methods employed for the samples. One LCS will be prepared with each batch of samples for analysis by a specific measurement.

The criteria used for the assessment of inorganic chemical accuracy are 75 to 125 percent for MS recoveries and 80 to 120 percent for LCS recoveries. For organic chemical accuracy, MS and LCS laboratory-specific percent recovery criteria developed and generated in-house by the laboratory according to approved laboratory procedures are applied. The criteria used for the assessment of radiochemical accuracy are 80 to 120 percent for LCS and MS recoveries.

Any values outside the specified criteria do not necessarily result in the qualification of analytical data. It is only one factor in making an overall judgment about the quality of the reported analytical results. Factors beyond laboratory control, such as sample matrix effects, can cause the measured values to be outside of the established criteria. Therefore, the entire sampling and analytical process may be evaluated when determining the usability of the affected data.

The performance metric for assessing the DQI of accuracy on DQO decisions (see Table 6-1) is that at least 80 percent of the sample results for each measured contaminant are not qualified for accuracy. If this performance is not met, an assessment will be conducted and presented in the CADD for CAU 562 on the impacts to DQO decisions specific to affected contaminants and CASs.

6.2.5 Representativeness

Representativeness is the degree to which sample characteristics accurately and precisely represent characteristics of a population or an environmental condition (EPA, 2002). Representativeness is assured by carefully developing the sampling strategy during the DQO process such that false negative and false positive decision errors are minimized. The criteria listed in DQO Step 6 – Specify the Tolerable Limits on Decision Errors are:

- For Decision I judgmental sampling, having a high degree of confidence that the sample locations selected will identify COCs if present anywhere within the CAS.
- Having a high degree of confidence that analyses conducted will be sufficient to detect any COCs if present in the samples.
- For Decision II, having a high degree of confidence that the sample locations selected will identify the extent of COCs.

These are qualitative measures that will be used to assess measurement system performance for representativeness. The assessment of this qualitative criterion will be presented in the CADD for CAU 562.

6.2.6 Completeness

Completeness is defined as generating sufficient data of the appropriate quality to satisfy the data needs identified in the DQOs. For judgmental sampling, completeness will be evaluated using both a quantitative measure and a qualitative assessment. The quantitative measurement to be used to evaluate completeness is presented in Table 6-1 and is based on the percentage of measurements made that are judged to be valid.

For the judgmental sampling approach, the completeness goal for targeted contaminants and the remaining COPCs is 100 and 80 percent, respectively. If this goal is not achieved, the dataset will be assessed for potential impacts on making DQO decisions.

The qualitative assessment of completeness is an evaluation of the sufficiency of information available to make DQO decisions. This assessment will be based on meeting the data needs identified in the DQOs and will be presented in the CADD for CAU 562. Additional samples will be collected if it is determined that the number of samples do not meet completeness criteria.

6.2.7 Comparability

Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared to another (EPA, 2002). The criteria for the evaluation of comparability will be that all sampling, handling, preparation, analysis, reporting, and data validation were performed and documented in accordance with approved procedures that are in conformance with standard industry practices. Analytical methods and procedures approved by DOE will be used to analyze, report, and validate the data. These methods and procedures are in conformance with applicable methods used in industry and government practices. An evaluation of comparability will be presented in the CADD for CAU 562.

6.2.8 Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest (EPA, 2002). The evaluation criteria for this parameter will be that measurement sensitivity (detection limits) will be 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. This assessment will be presented in the CADD for CAU 562.

7.0 Duration and Records Availability

7.1 Duration

Table 7-1 is a tentative duration of activities (in calendar days) for CAI activities.

Table 7-1
Corrective Action Investigation Activity Durations

Duration (days)	Activity
10	Site Preparation
76	Fieldwork Preparation and Mobilization
55	Sampling
160	Data Assessment
180	Waste Management

7.2 Records Availability

Historical information and documents referenced in this plan are retained in the NNSA/NSO project files in Las Vegas, Nevada, and can be obtained through written request to the NNSA/NSO Federal Sub-Project Director. This document is available in the DOE public reading rooms located in Las Vegas and Carson City, Nevada, or by contacting the DOE Federal Sub-Project Director. The NDEP maintains the official Administrative Record for all activities conducted under the auspices of the FFACO.

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Appendix A

Data Quality Objectives

A.1.0 Introduction

The DQO process described in this appendix is a seven-step strategic systematic planning method used to plan data collection activities and define performance criteria for the CAU 562, Waste Systems, 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 562 is insufficient to evaluate and select preferred corrective actions; therefore, a CAI will be conducted.

The CAU 562 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 *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA, 2006).

The DQO process presents a judgmental sampling approach. In general, the procedures used in the DQO process provide:

- A method to establish performance or acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of a study.

- Criteria that will be used to establish the final data collection design such as:

  - The nature of the problem that has initiated the study and a conceptual model of the environmental hazard to be investigated.

  - The decisions or estimates that need to be made and the order of priority for resolving them.

  - The type of data needed.

  - An analytic approach or decision rule that defines the logic for how the data will be used to draw conclusions from the study findings.

- Acceptable quantitative criteria on the quality and quantity of the data to be collected, relative to the ultimate use of the data.

- A data collection design that will generate data meeting the quantitative and qualitative criteria specified. A data collection design specifies the type, number, location, and physical quantity of samples and data, as well as the QA and QC activities that will ensure that sampling design and measurement errors are managed sufficiently to meet the performance or acceptance criteria specified in the DQOs.

A.2.0 Background Information

The following 13 CASs that comprise CAU 562 are located in Areas 2, 23, and 25 of the NTS, as shown in Figure A.2-1:

- 02-26-11, Lead Shot
- 02-44-02, Paint Spills and French Drain
- 02-59-01, Septic System
- 02-60-01, Concrete Drain
- 02-60-02, French Drain
- 02-60-03, Steam Cleaning Drain
- 02-60-04, French Drain
- 02-60-05, French Drain
- 02-60-06, French Drain
- 02-60-07, French Drain
- 23-60-01, Mud Trap Drain and Outfall
- 23-99-06, Grease Trap
- 25-60-04, Building 3123 Outfalls

Sections A.2.1 through A.2.13 provide a CAS description, physical setting and operational history, release information, and previous investigation results for each CAS in CAU 562. 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 CAS 02-26-11, Lead Shot

Corrective Action Site 02-26-11 consists of releases to the soil from shot that has been abandoned in the former Laborers Storage Area. Figure A.2-2 shows a site sketch of the CAS.

Although the official FFACO name for this CAS is “Lead Shot,” initial evaluation has indicated that some of the material may not be lead; therefore, the material will be referred to as “shot” until the analytical results of the material provide the material provide an accurate composition.

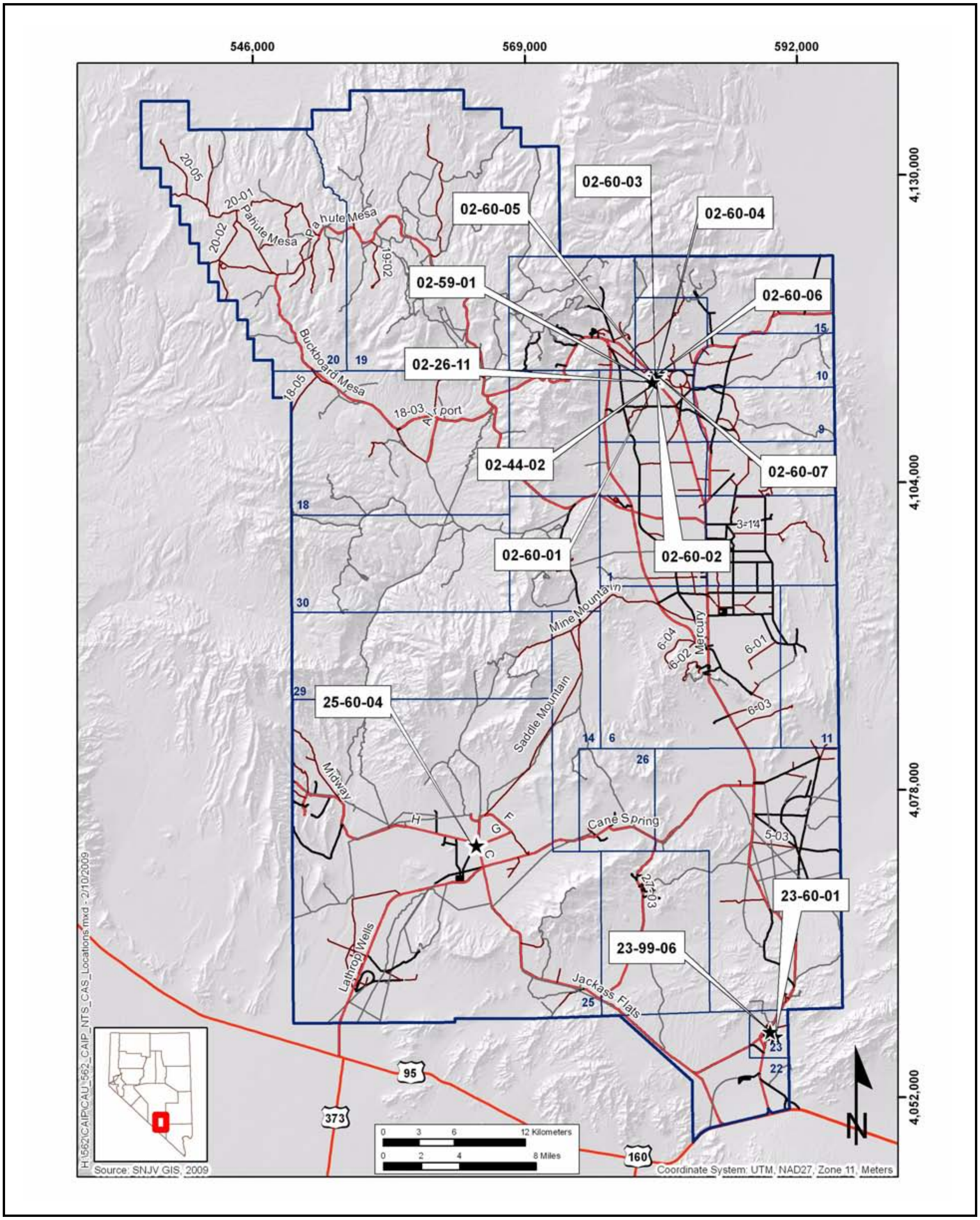

Figure A.2-1
CAU 562, CAS Location Map

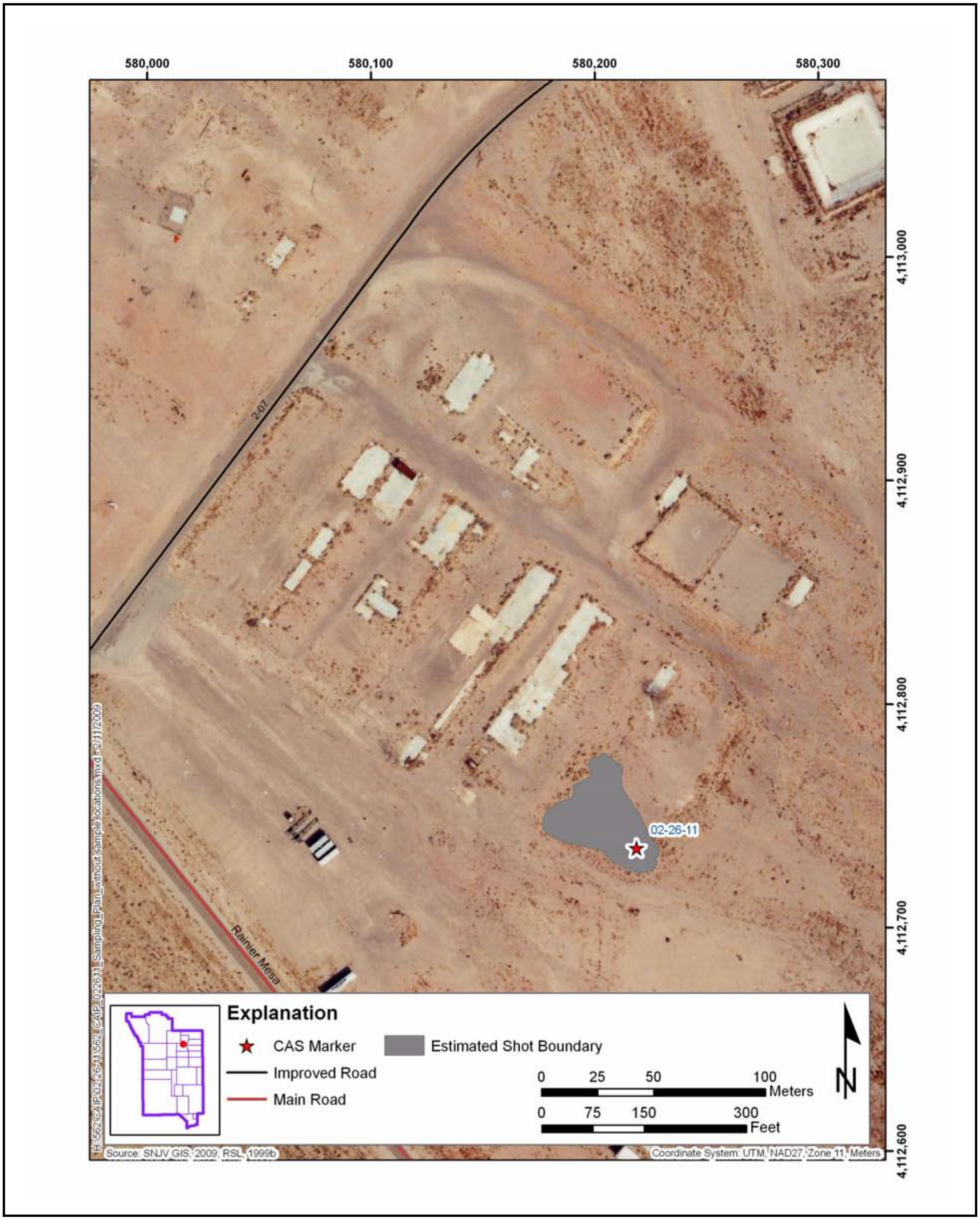

Figure A.2-2
Site Sketch of CAS 02-26-11, Lead Shot

Physical Setting and Operational History **–** Corrective Action Site 02-26-11 is located on Yucca Flat in Area 2. The shot was identified in the southwest corner of the former Laborers Storage Area in the Area 2 Camp. The Area 2 Camp was used to support LLNL drilling and construction activities. Although no specific information has been identified discussing the use of the Laborers Storage Area, it is assumed that this area was used to store equipment, tools, materials, and/or other items used by the laborers to conduct work. Additionally, materials used by LLNL to conduct drilling and construction activities may have been stored in this area. It is documented that the shot was stored in the Laborers Storage Area. It is presumed that the shot was either spilled or the packaging for the shot deteriorated (i.e., sandbags).

Corrective Action Site 02-26-11 is located in the upper-central region of Area 2 in the Yucca Flat hydrographic region. Precipitation for the area from 2003 through 2008, as measured at the BJY Station, ranged from 4.33 to 10.43 in./yr, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. The CAS is located within the Aqueduct Mesa drainage basin, which drains south to Yucca Lake. The area is relatively flat with no nearby drainage channels. The nearest well is USGS WW-2, which is located approximately 0.68 mi northeast of CAS 02-26-11. The depth to groundwater on August 21, 2008, was measured at 2,051.1 ft bgs (USGS, 2008). The soil at CAS 02-26-11 appears native and consists of sand to cobble-sized alluvium of various lithologies. Although the soil is native, the area has been disturbed due to the construction of numerous facilities in the surrounding area.

Release Information **–** The release at this CAS includes any lead or other metals that may have leached out of the shot to the underlying soil. No visible soil stains or other biasing factors are present within the footprint of the shot.

Previous Investigation Results **–** Previous investigations at this CAS include a site visit. The shot consists of various sized, small-diameter shot. The shot present in some portions of the site boundary is rusted and has been fused together. Other shot in the site boundary is gray and of smaller diameter. The shot is concentrated in a number of areas throughout the site boundary but is scattered thinly throughout the remainder of the area. The area is moderately vegetated with large bushes.

A.2.2 CAS 02-44-02, Paint Spills and French Drain

Corrective Action Site 02-44-02 consists of the soil impacted by the paint, historical spill, and french drain. Figure A.2-3 shows a site sketch of the CAS.

Physical Setting and Operational History – Corrective Action Site 02-44-02 is located on Yucca Flat in Area 2. The CAS components were identified in the vicinity of the Painters Shed, Shop, and Storage Rack in the Area 2 Camp. The Area 2 Camp was used to support LLNL drilling and construction activities. Although no specific information has been identified discussing the use of the painters buildings, it is assumed that this area was used to support the painters' activities and to store paint, equipment, tools, materials, and/or other items used by the painters to conduct work. These activities resulted in paint spills and the historical spill. It is unknown how the french drain was associated with the painters' activities.

Corrective Action Site 02-44-02 is located in the upper-central region of Area 2 in the Yucca Flat hydrographic region. Precipitation for the area from 2003 through 2008, as measured at the BJY Station, ranged from 4.33 to 10.43 in./yr, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. The CAS is located within the Aqueduct Mesa drainage basin, which drains south to Yucca Lake. The area is relatively flat with no nearby drainage channels. The nearest well is USGS WW-2, which is located approximately 0.68 mi northeast of CAS 02-44-02. The depth to groundwater on August 21, 2008, was measured at 2,051.1 ft bgs (USGS, 2008). The soil at CAS 02-44-02 appears native and consists of sand to cobble-sized alluvium of various lithologies. Although the soil is native, the area has been disturbed due to the construction of numerous facilities in the surrounding area.

Release Information – The release at this CAS include any paint or other material that may have spilled on or around the three painters facilities as well as any releases from the french drain. Scaling paint is found on the Painters Shed foundation, and paint spills are on the concrete pad and soil by the Paint Storage Rack. Documentation indicates that a spill, possibly of resin, occurred adjacent to the Paint Shop, although no staining is currently visible. No staining is visible around the french drain or on the sediment visible at the base of the drain.

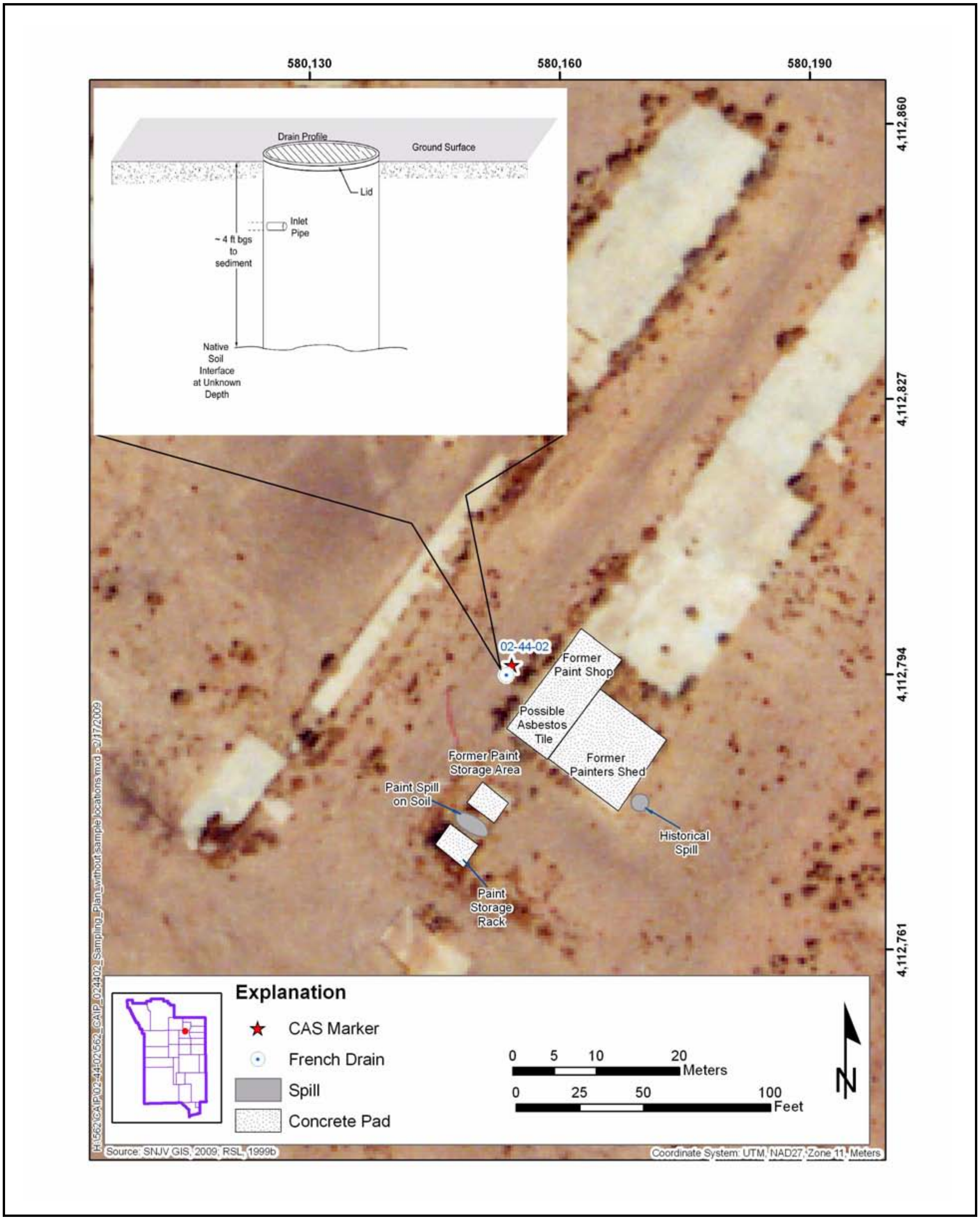

Figure A.2-3
Site Sketch of CAS 02-44-02, Paint Spills and French Drain

***Previous Investigation Results* –** Previous investigations at this CAS include a site visit. The french drain is located approximately 8 ft northwest of the Paint Shop building foundation. The french drain is 2 ft in diameter and has a 1- to 2-in. diameter inlet pipe coming from the direction of the former Paint Shop. The source of the piping is unknown. Soil or sediment is visible at approximately 4 ft bgs. The casing for the drain appears to be double lined, with no visible perforations in the casing.

A 20-by-20-ft area of paint stains and scaling paint is present on the Paint Shed building foundation. Additional paint is present on the soil and concrete pad at the Paint Storage Rack. The storage rack surrounds a concrete pad that is stained by paint. The paint spills on the soil adjacent to the outside of the northeastern side of the rack range from 1 to 2 in. thick and have been mixed in with soil. The paint spills cover an area approximately 15 by 3 ft. The remaining sides of the rack are surrounded by vegetation, so the extent of paint spills, if any, is unknown.

A historical spill was documented as having occurred adjacent to the southeastern edge of the former Painters Shed foundation. The spill was not visible during the field investigation, but the coordinates of the spill were provided in a historical document (REECo, 1995).

A.2.3 CAS 02-59-01, Septic System

Corrective Action Site 02-59-01 consists of the soil impacted by the septic system. Figure A.2-4 shows a site sketch of the CAS.

***Physical Setting and Operational History* –** Corrective Action Site 02-59-01 is located on Yucca Flat in Area 2. The CAS was identified adjacent to a cable runway in the Area 2 Camp, which was used to support LLNL drilling and construction activities. The LLNL Warehouse, Field Operations Support Facility, Photo Skid Trailer, Conference Room Trailer, and Cable Fabrication Building discharged to the septic system via toilets, sinks, service sinks, floor drains, and shower drains. The buildings have been demolished, but the trailers remain on site. The septic system is located south of the Conference Room Trailer. Cable spools are still being stored in the vicinity of the leachfield.

Corrective Action Site 02-59-01 is located in the upper central region of Area 2 in the Yucca Flat hydrographic region. Precipitation for the area from 2003 through 2008, as measured at the BJY

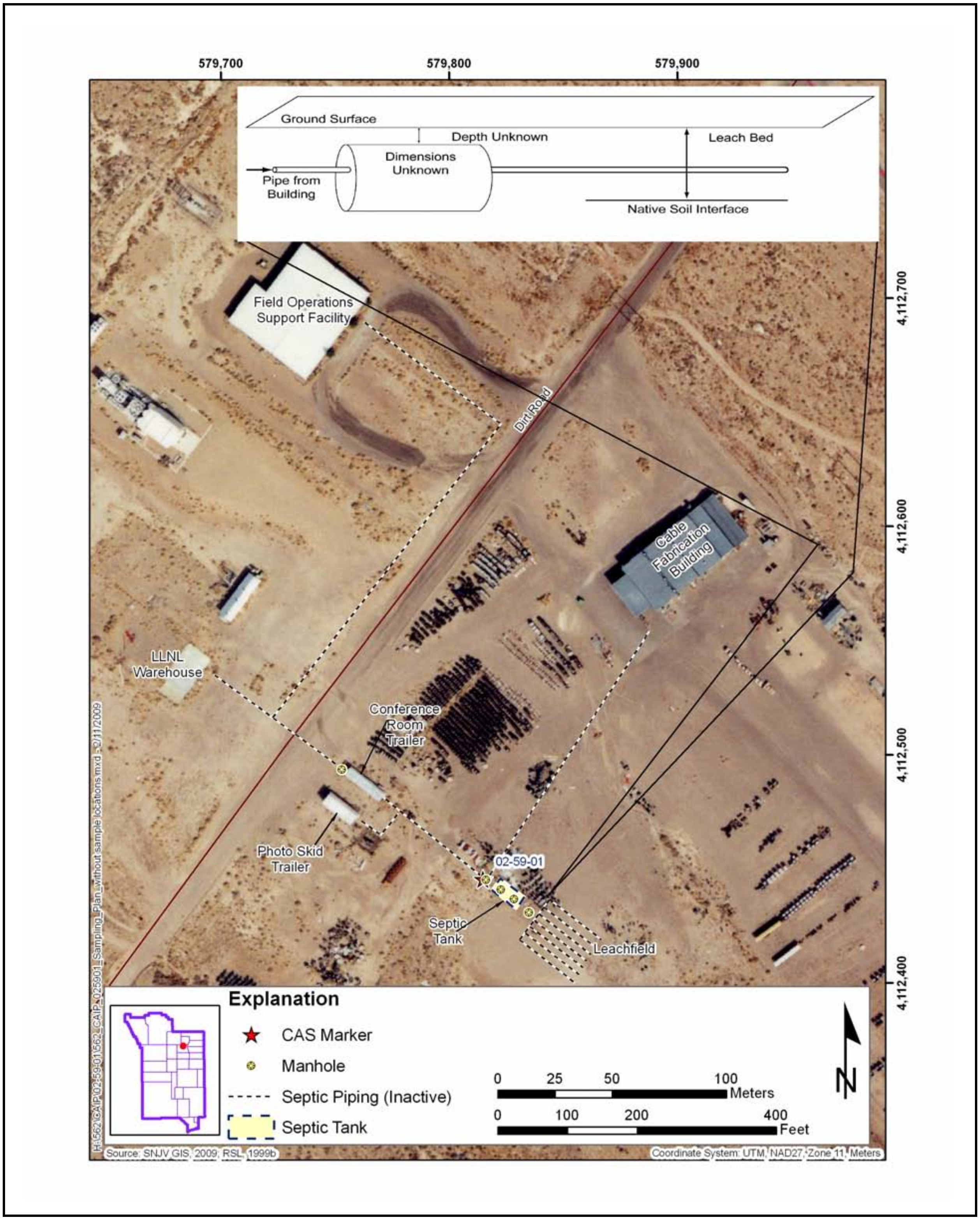

Figure A.2-4
Site Sketch of CAS 02-59-01, Septic System

Station, ranged from 4.33 to 10.43 in./yr, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. The CAS is located within the Aqueduct Mesa drainage basin, which drains south to Yucca Lake. The area is relatively flat with no nearby drainage channels. The nearest well is USGS WW-2, which is located approximately 1 mi northeast of CAS 02-59-01. The depth to groundwater on August 21, 2008, was measured at 2,051.1 ft bgs (USGS, 2008). The soil at CAS 02-59-01 appears native and consists of sand to cobble-sized alluvium of various lithologies. Although the soil is native, the area has been disturbed due to the construction of numerous facilities in the surrounding area.

Release Information **–** The release at this CAS includes the effluent from the buildings to the septic system. The contents of the tank are unknown; however, if material is present in the tank, there is a possibility that this PSM could be released if the tank containment fails at any time in the future.

Previous Investigation Results **–** Previous investigations at this CAS include a site visit. Because the septic tank and leachfield are subsurface, the four access manholes identify the location of the septic tank, and the northern-center-most portion of the leachfield. Another manhole is present north of the septic system, near the Conference Room Trailer. No other visible indicators of the system are present. Drawings show that the leachfield has seven leachlines and is 40 ft long by 35 ft wide. Based on these dimensions, a portion of the leachfield, and possibly the septic tank, is covered by cable spools that have been stored in the area.

A.2.4 CAS 02-60-01, Concrete Drain

Corrective Action Site 02-60-01 consists of the soil potentially impacted by releases from the concrete drain. Figure A.2-5 shows a site sketch of the CAS.

Physical Setting and Operational History **–** Corrective Action Site 02-60-01 is located on Yucca Flat in Area 2. The CAS was identified adjacent to the Area 2 Tank Farm and Operations Warehouse in the Area 2 Camp, which was used to support LLNL drilling and construction activities. Although no specific information has been identified discussing the use of the Area 2 Tank Farm and Operations Warehouse, documentation states that a 2-in. rubber hose ran from the building to the covered concrete drain. It is unknown whether there is any piping associated with the concrete drain or what

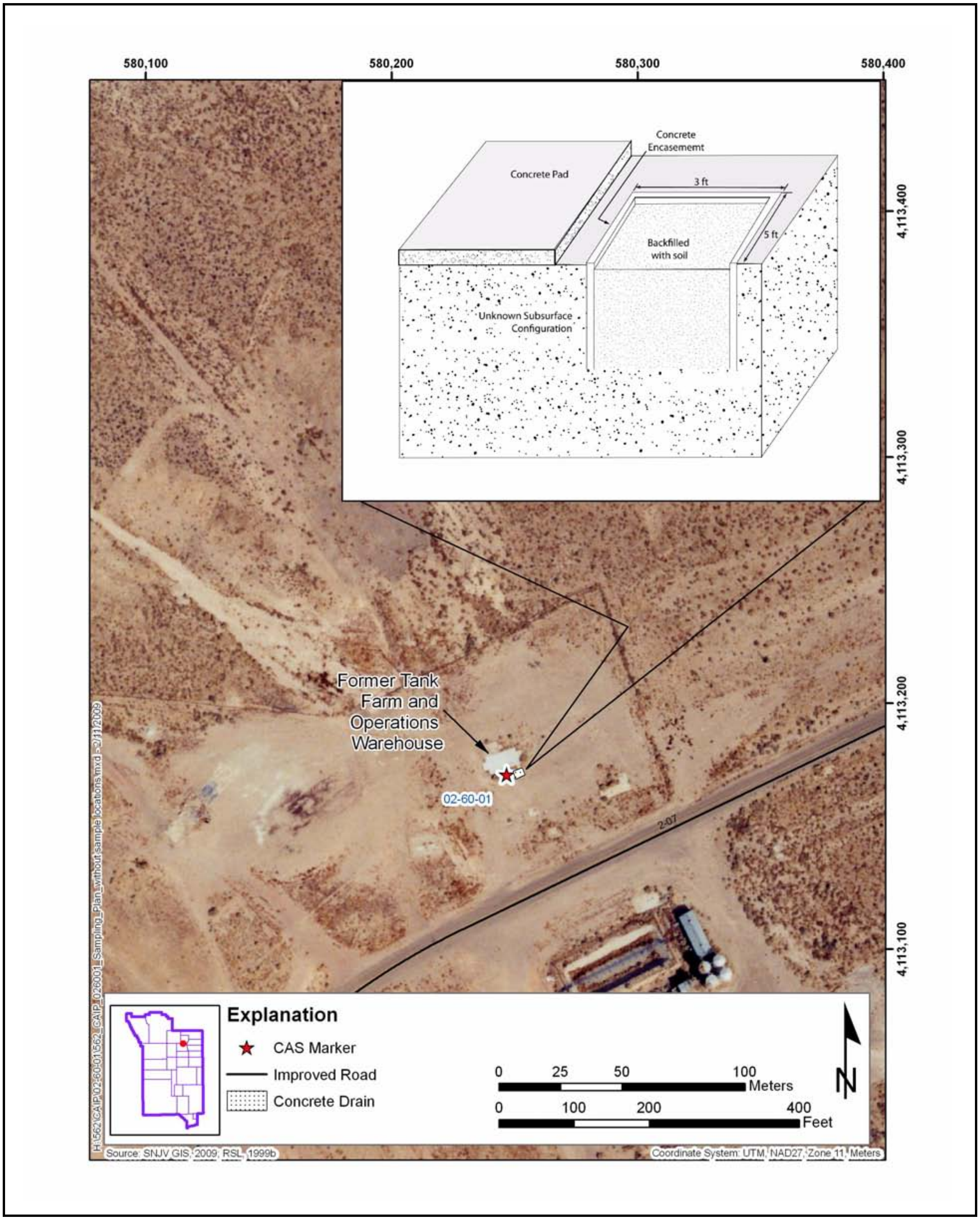

Figure A.2-5
Site Sketch of CAS 02-60-01, Concrete Drain

source discharged to the concrete drain. The Area 2 Tank Farm and Operations Warehouse has been demolished. All that remains is the building foundation and the concrete drain located adjacent to the southern edge of the foundation.

Corrective Action Site 02-60-01 is located in the upper-central region of Area 2 in the Yucca Flat hydrographic region. Precipitation for the area from 2003 through 2008, as measured at the BJY Station, ranged from 4.33 to 10.43 in./yr, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. The CAS is located within the Aqueduct Mesa drainage basin, which drains south to Yucca Lake. The area is relatively flat with no nearby drainage channels. The nearest well is USGS WW-2, which is located approximately 0.51 mi northeast of CAS 02-60-01. The depth to groundwater on August 21, 2008, was measured at 2,051.1 ft bgs (USGS, 2008). The soil at CAS 02-60-01 appears native and consists of sand to cobble-sized alluvium of various lithologies. Although the soil is native, the area has been disturbed due to the construction of numerous facilities in the surrounding area.

***Release Information* –** The release at this CAS includes effluent discharged to the soil surrounding the concrete drain. It is unknown whether the drain is enclosed or whether the effluent drained to the subsurface. No staining is visible around the concrete drain, and because the drain has been backfilled, it is unknown whether PSM exists at the base of the drain.

***Previous Investigation Results* –** Previous investigations at this CAS include a site visit and a geophysical survey. Currently, no cover is present on the drain, and the drain has been backfilled with native soil. A portion of the concrete border of the drain is still visible. The drain is adjacent to the southern side of the Area 2 Tank Farm and Operations Warehouse building foundation. A geophysical survey was completed of the concrete drain to determine whether piping was associated with this feature. There were no linear anomalies consistent with piping; however, two anomalies were identified directly outside the concrete encasement (Weston, 2007). It was noted that these were not a result of surface metal but could possibly be buried metal because the area has been disturbed. Further investigation is required to identify these anomalies.

A.2.5 CAS 02-60-02, French Drain

Corrective Action Site 02-60-02 consists of the soil potentially impacted by releases from the french drain and elongated drains adjacent to the building foundation. Figure A.2-6 shows a site sketch of the CAS.

***Physical Setting and Operational History* –** Corrective Action Site 02-60-02 is located on Yucca Flat in Area 2. The CAS was identified adjacent to the former Sheet Metal and Pipefitters Shop in the Area 2 Camp, which was used to support LLNL drilling and construction activities. Although no specific information has been identified discussing the exact use of the Sheet Metal and Pipefitters Shop, it is assumed that effluent from activities at this building was discharged to both the french drain and the elongated drains that are present along the northwestern side of the building foundation. It is unknown what source discharged to the drains. The Sheet Metal and Pipefitters Shop has been demolished, and the building foundation and drains are all that remain.

Corrective Action Site 02-60-02 is located in the upper-central region of Area 2 in the Yucca Flat hydrographic region. Precipitation for the area from 2003 through 2008, as measured at the BJY Station, ranged from 4.33 to 10.43 in./yr, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. The CAS is located within the Aqueduct Mesa drainage basin, which drains south to Yucca Lake. The area is relatively flat with no nearby drainage channels. The nearest well is USGS WW-2, which is located approximately 0.66 mi northeast of CAS 02-60-02. The depth to groundwater on August 21, 2008, was measured at 2,051.1 ft bgs (USGS, 2008). The soil at CAS 02-60-02 appears native and consists of sand to cobble-sized alluvium of various lithologies. Although the soil is native, the area has been disturbed due to the construction of numerous facilities in the surrounding area.

***Release Information* –** The release at this CAS includes effluent discharged to the soil surrounding the drains. The casing of the french drain is perforated so effluent would have been released to the surrounding soil. The elongated drains do not appear to be enclosed; therefore, the surrounding soil has likely been impacted by effluent discharged to the drain. No staining is visible around the drains or in the sediment present within the drains.

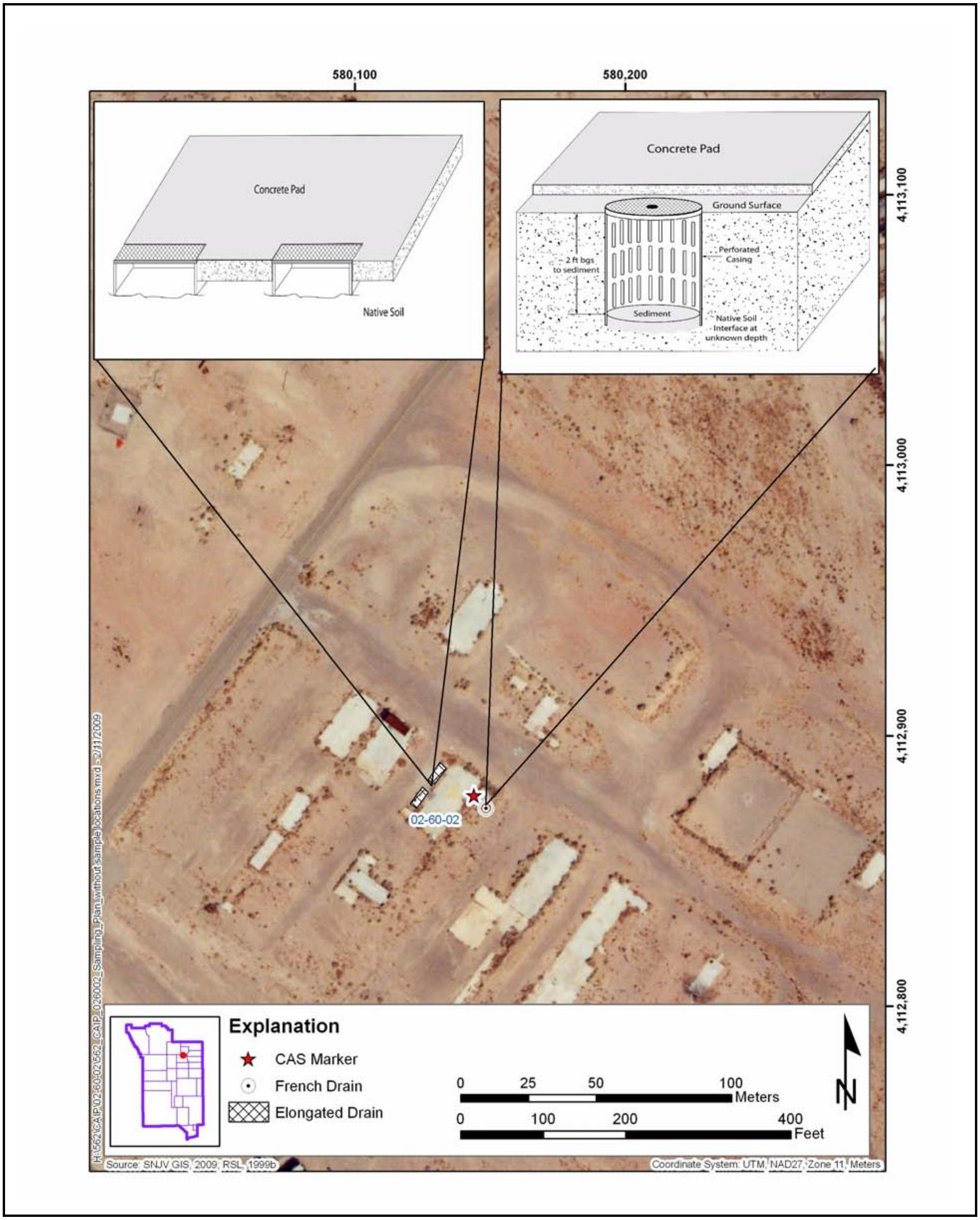

Figure A.2-6
Site Sketch of CAS 02-60-02, French Drain

Previous Investigation Results – Previous investigations of CAS 02-60-02 consist of a site visit and a geophysical survey. The french drain is covered by a thin, circular piece of steel with a small hole cut out of the center. The casing of the drain is perforated, and sediment is present at approximately 2 ft bgs. The two elongated drains are covered by a removable metal grate, and sediment is at the base of both drains. The drains do not appear to be enclosed, and there is no visual evidence of piping. A geophysical survey was conducted around the two elongated drains; no linear or other anomalies were identified (Weston, 2007). The french drain is located on the southeast side of the Sheet Metal and Pipefitters Shop building foundation, while the elongated drains are located on the edge of the northwestern side of the concrete pad.

A.2.6 CAS 02-60-03, Steam Cleaning Drain

Corrective Action Site 02-60-03 consists of the soil potentially impacted by releases from the steam cleaning sump and the drain/outfall that discharges from an adjacent concrete pad. Figure A.2-7 shows a site sketch of the CAS.

Physical Setting and Operational History – Corrective Action Site 02-60-03 is located on Yucca Flat in Area 2. The CAS was identified adjacent to the former Linemans Shop in the Area 2 Camp, which was used to support LLNL drilling and construction activities. Documentation states that historical steam cleaning activities took place in the Area 2 Camp, specifically in the Linemans Yard, Mechanics Yard, and Reefer Shop Yard. Equipment parts, air conditioner exteriors, and tunnel and heavy construction equipment were listed as items that were cleaned in these yards. Although no specific information has been identified discussing the exact equipment steam cleaned at CAS 02-60-03, it is assumed that equipment and vehicles from the Linemans Yard, and possibly the other yards mentioned, were decontaminated at this location.

Corrective Action Site 02-60-03 is located in the upper-central region of Area 2 in the Yucca Flat hydrographic region. Precipitation for the area from 2003 through 2008, as measured at the BJY Station, ranged from 4.33 to 10.43 in./yr, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. The CAS is located within the Aqueduct Mesa drainage basin, which drains south to Yucca Lake. The area is relatively flat with no nearby drainage channels. The nearest well is USGS WW-2, which is located approximately 0.72 mi northeast of CAS 02-60-03.

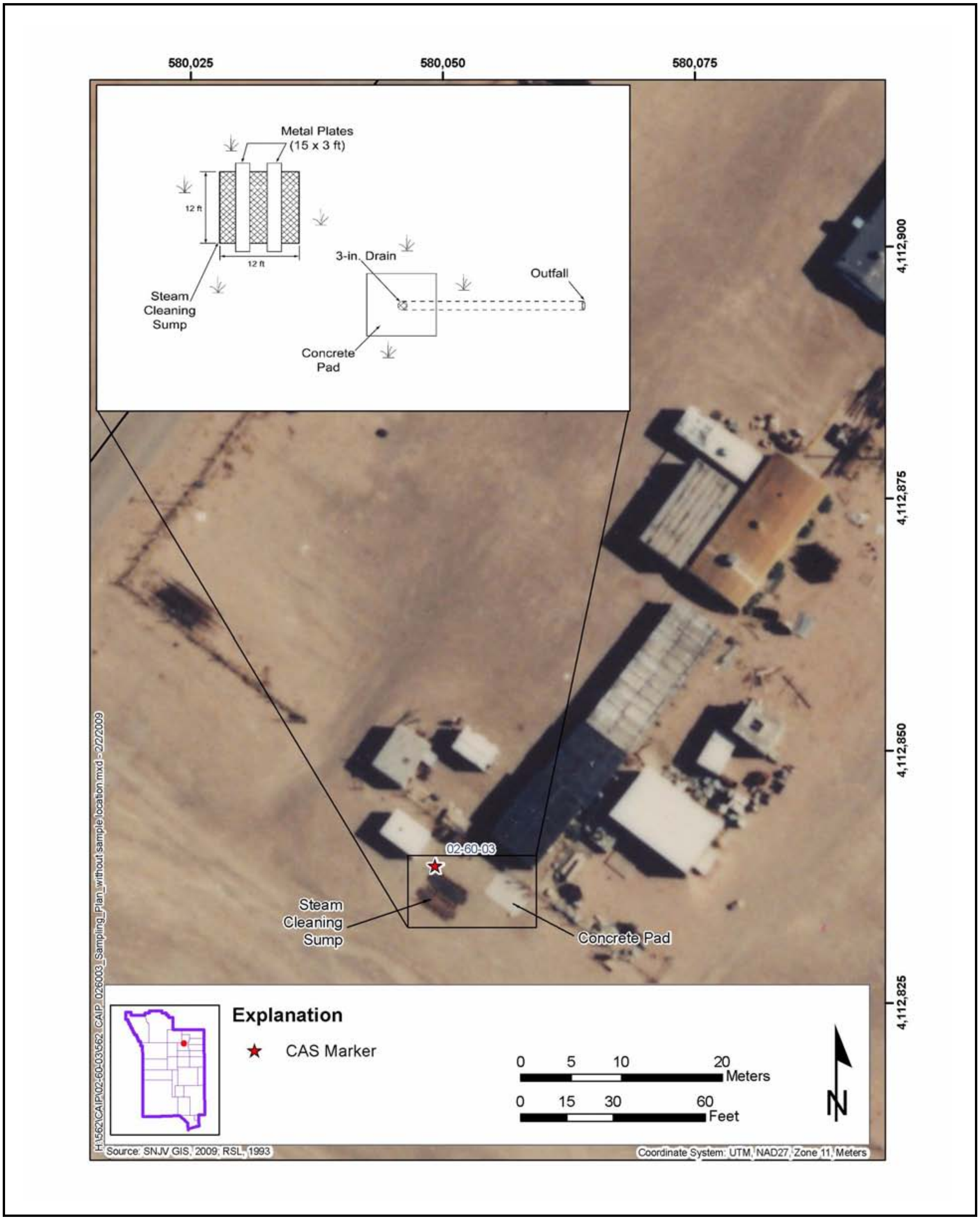

Figure A.2-7
Site Sketch of CAS 02-60-03, Steam Cleaning Drain

The depth to groundwater on August 21, 2008, was measured at 2,051.1 ft bgs (USGS, 2008). The soil at CAS 02-60-03 appears native and consist of sand to cobble-sized alluvium of various lithologies. Although the soil is native, the area has been disturbed due to the construction of numerous facilities in the surrounding area.

Release Information – The release at this CAS includes effluent discharged to the soil at the sump and drain/outfall location. As items were cleaned over the sump and on the concrete pad, there could have been runoff to the surrounding soil. It is unknown whether the base of the sump is open so that effluent would have been released directly to the soil below the sump. A drain in the center of the concrete pad presumably leads to the outfall, which is open to daylight and where effluent would have been discharged. No staining is visible around the sump or concrete pad and outfall location.

Previous Investigation Results – Previous investigations of CAS 02-60-03 consist of a site visit. The sump is covered by a metal grate that measures 12 by 12 ft and is configured for holding vehicles. Vegetation exists below the grate, so the base of the sump is not visible. The concrete pad with the 3-in. drain in the center is approximately 10 ft east of the sump. An open-ended, gray plastic pipe extends approximately 15 ft northeast from the concrete pad. The majority of the pipe is visible at the ground surface; however, a portion of the pipe is covered by uncompacted soil.

A.2.7 CAS 02-60-04, French Drain

Corrective Action Site 02-60-04 consists of the soil potentially impacted by releases from the french drain. Figure A.2-8 shows a site sketch of the CAS.

Physical Setting and Operational History – Corrective Action Site 02-60-04 is located on Yucca Flat in Area 2. The CAS was identified in a concrete pad adjacent to the former Refrigeration Shop in the Area 2 Camp, which was used to support LLNL drilling and construction activities. Although no specific information has been identified discussing the use of the french drain, it is assumed that the french drain was used in conjunction with activities at the Refrigeration Shop (i.e., cleaning parts and equipment on the concrete pad, disposal of fluids from the shop).

Corrective Action Site 02-60-04 is located in the upper-central region of Area 2 in the Yucca Flat hydrographic region. Precipitation for the area from 2003 through 2008, as measured at the BJY

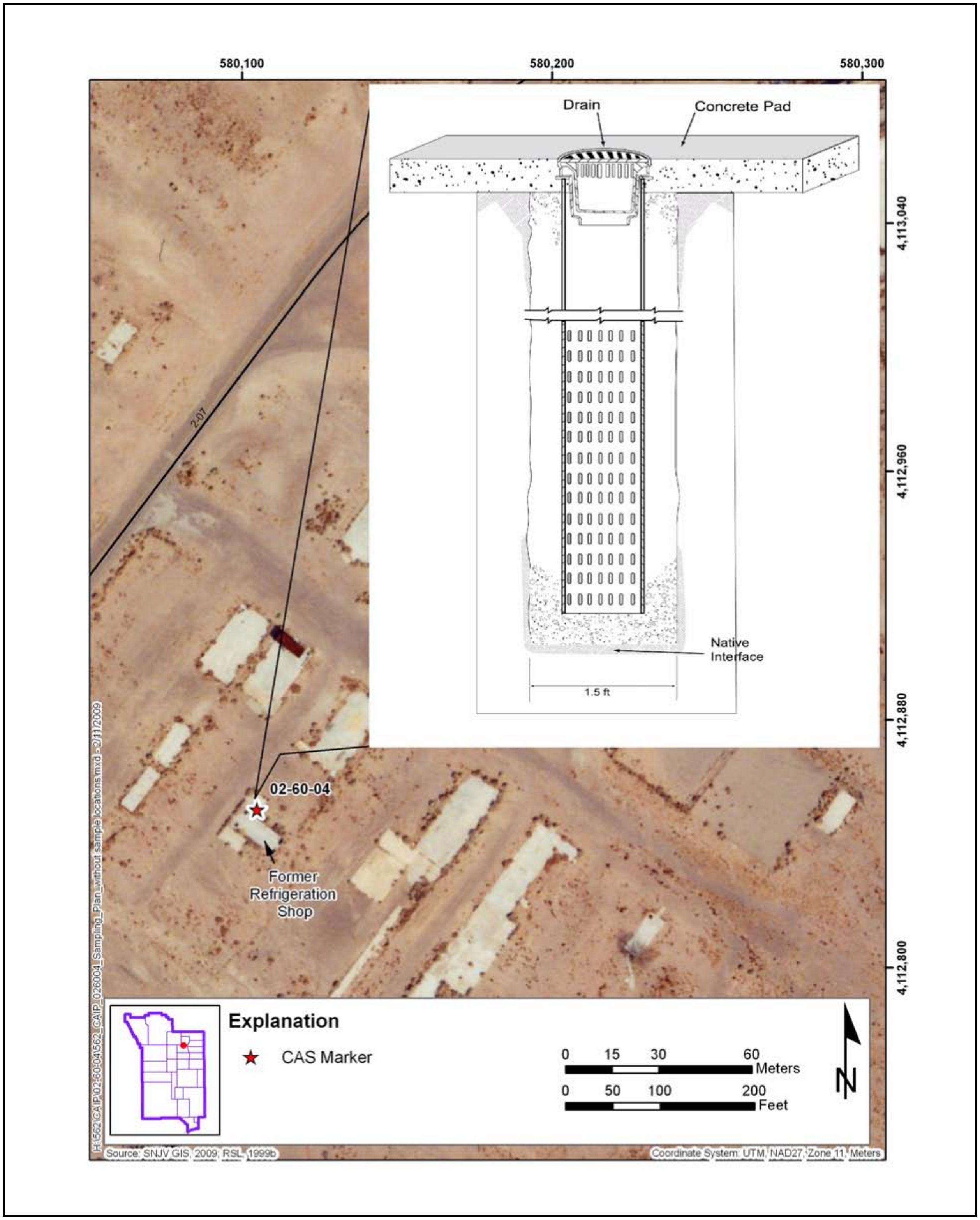

Figure A.2-8
Site Sketch of CAS 02-60-04, French Drain

Station, ranged from 4.33 to 10.43 in./yr, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. The CAS is located within the Aqueduct Mesa drainage basin, which drains south to Yucca Lake. The area is relatively flat with no nearby drainage channels. The nearest well is USGS WW-2, which is located approximately 0.69 mi northeast of CAS 02-60-04. The depth to groundwater on August 21, 2008, was measured at 2,051.1 ft bgs (USGS, 2008). The soil at CAS 02-60-04 appears native and consists of sand to cobble-sized alluvium of various lithologies. Although the soil is native, the area has been disturbed due to the construction of numerous facilities in the surrounding area.

Release Information **–** The release at this CAS includes effluent discharged to the soil via the french drain. The casing of the drain is perforated so that effluent could drain into the pea gravel pack that surrounds the casing. Ultimately, the effluent was released to the subsurface soil.

Previous Investigation Results **–** Previous investigations of CAS 02-60-04 consist of a site visit. A 12-in. diameter drain lid is present on the center of a concrete pad. A drawing show the drain casing extends 8.5 ft bgs and is surrounded by a 1.5 ft pea gravel pack. Soil and vegetation is present at about 1.5 ft below the drain lid. According to the drawing, a bucket sits on top of the casing, so the soil and vegetation may have been deposited in the bucket over time; therefore, the entire drain casing may not have been backfilled with soil. The casing is perforated but closed at the base.

A.2.8 CAS 02-60-05, French Drain

Corrective Action Site 02-60-05 consists of the soil potentially impacted by releases from the french drain. Figure A.2-9 shows a site sketch of the CAS.

Physical Setting and Operational History **–** Corrective Action Site 02-60-05 is located on Yucca Flat in Area 2. The CAS was identified adjacent to the former Operators Office and the D-38 Storage Yard in the Area 2 Camp, which was used to support LLNL drilling and construction activities. Documentation states that the french drain was used as a hand washing station, perhaps by personnel occupying the Operators Office or working in the storage yard. No other information has been identified discussing the use and details of the french drain.

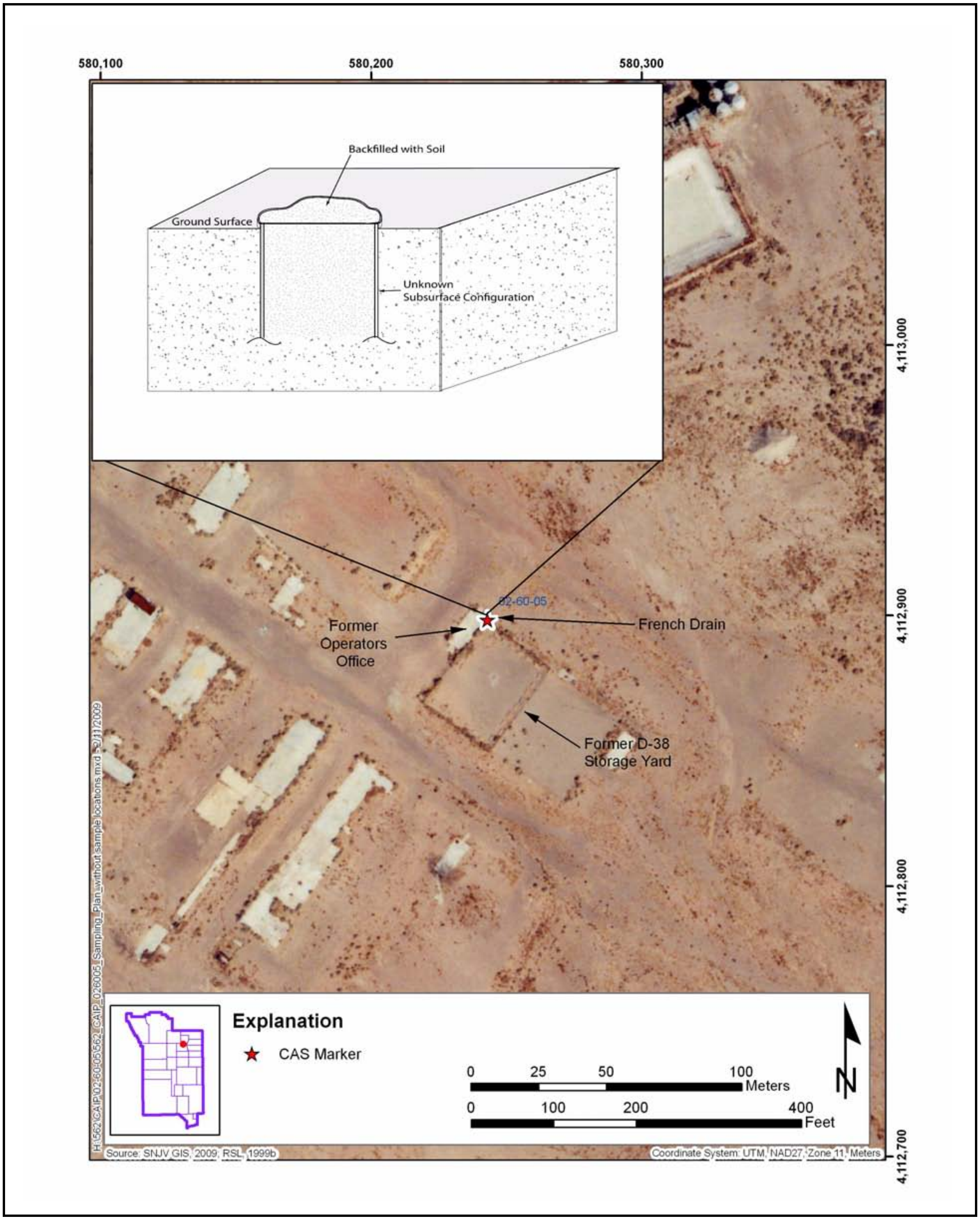

Figure A.2-9
Site Sketch of CAS 02-60-05, French Drain

Corrective Action Site 02-60-05 is located in the upper-central region of Area 2 in the Yucca Flat hydrographic region. Precipitation for the area from 2003 through 2008, as measured at the BJY Station, ranged from 4.33 to 10.43 in./yr, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. The CAS is located within the Aqueduct Mesa drainage basin, which drains south to Yucca Lake. The area is relatively flat with no nearby drainage channels. The nearest well is USGS WW-2, which is located approximately 0.60 mi northeast of CAS 02-60-05. The depth to groundwater on August 21, 2008, was measured at 2,051.1 ft bgs (USGS, 2008). The soil at CAS 02-60-05 appears native and consists of sand to cobble-sized alluvium of various lithologies. Although the soil is native, the area has been disturbed due to the construction of numerous facilities in the surrounding area.

Release Information **–** The release at this CAS includes effluent discharged to the french drain. It is unknown whether the drain is perforated or open at the base. No staining is visible around the french drain.

Previous Investigation Results **–** Previous investigations of CAS 02-60-05 consist of a site visit. The french drain may be a buried 55-gallon drum that has since been backfilled with native soil. The interior of the drain casing cannot be viewed. The rim of the casing is approximately 2 in. above ground surface and has been misshapen over time. The french drain is approximately 1 ft from the D-38 Storage Yard fencing. Vegetation is fairly dense in the area of the drain.

A.2.9 CAS 02-60-06, French Drain

Corrective Action Site 02-60-06 consists of the soil potentially impacted by releases from the french drain. Figure A.2-10 shows the location of the CAS.

Physical Setting and Operational History **–** Corrective Action Site 02-60-06 is located on Yucca Flat in Area 2. The CAS was identified adjacent to the former Electricians Shop in the Area 2 Camp, which was used to support LLNL drilling and construction activities. Documentation states that the french drain was used as a hand washing station, perhaps by personnel occupying the Electricians Shop. No other information has been identified discussing the use and details of the french drain.

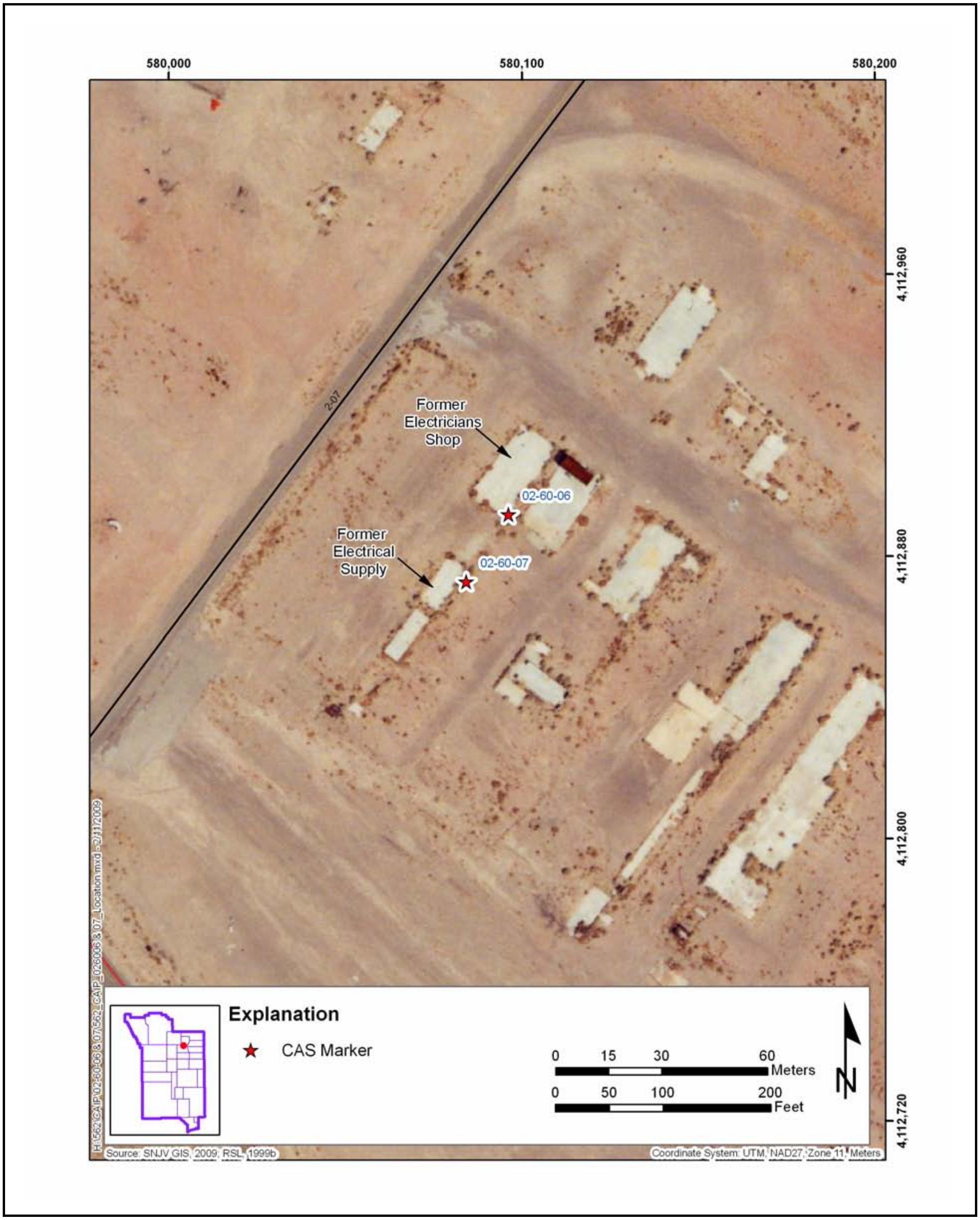

Figure A.2-10
Site Sketch of CASs 02-60-06, French Drain, and 02-60-07, French Drain

Corrective Action Site 02-60-06 is located in the upper-central region of Area 2 in the Yucca Flat hydrographic region. Precipitation for the area from 2003 through 2008, as measured at the BJY Station, ranged from 4.33 to 10.43 in./yr, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. The CAS is located within the Aqueduct Mesa drainage basin, which drains south to Yucca Lake. The area is relatively flat with no nearby drainage channels. The nearest well is USGS WW-2, which is located approximately 0.67 mi northeast of CAS 02-60-06. The depth to groundwater on August 21, 2008, was measured at 2,051.1 ft bgs (USGS, 2008). The soil at CAS 02-60-06 appears native and consists of sand to cobble-sized alluvium of various lithologies. Although the soil is native, the area has been disturbed due to the construction of numerous facilities in the surrounding area.

Release Information – The release at this CAS includes effluent discharged to the french drain. It is unknown whether the drain is perforated or open at the base. No additional information regarding release information has been identified.

Previous Investigation Results – Previous investigations of CAS 02-60-06 consist of a site visit and a geophysical survey. The french drain was not able to be identified during the site visit. A 3-in. steel pipe was found in the location where the french drain was identified in historical documentation. A geophysical survey of the pipe was completed, and a linear anomaly was found heading south from the pipe. Heavy vegetation surrounding not only the pipe but the entire building foundation limited the scope of the survey; therefore, the termination point of the linear anomaly was not found (Weston, 2007). It is not believed that the 3-in. pipe is the french drain, but it may be associated in some capacity. Removal of the vegetation surrounding the building foundation will be necessary to find the french drain. Because the configuration of the french drain is unknown, a site sketch has not been included.

A.2.10 CAS 02-60-07, French Drain

Corrective Action Site 02-60-07 consists of the soil potentially impacted by releases from the french drain. Figure A.2-10 shows the location of the CAS.

Physical Setting and Operational History **–** Corrective Action Site 02-60-07 is located on Yucca Flat in Area 2. The CAS was identified adjacent to the former Electrical Supply Building in the Area 2 Camp, which was used to support LLNL drilling and construction activities. Documentation states that the french drain was used as a hand washing station, perhaps by personnel occupying the Electrical Supply Building. No other information has been identified discussing the use and details of the french drain.

Corrective Action Site 02-60-07 is located in the upper-central region of Area 2 in the Yucca Flat hydrographic region. Precipitation for the area from 2003 through 2008, as measured at the BJY Station, ranged from 4.33 to 10.43 in./yr, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. The CAS is located within the Aqueduct Mesa drainage basin, which drains south to Yucca Lake. The area is relatively flat with no nearby drainage channels. The nearest well is USGS WW-2, which is located approximately 0.69 mi northeast of CAS 02-60-07. The depth to groundwater on August 21, 2008, was measured at 2,051.1 ft bgs (USGS, 2008). The soil at CAS 02-60-07 appears native and consists of sand to cobble-sized alluvium of various lithologies. Although the soil is native, the area has been disturbed due to the construction of numerous facilities in the surrounding area.

Release Information **–** The release at this CAS includes effluent discharged to the french drain. It is unknown whether the drain is perforated or open at the base. No additional information regarding release information has been identified.

Previous Investigation Results **–** Previous investigations of CAS 02-60-07 consist of a site visit and a geophysical survey. The french drain was not able to be identified during the site visit. A 4-in. steel pipe was found in the location where the french drain was identified in historical documentation. A geophysical survey of the pipe was completed, and no anomalies were identified. Heavy vegetation surrounding not only the pipe but the entire building foundation limited the scope of the survey. It is not believed that the 4-in. pipe is the french drain, but it may be associated in some capacity. Removal of the vegetation surrounding the building foundation will be necessary to find the french drain. Because the configuration of the french drain is unknown, a site sketch has not been included.

A.2.11 CAS 23-60-01, Mud Trap Drain and Outfall

Corrective Action Site 23-60-01 consists of the soil potentially impacted by releases from the mud trap, grease rack, and outfall. Figure A.2-11 shows a site sketch of the CAS.

Physical Setting and Operational History – Corrective Action Site 23-60-01 is located in Mercury in Area 23. The CAS was identified adjacent to a wash shed in the former DNA Compound. The DNA Compound supported various DoD activities, including offices, maintenance buildings, gasoline pumps, and a vehicle wash area. The mud trap, grease rack, and outfall were added in 1958 to support the vehicle wash area. A trench drain present inside the wash shed collected effluent and discharged to the mud trap via piping. Overflow from the mud trap would then discharge to the outfall, which is located outside the compound fence line. No specific documentation was identified discussing the use of the grease rack, although it is assumed to have been used for vehicle maintenance.

Corrective Action Site 23-60-01 is located within the Mercury Valley drainage basin. Precipitation for the area from 2003 through 2008, as measured at the Mercury Gauging Station, ranged from 3.38 to 8.11 in. per year, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. Surface drainage and groundwater flow in the Mercury Valley is in the southwest direction. The outfall discharged to a wash south of the CAS that flows west. The nearest groundwater well to CAS 23-60-01 is USGS Well SM-23-1, an active well located approximately 1.5 mi southwest of the sites. The most recent recorded depth to the water table is approximately 1,164 ft bgs (USGS, 2008). The soil near the mud pit and grease rack consists of non-native pea gravel on the surface with a fine sandy silt below that is likely fill material. Near the outfall, the soil appears native and consists of sand to cobble-sized alluvium of various lithologies.

Release Information – The release at this CAS includes effluent discharged to the soil from the mud trap, grease, rack, and outfall. The mud trap is contained, so unless there has been a breach in the concrete encasement or piping or an overflow, there should not be a release associated with the mud trap. The outfall was designed to release to daylight, although the outfall currently is covered by soil. No containment exists below the grease rack; therefore, if vehicles were in place on the grease rack

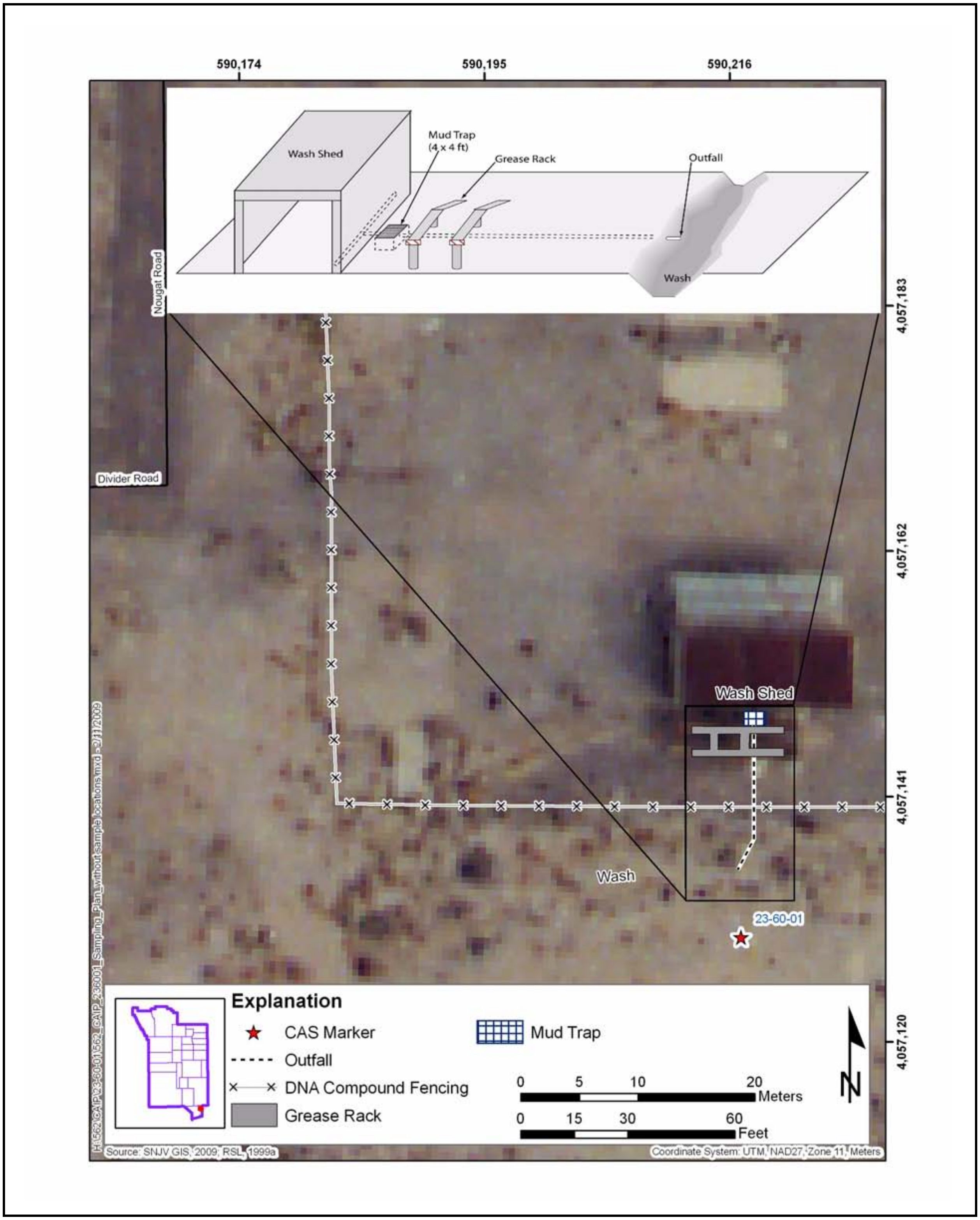

Figure A.2-11
Locations of CAS 23-60-01, Mud Trap Drain and Outfall

and a leak or spill occurred, then there would have been a release to the soil. No staining is visible in the wash or below the grease rack.

Previous Investigation Results – Previous investigations of CAS 23-60-01 consist of a site visit and a geophysical survey. A concrete trench inside the wash shed drains to the mud trap via a 4-in. pipe. The mud trap is 4 by 4 by 4 ft, with 6-in. thick concrete walls. Two pieces of metal grate cover the mud trap so rainwater can enter the trap. During the site visit, liquid was present in the trap, presumably due to recent heavy rainfall. The mud trap drains via piping to the outfall area located approximately 40 ft south of the mud trap. The outfall originally opened up in a wash but has since been covered by soil erosion. The termination point of the outfall was determined through a geophysical survey (Weston, 2007).

A.2.12 CAS 23-99-06, Grease Trap

Corrective Action Site 23-99-06 consists of the soil potentially impacted by releases from the grease trap. Figure A.2-12 shows a site sketch of the CAS.

Physical Setting and Operational History – Corrective Action Site 23-99-06 is located in Mercury in Area 23. The CAS was identified adjacent to Building 109, a former commercial gas service station. The building is currently used as the Housing/Revenues Building. Before the building was converted to its current configuration, a grease pit and drywell inside the building drained to the grease trap located on the south side of Building 109. The grease trap then drained via piping to the active sewer system. Sometime in the mid-1980s, the grease pit and drywell were made inactive and filled with concrete so that discharge to the grease trap ceased. The grease trap was not filled in during the building renovation.

Corrective Action Site 23-99-06 is located within the Mercury Valley drainage basin. Precipitation for the area from 2003 through 2008, as measured at the Mercury Gauging Station, ranged from 3.38 to 8.11 in. per year, with a mean annual value of 6.73 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. Surface drainage and groundwater flow in the Mercury Valley is in the southwest direction. No washes exist near CAS 23-99-06. The nearest groundwater well to CAS 23-99-06 is USGS Well SM-23-1, an active well located approximately 1.5 mi southwest of the sites. The most

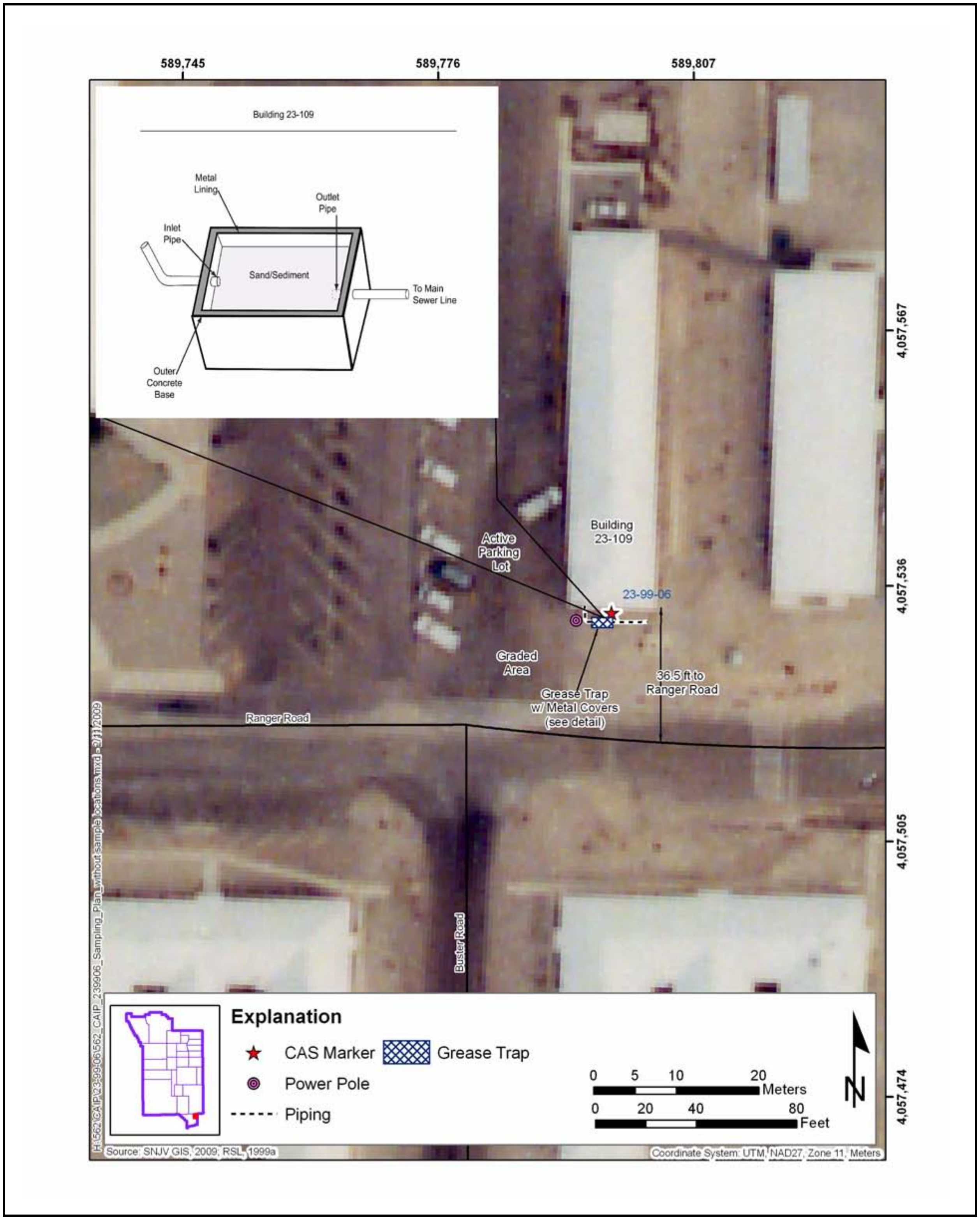

Figure A.2-12
Site Sketch of CAS 23-99-06, Grease Trap

recent recorded depth to the water table is approximately 1,164 ft bgs (USGS, 2008). The soil consists of sand to cobble-sized alluvium of various lithologies and has been disturbed due to the CAS's location in an active area.

Release Information **–** The potential release at this CAS includes effluent discharged to the soil from the grease trap. The grease trap is contained so unless there has been a breach in the concrete encasement or piping or an overflow, there should not be a release associated with the grease trap.

Previous Investigation Results **–** Previous investigations of CAS 23-99-06 consist of a site visit. The grease trap is 5 by 3 ft, with 6 in.-thick concrete walls. The grease trap is completely covered by two heavy pieces of metal. The lids were removed to expose the grease trap's interior. The grease trap is partially filled with damp soil that has a hydrocarbon odor. The grease trap drains via piping to sewer system piping.

A.2.13 CAS 25-60-04, Building 3123 Outfalls

This CAS was added to CAU 562 after the DQO strategy was developed and agreed upon. However, this site consists of outfalls that were already present on the agreed upon CSM; therefore, no adjustments to the CSM was necessary.

Corrective Action Site 25-60-04 consists of the soil impacted by releases from the two outfalls. Figure A.2-13 shows a site sketch of the CAS.

Physical Setting and Operational History **–** Corrective Action Site 25-60-04 is located in the Reactor Control Point (RCP) in Area 23. The CAS was identified as being associated with Building 3123, Technical Services, which contained laboratory, shop, and office space. Two outfalls were identified, Drain A and Drain B. Drain A received effluent from floor drains, utility trench drains, and sinks present in the labs; some of the labs were named the Neutronics Lab, Radiation Lab, and Central Repair. Drain A was designed to extend 25 ft west of the building and drain to daylight. One sink and one floor drain from a room with unknown use discharged to Drain B, which was designed to extend between 33.5 and 40 ft south of the building and drain to daylight. Drains A and B consisted of 4-in. acid-resistant piping called Duriron. The building is currently being used for other purposes, and effluent was inadvertently being discharged to the outfalls. Drain A has been receiving effluent

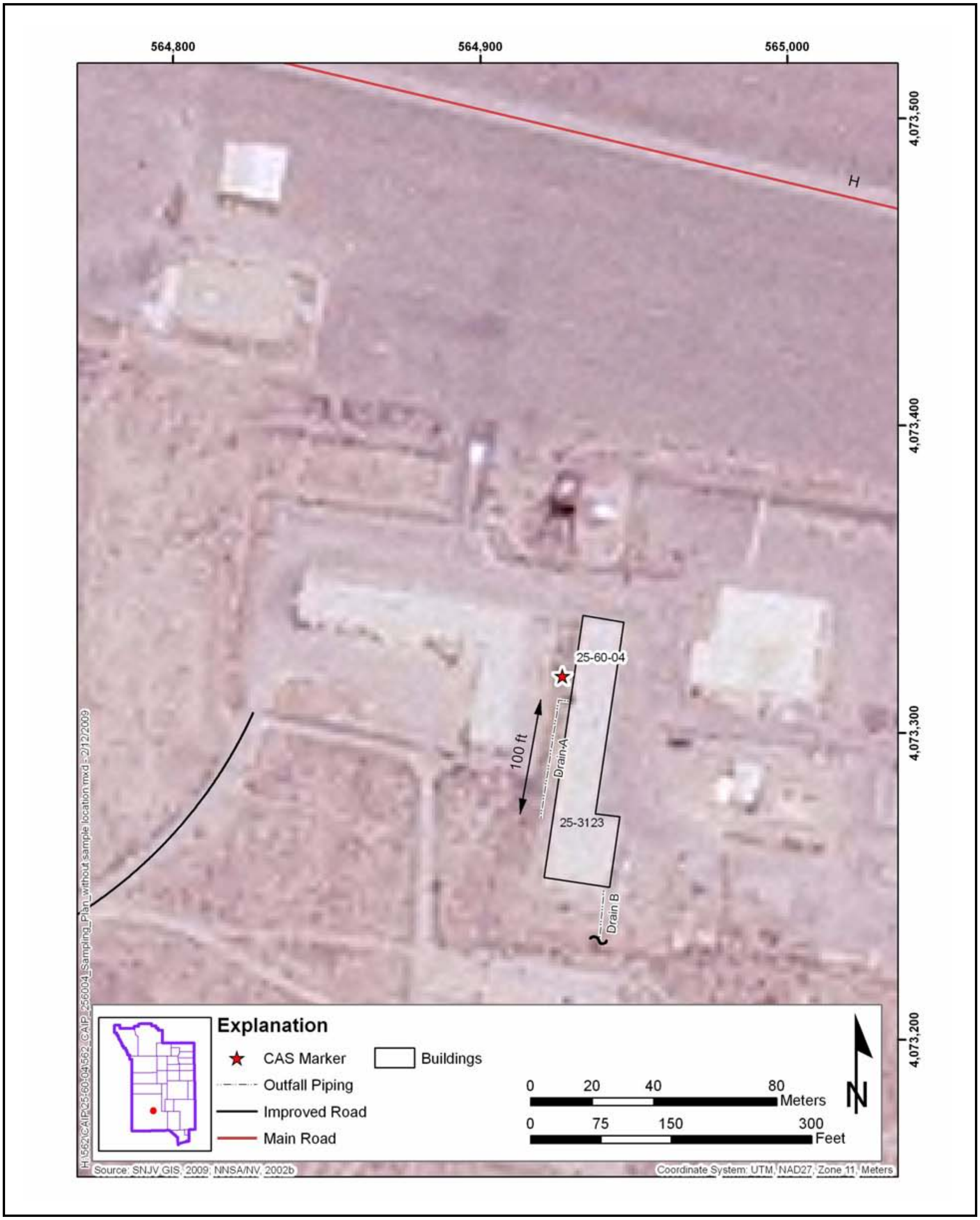

Figure A.2-13
Site Sketch of CAS 25-60-04, Building 3123 Outfalls

from the main kitchen (located in the former laboratory area), while Drain B has been receiving effluent from a smaller kitchen area. Although the building remains active, the source of discharge to the outfalls has ceased and they are now inactive.

Corrective Action Site 25-60-04 is located in Area 25 within the Jackass Flats drainage basin. Precipitation for the area from 2003 through 2008, as measured at the Jackass Flats (4JA) Station, ranged from 3.99 to 11.04 in./yr, with a mean annual value of 7.74 in. (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95 percent UCL of 63.07 in. Area 25 (Jackass Flats) is an intermontane valley of the NTS bordered by highlands on all sides except for a large drainage outlet to the southwest. The nearest groundwater well to CAS 25-60-04 is the J-11 Water Well, which is located 1.5 mi southwest. The most recent recorded depth to the water table is approximately 1,040 ft bgs (USGS, 2008). The soil at CAS 25-60-04 appears native and consists of sand to cobble-sized alluvium of various lithologies.

Release Information **–** The potential release at this CAS includes effluent discharged to the soil from the two outfalls. Both outfalls drained to the ground surface initially, and more recently, to subsurface soils.

Previous Investigation Results **–** Previous investigations of CAS 25-60-04 consist of a site visit and a camera survey. The original termination point for Drain A was identified by excavation to be about 25 ft west of the building. An elbow has been added to the end of the pipe, and the pipe now terminates approximately 100 ft south of the original termination point. The pipe is buried approximately 2 ft bgs and a length of the pipe is covered by asphalt. Stained soil, which smelled heavily of kitchen grease, was evident at the opening of the outfall. The excavations remain open. An attempt was made to put a camera down Drain B to ascertain its configuration; however, the camera was not able to navigate the bend in the pipe due to the angle the pipe takes to the subsurface. No evidence exists of the pipe on the ground surface; therefore, the pipe may have been covered with soil or has been reconfigured.

A.3.0 Step 1 - State the Problem

Step 1 of the DQO process defines the problem that requires study, identifies the planning team, and develops a conceptual model of the environmental hazard to be investigated.

The problem statement for CAU 562 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 562."

A.3.1 Planning Team Members

The DQO planning team consists of representatives from NDEP, NNSA/NSO, SNJV, and NSTec. The DQO planning team met on December 11, 2008, for the DQO meeting. The primary decision makers are the NDEP and NNSA/NSO representatives.

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 defines 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 562 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 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 will be notified and given the opportunity to comment on, or concur with, the recommendation.

The applicability of the CSM to each CAS is summarized in Table A.3-1 and discussed below. Table A.3-1 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.

Table A.3-1
Conceptual Site Model Description of Elements for Each CAS in CAU 562
(Page 1 of 2)

CAS Identifier	**02-26-11**	**02-44-02**	**02-59-01**	**02-60-01**	**02-60-02**	**02-60-03**	**02-60-04**	**02-60-05**	**02-60-06**	**02-60-07**	**23-60-01**	**23-99-06**	**25-60-04**
CAS Description	**Lead Shot**	**Paint Spills and French Drain**	**Septic System**	**Concrete Drain**	**French Drain**	**Steam Cleaning Drain**	**French Drain**	**French Drain**	**French Drain**	**French Drain**	**Mud Trap Drain and Outfall**	**Grease Trap**	**Building 3123 Outfalls**
Site Status	Sites are inactive and/or abandoned												
Exposure Scenario	Occasional Use Area										Industrial Use Area		
Sources of Potential Soil Contamination	Shot	Paint, effluent, spill	Effluent								Effluent, spills	Effluent	
Location of Contamination/ Release Point	Surface soil at or near locations of shot	Surface soil at or near the spill and paint; subsurface soil below the french drain	Subsurface soil below site components		Surface soil at or near the elongated drains; subsurface soil below the french drain	Surface soil at or near the sump, concrete pad, and outfall; subsurface soil below the sump	Subsurface soil below the french drains				Surface soil at or near the outfall and grease rack; subsurface soil below the mud trap	Subsurface soil below the grease trap	Shallow subsurface and subsurface soil at the outfall termination points
Amount Released	Unknown												

Table A.3-1
Conceptual Site Model Description of Elements for Each CAS in CAU 562
(Page 2 of 2)

CAS Identifier	02-26-11	02-44-02	02-59-01	02-60-01	02-60-02	02-60-03	02-60-04	02-60-05	02-60-06	02-60-07	23-60-01	23-99-06	25-60-04
Affected Media	Surface soil	Surface and subsurface soil; concrete pads	Subsurface soil		Surface and shallow subsurface soil		Shallow subsurface soil				Surface and shallow subsurface soil	Subsurface soil	Shallow subsurface and subsurface soil
Potential Contaminants	Lead		Unknown								TPH-DRO		Unknown
Transport Mechanisms	Percolation of precipitation through subsurface media serves as the major driving force for migration of contaminants. Surface water runoff may provide for the transportation of some contaminants within or outside the footprints of the CASs. The drains, septic system, and outfalls received effluent that could have served as a driving source for the migration of contaminants.												
Migration Pathways	Vertical transport is expected to dominate over lateral transport due to small surface gradients, except the outfall at CAS 23-60-01, which is located in a wash.												
Lateral and Vertical Extent of Contamination	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. Lateral and vertical extent of COC contamination is assumed to be within the spatial boundaries.												
Exposure Pathways	The potential for contamination exposure is limited to industrial and construction workers, and military personnel conducting training. These human receptors may be exposed to COPCs through oral ingestion, inhalation, dermal contact (absorption) of soil and/or debris due to inadvertent disturbance of these materials or irradiation by radioactive materials.												

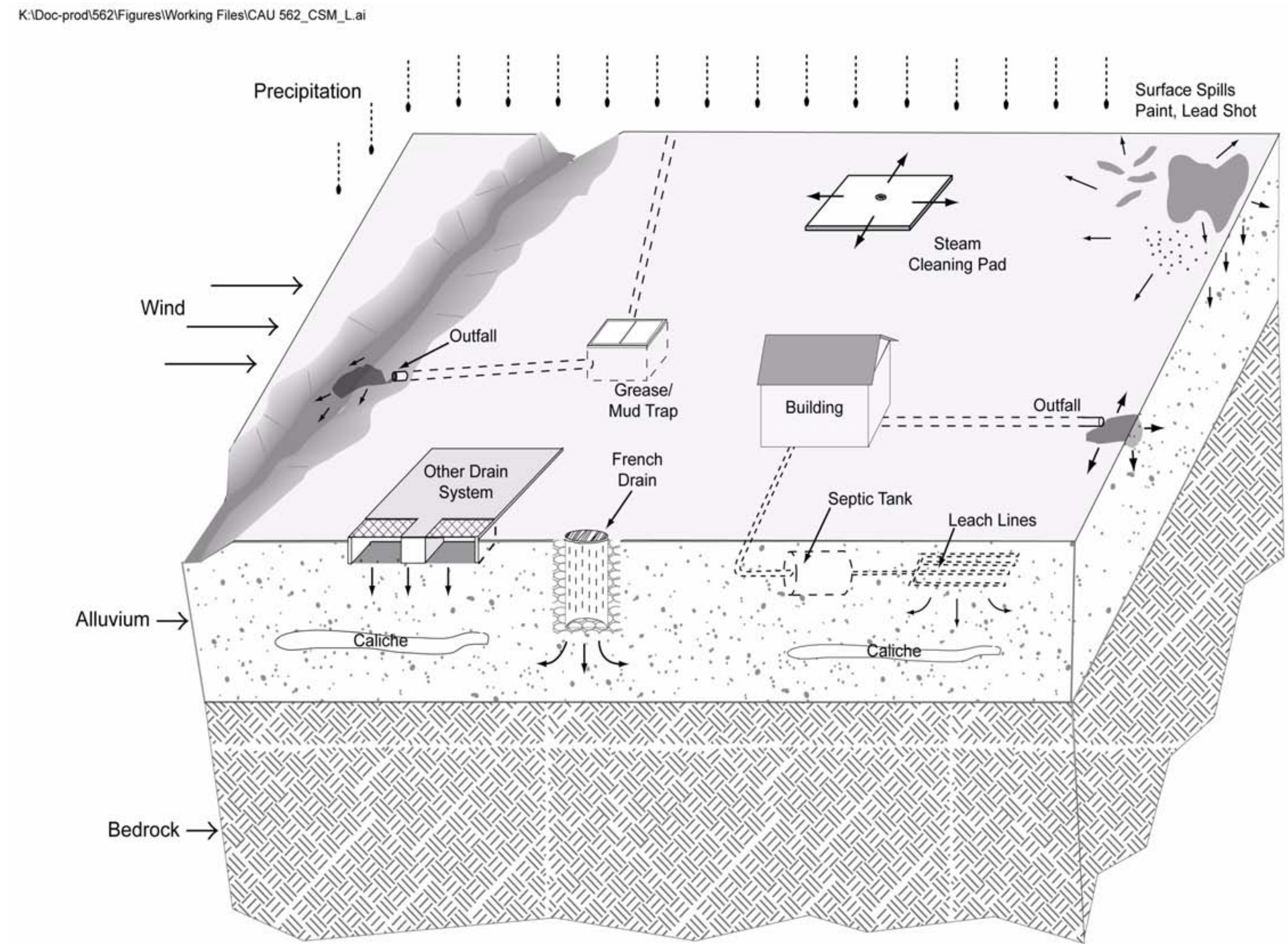

Figure A.3-1
Conceptual Site Model for CAU 562

A.3.2.1 Contaminant Release

The most likely locations of the contamination and releases to the environment are the soils directly below or adjacent to the CSM's surface and subsurface components (i.e., lead shot; septic tank; drains; sump; associated underground piping, including outfalls; grease/mud traps; and leachfield). The CSM accounts for potential releases resulting from overflow to the ground surface from system components (e.g., drains, sump, drains, and traps) and surface spills. Any contaminants migrating from CASs, regardless of physical or chemical characteristics, are expected to exist at interfaces, and in the soil adjacent to spills and disposal features in lateral and vertical directions. Concentrations are expected to decrease with lateral 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 562 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 contaminants that could potentially be present at each CAS. The COPCs applicable to Decision I environmental samples from each of the CASs of CAU 562 are defined as the constituents reported from the analytical methods presented in Table A.3-2. Pesticides and herbicides have been included in the analytical suite for CAS 02-59-01, as these have been found in other septic system investigations on the NTS. Available information on all other CASs suggest that pesticides were not stored, mixed, or handled at the associated facilities. The CASs within CAU 562 that are identified as french drains are associated with former shops (e.g., paint and electrical) that have no history of storing or mixing pesticides or herbicides. Antimony has been included in the analytical suite for CAS 02-26-11, because it has been historically used as a hardener for lead shot. Because CAS 25-60-04 is located near the Reactor Control Point of Area 25, and has been identified as a potential beryllium site, beryllium has been added to the analytical suite for this CAS.

During the review of site history documentation, process knowledge information, personal interviews, past investigation efforts (where available), and inferred activities associated with the CASs, some of the COPCs were identified as targeted contaminants at specific CASs. Targeted

Table A.3-2
Analytical Program[a]

Analyses	02-26-11	02-44-02	02-59-01	02-60-01	02-60-02	02-60-03	02-60-04	02-60-05	02-60-06	02-60-07	23-60-01	23-99-06	25-60-04
Organic COPCs													
TPH-DRO	X	X	X	X	X	X	X	X	X	X	X	X	X
PCBs	X	X	X	X	X	X	X	X	X	X	X	X	X
SVOCs	X	X	X	X	X	X	X	X	X	X	X	X	X
VOCs	X	X	X	X	X	X	X	X	X	X	X	X	X
Pesticides	--	--	X	--	--	--	--	--	--	--	--	--	--
Herbicides	--	--	X	--	--	--	--	--	--	--	--	--	--
Inorganic COPCs													
RCRA Metals	X	X	X	X	X	X	X	X	X	X	X	X	X
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	X
Antimony	X	--	--	--	--	--	--	--	--	--	--	--	--
Radionuclide COPCs													
Gamma Spectroscopy[b]	X	X	X	X	X	X	X	X	X	X	X	X	X

[a]The COPCs are the constituents reported from the analytical methods listed.
[b]Results of gamma analysis will be used to determine whether further isotopic analysis is warranted.

X = Required analytical method
-- = Not required

contaminants are those COPCs for which available site and process information suggests that they may be reasonably suspected to be present at a given CAS. The targeted contaminants are required to meet more stringent completeness criteria than other COPCs, thus providing greater protection against a decision error (see Section 6.2.6). Targeted contaminants for each CAU 562 CAS are identified in Table A.3-3.

Table A.3-3
Targeted Contaminants for CAU 562

CAS	Chemical Targeted Contaminant(s)	Radiological Targeted Contaminant(s)
02-26-11	Lead	None
02-44-02	Lead	None
02-59-01	None	None
02-60-01	None	None
02-60-02	None	None
02-60-03	None	None
02-60-04	None	None
02-60-05	None	None
02-60-06	None	None
02-60-07	None	None
23-60-01	TPH-DRO (hazardous constituents of diesel)	None
23-99-06	TPH-DRO (hazardous constituents of diesel)	None
25-60-04	None	None

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 or 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.

A.3.2.5 Migration Pathways and Transport Mechanisms

Migration pathways include the lateral migration of potential contaminants across surface soils/sediments and vertical migration of potential contaminants through subsurface soils. Contaminants released into a wash, as in the case at CAS 23-60-01, are subject to a much higher potential for lateral transport than contaminants released to other surface areas that are not in drainage areas. Washes are generally dry but are subject to infrequent, potentially intense, stormwater flows. These stormwater flow events provide an intermittent mechanism for both vertical and horizontal transport of contaminants. Contaminated sediments entrained by these stormwater events would be carried by the streamflow to locations where the flowing water loses energy and the sediments drop out. These locations are readily identifiable by hydrologists as sedimentation areas. Surface water from the Area 2 CASs drain to Yucca Lake, while the Area 23 surface water drains to Amargosa Valley.

Infiltration and percolation of precipitation serves as a driving force for downward migration of contaminants. However, due to high PET (annual PET at the Area 3 RWMS has been estimated at 62.6 in. [Shott et al., 1997]) and limited precipitation for this region (6.35 in./yr [ARL/SORD, 2008]), percolation of infiltrated precipitation at the NTS does not provide a significant mechanism for vertical migration of contaminants to groundwater (DOE/NV, 1992).

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 irradiation by radioactive materials. The land-use and exposure scenarios for the CAU 562 CASs are listed in

Table A.3-4. These are based on NTS current and future land use. The Area 2 CASs are at remote locations without any site improvements and where no regular work is performed. The possibility still exists, 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. The Area 23 and 25 CASs are in populated areas where site improvement can take place and where regular work is performed. Therefore, these sites are classified as industrial use areas.

Table A.3-4
Land-Use and Exposure Scenarios

CAS	Record of Decision Land-Use Zone	Exposure Scenario
02-26-11 02-44-02 02-59-01 02-60-01 02-60-02 02-60-03 02-60-04 02-60-05 02-60-06 02-60-07	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 Worker will be exposed to the site occasionally (up to 80 hours per year for 5 years). Site structures are not present for shelter and comfort of the worker.
23-60-01 23-99-06	Reserved (within NTS area) This area is 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 DoD land-navigation exercise and training.	Industrial Area Worker will be exposed to the site full time (225 days per year, 10 hours per day for 25 years). Active powered buildings with toilets are present at the site.
25-60-04	Research Test and Experiment The Research Test and Experiment Zone is designated for small-scale research and development projects and demonstrations; pilot projects; outdoor tests; and experiments for development, QA, or reliability of material and equipment under controlled conditions. This includes compatible nondefense research, development, and testing projects and activities.	

A.4.0 Step 2 - Identify the Goal of the Study

Step 2 of the DQO process states how environmental data will be used in meeting objectives and solving the problem, identifies study questions or decision statement(s), and considers alternative outcomes or actions that can occur upon answering the question(s).

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. 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:

- The lateral and vertical extent of COC contamination
- The information needed to determine potential remediation waste types
- The information needed to evaluate the feasibility of remediation alternatives

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 future release from source material introducing a COC to the surrounding environmental media, the following conservative assumptions were made:

- Any current containment of wastes would fail at some point, and the contents would be released to the surrounding media.

- For non-liquid wastes, the resulting concentration of contaminants in the surrounding media would be equal to the concentration of contaminants in the waste.

- For liquid wastes, the resulting concentration of contaminants in the surrounding soil will be calculated based on the concentration of contaminants in the waste and the liquid holding capacity of the soil.

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

This section identifies actions that may be taken to solve the problem 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 Information Inputs

Step 3 of the DQO process identifies the information needed, determines sources for information, 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 need to be collected and analyzed following these two criteria:

- Samples must be collected in areas most likely to contain a COC (judgmental 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 determine potential remediation waste types.
- Samples of the waste in site components (e.g., septic tank, grease and mud traps) must provide sufficient information to determine whether they contain PSM.
- Appropriate samples must be submitted to evaluate the feasibility of remediation alternatives (e.g., geotechnical data if construction or evaluation of barriers is considered).
- 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 auguring, 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 562 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 be from locations that most likely contain a COC, if present.

Decision I sample locations at all of the CAU 562 CASs 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.3-2.

Field-survey techniques may be used to select appropriate sampling locations and field-screening techniques may be used to provide 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 methods may be used to select analytical samples at CAU 562:

- Walkover surface area radiological surveys – A radiological survey instrument will be used over approximately 100 percent of the CAS boundaries in Areas 2 and 25, as permitted by terrain and field conditions, to detect locations of elevated radioactivity.
- 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 562:

- 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 geophysical survey results that are not consistent with the natural surroundings (e.g., buried concrete or metal).

- Debris: Materials that contain, or contained, hazardous or radioactive substances.

- 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's input exists that a release of hazardous or radioactive substances may have occurred.

- Experience and data from investigations of similar sites.

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

- Odor.

- Other biasing factors: Factors not previously defined for the CAI that become evident once the investigation of the site is under way.

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.5.2.2 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.

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

Step 4 of the DQO process defines the target population of interest and its relevant spatial boundaries, specifies temporal and other practical constraints associated with sample/data collection, and defines the sampling units on which decisions or estimates will be made.

A.6.1 Target Populations of Interest

The population of interest to resolve Decision I ("Is any COC present in environmental media within the CAS?") is at any location within the site that is contaminated with any contaminant above a FAL. 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.
- 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

Practical constraints such as military activities at the NTS, weather (i.e., high winds, rain, lightning, extreme heat), utilities, threatened or endangered animal and plants, unstable or steep terrain, and/or access restrictions may affect the ability to investigate this site. Three CASs in CAU 562 have practical constraints. At CAS 23-60-01, the location of the mud trap between the wash shed and the

Table A.6-1
Spatial Boundaries of CAU 562 CASs

CAS	Spatial Boundaries
02-26-11	The footprint of the shot plus a 50-ft lateral buffer; 15 ft bgs vertically.
02-44-02	The area containing the paint and historical spills as well as the french drain plus a 50-ft lateral buffer; 15 ft bgs vertically of the spills and the base of the french drain.
02-59-01	The footprint of the septic system plus a 50-ft lateral buffer; 20 ft bgs vertically.
02-60-01	The footprint of the concrete drain plus a 50-ft lateral buffer; 15 ft bgs vertically of the base of the concrete drain.
02-60-02	The footprint of the french drain and elongated drains plus a 50-ft lateral buffer; 15 ft bgs vertically of the base of the drains.
02-60-03	The footprint of the steam cleaning sump and outfall plus a 50-ft lateral buffer; 15 ft bgs vertically of the base of the sump and outfall.
02-60-04	The footprint of the french drain plus a 50-ft lateral buffer; 15 ft bgs vertically of the base of the drain.
02-60-05	The footprint of the french drain plus a 50-ft lateral buffer; 15 ft bgs vertically of the base of the drain.
02-60-06	The footprint of the french drain plus a 50-ft lateral buffer; 15 ft bgs vertically of the base of the drain.
02-60-07	The footprint of the french drain plus a 50-ft lateral buffer; 15 ft bgs vertically of the base of the drain.
23-60-01	The footprint of the mud trap and outfall plus a 50-ft lateral buffer for the mud trap and a 500-ft lateral buffer for the outfall located in the wash; 15 bgs vertically of the base of the mud trap and outfall.
23-99-06	The footprint of the grease trap plus a 50-ft lateral buffer; 15 ft bgs vertically of the base of the grease trap.
25-60-04	The footprint of the two outfalls plus a 50-ft lateral buffer; 15 ft bgs vertically from the base of the outfall.

grease rack restricts the use of heavy equipment. Both CASs 23-99-06 and 25-60-04 are associated with active buildings that have numerous active utilities within the site boundary.

A.6.4 Define the Sampling Units

The scale of decision making in Decision I is defined as the CAS or CAS components. Any COC detected at any location within the CAS components will cause the determination that the CAS is contaminated and needs further evaluation. The scale of decision making for Decision II is defined as a contiguous area contaminated with any COC originating from the CAS or the CAS components. Resolution of Decision II requires this contiguous area to be bounded laterally and vertically.

A.7.0 Step 5 - Develop the Analytic Approach

Step 5 of the DQO process specifies appropriate population parameters for making decisions, defines action levels, and generates an "If … then … else" decision rule that involves it.

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.

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 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 (NAC, 2006a). For the evaluation of corrective actions, NAC Section 445A.22705 (NAC, 2006b) requires the use of ASTM Method E 1739-95 (ASTM, 1995) 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."

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 E 1739-95 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 CADD for CAU 562. The FALs will be defined (along with the basis for their definition) in the CADD for CAU 562.

A.7.2.1 Chemical PALs

Except as noted herein, the chemical PALs are defined as the *Region 9: Superfund, Preliminary Remediation Goals, Screening Levels for Chemical Contaminants* in industrial soils (EPA, 2008). Background concentrations for RCRA metals 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 concentration 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 CADD for CAU 562.

A.7.2.2 Total Petroleum Hydrocarbon PALs

The PAL for TPH is 100 mg/kg as listed in NAC 445A.2272 (NAC, 2006c).

A.7.2.3 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).

A.7.3 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, else 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, else no further investigation is needed for that COPC in that population.
- If a COC exists at any CAS, then a corrective action will be determined, else no further action will be necessary.
- If a waste is present that, if released, has the potential to cause the future contamination of site environmental media, then a corrective action will be determined, else no further action will be necessary.

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 in any bounding direction, then additional samples will be collected to complete the Decision II evaluation, else the extent of the COC contamination has been defined.
- If valid analytical results are available for the waste characterization samples defined in Section A.9.0, then the decision will be that sufficient information exists to determine potential remediation waste types and evaluate the feasibility of remediation alternatives, else collect additional waste characterization samples.

A.8.0 Step 6 - Specify Performance or Acceptance Criteria

Step 6 of the DQO process defines the decision hypotheses, specifies controls against false rejection and false acceptance decision errors, examines consequences of making incorrect decisions from the test, and places acceptable limits on the likelihood of making decision errors.

A.8.1 Decision Hypotheses

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 and concurrence of CSMs (based on process knowledge) by stakeholder participants during the DQO process

- Validity testing of CSMs based on investigation results

- Evaluation of the data quality based on DQI parameters

A.8.2 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.8.2.1 False Negative Decision Error for Judgmental Sampling

In judgmental sampling, the selection of the number and location of samples is based on knowledge of the feature or condition under investigation and on professional judgment (EPA, 2002). Judgmental sampling conclusions about the target population depend upon the validity and accuracy of professional judgment.

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

- For Decision I, having a high degree of confidence that the sample locations selected will identify COCs if present anywhere within the CAS. For Decision II, having a high degree of confidence that the sample locations selected will identify the extent of COCs.
- Having a high degree of confidence that analyses conducted will be sufficient to detect any COCs present in the samples.
- Having 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 in accordance with the manufacturer's instructions and approved procedures. The CADD for CAU 562 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 CADD for CAU 562.

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 for 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. Site-specific DQIs are discussed in more detail in Section 6.2.2.

To provide information for the assessment of the DQIs of precision and accuracy, the following QC samples will be collected as required by the Industrial Sites QAPP (NNSA/NV, 2002a):

- 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.8.3 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.

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 QC samples will be collected as required by the Industrial Sites QAPP (NNSA/NV, 2002a):

- Trip blanks (one per sample cooler containing VOC environmental samples)
- Equipment blanks (one per sampling event)
- Source blanks (one per uncharacterized source lot)
- Field blanks (three at the Area 2 CASs [many of these CASs are directly adjacent to one another] and one at each of the remaining CASs in Areas 23 and 25)

A.9.0 Step 7 - Develop the Plan for Obtaining Data

Step 7 of the DQO process selects and documents a design that will yield data that will best achieve performance or acceptance criteria. A judgmental sampling scheme will be implemented to select sample locations and evaluate analytical results for CAU 562. Sections A.9.1 through A.9.2 contain general information about collecting Decision I and Decision II samples under a judgmental sampling design, while the subsequent sections provide CAS-specific sampling activities, including proposed sample locations. Environmental sample results will be compared to FALs to determine the need for corrective action. Potential source material sample results will be evaluated against the PSM criteria (Section 3.4) to determine the need for corrective action.

A.9.1 Decision I Sampling

A judgmental sampling design will be implemented for all of the CASs in CAU 562. 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. Adequate representativeness of the entire target population may not be a requirement to developing a sampling design. If good prior information is available on the target site of interest, then the sampling may be designed to collect samples only from areas suspected to have the highest concentration levels on the target site. If the observed concentrations from these samples are below the action level, then a decision can be made that the site contains safe levels of the contaminant without the samples being truly representative of the entire area (EPA, 2006).

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; depth intervals will be 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 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 Site Supervisor may modify the number, location, and spacing of step-outs as warranted by site conditions.

A.9.3 CAS 02-26-11, Lead Shot

At CAS 02-26-11, the area containing shot will be investigated. The area containing the shot has been estimated as 15,500 square feet. The shot is scattered throughout the site; however, the shot is not uniformly distributed, and some areas have a higher density of shot than other areas. Two surface (0.0 to 0.5 ft bgs) samples, which will include the shot, will be collected from two locations: one area with a high concentration of rusted shot and one area with a high concentration of non-rusted shot. These samples will also be used to determine potential waste types. The surface samples will be collected in a manner that will be representative of surface material (i.e., without removing the shot) to provide information on the volume of potential waste. At each of these sample locations, a bounding sample will be collected at the 1.0 to 1.5 ft bgs interval or at a deeper interval if biasing factors are present (e.g., shot). Directly adjacent to each of the two sample locations, additional bounding samples with 2-in. lifts will be collected. The sample depths will be as follows: 0.0 to 2.0 in., 2.0 to 4.0 in., and 4.0 to 6.0 in. Shot will be removed from the these samples. The subsurface soil samples will be collected with the shot removed to provide information on the contaminants that may have leached from the shot.

A visual survey will be conducted to determine the lateral boundary of the site. A surface (0.0 to 0.5 ft bgs) sample will be collected on each side, depending on the shape of the boundary (e.g., one surface sample from each side of the boundary, if the shape of the boundary is a square).

Proposed Decision I sample locations have not yet been selected for CAS 02-26-11. An example of the sampling strategy and site boundary is shown on Figure A.9-1.

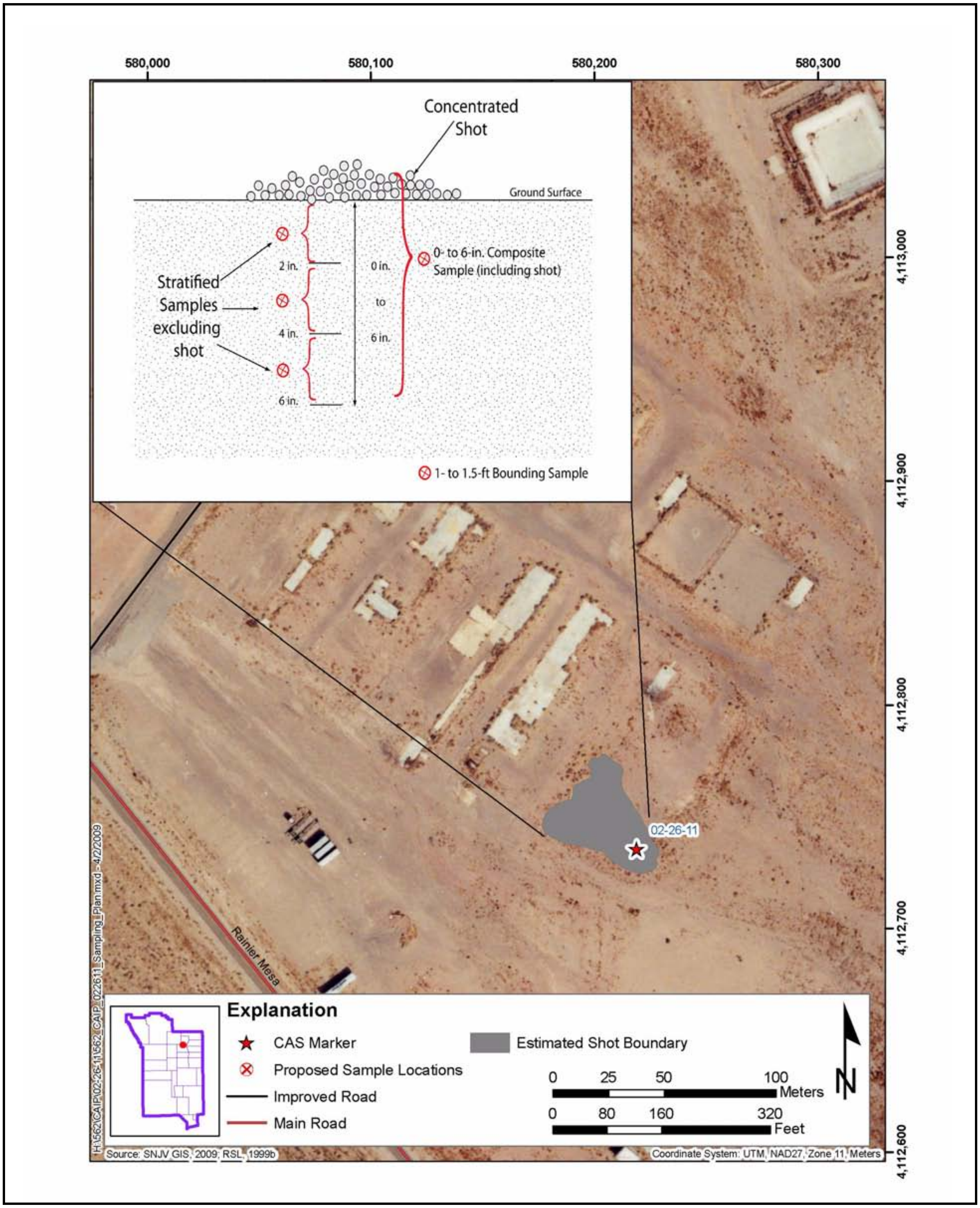

Figure A.9-1
Example Sampling Strategy at CAS 02-26-11, Lead Shot

A.9.4 CAS 02-44-02, Paint Spills and French Drain

At CAS 02-44-02, the following features will be investigated:

French Drain - One sample will be collected from the lowest point from the interior of the french drain. Another sample will be collected at the native interface below the base of the drain. The samples will be accessed using a backhoe or similar equipment, and collected using a scoop and pan. The pipe present within the french drain will either be excavated during sampling or traced to the source. If biasing factors are encountered during the excavation or pipe tracing, additional samples will be collected at locations selected by the Site Supervisor.

Paint Spills - Two PSM samples of the paint located on the foundation of the former Painters Shed and Paint Storage Rack will be collected. Environmental sample results will be compared to FALs to determine the need for corrective action. Potential source material sample results will be evaluated against the PSM criteria listed in Section 3.4 to determine the need for corrective action. Two environmental samples (0.0 to 0.5 ft and 1.0 to 1.5 ft bgs) will be collected from the paint spill location on the soil northeast of the Paint Storage Rack. Three surface (0.0 to 0.5 ft bgs) samples will be collected from each of the remaining sides (northwest, southeast, and southwest) of the Paint Storage Rack. Additionally, two surface (0.0 to 0.5 ft bgs) samples will be collected from the northeastern and southwestern sides of the former Painters Shed. Additional samples will be collected if other biasing factors are identified.

Historical Spill - Two samples (0.0 to 0.5 ft and 1.0 to 1.5 ft bgs) will be collected from the historical spill located on the southeastern side of the former Painters Shed. The exact location will be determined using GPS coordinates provided in the document that first identified the spill (REECo, 1995). The sample will be collected using a scoop and pan. Additional samples will be collected if other biasing factors are identified.

Proposed Decision I sample locations are shown in Figure A.9-2.

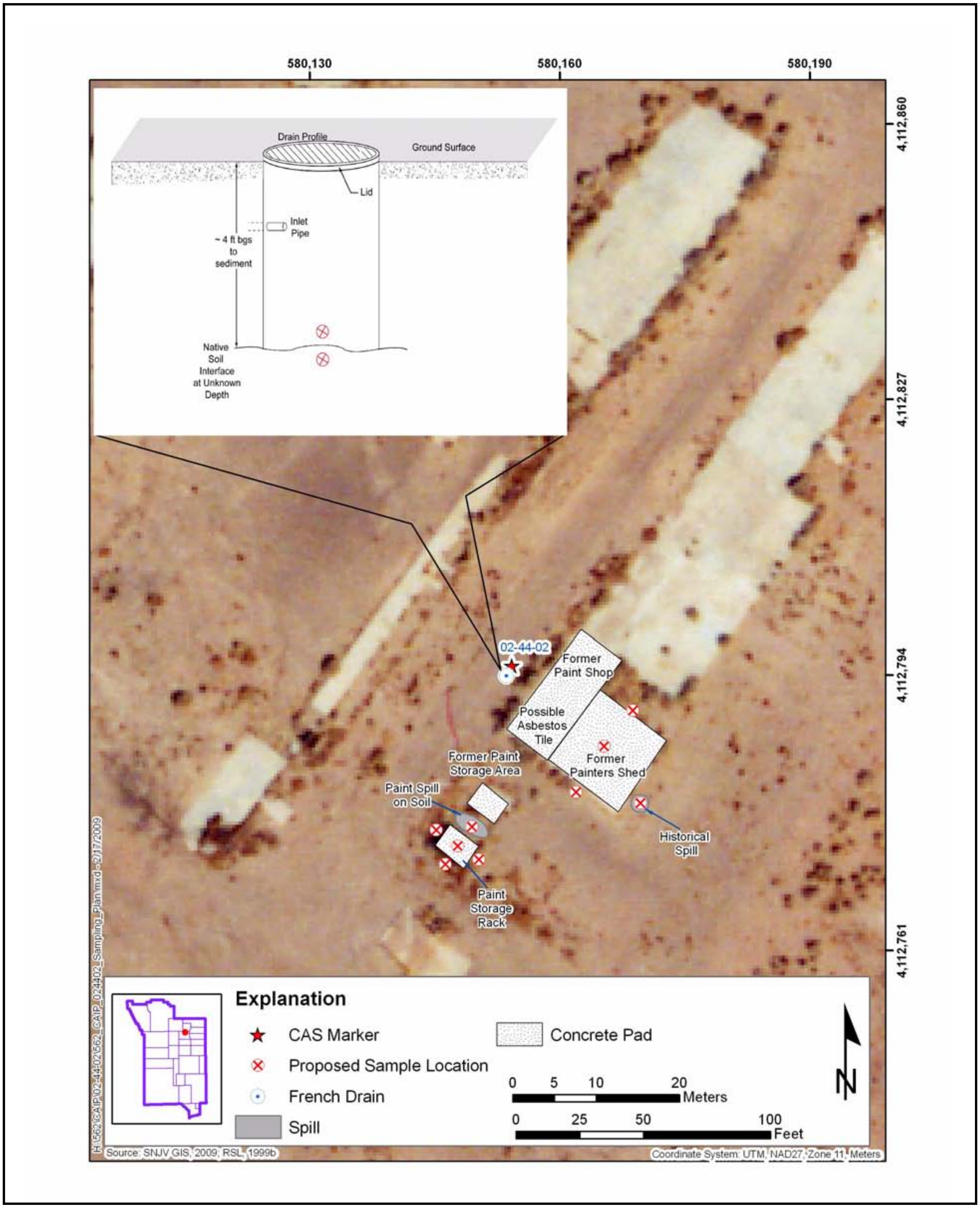

Figure A.9-2
Proposed Sample Locations at CAS 02-44-02, Paint Spills and French Drain

A.9.5 CAS 02-59-01, Septic System

At CAS 02-59-01, the following features will be investigated:

Septic Tank - A sample will be collected for each phase of material present in any compartment within the septic tank and distribution box, if present. The samples will be collected using the most appropriate method for the material being collected (e.g., composite liquid waste sampler [COLIWASA] for liquid, extended scoop for sludge). Sampling outside the tank will include two samples from below the inlet and outlet pipe connections. Another two samples will be collected from each end of the base of the tank; these sample locations will be altered if biasing factors are encountered. If a distribution box is present, samples will be collected from below the influent and effluent piping at the base of the distribution box. These samples will be accessed using a backhoe or similar equipment, and collected using a grab sampling technique.

Leachfield - Six samples will be collected from the proximal and distal ends of the outer and center leachlines. The samples will be accessed using a backhoe or similar equipment, and collected using a grab sampling technique.

If COCs are identified in the septic system, then the piping associated with the septic tank and leach field will be video surveyed to identify breaches, if present. If breaches are identified, Decision II samples will be collected as appropriate.

Proposed Decision I sample locations are shown in Figure A.9-3.

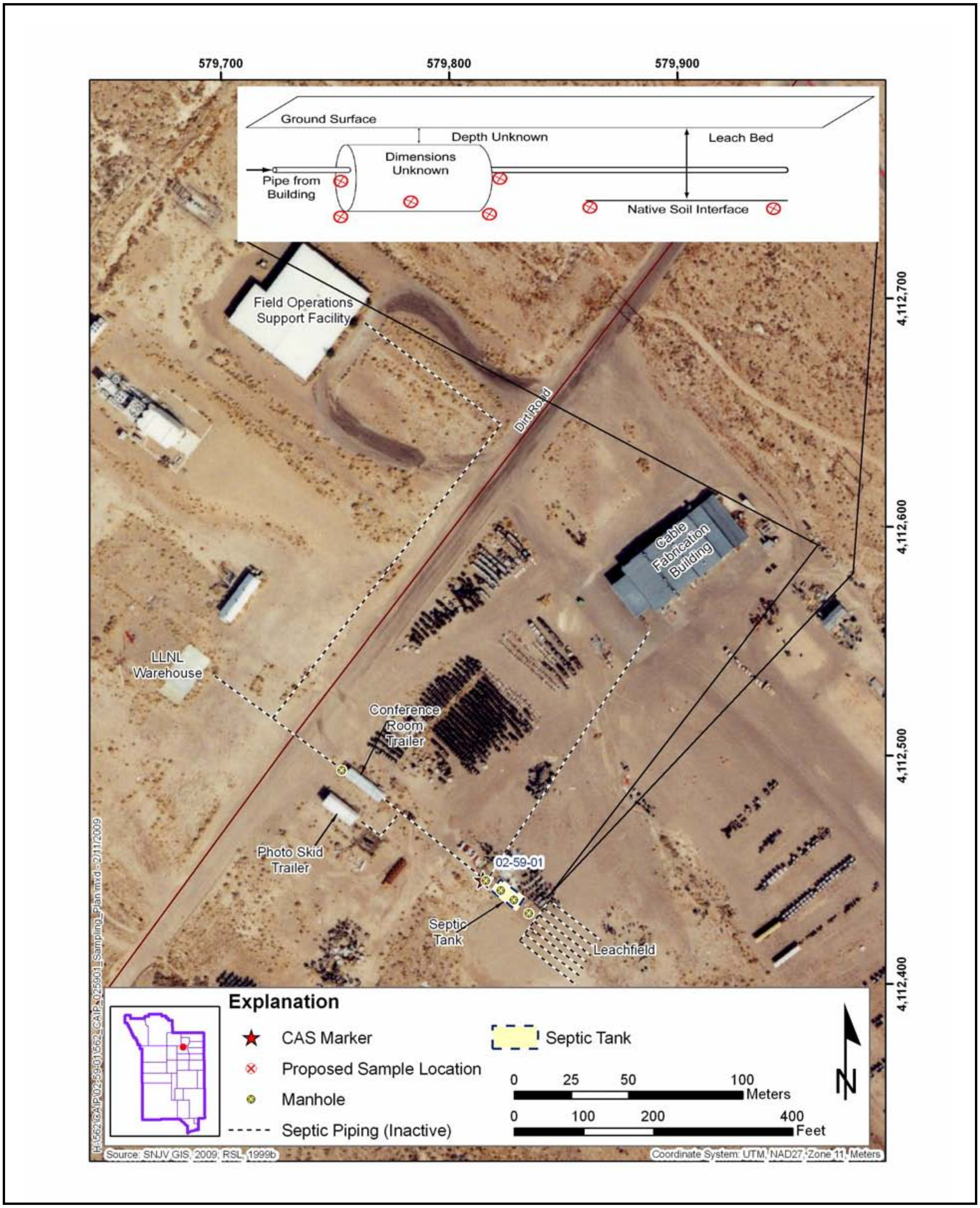

Figure A.9-3
Proposed Sample Locations at CAS 02-59-01, Septic System

A.9.6 CAS 02-60-01, Concrete Drain

At CAS 02-60-01, the concrete drain and surrounding soil will be sampled. One sample will be collected from the lowest point of the interior of the concrete drain. Another sample will be collected from below the base of the concrete drain at the native soil interface. Because the drain has been backfilled with native soil, the interior will need to be excavated either by using a backhoe with a narrow bucket or hand excavation (e.g., using shovels). If biasing factors are identified during excavation, additional samples will be collected. The base of the drain will be accessed using the backhoe or similar equipment. Samples will be collected using a grab sampling technique.

Excavation will be completed near the outside of the drain to determine the source of the two anomalies identified during a geophysical survey. It is anticipated that the anomalies represent shallow subsurface metal debris and are not of environmental concern. Therefore, if there is no indication of an environmental release associated with the debris, no sampling is required. Upon excavation, if a feature is present that could have resulted in an environmental release (e.g., piping), a sampling strategy will be implemented that is typical to that type of feature.

Proposed Decision I sample locations are shown in Figure A.9-4.

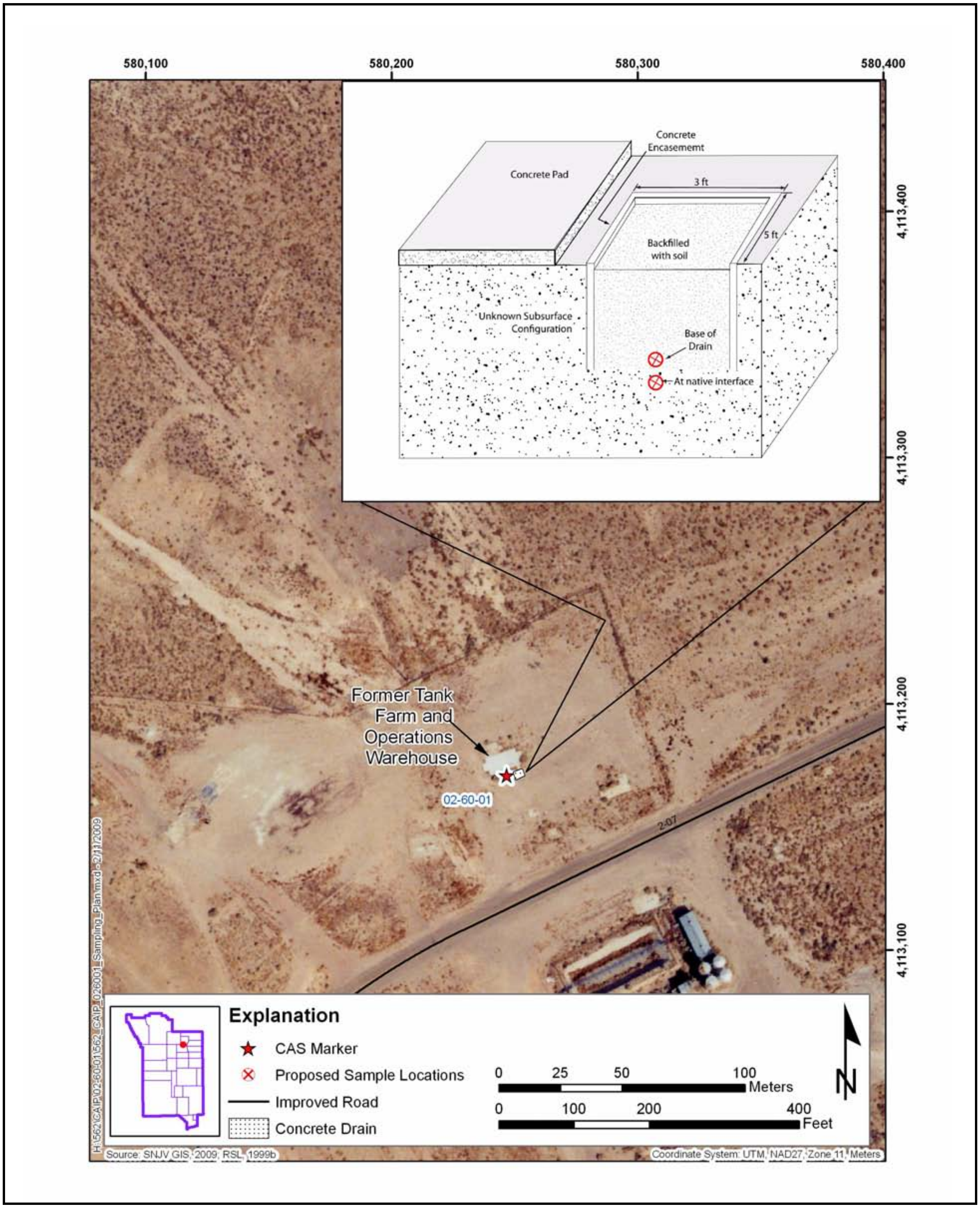

Figure A.9-4
Proposed Sample Locations at CAS 02-60-01, Concrete Drain

A.9.7 CAS 02-60-02, French Drain

At CAS 02-60-02, the following features will be investigated:

French Drain - One sample will be collected from the lowest point from the interior of the french drain. Another sample will be collected at the native interface below the base of the drain. The samples will be accessed using a backhoe or similar equipment, and collected using a grab sampling technique. If biasing factors are encountered during the excavation, additional samples will be collected at locations selected by the Site Supervisor.

Elongated Drains - Two samples will be collected of the sediment from within each of the drains. Additionally, two samples will be collected from below the drains at the native soil interface. If biasing factors are identified, samples will be collected from locations selected by the Site Supervisor. Because the drains are shallow, the samples can be collected with hand sampling tools. If the native soil interface below the drains cannot be accessed by hand excavation (e.g., hand auger), a backhoe or similar equipment may be used.

Proposed Decision I sample locations are shown in Figure A.9-5.

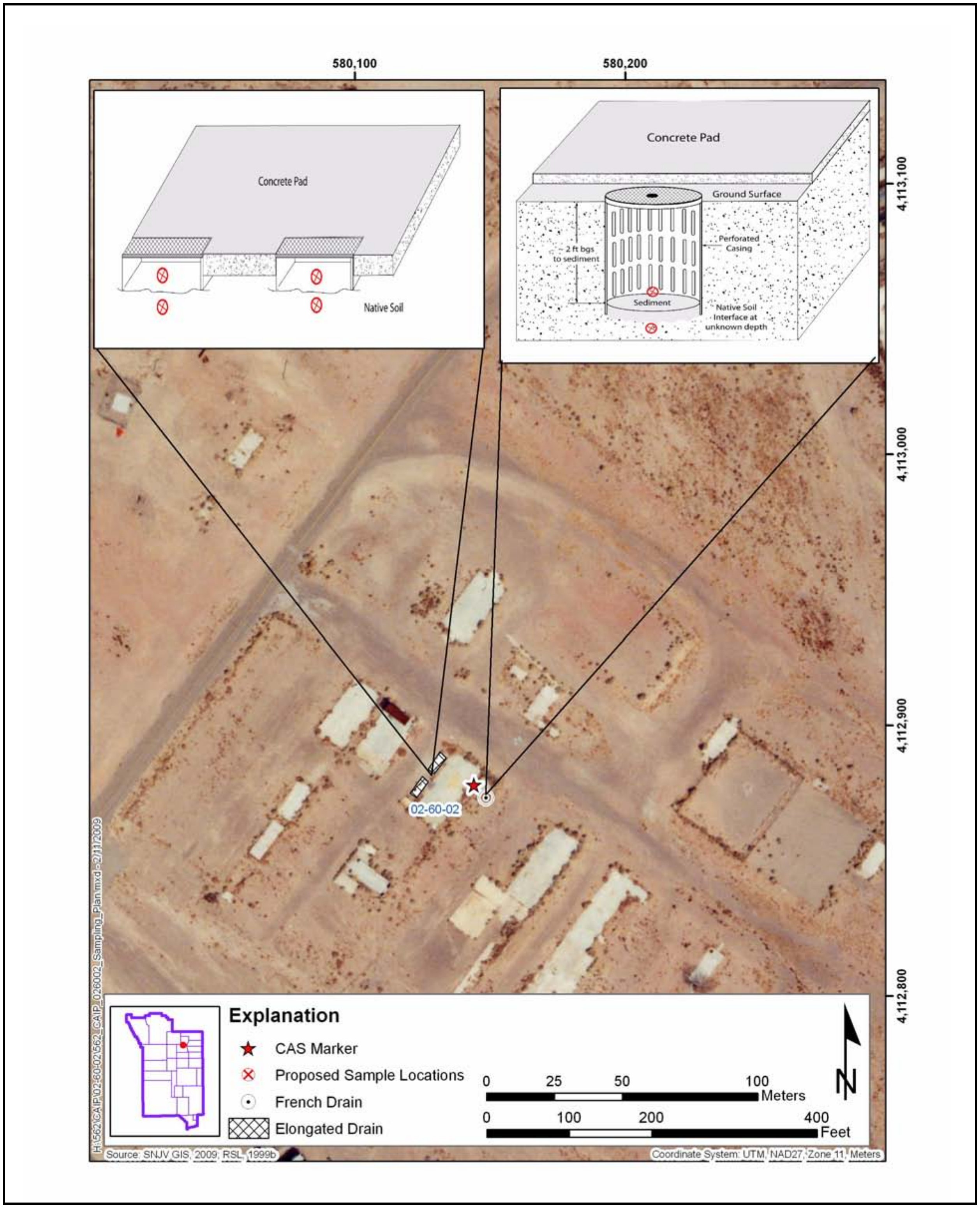

Figure A.9-5
Proposed Sample Locations at CAS 02-60-02, French Drain

A.9.8 CAS 02-60-03, Steam Cleaning Drain

At CAS 02-60-03, the following features will be investigated:

Steam Cleaning Sump - One sample will be collected of the surface material present inside the steam cleaning sump. Another sample will be collected at the native soil interface below the material that has collected in or at the bottom of the sump. The grate will be removed and the samples will be accessed using a backhoe or similar equipment. Additional samples of the material within the sump will be collected if biasing factors (e.g., staining, odors, radioactivity) are identified during excavation. Four surface (0.0 to 0.5 ft bgs) samples will be collected of the soil surrounding each side of the sump. The samples will be collected using a grab sampling technique. If biasing factors are encountered during excavation and sample collection, additional samples will be collected from locations selected by the Site Supervisor.

Steam Cleaning Pad and Outfall - The outfall will be surveyed to determine whether the drain located on the adjacent steam cleaning pad is the source. If the pipe is associated with the drain and is a discharge pipe, then one surface (0.0 to 0.5) sample will be collected at the outfall opening. If it is determined that the pipe was a conduit pipe or some other feature that is not suspected to be a source of environmental concern, then no samples will be collected at this location and additional investigation will be completed to determine the discharge point for the drain. Samples will be collected at the discharge point for the drain. Additionally, four surface (0.0 to 0.5 ft bgs) samples will be collected of the soil surrounding each side of the steam cleaning pad.

If biasing factors are encountered during excavation and sample collection, additional samples will be collected from locations selected by the Site Supervisor.

Proposed Decision I sample locations are shown in Figure A.9-6.

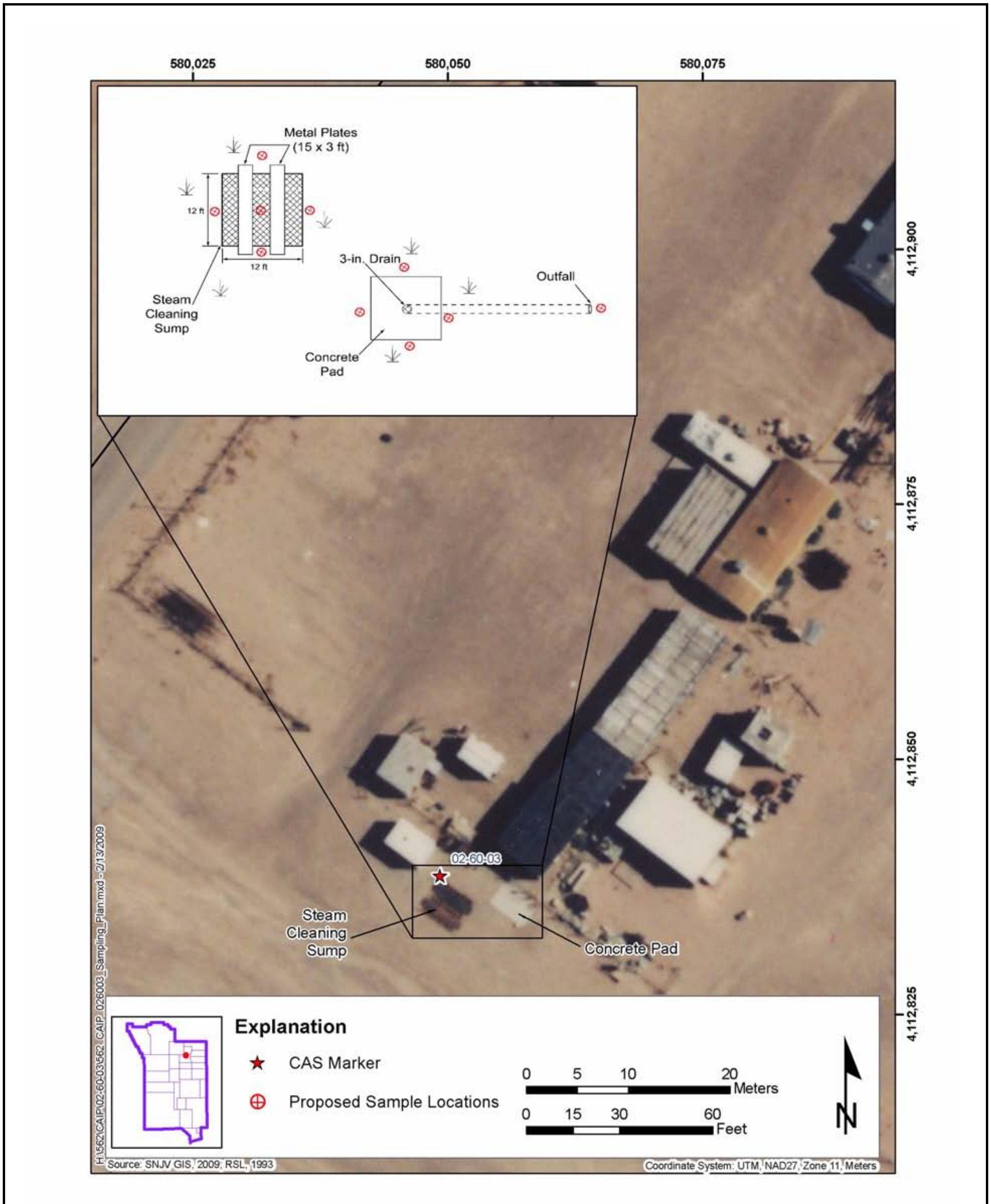

Figure A.9-6
Proposed Sample Locations at CAS 02-60-03, Steam Cleaning Drain

A.9.9 CAS 02-60-04, French Drain

At CAS 02-60-04, the french drain and surrounding soil will be investigated. One sample will be collected from the lowest point from the interior of the french drain. Another sample will be collected at the native interface below the base of the drain. Because the drain is small in diameter; surrounded by thick, reinforced concrete; and has potentially been backfilled, the samples will be accessed using the most appropriate equipment to obtain the samples discussed (i.e., hand auger and/or backhoe). If biasing factors are encountered during the excavation, additional samples will be collected at locations selected by the Site Supervisor.

Proposed Decision I sample locations are shown in Figure A.9-7.

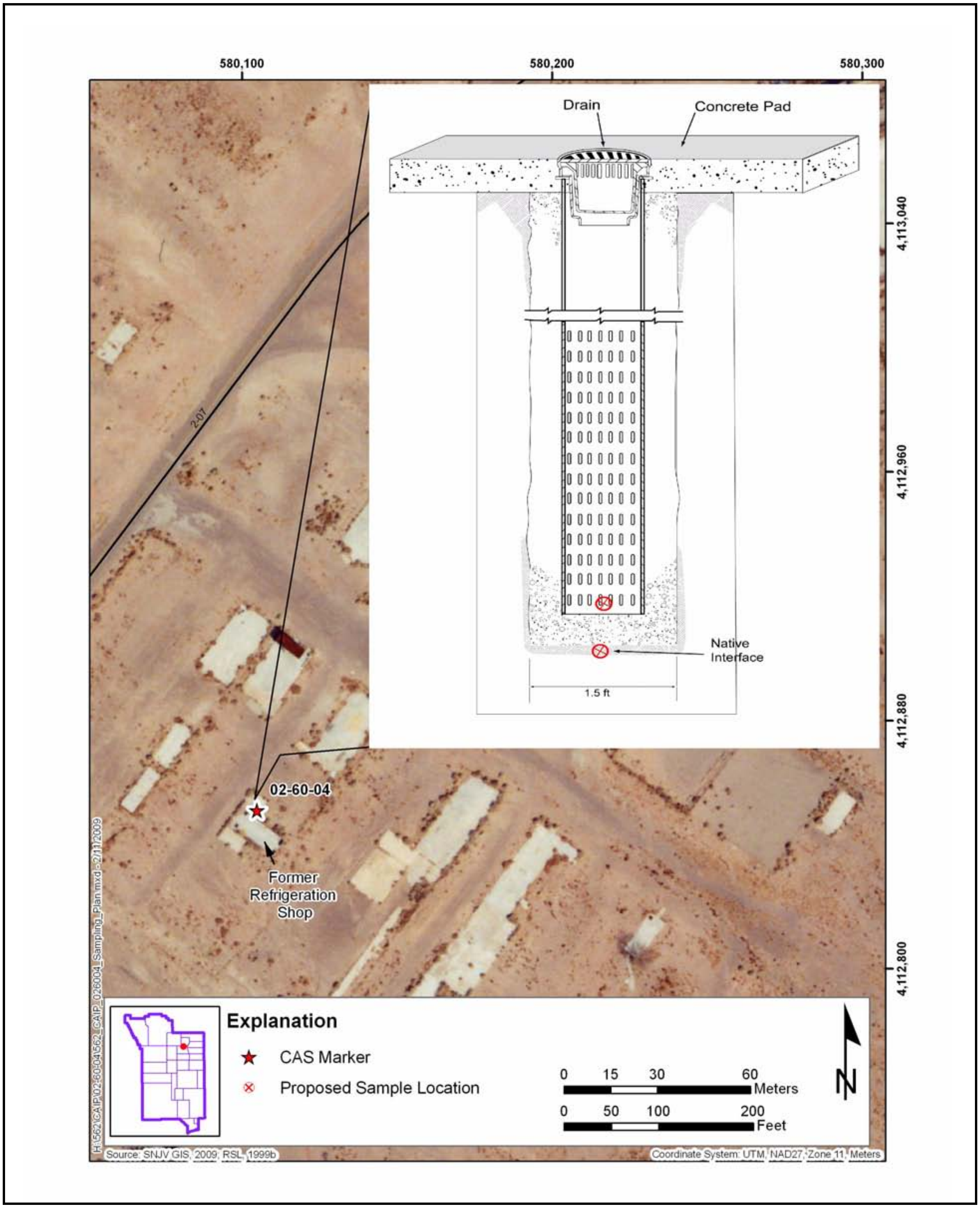

Figure A.9-7
Proposed Sample Locations at CAS 02-60-04, French Drain

A.9.10 CAS 02-60-05, French Drain

At CAS 02-60-05, the french drain and surrounding soil will be investigated. One sample will be collected from the lowest point from the interior of the french drain. Another sample will be collected at the native interface below the base of the drain. The samples will be accessed using a backhoe or similar equipment, and collected using a grab sampling technique. If biasing factors are encountered during the excavation, additional samples will be collected at locations selected by the Site Supervisor.

Proposed Decision I sample locations are shown in Figure A.9-8.

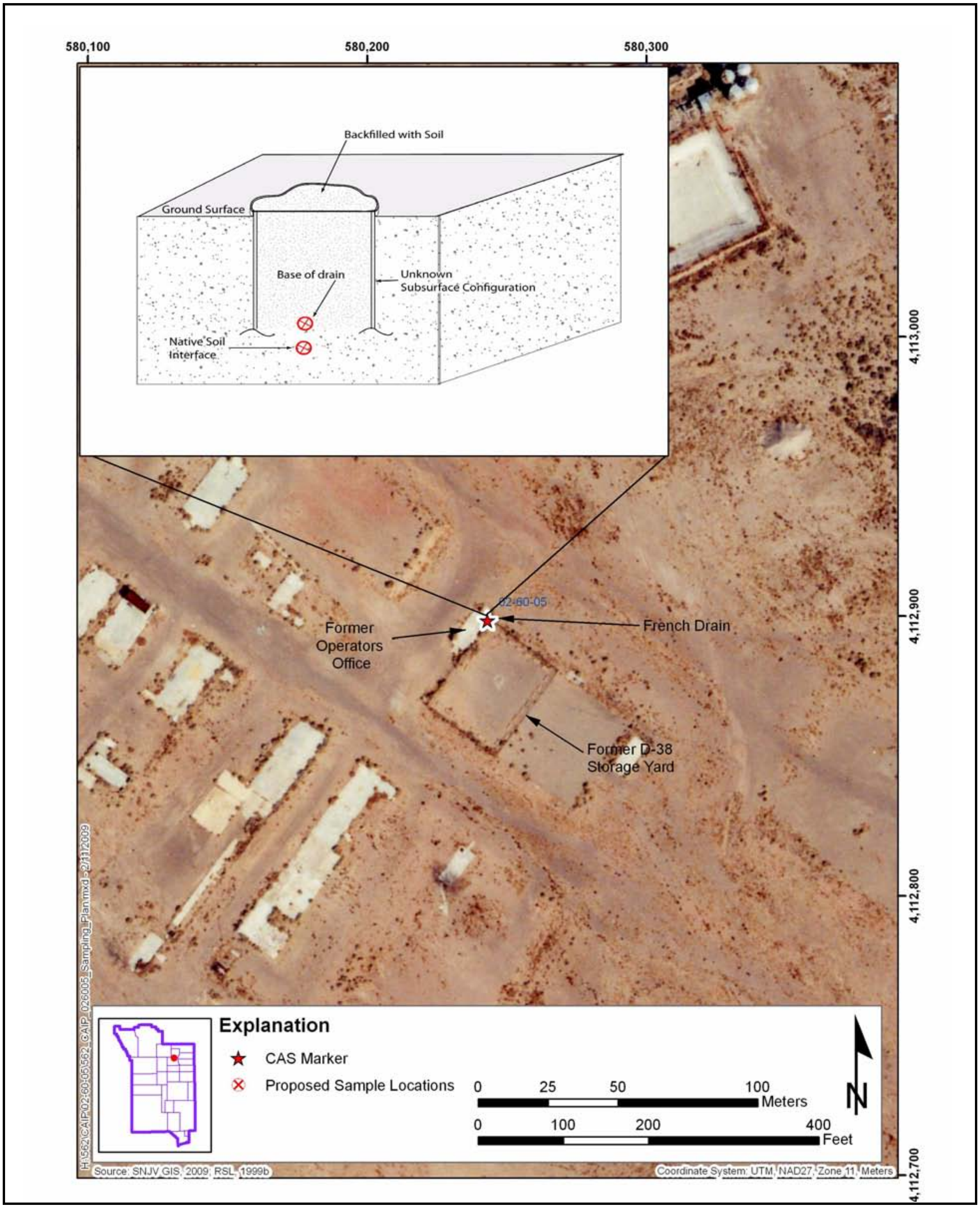

Figure A.9-8
Proposed Sample Locations at CAS 02-60-05, French Drain

A.9.11 CAS 02-60-06, French Drain

At CAS 02-60-06, the french drain and surrounding soil will be investigated. The location of the french drain has not been identified due to heavy vegetation surrounding the associated building's foundation. Vegetation, and possibly some surface soil, will be removed to locate the french drain. If the feature identified is similar to the other french drains within CAU 562, a similar sampling strategy will be implemented. One sample will be collected from the lowest point from the interior of the french drain and another sample collected at the native interface below the base of the drain. If the feature identified has additional system components, such as piping, or is not similar to the other french drains in CAU 562, additional sampling or an altered sampling strategy will be performed as determined by the Site Supervisor. The Site Supervisor will use professional judgment to select locations most likely to be contaminated by a COC, if present. If the configuration of the system is different and is outside the scope of the CSM, work will be temporarily suspended and the situation reviewed. Recommendations will be made to the decision-makers on how to proceed.

The method used to access and collect samples will be determined during the field investigation. If biasing factors are encountered during the excavation to access sample locations, additional samples will be collected.

Because the configuration of the french drain is not known, a figure showing the proposed Decision I sample locations is not included.

A.9.12 CAS 02-60-07, French Drain

At CAS 02-60-07, the french drain and surrounding soil will be investigated. The location of the french drain has not been identified due to heavy vegetation surrounding the associated building's foundation. Vegetation, and possibly some surface soil, will be removed to locate the french drain. If the feature identified is similar to the other french drains within CAU 562, a similar sampling strategy will be implemented. One sample will be collected from the lowest point from the interior of the french drain and another sample collected at the native interface below the base of the drain. If the feature identified has additional system components, such as piping, or is not similar to the other french drains in CAU 562, additional sampling or an altered sampling strategy will be performed as determined by the Site Supervisor. The Site Supervisor will use professional judgment to select locations most likely to be contaminated by a COC, if present. If the configuration of the system is different and is outside the scope of the CSM, work will be temporarily suspended and the situation reviewed. Recommendations will be made to the decision-makers on how to proceed.

The method used to access and collect samples will be determined during the field investigation. If biasing factors are encountered during the excavation to access sample locations, additional samples will be collected.

Because the configuration of the french drain is not known, a figure showing the proposed Decision I sample locations is not included.

A.9.13 CAS 23-60-01, Mud Trap Drain and Outfall

At CAS 23-60-01, the following features will be investigated:

Mud Trap - A sample of the material located in the trench drain within the wash shed that leads to the mud trap will be collected. This sample will be collected from the location where the largest volume of sediments exist. The drain will be inspected for the presence of biasing factors (e.g., staining, radioactivity, odors). If biasing factors are present, additional representative sample(s) of the sediments will be collected. A sample will also be collected for each phase of material present within the mud trap. The samples will be collected using the most appropriate method for the material being collected (e.g., COLIWASA for liquid, extended scoop for sludge). Samples outside the mud trap will not be collected due to accessibility issues. However, if COCs are identified inside the mud trap, samples may be collected below the inlet and outlet piping by hand excavation to determine whether there has been a release.

Grease Rack - The area below the grease rack will be visually surveyed to locate biasing factors from which sample locations will be selected. If no biasing factors are present, one surface (0.0 to 0.5 ft bgs) sample will be collected from two locations beneath the grease rack, as shown in Figure A.9-9. If biasing factors are determined to be present below the layer of gravel, then the locations may be changed and/or additional samples may be collected. The samples will be collected using a grab sampling technique.

Outfall - The opening of the outfall is not visible and will need to be excavated for sampling. One sample will be collected at the opening of the outfall. A visual survey will be conducted of the area downstream of the outfall to look for biasing factors. If biasing factors are identified, surface (0.0 to 0.5 ft bgs) samples will be collected. Samples will be collected using a grab sampling technique.

Proposed Decision I sample locations are shown in Figure A.9-9.

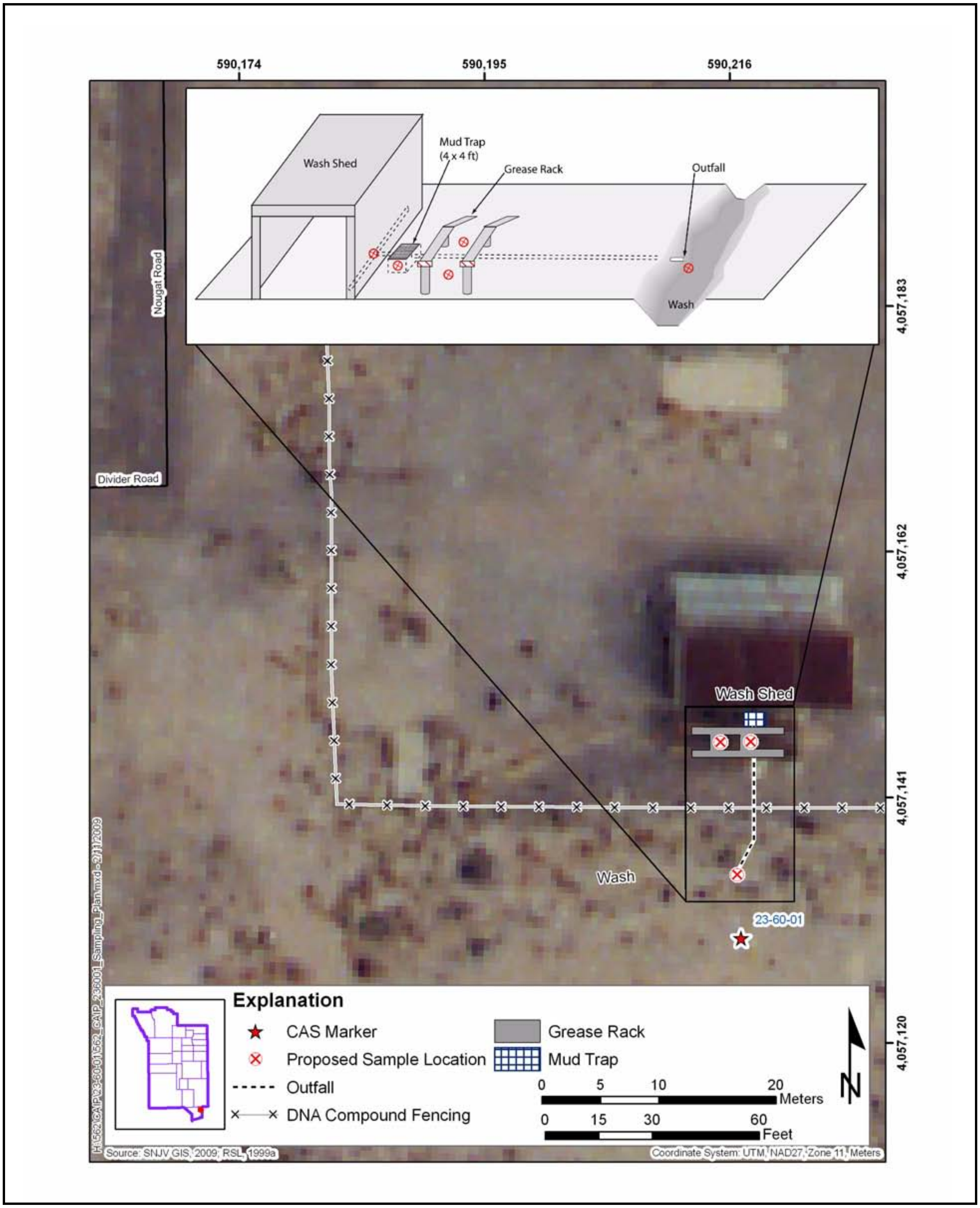

Figure A.9-9
Proposed Sample Locations at CAS 23-60-01, Mud Trap Drain and Outfall

A.9.14 CAS 23-99-06, Grease Trap

At CAS 23-99-06, the grease trap will be investigated. Initial sampling will be to collect a sample of the contents of the grease pit. If this sample demonstrates that the contents are contaminated, then the sediments will be removed, and the base of the trap will be inspected for cracks. If the integrity of the pit is acceptable, then no further sampling will be conducted. However, if the pit is cracked, and it is determined that this is a significant vertical migration pathway, discussions will be held with NDEP to determine the path forward. A sample will be collected of the material present within the trap. The samples will be collected using the most appropriate method for accessing the material (e.g., extended scoop). Samples outside the grease trap will not be collected because of accessibility issues.

Proposed Decision I sample locations are shown in Figure A.9-10.

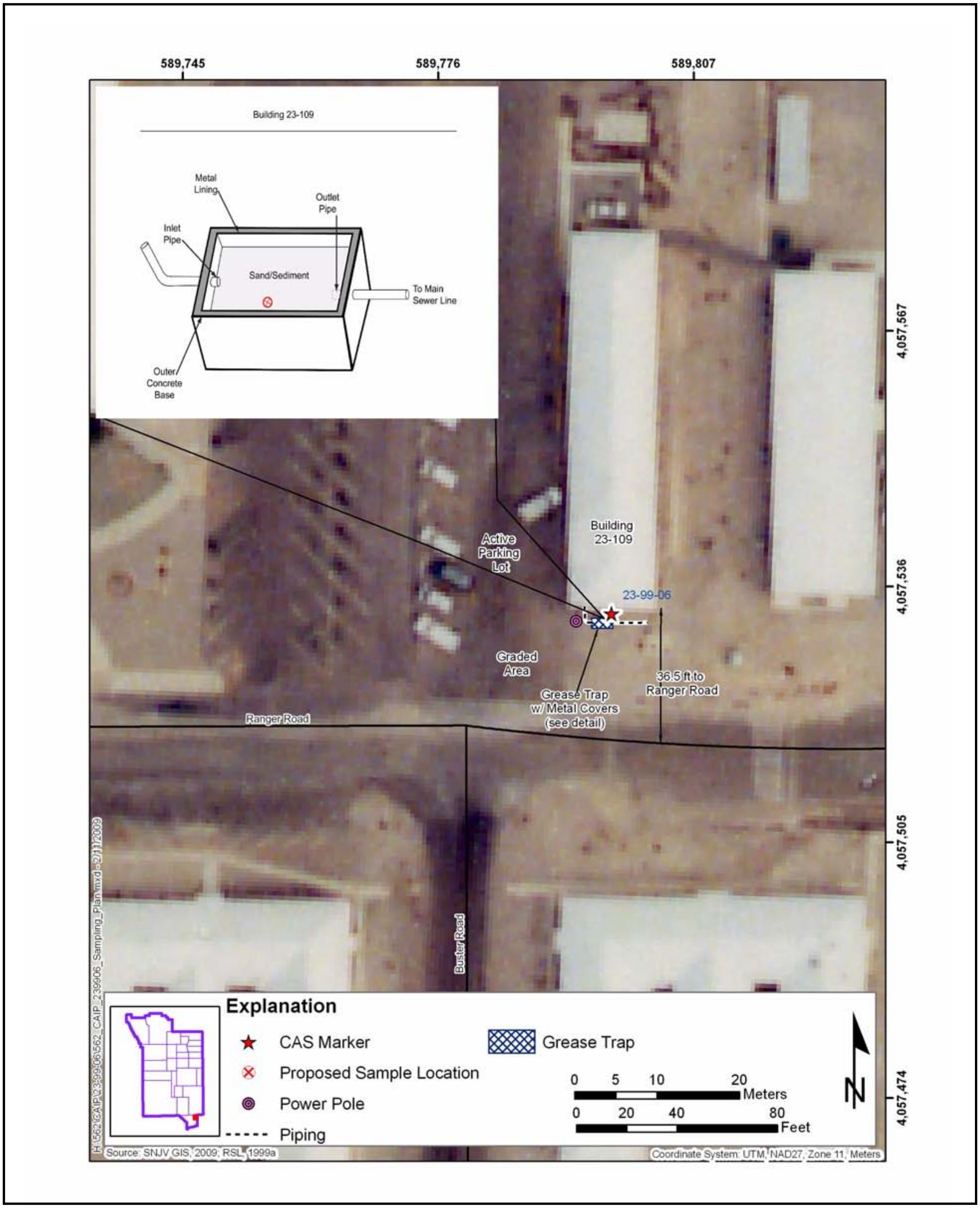

Figure A.9-10
Proposed Sample Locations at CAS 23-99-06, Grease Trap

A.9.15 CAS 25-60-04, Building 3123 Outfalls

At CAS 25-60-04, the following features will be investigated:

Drain A - One sample will be collected at the elbow, which was the original outfall opening (25 ft west of the building). Another sample will be collected at the current outfall opening (approximately 100 ft south of the original outfall opening). A visual survey will be conducted to look for biasing factors. If biasing factors are identified, additional samples will be collected. Samples will be collected using a grab sampling technique.

Drain B - The opening of the outfall is not visible and will need to be hand excavated for sampling. One sample will be collected at the opening of the outfall. A visual survey will be conducted to look for biasing factors. If biasing factors are identified, additional samples will be collected. Samples will be collected using a grab sampling technique or another appropriate method if the pipe is not at a shallow depth.

The piping configuration for both outfalls, Drains A and B, will be determined through either excavation, camera survey, or a geophysical survey. Additional samples may be collected if biasing factors are found (e.g., at pipe ends, joints, breaches).

Proposed Decision I sample locations are shown in Figure A.9-11.

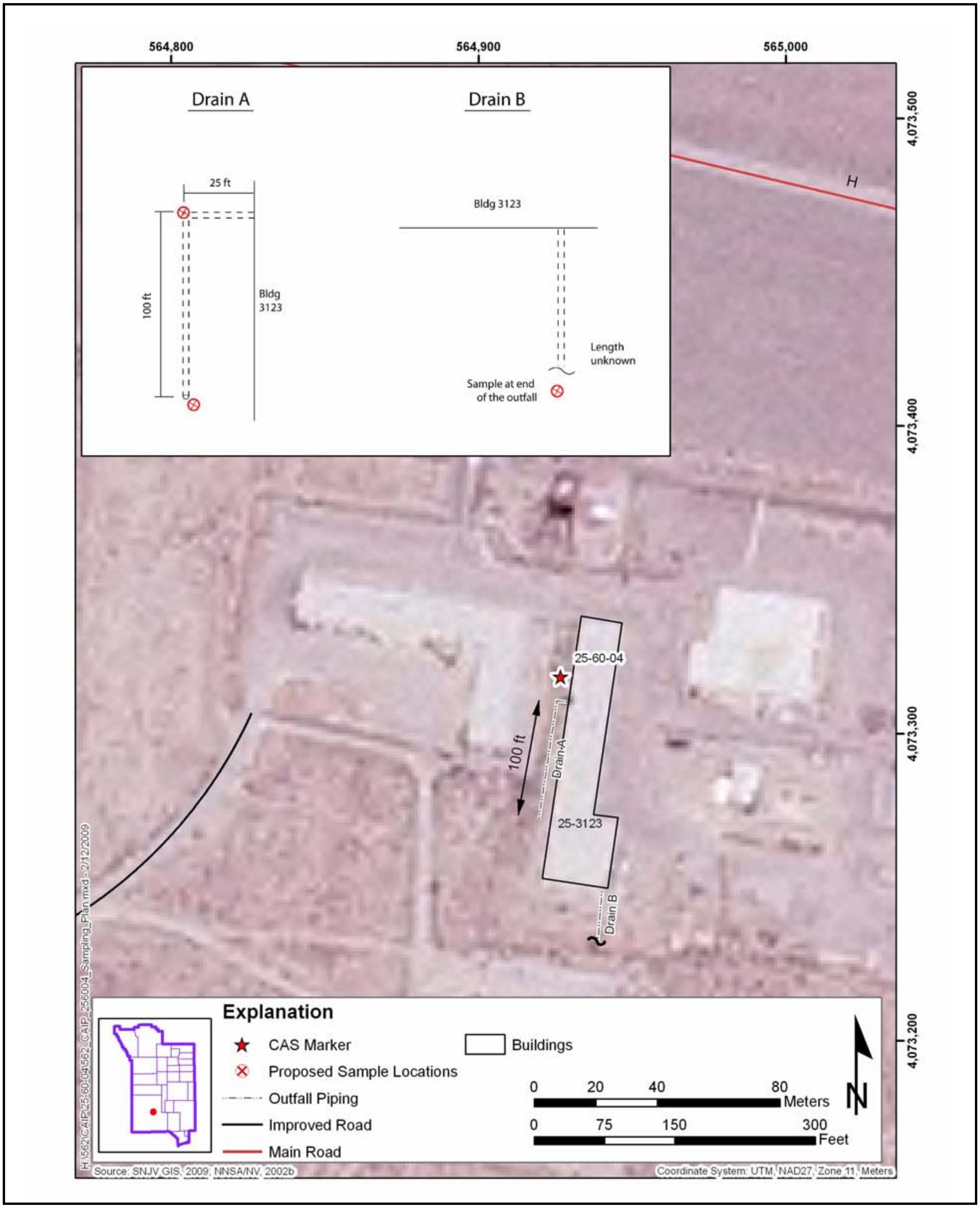

Figure A.9-11
Proposed Sample Locations at CAS 25-60-04, Building 3123 Outfalls

A.10.0 References

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

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Appendix B

Project Organization

B.1.0 Project Organization

The NNSA/NSO Federal Sub-Project Director is Kevin Cabble. He can be contacted at (702) 295-5000. The NNSA/NSO Task Manager is Tiffany Lantow. She can be contacted at (702) 295-7645.

The identification of the project Health and Safety Officer and the Quality Assurance Officer can be found in the appropriate plan. However, personnel are subject to change, and it is suggested that the NNSA/NSO Federal Sub-Project Director be contacted for further information. The Task Manager will be identified in the FFACO Monthly Activity Report before the start of field activities.

Appendix C

Nevada Division of Environmental Protection Comments

(3 Pages)

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

1. Document Title/Number Draft Corrective Action Investigation Plan for Corrective Action Unit 562: Waste Systems, Nevada Test Site, Nevada
2. Document Date February 2009
3. Revision Number 0
4. Originator/Organization Stoller-Navarro
5. Responsible DOE/NV ERP Sub-Project Director. Kevin J. Cabble
6. Date Comments Due 3/16/09
7. Review Criteria Full
8. Reviewer/Organization/Phone No. Jeff MacDougall, NDEP, 486-2850
9. Reviewer's Signature

10. Comment Number/ Location	11. Type[a]	12. Comment	13. Comment Response	14. Accept
1) Sections 2.1.1, 2.1.2, and 2.1.3	M	Provide the upper and lower range for precipitation with the mean value and mean and the 95% UCL for the PET. These ranges should be presented once in all documents, subsequently average values may be used throughout the rest of the document.	Sections 2.1.1, 2.1.2 and 2.1.3 in the main document and the corresponding Sections A.2.1 through A.2.13 in Appendix A have been revised to provide the upper and lower range for precipitation for the Yucca Flat, Mercury Valley, and Jackass Flats areas with the corresponding mean annual values for the years 2003 through 2008. The mean annual and 95% UCL for the PET rate has also been provided, as estimated for 2003 through 2008 at the Area 3 RWMS. The text for these sections have been revised to read as follows: Section 2.1.1, Yucca Flat, and Sections A.2.1 through A.2.10, Physical Setting: "Precipitation for the area from 2003 through 2008, as measured at the Buster Jangle Wye (BJW) Station, ranged from 4.33 to 10.43 inches (in.) per year, with a mean annual value of 6.73 inches (ARL/SORD, 2008). The mean annual potential evapotranspiration (PET) rate, as estimated for 2003 through 2008 at the Area 3 radioactive waste management site (RWMS), was 61.71 in. with a 95% UCL of 63.07 inches."	

[a]Comment Types: M = Mandatory, S = Suggested.
Return Document Review Sheets to DOE/NV Environmental Restoration Division, Attn: QAC, M/S 505.

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

Document Title/Number Draft Corrective Action Investigation Plan for Corrective Action Unit 562: Waste Systems, Nevada Test Site, Nevada

Revision Number 0

Reviewer/Organization Jeff MacDougall, NDEP, 486-2850

10. Comment Number/ Location	11. Type[a]	12. Comment	13. Comment Response	14. Accept
1) Sections 2.1.1, 2.1.2, and 2.1.3 (continued)			Section 2.1.2, Mercury Valley, and Sections A.2.11 and A.2.12, Physical Setting: "Precipitation for the area from 2003 through 2008, as measured at the Mercury Gauging Station, ranged from 3.38 to 8.11 in. per year, with a mean annual value of 6.73 inches (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95% UCL of 63.07 inches." Section 2.1.3, Jackass Flats, and Section A.2.13, Physical Setting: "Precipitation for the area from 2003 through 2008, as measured at the Jackass Flats (4JA) Station, ranged from 3.99 to 11.04 in. per year, with a mean annual value of 7.74 inches (ARL/SORD, 2008). The mean annual PET rate, as estimated for 2003 through 2008 at the Area 3 RWMS, was 61.71 in. with a 95% UCL of 63.07 inches."	
2) Figure 3-1, Page 19	M	Under Secondary Sources the box titled Contaminated Subsurface Media has two arrows attaching to the box titled Leaching. One arrow is all that is needed to indicate the potential of leaching.	Figure 3-1 has been revised to remove the extra arrow leading from the box entitled "Contaminated Subsurface Media" and to the box entitled "Leaching."	
3) Section 3.3 and other areas of draft	M	It is mentioned that interm actions will be reported in the "investigation report". The term investigation report is used through the CAIP. Please verify which report this is. (For the CAU 371 CAIP the term was changed to CADD.)	Throughout the CAIP, the term "investigation report" has been revised to specify the type of report (i.e., a "CADD"). Section 3.3, second to last paragraph, last sentence, has been revised to read: "Any interim actions conducted will be reported in the investigation report (i.e., CADD) for CAU 562."	

[a]Comment Types: M = Mandatory, S = Suggested.
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NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

Document Title/Number Draft Corrective Action Investigation Plan for Corrective Action Unit 562: Waste Systems, Nevada Test Site, Nevada

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Reviewer/Organization Jeff MacDougall, NDEP, 486-2850

10. Comment Number/ Location	11. Type[a]	12. Comment	13. Comment Response	14. Accept
4) Section 4.2.3, 4th Bullet	M	Specify the criteria used to determine whether or not these samples will be necessary.	Section 4.2.3, 4th bullet, has been updated to read: "Collect soil samples from locations outside the influence of releases from the CAS, if necessary, to determine background concentrations and/or CAS bounding information for the area of contamination."	
5) Section 5.1, 4th Bullet	M	Sentence reads "Contained media..." should it read "Contaminated media..."?	Section 5.1, fourth sentence, has been revised to read: "Contaminated media....., or mixed waste."	

[a]Comment Types: M = Mandatory, S = Suggested.
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