ERRATA SHEET

The Following Corrections and Clarifications Apply to: Corrective Action Investigation Plan for Corrective Action Unit 563: Septic Systems, Nevada Test Site, Nevada

DOE Document Number: DOE/NV--1181

Revision: Revision 0

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The 9th reference listed on Page 57 (*Section 8.0 References)* incorrectly states Rev. 6-01 as the most current revision for the referenced document: Update revision number to "Rev. 6-02" showing the reference to read:

> "U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2006b. *Nevada Test Site Waste Acceptance Criteria,* DOE/NV--325, **Rev. 6-02**. Las Vegas, NV."

The 8th reference listed on Page A.51 (*Section 10.0 References)* incorrectly states Rev. 6-01 as the most current revision for the referenced document: Update revision number to "Rev. 6-02" showing the reference to read:

"U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2006. *Nevada Test Site Waste Acceptance Criteria*, DOE/NV--325, **Rev. 6-02**. Las Vegas, NV."

Nevada
Environmental
Restoration
Project

DOE/NV--1181

National Nuclear Security Administration

Corrective Action Investigation Plan for Corrective Action Unit 563: Septic Systems Nevada Test Site, Nevada

Controlled Copy No.: ___
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January 2007

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U.S. Department of Energy
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CORRECTIVE ACTION INVESTIGATION PLAN FOR CORRECTIVE ACTION UNIT 563: SEPTIC SYSTEMS NEVADA TEST SITE, NEVADA

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

Controlled Copy No.: ___

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CORRECTIVE ACTION INVESTIGATION PLAN FOR CORRECTIVE ACTION UNIT 563: SEPTIC SYSTEMS NEVADA TEST SITE, NEVADA

Approved by: APPROVED SIGNATURE Date: 01/17/2007

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List of Acronyms and Abbreviations

ACP	Asbestos concrete pipe
ASTM	American Society for Testing and Materials
bgs	Below ground surface
BN	Bechtel Nevada
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 Resource Conservation and Liability Act*
CFR	*Code of Federal Regulations*
COC	Contaminant of concern
COPC	Contaminant of potential concern
CSM	Conceptual site model
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
dpm/100 cm^2	Disintegrations per minute per 100 square centimeters
DQI	Data quality indicator
DQO	Data quality objective
DRI	Desert Research Institute
EPA	U.S. Environmental Protection Agency
FADL	Field Activity Daily Log

Acronyms and Abbreviations *(Continued)*

FAL	Final action level
FFACO	*Federal Facility Agreement and Consent Order*
FSR	Field-screening result
ft	Foot
GPR	Global Position Receiver
GPS	Global Positioning System
HWAA	Hazardous waste accumulation area
IDW	Investigation-derived waste
in.	Inch
ISMS	Integrated Safety Management System
LCS	Laboratory control sample
m	Meter
MDC	Minimum detectable concentration
MDL	Minimum detectable limit
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
mi	Mile
mrem/yr	Millirem per year
MS	Matrix spike
MSD	Matrix spike duplicate
N/A	Not applicable
NAC	*Nevada Administrative Code*
NCRP	National Council on Radiation Protection and Measurement
ND	Normalized difference

Acronyms and Abbreviations *(Continued)*

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
PCB	Polychlorinated biphenyl
pCi/g	Picocuries per gram
pCi/L	Picocuries per liter
POC	Performance Objective for the Certification of Nonradioactive Hazardous Waste
PPE	Personal protective equipment
ppm	Parts per million
PRG	Preliminary remediation goal
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RadCon	Radiological control
RBCA	Risk-based corrective action
RCA	Radiologically controlled area
RCRA	*Resource Conservation and Recovery Act*

Acronyms and Abbreviations *(Continued)*

REECo	Reynolds Electrical and Engineering Co., Inc.
RL	Reporting limit
RMA	Radioactive material area
RPD	Relative percent difference
SDWS	*Safe Drinking Water Standards*
SNJV	Stoller-Navarro Joint Venture
SS	Site Supervisor
SSHASP	Site-specific health and safety plan
SSTL	Site-specific target level
SVOC	Semivolatile organic compound
TM	Task Manager
TPH	Total petroleum hydrocarbons
TSCA	*Toxic Substance Control Act*
UGTA	Underground Test Area
USGS	U.S. Geological Survey
VOC	Volatile organic compound
VCP	Vitrified clay pipe
%R	Percent recovery

Executive Summary

Corrective Action Unit 563, Septic Systems, is located in Areas 3 and 12 of the Nevada Test Site, which is 65 miles northwest of Las Vegas, Nevada. Corrective Action Unit 563 is comprised of the four corrective action sites (CASs) below:

- 03-04-02, Area 3 Subdock Septic Tank
- 03-59-05, Area 3 Subdock Cesspool
- 12-59-01, Drilling/Welding Shop Septic Tanks
- 12-60-01, Drilling/Welding Shop 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 (CAI) 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 October 19, 2006, by representatives of the Nevada Division of Environmental Protection; U.S. Department of Energy, 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 data type, amount, and quality needed to develop and evaluate appropriate corrective actions for CAU 563.

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

The scope of the CAI for CAU 563 includes the following activities:

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

- Conduct a radiological survey at CAS 12-59-01.

- Perform field screening.

- Collect and submit environmental samples for laboratory analysis to determine whether contaminants of concern are present, and if they are, collect additional step-out samples to define the extent of the contamination.

- Collect samples of investigation-derived waste for waste management and minimization purposes, as needed.

This CAIP has been developed in accordance with the *Federal Facility Agreement and Consent Order* that was agreed to by the State of Nevada, the U.S. Department of Energy, and the U.S. Department of Defense. Under the *Federal Facility Agreement and Consent Order*, this CAIP will be submitted to the Nevada Division of Environmental Protection for approval. Field work 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) 563: Septic Systems, Nevada Test Site (NTS), Nevada.

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

Corrective Action Unit 563 is located in Areas 3 and 12 of the NTS, which is approximately 65 miles (mi) northwest of Las Vegas, Nevada (Figure 1-1). Corrective Action Unit 563 is comprised of the four corrective action sites (CASs) shown on Figure 1-1 and listed below:

- 03-04-02, Area 3 Subdock Septic Tank
- 03-59-05, Area 3 Subdock Cesspool
- 12-59-01, Drilling/Welding Shop Septic Tanks
- 12-60-01, Drilling/Welding Shop Outfalls

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

1.1 Purpose

The CASs in CAU 563 are being investigated because hazardous and/or radioactive constituents may be present at concentrations that could potentially pose a 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 about CAU 563 will be generated by conducting a CAI before evaluating and selecting corrective action alternatives.

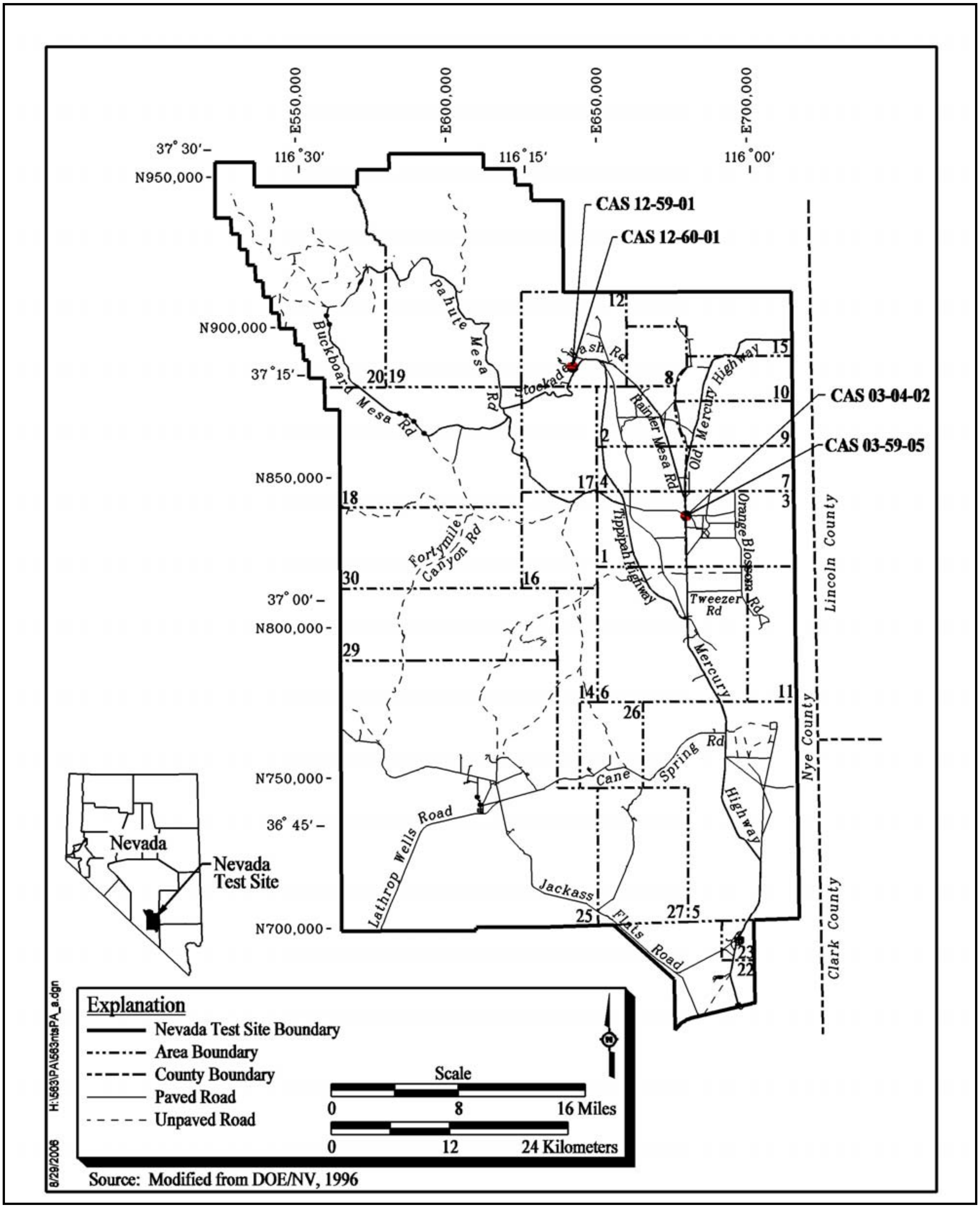

Figure 1-1
Nevada Test Site Map with CAU 563 CAS Locations

1.1.1 Corrective Action Unit 563 History and Description

Corrective Action Unit 563, Septic Systems, consists of four inactive sites located in Areas 3 and 12 of the NTS. The CAU 563 sites consist of septic systems and surface discharge points. The Area 3 sites were used to manage domestic waste from personnel who supported NTS activities at the Area 3 Subdock in the Yucca Flat region from the 1970s to 1985. The Area 12 sites were used to manage domestic and industrial waste from personnel who supported NTS activities at the E-Tunnel Drilling/Welding Shop in the Rainier Mesa region during the 1960s to the late 1970s or early 1980s. Operational histories for each CAU 563 CAS are detailed in Section 2.2.

1.1.2 Data Quality Objectives 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 563. 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 of this document, a summary of the DQO process is provided below.

The DQO problem statement for CAU 563 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 563.” 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)?”
    - 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, 2006b).

  - If a COC is detected, then Decision II must be resolved. If a COC is not detected, the investigation for that CAS is considered complete.

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

  - Identifying the lateral and vertical extent of COC contamination in media.

  - Information needed to characterize investigation-derived waste (IDW) for disposal.

  - Information needed to determine potential remediation waste types.

  - 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 563 CAS by collecting and analyzing samples generated during a corrective action investigation. The presence and nature of contamination at each CAS will be determined by sampling locations that are identified as being the most probable to contain COCs if they are present anywhere within the CAS boundaries. If it is determined that COCs are present at a CAS, that CAS will be further addressed by determining the extent of contamination before evaluating corrective action alternatives.

1.2 Scope

To generate information needed to resolve the decision statements identified in the DQO processes, the scope of the CAI for CAU 563 includes the following activities:

- Move surface debris and/or materials, as needed, to facilitate sampling.
- Conduct a radiological survey at CAS 12-59-01.
- Perform field screening.
- Collect and submit environmental samples for laboratory analysis.
- Collect samples of source material to determine the potential for a release.
- Collect samples of IDW, as needed, for waste management and minimization purposes.
- 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 included 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 563. Objectives of the investigation, including CSMs, 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, 2002a). The project schedule and records availability are discussed in Section 7.0. Section 8.0 is 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 563 is comprised of four CASs that were grouped together based on the geographical location of the sites, technical similarities (septic systems and outfalls), and the agency responsible for closure. The two Area 3 CASs are located at the Area 3 Subdock and include CAS 03-04-02 (septic tank) and CAS 03-59-05 (cesspool). The Area 12 CASs are located at the Drilling/Welding Maintenance Shops and include CAS 12-59-01(septic tanks) and CAS 12-60-01 (outfalls).

2.1 Physical Setting

The following sections describe the general physical settings of Areas 3 and 12 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 for 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).

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

2.1.1 Corrective Action Sites 03-04-02, Area 3 Subdock Septic Tank, and 03-59-05, Area 3 Subdock Cesspool

These CASs are located in the northwest section of Area 3 at the former Area 3 Subdock-South location, which is just southeast of the intersection of Mercury Highway and the 3-03 Road (see Figures A.2-2 and A.2-3). The septic system is situated in a relatively flat area that eventually drains to the Yucca Flat dry lake bed. The subsurface piping of each system was once connected to toilets and hand sinks in a support trailer. Surface soil at the sites is sandy with gravel and pebble-sized rocks. Vegetation is not abundant at these locations and is scattered throughout the immediate area.

Corrective Action Sites 03-04-02 and 03-59-05 are located within the intermontane basin of the Yucca Flat Hydrographic region at the eastern part 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). The average annual precipitation at Station UCC on the Yucca Flat dry lake is 6.62 inches (in.) (NOAA, 2002). The recharge rate to the Yucca Flat area is relatively low (1.76 millimeters per year) due to the thickness of the unsaturated zone extending to more than 600 feet (ft) below ground surface (bgs) (USGS, 1996).

The nearest well to CAS 03-04-02 and CAS 03-59-05 is U.S. Geological Survey (USGS) Well ER-3-2, located approximately 0.72 mi (1.16 kilometers) to the southeast and penetrates approximately 2,631 ft (801.9 meters [m]) of alluvium. According to available drilling logs, Well ER-3-2 was drilled to a total depth of 3,000 ft (914.4 m) bgs. The drill hole penetrated alluvium, nonwelded to partially welded ash flow and bedded tuff of the Ammonia Tanks Tuff, and nonwelded to moderately welded ashflow of the Rainier Mesa Tuff, but did not penetrate bedrock.

U.S. Geological Survey Water Well A is located 110 ft (34 m) south of ER-3-2, approximately 1.1 mi southeast of CAS 03-04-02 and CAS 03-59-05 (USGS and DOE, 2006). The primary use of Water Well A was to provide water for domestic use for the Area 3 mud plant in the 1960s (Wuellner, 1994). Water Well A was drilled to a depth of 1,870 ft, penetrating only alluvial materials. The well was saturated below 1,610 ft at an elevation of 2,402.5 ft above mean sea level (USGS, 1961; Wuellner, 1994). The transmissivity of the alluvium is approximately 800 gallons per day per foot, and the yield is more than 150 gallons per minute. The water is relatively soft and of the sodium-bicarbonate type (USGS, 1961).

2.1.2 Corrective Action Sites 12-59-01, Drilling/Welding Shop Septic Tanks, and 12-60-01, Drilling/Welding Shop Outfalls

These CASs are located in the south-central section of Area 12 at the former Drilling/Welding Shop location, which is east-southeast of the intersection of Stockade Wash Road and the E-tunnel Access

Road (see Figures A.2-4 and A.2-5). Two septic tanks (CAS 12-59-01) are situated in a moderately sloping area while the outfalls associated with each tank piping daylight in drainage channels that in turn drain southeast toward the Tongue Wash. The three outfalls (CAS 12-60-01) daylight on steeply sloping land that drains to moderately sloping drainage channels, which in turn drain southeast toward the Tongue Wash. The subsurface piping connected to the CAS 12-59-01 septic systems originated at toilets/toilet trailers associated with the Drilling/Welding Shops; the Saw Cover Building (North Tank), and a cleanout located northeast of the Drilling/Welding Shops (South Tank). The outfall pipes of CAS 12-60-01 originate at the Pipe Racks (two drain lines) and Hydraulic Pipe Cutting (one drain line) areas of the Drilling/Welding Shops. Surface soil at the site is gravelly with pebble-sized rocks. Bedrock is shallow outcrops just west and upslope of the immediate area. Vegetation is somewhat abundant and scattered throughout the immediate area.

Corrective Action Sites 12-59-01 and 12-60-01 are located within the Ash Meadows groundwater subbasin near Rainier Mesa. Groundwater may be draining into the Alkali Flat/Furnace Creek subbasin (via Timber Mountain) with flow ultimately discharging in Alkali Flat and Furnace Creek in Death Valley.

Surface water at CAS 12-59-01 and CAS 12-60-01 drains into Tongue Wash, which eventually flows into other ephemeral channels draining east into Yucca Flat, a closed hydrographic basin (DRI, 1996).

The nearest active well to CASs 12-59-01 and 12-60-01 is in the Area 12 Camp, Well ER-12-1, located at an elevation of 5,817.12 ft and approximately 1,500 ft west of the site marker of CAS 12-59-01. As of 2005, groundwater level was measured to be at approximately 1,525 ft bgs.

2.2 Operational History

The following subsections provide a description of the use and history of each CAS in CAU 563 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.

2.2.1 Corrective Action Sites 03-04-02, Area 3 Subdock Septic Tank, and 03-59-05, Area 3 Subdock Cesspool

These CASs consist of the septic system components and are the potential release of domestic wastes to the surrounding soils from two separate septic systems. Both septic systems are inactive and abandoned and are located at the Area 3 Subdock-South, which was the location of office buildings, support trailers, and toilet trailers for the adjacent Area 3 Subdock. The Area 3 Subdock Complex was operational from the mid-1970s to 1985. The respective trailer utility connections and concrete pads for surrounding buildings remain at this location. Figures A.2-2 and A.2-3 show the locations of the former structures, the septic tank and the cesspool, and the associated subsurface pipings.

2.2.2 Corrective Action Site 12-59-01, Drilling/Welding Shop Septic Tanks

This CAS consists of the septic system components and the potential release of domestic and possibly industrial wastes to the surrounding soils of two septic systems, one “North Tank” and one “South Tank.” The septic system wastes originated at toilets/hand sinks located in toilet trailers and restrooms (North Tank) and cleanout(s) (South Tank) associated with the Drilling/Welding Shops. Both septic systems are inactive and abandoned and are located at or near the Drilling/Welding Shop Complex, which primarily supported the maintenance of equipment used during the E-Tunnel drilling and testing activities. The Drilling/Welding Shop Complex was operational from the mid-1960s through the late 1970s or early 1980s. The concrete pads of the buildings at the complex remain at this location. Figure A.2-4 shows the locations of the two septic tanks, the associated subsurface pipings and outfalls, and surrounding concrete pads of former buildings.

2.2.3 Corrective Action Site 12-60-01, Drilling/Welding Shop Outfalls

This CAS is the potential release of industrial wastewaters to the surrounding soils from three drainlines and respective outfalls originating from pipe rack cleaning and hydraulic pipe cutting activities at the Drilling/Welding Shops. The three drain lines are inactive, abandoned, and located just beneath the concrete pad of the Area 12 Drilling/Welding Shop, which primarily supported the maintenance of equipment used during the E-Tunnel drilling and testing activities. The Drilling/Welding Shop Complex was operational from the 1960s through the late 1970s or early 1980s. Only the concrete pads of the buildings at the complex remain at this location.

Figures A.2-4 and A.2-5 show the locations of the respective former structures, the three outfalls, and the associated subsurface drain lines.

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 at the CAU 563 CASs. Site visits indicate that wastes such as rusted steel equipment, hydrocarbon waste and other miscellaneous debris and domestic trash are currently present at the sites.

2.3.1 Corrective Action Sites 03-04-02, Area 3 Subdock Septic Tank, and 03-59-05, Area 3 Subdock Cesspool

Solid waste items identified at the Area 3 Subdock-South sites include a small amount of miscellaneous building debris and a few scattered patches asphalt paving material. Potential waste types include sanitary waste, hydrocarbon waste, *Resource Conservation and Recovery Act* (RCRA) hazardous waste, radioactive waste, and mixed waste. All waste types may be comprised of debris, IDW, decontamination liquids, and soils.

2.3.2 Corrective Action Sites 12-59-01, Drilling/Welding Shop Septic Tanks, and 12-60-01, Drilling/Welding Shop Outfalls

Solid waste items identified at the Area 3 Subdock-South sites include a small amount of miscellaneous building material debris, domestic trash, both large and small rusted metal pipe racks, and two radioactive fan units staged on a concrete pad directly above the outfalls. Potential waste types include sanitary waste, hydrocarbon waste, RCRA-listed hazardous waste, radioactive 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. There has been no known migration of contamination at any of the CAU 563 CASs. Potentially affected media for all CASs include surface and shallow subsurface soils. 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. The following subsections contain CAS-specific descriptions of known or suspected releases associated with CAU 563.

2.4.1 Corrective Action Sites 03-04-02, Area 3 Subdock Septic Tank, and 03-59-05, Area 3 Subdock Cesspool

There is no information that suggests contaminants were released from the septic tank at CAS 03-04-02 to the surrounding soils. The cesspool design at CAS 03-59-05 is unknown, however, it is suspected that release of wastewater would be to the surrounding soils. Contaminants would have been limited in volume and are expected to be located in the soil within close proximity to the septic tank, the cesspool or the respective subsurface piping.

Surface soils may have been impacted by contamination associated with atmospheric testing. This contamination is not associated with a release from CAU 563 and will not be included in the subsequent evaluation of CASs 03-04-02 or 03-59-05, as it will be addressed under the Soils Project.

2.4.2 Corrective Action Sites 12-59-01, Drilling/Welding Shop Septic Tanks, and 12-60-01, Drilling/Welding Shop Outfalls

The septic tanks at CAS 12-59-01 and the drains/pipelines at CAS 12-60-01 were designed to release effluent to the surface soils via their respective outfalls. Contaminants would have been limited in volume and are expected to be located in the soil within close proximity to the septic tanks, subsurface piping, or the outfalls.

2.5 Investigative Background

The following subsections summarize the known investigations conducted at the CAU 563 sites. More detailed discussions of these investigations are in Appendix A.

2.5.1 Corrective Action Sites 03-04-02, Area 3 Subdock Septic Tank, and 03-59-05, Area 3 Subdock Cesspool

A geophysical survey was performed by SNJV of the Area 3 sites (Fahringer, 2004). Results indicate subsurface tanks are present in locations that were identified on engineering drawings and during site visits.

2.5.2 Corrective Action Site 12-59-01, Drilling/Welding Shop Septic Tanks, and 12-60-01, Drilling/Welding Shop Outfalls

In September 2006, a geophysical survey was performed by SNJV at both of the Area 12 sites (Weston, 2006). Results indicate subsurface pipelines are present in locations that were identified on engineering drawings and during recent site visits.

In April 2003, a radiological survey was performed by Bechtel Nevada (BN) of the North and South septic tanks at CAS 12-59-01 (Simonsen, 2003). Results indicate the areas surveyed around the South Tank manholes showed elevated readings above MDAs from 300 to 800 disintegrations per minute per 100 square centimeters (dpm 100 cm^2). Direct readings from inside the tank could not be performed due to the small access of the manholes.

2.5.3 National Environmental Policy Act

Site investigation activities, such as those proposed for the CAU 563 Cass are included in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996).

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 563. This checklist requires NNSA/NSO project personnel to evaluate 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 563 and formulation of the CSM. Also presented is a summary listing of the contaminants reasonably suspected to be present at each CAS, the COPCs, the preliminary action levels (PALs) for the investigation, 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 is also used to support appropriate sampling strategies and data collection methods. The CSM has been developed for CAU 563 using the following information:

- Information from the physical setting
- Potential contaminant sources
- Release information
- Historical background information
- Knowledge from similar site
- Physical and chemical properties of the potentially affected media and COPCs

Figure 3-1 depicts a diagrammatic representation of the conceptual pathways from the CAU 563 sources to potential receptors. 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 re-assessed, and a recommendation will be made as how to best 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 the CAU 563 CASs.

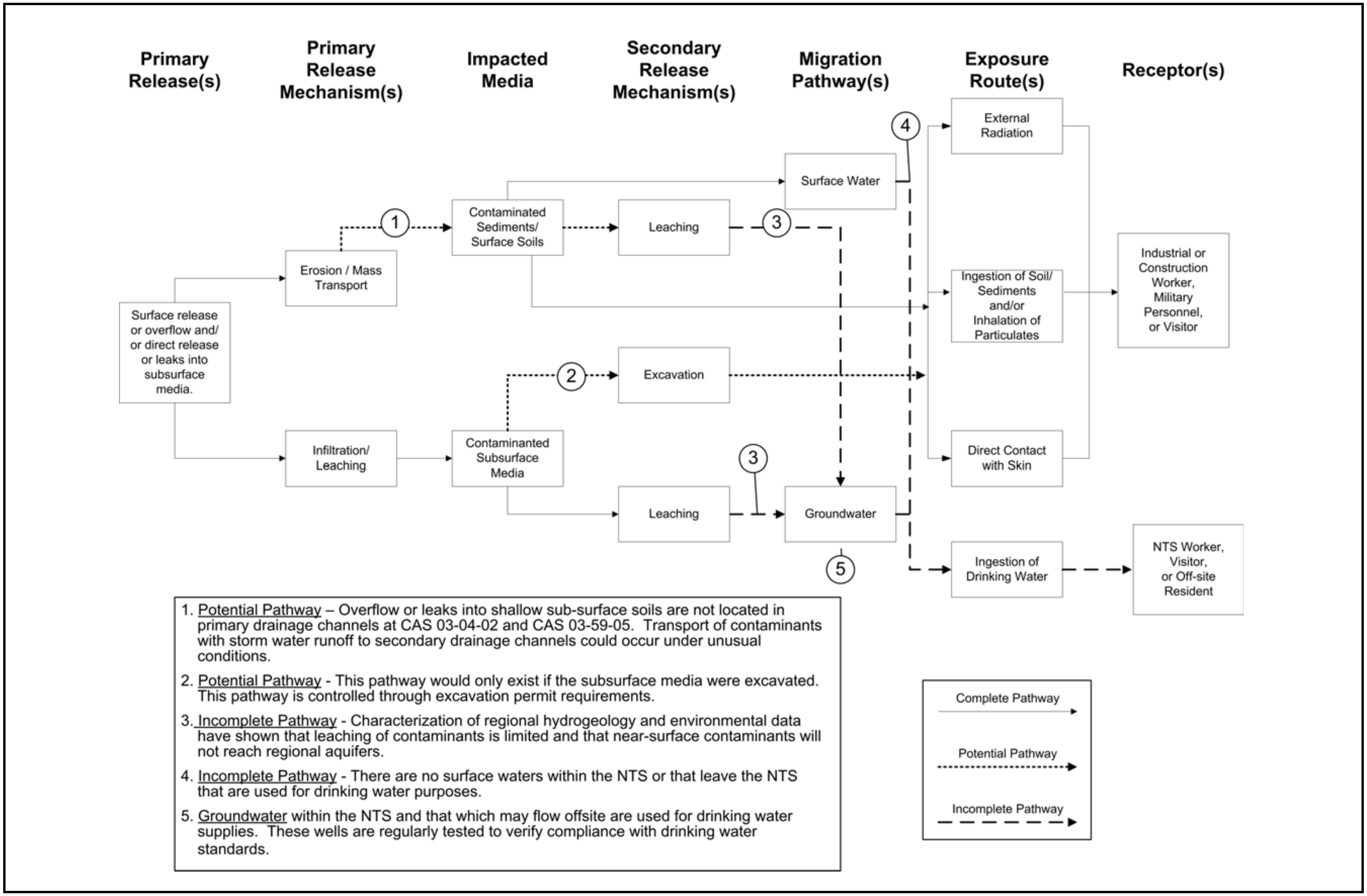

Figure 3-1
Conceptual Site Model Diagram

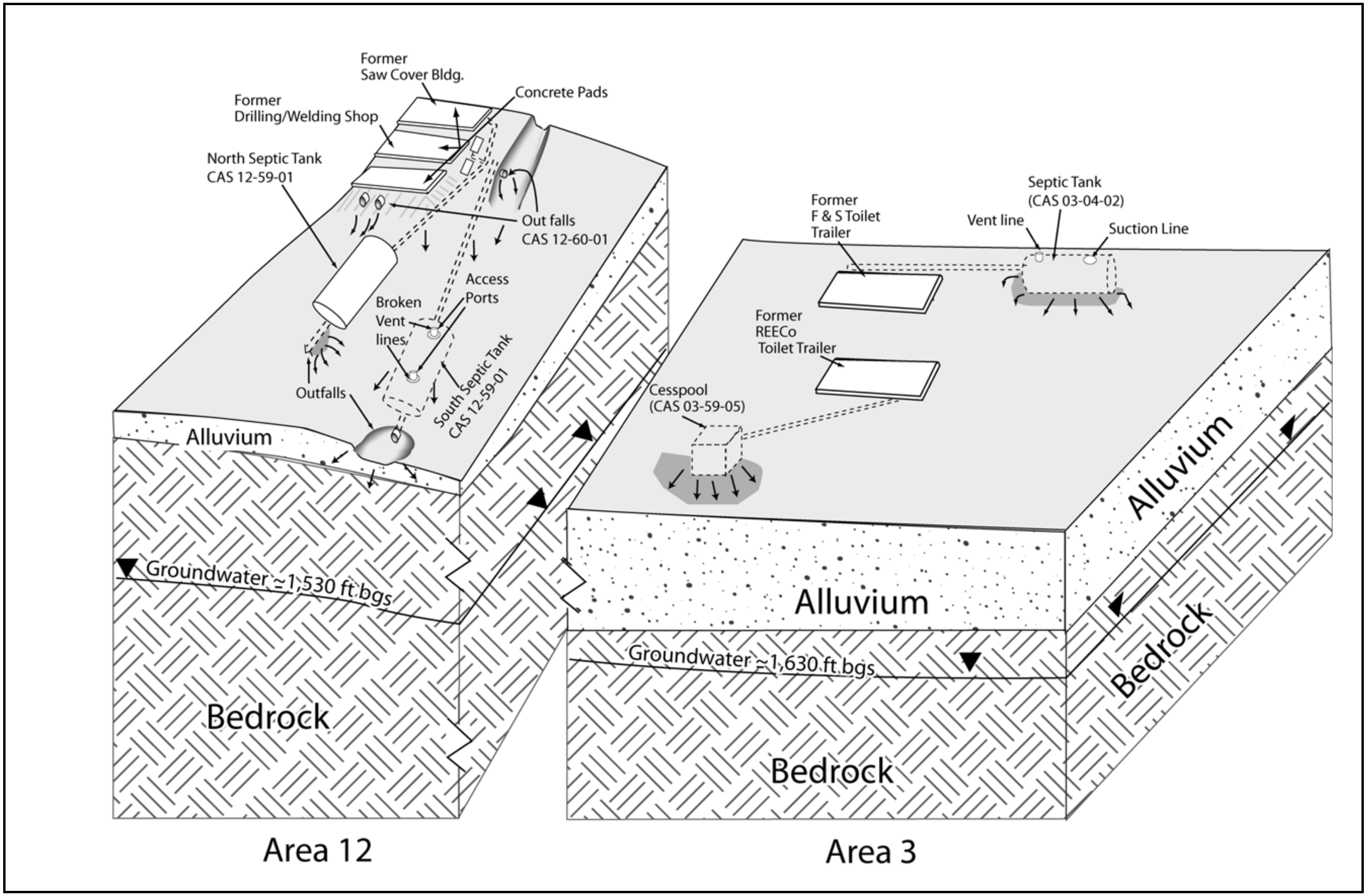

Figure 3-2
Corrective Action Unit 563 Conceptual Site Model

3.1.1 Land Use and Exposure Scenarios

Corrective Action Sites 03-04-02, 03-59-05, 12-59-01, and 12-60-01 are located in the land-use zone described as the "Nuclear and High Explosives Test Zone" (DOE/NV, 1998). This area is reserved for compatible defense and nondefense research, development, and testing activities. The "Nuclear and High Explosives Test Zone" is restricted and dictates future land uses will be limited to nonresidential activities (i.e., industrial).

All CAU 563 CASs meet the criteria for the occasional use exposure scenario based on the current and projected future land uses. This exposure scenario assumes exposure to industrial workers who are not assigned to the area as a regular worksite but may occasionally use the site for intermittent or short-term activities. A site worker under this scenario is assumed to be on the site for an equivalent of 8 hours per day, 10 days per year, over 5 years.

3.1.2 Contaminant Sources

The contamination sources for the Septic Systems CSM are the Area 3 Subdock-South sewage from toilets and sinks; the Area 12 toilets, sinks, and possibly spills from machining operations and decontamination of drilling equipment, and the collection/discharge components (e.g., piping and outfalls).

3.1.3 Release Mechanisms

Release mechanisms for the Area 3 sites are spills and leaks onto surface soils or into shallow subsurface soils resulting from pumping of the septic tank/cesspool, breaches in the septic tanks, cesspool, subsurface piping. The Area 12 sites releases are from breaches in the septic tanks, subsurface piping, discharges into and from the outfalls, or from equipment or stored materials. If any operational materials were stored at the Area 12 sites in containers, they may have leaked or been spilled.

3.1.4 Migration Pathways

Migration pathways at the CAU 563 CASs include the lateral migration of potential contaminants across surface soils/sediments at the Area 12 sites and vertical migration of potential contaminants through subsurface soils at both the Area 3 and Area 12 sites. 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 in the near surface (concrete pads, gravel trenches along pipelines) and in the shallow subsurface (e.g., bedrock, caliche layers).

Surface migration pathways at the Area 3 CASs are expected to be minor, as the land in which they are situated is relatively flat, and the potential release sites are not located in or near drainages. Subsurface migration pathways at the Area 3 CASs are expected to be predominately vertical, although spills or leaks below the ground surface (e.g., base of septic tank, subsurface piping) may also have limited lateral migration before infiltration. Surface migration pathways for the Area 12 CASs are expected to be moderate to high as the land in which they are situated is sloped, and the potential release sites include drainage channels extending downslope to the Tongue Wash.

Contaminants potentially released into the Tongue Wash are subject to more significant transport mechanisms than contaminants released to other surface areas. The Tongue Wash is generally dry but is 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. The Tongue Wash eventually drains into Yucca Lake where the potentially contaminated sediments would be deposited.

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 potential evapotranspiration and limited precipitation for this region, percolation of infiltrated precipitation at the NTS does not provide a significant mechanism for vertical migration of contaminants to groundwater (DOE/NV, 1992).

Annual potential evapotranspiration at the Area 3 Radiological Waste Management Site has been estimated at 62.6 in. (Shott et al., 1997), while the average annual precipitation at the Yucca Flat dry lake bed is 6.62 to 6.7 in. (Winograd and Thordarson, 1975; ARL/SORD, 2006). At the Area 12 CASs, the annual potential evapotranspiration has been estimated at 24.0 in. (Shott et al., 1997), while the average annual precipitation at the Rainier Mesa is approximately 13.8 in. (Winograd and Thordarson, 1975; ARL/SORD, 2006).

3.1.5 Exposure Points

Exposure points for both CSMs are expected to be areas of surface contamination where visitors and site workers will come in contact with surface soil. Subsurface exposure points may also exist if workers come in contact with contaminated media during excavation activities. Site workers may also be exposed to radiological contamination by performing activities in proximity to radiologically contaminated materials.

3.1.6 Exposure Routes

Exposure routes to site workers include exposure to radiation fields, ingestion, inhalation, and/or dermal contact (absorption) from disturbance of, or direct contact with, contaminated media.

3.1.7 Additional Information

Information concerning topography, geology, climatic conditions, hydrogeology, floodplains, and infrastructure at the CAU 563 CASs are presented in Section 2.1, as they pertain 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 563 are defined as the list of constituents represented by the analytical methods identified in Table 3-1 for Decision I environmental samples taken at each of the CASs. The constituents reported for each analytical method are listed in Table 3-2.

Table 3-1
Analytical Program and COPCs for CAU 563[a]
(Includes Waste Characterization Analyses)

Analyses	CAS 03-04-02	CAS 03-59-05	CAS 12-59-01	CAS 12-60-01
Organic COPCs				
Volatile Organic Compounds[b]	X	X	X	X
Semivolatile Organic Compounds[b]	X	X	X	X
Total Petroleum Hydrocarbons-Diesel-Range Organics	X	X	X	X
Polychlorinated Biphenyls	X	X	X	X
Inorganic COPCs				
RCRA Metals[b]	X	X	X	X
Radionuclide COPCs				
Gamma Spectroscopy	X	X	X	X
Isotopic Uranium	X	X	X	X
Isotopic Plutonium	X	X	X	X
Strontium-90	X	X	X	X
Waste Characterization Analyses				
Gross Alpha	(x)	(x)	(x)	(x)
Gross Beta	(x)	(x)	(x)	(x)
Tritium	(x)	(x)	(x)	(x)

[a]The COPCs are the constituents reported from results of the analyses listed.
[b]If sample(s) are collected for waste management purposes, analysis may also include *Toxicity Characteristic Leaching Procedure*.

CAS = Corrective action site
COPCs = Contaminants of potential concern
RCRA = *Resource Conservation and Recovery Act*

X = Required analyses on all samples
(x) = Required analyses on samples taken from material(s) slated for disposal.

Table 3-2
Constituents Reported by Analytical Methods

VOCs		SVOCs		TPH	PCBs	RCRA Metals	Gamma-Emitting Radionuclides	Isotopic Radionuclides
1,1,1-Trichloroethane	Dibromochloromethane	2,3,4,6-Tetrachlorophenol	Dibenzofuran	TPH (Diesel-Range Organics)	Aroclor 1016	Arsenic	Actinium-228	Plutonium-238
1,1,1,2-Tetrachloroethane	Dichlorodifluoromethane	2,4-Dimethylphenol	Diethyl Phthalate		Aroclor 1221	Barium	Americium-241	Plutonium-239/240
1,1,2,2-Tetrachloroethane	Ethyl methacrylate	2,4-Dinitrotoluene	Dimethyl Phthalate		Aroclor 1232	Cadmium	Cesium-137	Strontium-90
1,1,2-Trichloroethane	Ethylbenzene	2,4,5-Trichlorophenol	Di-n-butyl Phthalate		Aroclor 1242	Chromium	Cobalt-58	Uranium-234
1,1-Dichloroethane	Isobutyl alcohol	2,4,6-Trichlorophenol	Di-n-octyl Phthalate		Aroclor 1248	Lead	Europium-152	Uranium-235
1,1-Dichloroethene	Isopropylbenzene	2-Chlorophenol	Fluoranthene		Aroclor 1254	Mercury	Europium-154	Uranium-238
cis-1,2-Dichloroethene	m-Dichlorobenzene (1,3)	2-Methylnaphthalene	Fluorene		Aroclor 1260	Selenium	Europium-155	Tritium
1,2-Dichloroethane	Methacrylonitrile	2-Methylphenol	Hexachlorobenzene		Aroclor 1268	Silver	Lead-212	**Other Radiological Measurements**
1,2-Dichloropropane	Methyl methacrylate	2-Nitrophenol	Hexachlorobutadiene[b]				Lead-214	Gross alpha
1,2,4-Trichlorobenzene	Methylene chloride	3-Methylphenol[a]	Hexachloroethane				Niobium-94	Gross beta
1,2,4-Trimethylbenzene	N-Butylbenzene	4-Chloroaniline	Indeno(1,2,3-cd)pyrene				Potassium-40	
1,2-Dibromo-3-chloropropane	N-Propylbenzene	4-Methylphenol[a]	Naphthalene[b]				Thallium-208	
1,3,5-Trimethylbenzene	o-Dichlorobenzene (1,2)	4-Nitrophenol	Nitrobenzene				Thorium-234	
1,4-Dioxane	p-Dichlorobenzene (1,4)	Acenaphthene	N-Nitroso-di-n-propylamine				Uranium-235	
2-Butanone	p-isopropyltoluene	Acenaphthylene	Pentachlorophenol					
2-Chlorotoluene	sec-Butylbenzene	Aniline	Phenanthrene					
2-Hexanone	Styrene	Anthracene	Phenol					
4-Methyl-2-pentanone	tert-Butylbenzene	Benzo(a)anthracene	Pyrene					
Acetone	Tetrachloroethene	Benzo(a)pyrene	Pyridine					
Acetonitrile	Toluene	Benzo(b)fluoranthene						
Allyl chloride	Total Xylenes	Benzo(g,h,i)perylene						
Benzene	Trichloroethene	Benzo(k)fluoranthene						
Bromodichloromethane	Trichlorofluoromethane	Benzoic Acid						
Bromoform	Vinyl acetate	Benzyl Alcohol						
Bromomethane	Vinyl chloride	Bis(2-ethylhexyl) phthalate						
Carbon disulfide		Butyl benzyl phthalate						
Carbon tetrachloride		Carbazole						
Chlorobenzene		Chrysene						
Chloroethane		Dibenzo(a,h)anthracene						
Chloroform								
Chloromethane								
Chloroprene								

[a]May be reported as 3,4-methylphenol
[b]May be reported with VOCs

PCB = Polychlorinated biphenyl
RCRA = *Resource Conservation and Recovery Act*
SVOC = Semivolatile organic compound

TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

The list of COPCs is intended to encompass all of the 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 or other 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 563 sites is not available.

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 analytes at specific CASs. Targeted analytes 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.1.0 through A.7.0). Targeted contaminants for each CAU 563 CAS are identified in Table 3-3.

Table 3-3
Targeted Analytes for CAU 563

CAS Number	Chemical Targeted Analyte	Radiological Targeted Analyte
03-04-02	--	--
03-59-05	--	--
12-59-01	Trichloroethene	--
12-60-01	Trichloroethene	--

CAS = Corrective action site
-- = No targeted analytes identified

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, 2006a). This process conforms with *Nevada Administrative Code* (NAC) Section 445A.227, which lists the requirements for sites with soil contamination. For the evaluation of corrective actions, NAC Section 445A.22705 requires the use of American Society for Testing and Materials (ASTM) Method E 1739-95 to "conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards (i.e., FALs) or to establish that corrective action is not necessary."

This RBCA process, summarized in Figure 3-3, defines three tiers (or levels) of evaluation involving increasingly sophisticated analyses:

- Tier 1 is conducted by comparing sample results from source areas (highest concentrations) 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 is 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 petroleum hydrocarbons (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 is 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 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.

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

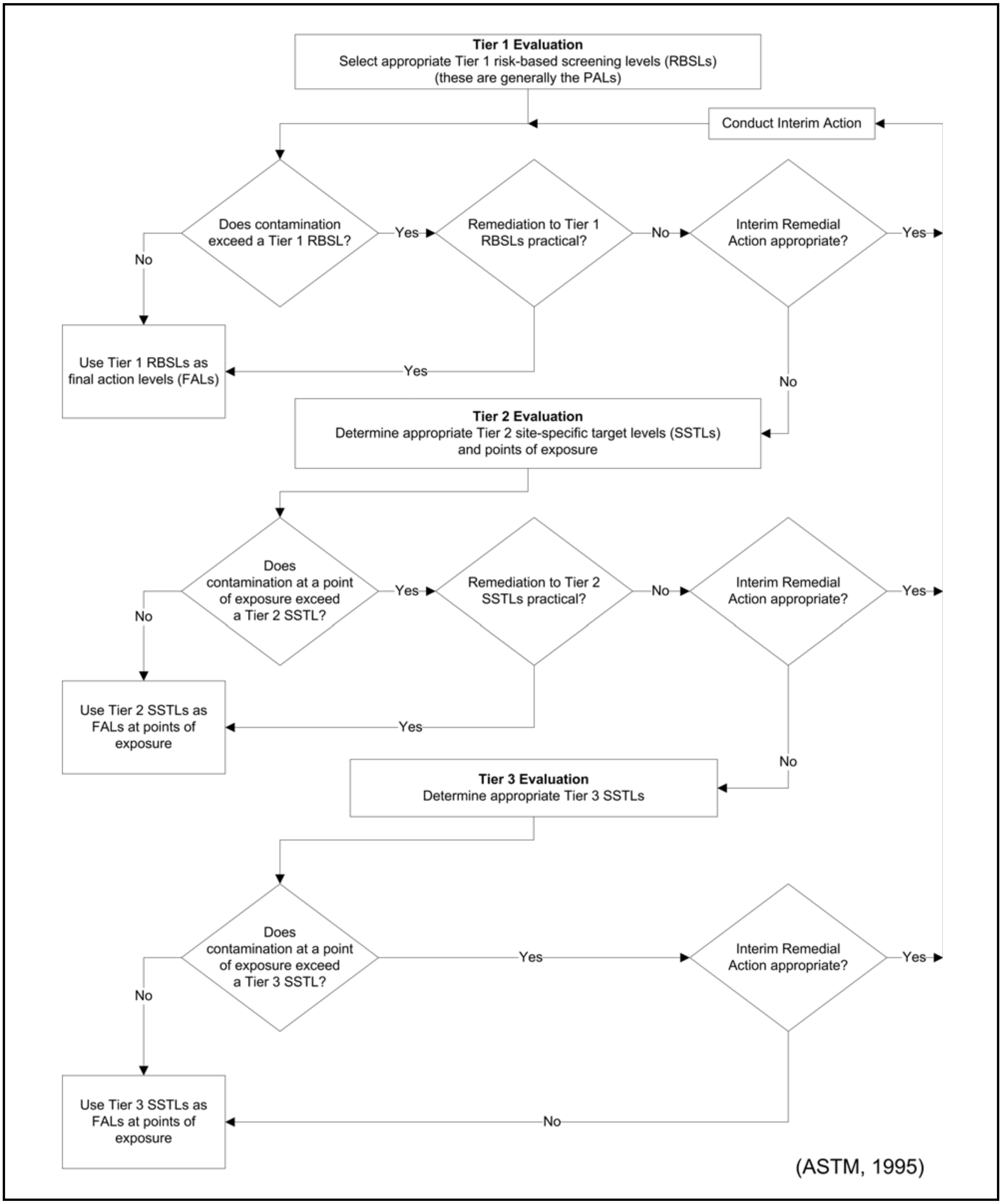

Figure 3-3
Risk-Based Corrective Action Decision Process

3.3.1 Chemical PALs

Except as noted herein, the chemical PALs are defined as the U.S. Environmental Protection Agency (EPA) *Region 9 Risk-Based Preliminary Remediation Goals (PRGs)* for contaminant constituents in industrial soils (EPA, 2004). 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 mean plus two standard deviations for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (formerly the Nellis Air Force Range) (NBMG, 1998; Moore, 1999). For detected chemical COPCs without established PRGs, the protocol used by the EPA Region 9 in establishing PRGs (or similar) will be used to establish PALs. If used, this process will be documented in the investigation report.

3.3.2 Total Petroleum Hydrocarbon PALs

The PAL for TPH is 100 parts per million (ppm) as listed in NAC 445A.2272 (NAC, 2006a).

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.

The PAL for tritium is based on the Underground Test Area (UGTA) Project limit of 400,000 picocuries per liter (pCi/L) for discharge of water containing tritium (NNSA/NV, 2002b). The activity of tritium in the soil moisture of soil samples will be reported in units of pCi/L for comparison to this PAL.

Solid media such as concrete and/or structures may pose a potential radiological exposure risk to site workers if contaminated. The radiological PAL for solid media will be defined as the unrestricted-release criteria defined in the *NV/YMP Radiological Control* (RadCon) *Manual* (NNSA/NSO, 2004).

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 563 was developed at a meeting on October 19, 2006. The DQOs were developed to identify data needs, clearly define the intended use of the environmental data, and to 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 563 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 563.” To address this question, the resolution of two decisions 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:
  - Identifying the volume of media containing any COC bounded by analytical sample results in lateral and vertical directions.
  - Information needed to characterize IDW for disposal.
  - Information needed to determine potential remediation waste types.
  - 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 wastes that are present at a site to impose COCs into site environmental media if the wastes were to be released. To evaluate the potential for septic tank contents to result in the introduction of a COC to the surrounding environmental media, the following conservative assumptions were made:

- That the tank containment would fail at some point and the contents would be released to the surrounding media.
- That the resulting concentration of contaminants in the surrounding media would be equal to the concentration of contaminants in the tank waste.
- That any liquid contaminant in the septic tanks exceeding the RCRA toxicity characteristic concentration can result in COC introduction into the surrounding media.

Sludge containing a contaminant exceeding an equivalent FAL concentration would be considered to be potential source material and would require a corrective action. Septic tank liquids with contaminant concentrations exceeding an equivalent toxicity characteristic action level would be considered to be potential source material and would require a corrective action.

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 investigation report 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 minimum detectable concentrations (MDCs) for each CAU 563 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. Due to changes in analytical methodology and changes in analytical laboratory contracts, information in Tables 3-4 and 3-5 that varies from corresponding information in the QAPP will supersede that information in the QAPP (NNSA/NV, 2002a).

Table 3-4
Analytical Requirements for Radionuclides for CAU 563
(Page 1 of 2)

Parameter/Analyte	Matrix	Analytical Method	MDC[a]	PAL[b,c]	Laboratory Precision (RPD)	Percent Recovery (%R)
Gamma Spectroscopy						
Americium-241	Soil	HASL-300[f]	2.0 pCi/g[e]	12.7 pCi/g	Relative Percent Difference (RPD) 35% Normalized Difference -2<ND<2[g]	Laboratory Control Sample Recovery 80-120 Percent Recovery (%R)
Cesium-137	Soil	HASL-300[f]	0.5 pCi/g[e]	12.2 pCi/g		
Cobalt-60	Soil	HASL-300[f]	0.5 pCi/g[e]	2.68 pCi/g		
Isotopic Radionuclides						
Tritium	Soil	Lab Specific	400 pCi/L[d]	4.0+05 pCi/L[d]	Relative Percent Difference (RPD) 35% Normalized Difference -2<ND<2[g]	Laboratory Control Sample Recovery 80-120 Percent Recovery (%R) Chemical Yield 30-105[h] %R (not applicable for tritium)
Plutonium-238	Soil	ASTM C 1001-00[i]	0.05 pCi/g	13.0 pCi/g		
Plutonium-239/240	Soil	ASTM C 1001-00[i]	0.05 pCi/g	12.7 pCi/g		
Strontium-90	Soil	HASL 300[f]	0.5 pCi/g	838 pCi/g		
Uranium-234	Soil	ASTM C 1000-02[j]	0.05 pCi/g	143 pCi/g		
Uranium-235	Soil	ASTM C 1000-02[j]	0.05 pCi/g	17.6 pCi/g		
Uranium-238	Soil	ASTM C 1000-02[j]	0.05 pCi/g	105 pCi/g		

Table 3-4
Analytical Requirements for Radionuclides for CAU 563
(Page 2 of 2)

Parameter/Analyte	Matrix	Analytical Method	MDC[a]	PAL[b,c]	Laboratory Precision (RPD)	Percent Recovery (%R)
Other Radionuclides						
Gross alpha	Liquid	EPA 900.0 (1)	3.0 pCi/L	15.0 pCi/L	Relative Percent Difference (RPD) 20% Normalized Difference $-2<ND<2$[g]	Laboratory Control Sample Recovery 80-120 Percent Recovery (%R)
Gross beta	Liquid		4.0 pCi/L	50.0 pCi/L		

[a]The MDC is the lowest concentration of a radionuclide, if present in a sample, that can be detected with a 95 percent confidence level.
[b]The PALs for soil are based on the *National Council for Radiation Protection and Measurement* (NCRP) *Report No. 129 Recommended Screening Limits for Contaminated Soil and Review of Factors Relevant to Site-Specific Studies* (NCRP, 1999) scaled to 25 mrem/yr dose and the guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993).
[c]PALs for liquids will be developed as needed.
[d]Units of pCi/L will be reported by the analytical laboratory based on the activity of the tritium in the soil moisture. The PAL for tritium in soil is based on the UGTA Project limit of 400,000 pCi/L for discharge of water containing tritium to an infiltration basin/area (NNSA/NV, 2002b).
[e]MDCs vary depending on the presence of other gamma-emitting radionuclides in the sample and are relative to the MDC for Cesium-137.
[f]*The Procedures Manual of the Environmental Measurements Laboratory*, HASL-300 (DOE, 1997).
[g] ND is not RPD, it is another measure of precision used to evaluate duplicate analyses. The ND is calculated as the difference between two results divided by the square root of the sum of the squares of their total propagated uncertainties. *Evaluation of Radiochemical Data Usability* (Paar and Porterfield, 1997).
[h]*General Radiochemistry and Routine Analytical Services Protocol* (GRASP) (EG&G Rocky Flats, 1991). The chemical yield only applies to plutonium, uranium and strontium.
[i]*Standard Test Method for Radiochemical Determination of Plutonium in Soil by Alpha Spectroscopy* (ASTM, 2002c).
[j]*Standard Test Method for Radiochemical Determination of Uranium Isotopes in Soil by Alpha Spectrometry* (ASTM, 2000a).

ASTM = American Society for Testing and Materials
HASL = Health and Safety Laboratory
MDC = Minimum detectable concentration
mrem/yr = Millirem per year
ND = Normalized difference
PAL = Preliminary action level
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
UGTA = Underground Test Area

Table 3-5
Analytical Requirements for Chemical COPCs for CAU 563
(Page 1 of 2)

Parameter/Analyte	Medium or Matrix	Analytical Method	Minimum Detectable Concentration (MDC)	Laboratory Precision (RPD)[a]	Percent Recovery (%R)[b]
ORGANICS					
Total Volatile Organic Compounds	Aqueous	8260B[c]	Less than action level[d]	Lab-specific[e]	Lab-specific[e]
	Soil				
Total Semivolatile Organic Compounds	Aqueous	8270C[c]			
	Soil				
Polychlorinated Biphenyls	Aqueous	8082[c]			
	Soil				
Total Petroleum Hydrocarbons-Diesel-Range Organics	Soil	8015B modified[c]			
INORGANICS					
Total RCRA Metals					
Arsenic	Aqueous	6010B[c]	Less than action level[d]	20	Matrix Spike Recovery at 75-125 Laboratory Control Sample Recovery at 80 - 120
	Soil			35[f]	
Barium	Aqueous	6010B[c]		20	
	Soil			35[f]	
Cadmium	Aqueous	6010B[c]		20	
	Soil			35[f]	
Chromium	Aqueous	6010B[c]		20	
	Soil			35[f]	

Table 3-5
Analytical Requirements for Chemical COPCs for CAU 563
(Page 2 of 2)

Parameter/Analyte	Medium or Matrix	Analytical Method	Minimum Detectable Concentration (MDC)	Laboratory Precision (RPD)[a]	Percent Recovery (%R)[b]
Lead	Aqueous	6010B[c]	Less than action level[d]	20	Matrix Spike Recovery at 75-125
	Soil			35[f]	
Mercury	Aqueous	7470A[c]		20	
	Soil	7471A[c]		35[f]	
Selenium	Aqueous	6010B[c]		20	Laboratory Control Sample Recovery at 80 - 120
	Soil			35[f]	
Silver	Aqueous	6010B[c]		20	
	Soil			35[f]	

[a]Precision is estimated from the RPD of the laboratory or field duplicates MSD and LCSD are spiked. It is calculated by: RPD = 100 x ($|A_1-A_2|$)/[(A_1+A_2)/2], where A_1 = Concentration of the parameter in the initial sample aliquot, A_2 = Concentration of the parameter in the duplicate sample aliquot.
[b]Accuracy is assessed from the percent recovery (%R) of parameters spiked into a blank or sample matrix of interest, or from the recovery of surrogate compounds spiked into each sample. The recovery of each spiked parameter is calculated by: %R = 100 x (A_s-A_u/A_n), where A_s = Concentration of the parameter in the spiked sample, A_u = Concentration of the parameter in the unspiked sample, A_n = Concentration increase that should result from spiking the sample.
[c]U.S. EPA *Test Methods for Evaluating Solid Waste Physical/Chemical Methods*, 3rd Edition, Parts 1-4, (SW-846) CD-ROM, Washington, DC (EPA,1996).
[d]Estimated Quantitation Limit as given in SW-846 (EPA, 1996).
[e]RPD and %R Performance Criteria are developed and generated in-house by the laboratory according to approved laboratory procedures.
[f]*Industrial Sites Quality Assurance Project Plan* (NNSA/NV, 2002a).

EQL = Estimated quantitation limit
LCSD = Laboratory control sample duplicate
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
MSD = Matrix spike duplicate
RCRA = *Resource Conservation and Recovery Act*
RPD = Relative percent difference

4.0 Field Investigation

This section contains a description of the activities to be conducted to gather and document information from the CAU 563 field investigation.

4.1 Technical Approach

The information necessary to satisfy the DQO data needs will be generated for each CAS in CAU 563 by collecting and analyzing samples generated during a field investigation. The presence and nature of contamination at each CAS will be evaluated by collecting samples using a judgmental approach at biased locations that are determined to be most probable to contain COCs if they are present anywhere within the CAS boundary.

If there is a waste present that, if released, has the potential to release significant 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 563 investigation. To determine whether contamination is from the CAU or from other sources, soil samples will be collected from background locations at the Area 3 Subdock-South 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 on a Record of Technical Change 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 563 include site preparation, sample location selection, and sample collection activities.

4.2.1 Site Preparation Activities

Site preparation activities will be conducted by the NTS management and operating contractor before to commencing investigation activities for CAU 563. Site preparation may include, but not be limited to: relocating or removing surface debris, equipment and structures; constructing hazardous waste accumulation areas (HWAAs) and site exclusion zones; providing sanitary facilities; and constructing decontamination facilities.

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

- Perform visual surveys at all CASs to identify any staining, discoloration, disturbance of native soils, or any other indication of potential contamination.
- Check for residual contents in septic tanks, and associated subsurface piping.
- Conduct a radiological survey at the CAS 12-59-01 septic tanks.
- Stake and/or flag sample locations and record their Global Positioning System (GPS) coordinates.

4.2.2 Sample Location Selection

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 recorded 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 number, location, and spacing of step-outs may be modified by the Task Manager (TM) or Site Supervisor (SS), as warranted by site conditions to achieve DQO criteria stipulated in Appendix A.

Where sampling locations are modified by the TM or SS, the justification for these modifications will be documented in the Field Activity Daily Log (FADL).

4.2.3 Sample Collection

The CAU 563 sampling program will consist of the following activities.

- Perform field screening, as necessary.
- Collect and analyze samples from locations as described in this section.
- Collect required QC samples.
- Collect additional samples, as necessary, to support characterization of waste.
- Collect soil samples from background locations at the Area 3 Subdock-South CASs.
- Perform radiological characterization surveys of construction materials and debris, as necessary, for disposal purposes.
- Record GPS coordinates for each environmental sample location.

Decision I surface soil samples (0 to 0.5 ft bgs) will be collected from shallow locations based on the CSM, biasing factors, FSRs, and existing information. 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 or backhoe excavation, as appropriate. Decision I subsurface soil samples will collected at depth intervals selected by the TM or SS, based on biasing factors to a depth where the biasing factors are no longer present.

Content(s) of the septic tanks and subsurface piping, if encountered, will be sampled to support investigation and waste management decisions. If multi-phased residual material is present, it will be collected by appropriate methods to characterize the separate phases.

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 the 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 SS 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 requirements) 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, 2002a) 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, and the procedures for protecting the environment. The ISMS program requires that site personnel will reduce or eliminate the possibility of injury, illness, or accidents, and to 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:

- Reasonably suspected potential hazards to site personnel and the public include, but are not limited to: 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, 2003b; NAC, 2006b), it will be inspected and/or samples collected by trained personnel.

4.4 Site Restoration

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

- Removal of all equipment, wastes, debris, and materials associated with the CAI.
- Removal of all signage and fencing (unless part of a corrective action).
- Grading of site to pre-investigation condition (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 563 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, amount of contaminated media contained in the waste, and 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. Contained 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 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 in investigation area (e.g., lead brick).
- Field-screening waste (e.g., spent solvent, disposable sampling equipment, and/or PPE contaminated by field-screening activities).

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: analytical results of samples either directly or indirectly associated with the waste, historical site knowledge, waste generation process knowledge, field observations, field-monitoring/screening results, and/or radiological survey/swipe results.

The SNJV Standard-Based Management System Subject Area, Radiological Release Material, shall be used to determine whether such materials may be declared nonradioactive. Onsite IDW management requirements by waste type are detailed in the subsequent sections. Applicable waste management regulations and requirements are listed in Table 5-1 of this document.

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] NTS Landfill Permit SW13.097.03[d]
Liquid/Rinsate (nonhazardous)	N/A	Water Pollution Control General Permit GNEV93001, Rev. 3iii[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] NAC[b] 445a.2272
Polychlorinated Biphenyls	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, 2005a, b, c)
[b]*Nevada Administrative Code* (NAC, 2006a, b,c)
[c]Area 23 Class II Solid Waste Disposal Site (NDEP, 1997a)
[d]Area 9 Class III Solid Waste Disposal Site (NDEP, 1997c)
[e]Nevada Test Site Sewage Lagoons (NDEP, 2005)
[f]*Resource Conservation and Recovery Act* (CFR, 2006)
[g]*Nevada Test Site Performance Objective for the Certification of Nonradioactive Hazardous Waste* (BN, 1995)
[h]*Nevada Test Site Waste Acceptance Criteria,* Rev. 6-01 (NNSA/NSO, 2006b)
[i]Area 6 Class III Solid Waste Disposal Site for hydrocarbon waste (NDEP, 1997b)
[j]*Toxic Substance Control Act* (CFR, 2003a, b)

CFR = *Code of Federal Regulations*
DOE = U.S. Department of Energy
N/A = Not applicable
NAC = *Nevada Administrative Code*
NDEP = Nevada Division of Environmental Protection
NRS = *Nevada Revised Statutes*
NTS = Nevada Test Site
NTSWAC = *Nevada Test Site Waste Acceptance Criteria*
POC = Performance Objective for the Certification of Nonradioactive Hazardous Waste
RCRA = *Resource Conservation and Recovery Act*
TSCA = *Toxic Substance Control Act*

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 10c Industrial Waste Landfill.

Office trash and lunch waste will be placed in the dumpster to be transported to the sanitary landfill for disposal. Sanitary IDW generated at each CAS will only be collected in plastic bags, sealed, labeled with the CAS number from each site in which it was generated, and dated. The waste will then be placed in a roll-off box located in Mercury, or other approved roll-off box location. The number of bags of sanitary IDW placed in the roll-off box will be counted as they are placed in the roll-off box, noted in a log, and documented in the FADL. These logs will provide necessary tracking information for ultimate disposal in the 10c Industrial Waste Landfill.

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 controlled area (RCA). This allows for the immediate segregation of radioactive waste from waste that may be unrestricted regarding radiological release. Removable contamination limits, as defined in Table 4-2 of 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 values of Table 4-2, by either direct radiological survey/swipe results or through process knowledge, will not be managed as potential radioactive waste but will be managed in accordance with the appropriate section of this document. Wastes in excess of the Table 4-2 and Table 5-1 values will be managed as potential radioactive waste and be managed 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 *Nevada Test Site Waste Acceptance Criteria* (NTSWAC) (NNSA/NSO, 2006b). Potential radioactive waste drums containing soil, PPE, disposable sampling equipment, and/or rinsate may be staged at a designated radioactive material area (RMA) or RCA when full or at the end of an investigation phase. The waste drums will remain at the RMA pending certification and disposal under NTSWAC requirements (NNSA/NSO, 2006b).

5.3.3 Hazardous Waste

The CAU will have waste accumulation areas established according to the needs of the project. Satellite accumulation areas and HWAAs will be managed consistent to federal and state regulation requirements. (CFR, 2003a, b; NAC, 2006a, b). The HWAAs will be properly controlled for access, and will be equipped with spill kits and appropriate spill containment. Suspected hazardous wastes will be placed in DOT-compliant containers. All containerized hazardous waste will be handled, inspected, and managed in accordance with Title 40 *Code of Federal Regulations* (CFR) 265 Subpart I (CFR, 2006). These provisions include managing the waste in containers compatible with waste type, and segregating incompatible waste types so that; in the event of a spill, leak, or release, incompatible wastes shall not contact one another. The HWAAs will be covered under a site-specific emergency response and contingency action plan until such time that the waste is determined to be nonhazardous or all containers of hazardous waste have been removed from the storage area. Hazardous waste will be characterized in accordance with the requirement of Title 40 CFR 261. RCRA-"listed" hazardous for trichloroethene waste has been identified at the CAU 563 Area 12 CASs. Any waste determined to be hazardous will be managed and transported in accordance with RCRA and DOT requirements to a permitted treatment, storage, and disposal facility (CFR, 2006).

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 (NDEP, 1997b), an appropriate hydrocarbon waste management facility (e.g., recycling facility), or other method in accordance with NDEP regulations.

5.3.5 Mixed Low-Level Waste

Mixed waste, if generated, shall be managed and dispositioned according to the requirements of RCRA (CFR, 2006) or subject to agreements between NNSA/NSO and the State of Nevada, as well as DOE requirements for radioactive waste. The waste will be marked with the words "Hazardous Waste Pending Analysis and Radioactive Waste Pending Analysis." Waste characterized as mixed will not be stored for a period of time that exceeds the requirements of RCRA unless subject to agreements between NNSA/NSO and the State of Nevada. The mixed waste shall be transported via approved hazardous waste/radioactive waste transporter to the NTS transuranic waste storage pad for storage pending treatment or disposal. Mixed waste with hazardous waste constituent concentrations below Land Disposal Restrictions may be disposed of at the NTS Area 5 Radioactive Waste Management Site if the waste meets the requirements of the NTSWAC (NNSA/NSO, 2006b), the NTS NDEP permit for a Hazardous Waste Management Facility (NEV HW0009 [NDEP, 2000]), and the RCRA Part B Permit Application for Waste Management Activities at the Nevada Test Site (DOE/NV, 1999). Mixed waste constituent concentrations exceeding Land Disposal Restrictions 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 polychlorinated biphenyl (PCBs) is governed by the *Toxic Substances Control Act* (USC, 1976) and its implementing regulations at 40 CFR 761 (CFR, 2003b). 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). The IDW will initially be evaluated using analytical results for media samples from the investigation. If any type of PCB waste is generated, it will be managed according to 40 CFR 761 (CFR, 2003b) as well as State of Nevada requirements (NAC, 2006a), guidance, and agreements with NNSA/NSO.

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. Any IDW that meets this description will be segregated and managed as potentially "characteristic" hazardous waste. This segregated population of waste will be either: assigned the characterization of the soil/sludge that was sampled, sampled directly, or undergo further evaluation using the 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. The PPE and equipment that is not visibly stained, discolored, or grossly contaminated and that is within the radiological free-release criteria, will be managed as nonhazardous sanitary waste.

5.4.2 Management of Decontamination Rinsate

Rinsate at CAU 563 will not be considered hazardous waste unless there is evidence that the rinsate may display a RCRA characteristic. Evidence may include such things as the presence of a visible sheen, pH, or association with equipment/materials used to respond to a release/spill of a hazardous waste/substance. Decontamination rinsate that is potentially hazardous (using associated sample results and/or process knowledge) will be managed as characteristic hazardous waste (CFR, 2003a). The regulatory status of the potentially hazardous rinsate will be determined through the application of associated sample results or through direct sampling. If the associated samples do not indicate the presence of hazardous constituents, then the rinsate will be considered to be nonhazardous.

The disposal of nonhazardous rinsate will be consistent with guidance established in current NNSA/NSO Fluid Management Plans for the NTS as follows:

- Rinsate that is determined to be nonhazardous and contaminated to less than 5x *Safe Drinking Water Standards* (SDWS) is not restricted as to disposal. Nonhazardous rinsate contaminated at 5x to 10x SDWS will be disposed of in an established infiltration basin or solidified and disposed of as sanitary waste or low-level waste in accordance with the respective sections of this document.

- Nonhazardous rinsate contaminated at greater than 10x SDWS will be disposed of in a lined basin or solidified and disposed of as sanitary waste or low-level waste in accordance with the respective sections of this document.

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 managed on site or containerized for transportation to an appropriate disposal site.

Onsite management of the soil waste 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 soil waste shall be protected from run-on and run-off using appropriate protective measures based on the type of contaminant(s) (e.g., covered with plastic and bermed).

Management of the soil waste for disposal consists of placing the soil in waste containers, labeling and temporarily storing the containers, and shipping them 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 soils placed back into a borehole or 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, waste generation process knowledge, field observations, field-monitoring/screening results, radiological survey/swipe results and/or the analytical results of samples either directly or indirectly associated with the waste may be used to characterized 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. Waste that is not sanitary will be entered into an approved waste management system where it will be managed and dispositioned according to federal, state requirements, and agreements between NNSA/NSO and the State of Nevada. The debris will be managed on site by berming and covering next to the excavation, placement in a container(s), or left on the footprint of the CAS, and its disposition deferred until implementation of corrective action at the site.

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 (CFR, 2003a). 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. In the event mixed waste is generated, the waste will be managed in accordance with Section 5.3.5 of this document.

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 563. 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, 2002a).

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 volatile organic compound (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 CAS per matrix).
- Field blanks (1 at Area 3 CASs and 1 at Area 12 CASs).
- Laboratory QC samples (1 per CAS per matrix).

Additional QC samples may be submitted based on site conditions at the discretion of the TM or SS. 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, 2002a).

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, 2002a), 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 suspected 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 Corrective Action Decision Document (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
- Comparability
- Completeness
- 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 criteria are not met. The subsequent sections discuss each of the DQIs that will be used to assess the quality of laboratory data. Due to changes in analytical methodology and changes in analytical laboratory contracts, criteria for precision and accuracy in Tables 3-4 and 3-5 that vary from corresponding information in the QAPP will supersede that in the QAPP (NNSA/NV, 2002a).

Table 6-1
Laboratory and Analytical Performance Criteria for CAU 563 Data Quality Indicators

Data Quality Indicator	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.
Sensitivity	Minimum detectable concentrations are less than or equal to respective FALs.	Cannot determine whether COCs are present or migrating at levels of concern.
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.
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.

CAS = Corrective action site
COC = Contaminant of concern
COPC = Contaminant of potential concern
DQO = Data quality objective
FAL = Final action level
ND = Normalized difference
RPD = Relative percent difference

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 laboratory control sample (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 chemical precision when both results are greater than or equal to 5x reporting limit (RL) is 20 and 35 percent, respectively, for aqueous and soil samples. 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 between sample results and duplicate results.

The criteria used for the assessment of radiological precision when both results are greater than or equal to 5x MDC is 20 and 35 percent, respectively, for aqueous and soil samples. When either result is less than 5x MDC, the normalized difference (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 (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 in the investigation report 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 re-analyzing 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: matrix spike (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 (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 in the investigation report 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 a characteristics of a population or an environmental condition (EPA, 2002). Representativeness is assured by a 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 within the CAS.
- For Decision I probabilistic sampling, having a high degree of confidence that the sample locations selected will represent contamination of the CAS.
- Having a high degree of confidence that analyses conducted will be sufficient to detect any COCs 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 investigation report.

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 DQO decisions-making. For the probabilistic sampling approach, the completeness goal is a calculated minimum sample size required to produce a valid statistical comparison of the sample mean to the FAL. The methodology for determining minimum required sample size is described in Appendix C.

The qualitative assessment of completeness is an evaluation of 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 investigation report. 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 comparability confidence with one dataset 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 using approved standard methods and procedures. This will ensure that data from this project can be compared to regulatory action levels that were developed based on data generated using the same or comparable methods and procedures. An evaluation of comparability will be presented in the investigation report.

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 investigation report.

7.0 Duration and Records Availability

7.1 Duration

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

Table 7-1
Corrective Action Investigation Activity Durations

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

7.2 Records Availability

Historic 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 Project Manager. This document is available in the DOE public reading rooms located in Las Vegas and Carson City, Nevada, or by contacting the appropriate DOE project manager. The NDEP maintains the official Administrative Record for all activities conducted under the auspices of the FFACO.

8.0 References

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

ASTM, see American Society for Testing and Materials.

Air Resources Laboratory/Special Operations and Research Division. 2006. NTS Climatological Rain Gauge Data website. As accessed at http://www.sord.nv.goe/home_climate_rain.htm on 7 August.

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

American Society for Testing and Materials. 1996. Sections 04.08 and 04.09, "Construction." In *Annual Book of ASTM Standards*. Philadelphia, PA.

American Society for Testing and Materials. 2000a. *Standard Test Method for Radiochemical Determination of Uranium Isotopes in Soil by Alpha Spectrometry*, ASTM C 1000-00. West Conshohocken, PA: ASTM International.

American Society for Testing and Materials. 2000b. *Standard Test Method for Strontium-90 in Water*, ASTM D 5811-00. West Conshohocken, PA: ASTM International.

American Society for Testing and Materials. 2002a. *Standard Test Method for Isotopic Uranium in Water by Radiochemistry,* ASTM D 3972-02. West Conshohocken, PA: ASTM International.

American Society for Testing and Materials. 2002b. *Standard Test Method for Plutonium in Water,* ASTM D 3865-02. West Conshohocken, PA: ASTM International.

American Society for Testing and Materials. 2002c. *Standard Test Method for Radiochemical Determination of Plutonium in Soil by Alpha Spectroscopy,* ASTM C 1001-00. West Conshohocken, PA: ASTM International.

BN, see Bechtel Nevada.

Bechtel Nevada. 1995. *Nevada Test Site Performance Objective for Certification of Nonradioactive Hazardous Waste*, Rev. 0, G-E11/96.01. Las Vegas, NV.

Bechtel Nevada. 1996. *U.S. Department of Energy, Nevada Operations Office Environmental Data Report for the Nevada Test Site - 1994,* DOE/NV/11718-026. Prepared by S.C. Black and Y.E. Townsend. Las Vegas, NV.

CFR, see *Code of Federal Regulations.*

Center for Land Use Interpretation. 1996. *The Nevada Test Site, A Guide to America's Nuclear Proving Ground*. Culver City, CA.

Code of Federal Regulations. 2003a. Title 40 CFR, Parts 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 2003b. Title 40 CFR, Part 763, "Asbestos." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 2006. Title 40 CFR, Part 265, "Hazardous Waste Management System: General." Washington, DC: U.S. Government Printing Office.

DOE, see U.S. Department of Energy.

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

DRI, see Desert Research Institute.

Desert Research Institute. 1988. *CERCLA Preliminary Assessment of DOE's Nevada Operations Office, Nuclear Weapons Testing Areas*, April. Las Vegas, NV.

Desert Research Institute. 1996. *ER-12-1 Completion Report*, Publication #45120. December. Prepared for the U.S. Department of Energy, Nevada Operations Office. Las Vegas, NV.

EPA, see U.S. Environmental Protection Agency.

ERDA, see U.S. Energy Research and Development Administration.

EG&G Rocky Flats. 1991. *General Radiochemistry and Routine Analytical Services Protocol (GRASP)*, Version 2.1, July. Golden, CO: Environmental Management Department.

Fahringer, P., Stoller-Navarro Joint Venture. 2004. Memorandum to E. Shupp (SNJV) entitled, "Area 3 Sub Dock South Geophysics - Memorandum of Finding, Winter 2004," 5 April. Las Vegas.FFACO, see *Federal Facility Agreement and Consent Order.*

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

Karanthanasis, A.D., and B.F. Hajek. 1982. "Quantitative Evaluation of Water Adsorption on Soil Clays." In *Soil Science Society of America Journal*, 46: 1321-1325. Madison, WI.

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

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

NAC, see *Nevada Administrative Code*.

NBMG, see Nevada Bureau of Mines and Geology.

NCRP, see National Council on Radiation Protection and Measurements.

NDEP, see Nevada Division of Environmental Protection.

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

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

NOAA, see National Oceanic and Atmospheric Administration.

NRS, see *Nevada Revised Statutes*.

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

National Oceanic and Atmospheric Administration. 2002. "Precipitation Summary." As accessed at http://www.sord.nv.doe.gov/home_climate.htm on 2 October 2006.

Nevada Administrative Code. 2006a. NAC 2272, "Total Petroleum Hydrocarbons." As accessed at accessed at http://www.leg.state.nv.us/nac/ on 7 August. Carson City, NV.

Nevada Administrative Code. 2006b. NAC 445A.2272, "Asbestos." As accessed at http://www.leg.state.nv.us/nac/ on 7 August. Carson City, NV.

Nevada Administrative Code. 2006c. NAC 444, "Sanitation." As accessed at http://www.leg.state.nv.us/nac on 7 August. Carson City, NV.

Nevada Bureau of Mines and Geology. 1972. *Geology and Mineral Deposits of Southern Nye County, Nevada, Bulletin 77*. Prepared by H.R. Cornwall. Reno, NV: Mackay School of Mines, University of Nevada.

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

Nevada Division of Environmental Protection. 1995. *Mutual Consent Agreement between the State of Nevada and the U.S. Department of Energy for the Storage of Low-Level Land Disposal Restricted Mixed Waste*. Carson City, NV.

Nevada Division of Environmental Protection. 1997a. *Class II Solid Waste Disposal Site for Municipal and Solid Waste, Area 23 of the NTS, Permit SW 13-097-04*. Carson City, NV.

Nevada Division of Environmental Protection. 1997b (as amended in August 2000). *Class III Solid Waste Disposal Site for Hydrocarbon Burdened Soils, Area 6 of the NTS,* Permit SW 13 097 02. Carson City, NV.

Nevada Division of Environmental Protection. 1997c (as amended in August 2000). *Class III Solid Waste Disposal Site; UIOC, Area 9 of the NTS,* Permit SW 13-097-03. Carson City, NV.

Nevada Division of Environmental Protection. 2000. *Nevada Test Site Permit for Hazardous Waste Management Facility* (NEV HW0009). Carson City, NV.

Nevada Division of Environmental Protection. 2005. *State of Nevada Water Pollution Control General Permit*, No. GNEV93001. Carson City, NV.

Nevada Revised Statutes. 2005a. NRS 444.440 - 444.620, "Collection and Disposal of Solid Waste." Carson City, NV.

Nevada Revised Statutes. 2005b. NRS 459.400 - 459.600, "Disposal of Hazardous Waste." Carson City, NV.

Nevada Revised Statutes. 2005c. NRS 618.750 - 618.840, "Disposal of Hazardous Waste." Carson City, NV.

Paar, J.G., and D.R. Porterfield. 1997. *Evaluation of Radiochemical Data Usability,* April, ES/ER/MS-5. Oak Ridge, TN: U.S. Department of Energy.

REECo., see Reynolds Electrical and Engineering Company, Inc.

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

Simonsen, R.J., Bechtel Nevada. 2003. Radiological Survey Report - Map, April, 03-FAC-1712-150. Las Vegas, NV.

USC, see *United State Code.*

USGS, see U.S. Geological Survey.

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

United States Code. 1976. 15 USC 2601 et seq., *Toxic Substances Control Act*. Enacted by Public Law No. 94-469, as amended. Washington, DC: U.S. Government Printing Office.

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

U.S. Department of Energy. 1997. *The Procedures Manual of the Environmental Measurements Laboratory,* HASL-300, 28th Ed., Vol. I. New York, NY.

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

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

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2004. *NV/YMP Radiological Control Manual*, Rev. 5, DOE/NV/11718-079, UC-702. Prepared by A.L. Gile of Bechtel Nevada. Las Vegas, NV.

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

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2006b. *Nevada Test Site Waste Acceptance Criteria*, DOE/NV--325, Rev. 6-01. Las Vegas, NV.

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

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

U.S. Department of Energy, Nevada Operations Office. 1997. *Integrated Safety Management Policy,* DOE Order NV P 450.4. Las Vegas, NV.

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

U.S. Department of Energy, Nevada Operations Office. 1999. *Resource Conservation and Recovery Act*, Part B, Permit Application for Waste Management Activities at the Nevada Test Site. Las Vegas, NV.

U.S. Ecology and Atlan-Tech. 1991. *Environmental Monitoring Report for the Proposed Ward Valley, California, Low Level Radioactive Waste Facility.* Rosewell, GA.

U.S. Energy Research and Development Administration. 1977. *Final Environmental Impact Statement, Nevada Test Site, Nye County, Nevada,* ERDA-1551, Washington, DC.

U.S. Environmental Protection Agency. 1980. *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* EPA 600/4-80-032. Washington, DC.

U.S. Environmental Protection Agency. 1996. *Test Method for Evaluating Solid Waste Physical/Chemical Methods*, SW-846, 3rd Edition. Washington, DC.

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

U.S. Environmental Protection Agency. 2004. *Region 9 Preliminary Remediation Goals (PRGs).* As accessed at http://www.epa.gov/region09/waste/sfund/prg/index.htm on 8 August 2006. Prepared by S.J. Smucker. San Francisco, CA.

U.S. Geological Survey. 1961. *Groundwater Test Well A, Nevada Test Site, Nye County, Nevada*, TEI-800. Prepared by C.E. Price and W. Thordarson on behalf of the U.S. Atomic Energy Commission. Denver, CO.

U.S. Geological Survey. 1990. *Geologic Map of the Nevada Test Site, Southern Nevada*. USGS Map I-2046. Denver, CO.

U.S. Geological Survey. 1996. *Summary of Hydrogeological Controls on Groundwater Flow at the Nevada Test Site, Nye County, Nevada,* USGS WRIR 96-4109. Prepared by R.J. Laczniak, J.C. Cole, D.A. Sawyer, and D.A. Trudeau.

U.S. Geological Survey. 1999. *Structural Relationships of Pre-Tertiary Rocks in the Nevada Test Site Region, Southern Nevada*, USGS Professional Paper 607. Prepared by J.C. Cole and P.H. Cashman. Washington, DC: U.S. Government Printing Office.

U.S. Geological Survey. 2003. *Simulation of Net Infiltration and Potential Recharge Using a Distributed Parameter Watershed Model of the Death Valley Region, Nevada and California,* U.S. Geological Survey Water Resources Investigations Report 03-4090. Prepared by J.A.Hevesi, A.L. Flint, and L.E. Flint.

U.S. Geological Survey. 2006. "Ground-Water Levels for Nevada." As accessed at http://nwis.waterdata.usgs.gov/nv/nwis/gwlevels on 8 August.

U.S. Geological Survey and U.S. Department of Energy. 2006. "USGS/DOE Cooperative Studies in Nevada Periodic Water Levels -- Nevada Test Site Map." As accessed at http://nevada.usgs.gov/doe_nv/doe_nv/ntsmap.htm on 7 August.

van Genuchten, M. 1980. "A Closed Form Equation for Predicting the Hydraulic Conductivity of Unsaturated Soils." In *Soil Science Society of America Journal*, 44: 892-898. Madison, WI.

Weston Solutions, Inc. 2006. "After Action Report, Technical Services for Preliminary Assessment Geophysical Investigations, Nevada Test Site, Six Corrective Action Sites, Nye County, Nevada." Task Order No. IS07 610. October. West Chester, PA.

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

Wuellner, J.W., Reynolds Electrical and Engineering Company, Inc. 1994. Memo to J.P. Bielawski (REECo) entitled, "Historical Information - Area 3 Waste Mud Impoundment." 2 May. Las Vegas, NV.

Appendix A

Data Quality Objectives

A.1.0 Introduction

The DQO process is a seven-step strategic systematic planning method used to plan data collection activities and define performance criteria for the CAU 563, Septic 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 563 is insufficient to evaluate and select preferred corrective actions; therefore, a CAI will be conducted.

The CAU 563 investigation will be based on the DQOs presented in this appendix as developed by representatives of the NDEP and the NNSA/NSO. The seven steps of the DQO process presented in Sections A.3.0 through A.9.0 were developed in accordance with *EPA Guidance 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 that serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of a study.
- Criteria 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.

- 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/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 four CASs that comprise CAU 563 are located in Areas 3 and 12 of the NTS, as shown in Figure A.2-1:

- 03-04-02, Area 3 Subdock Septic Tank
- 03-59-05, Area 3 Subdock Cesspool
- 12-59-01, Drilling/Welding Shop Septic Tanks
- 12-60-01, Drilling/Welding Shop Outfalls

The following sections (Sections A.2.1 through A.2.4) provide a CAS description, physical setting and operational history, release information, and previous investigation results for each CAS in CAU 563. The CAS-specific COPCs are provided in the following sections. Many of the COPCs are based on a conservative evaluation of possible site activities considering the incomplete site histories of the CASs and considering contaminants found at similar NTS sites. Targeted contaminants are defined as those contaminants that are known or that could be reasonably suspected to be present within the CAS based on previous sampling or process knowledge.

A.2.1 Corrective Action Site 03-04-02, Area 3 Subdock Septic Tank

Corrective Action Site 03-04-02 is located in Area 3 at the Subdock-South location which is south of the 3-03 Road and east of Mercury Highway. The site consists of the potential environmental releases associated with a buried septic tank and the associated subsurface piping. Engineering drawings show that the tank measures 10 by 6 ft, has a capacity of approximately 2,000 gallons, and is buried approximately 2.5 ft below grade (REECo, 1971a). The tank location is identified on the surface by six striped guard posts that surround a 2-in. vent line and an 8-in. suction line. The vent line rises 3 ft above grade and is located 2 ft north of the suction line. The suction line is capped by a 12-in. diameter metal cover. Engineering drawings show that the septic tank serviced a Fenix & Scisson toilet trailer that is no longer present at the site (REECo, 1971a). Approximately 100 ft of buried asbestos concrete pipe (ACP) connected the septic tank to the northern end of the Fenix & Scisson toilet trailer. A black stick-up ACP is located 66 ft north of the guard posts and is believed to have connected to the toilet trailer. Historical documents indicate that the contents of the septic tank were pumped and transported for disposal on a bi-weekly basis (Author Unknown, 1991). See Figure A.2-2 for a diagram of the CAS components.

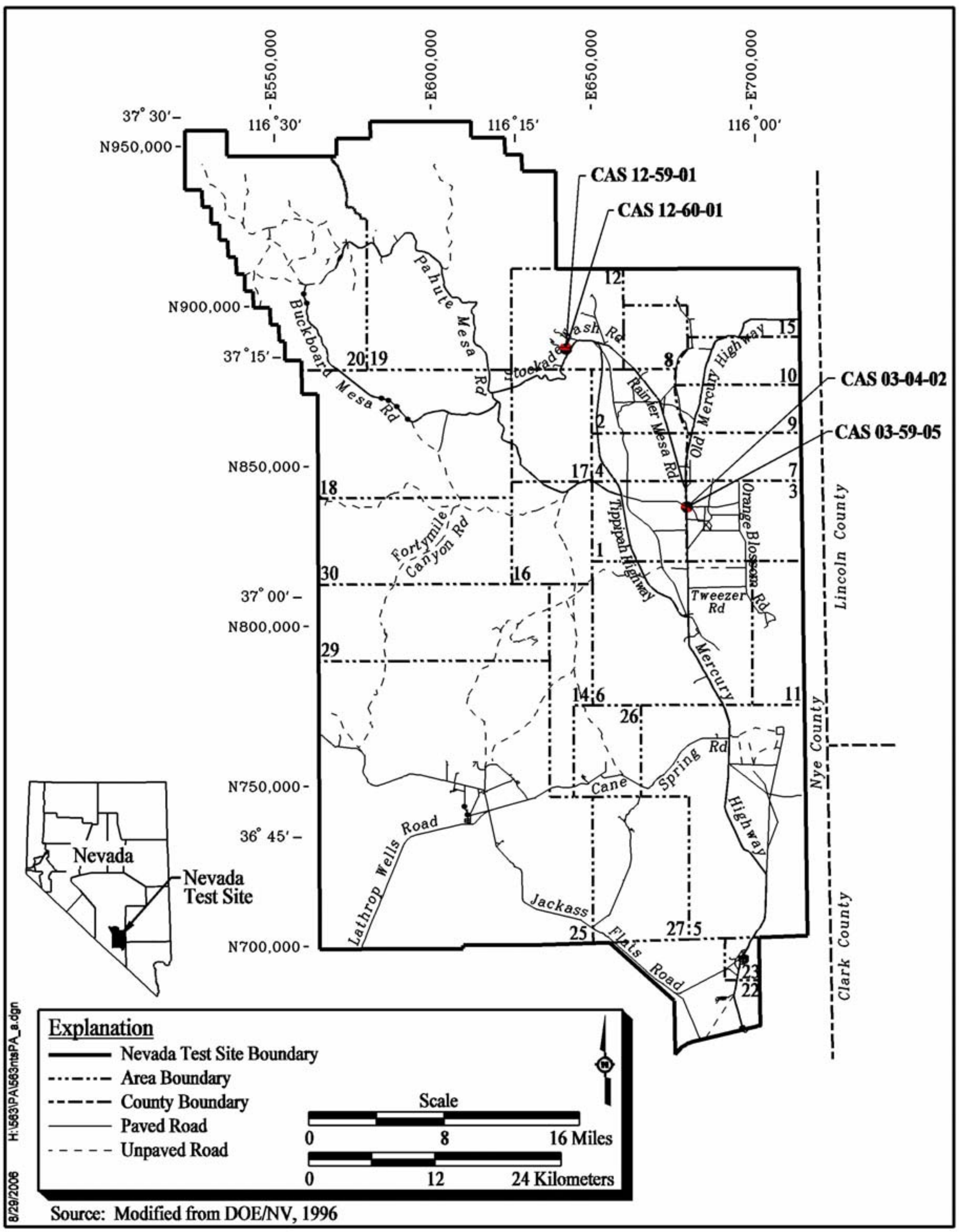

Figure A.2-1
Corrective Action Unit 563, CAS Location Map

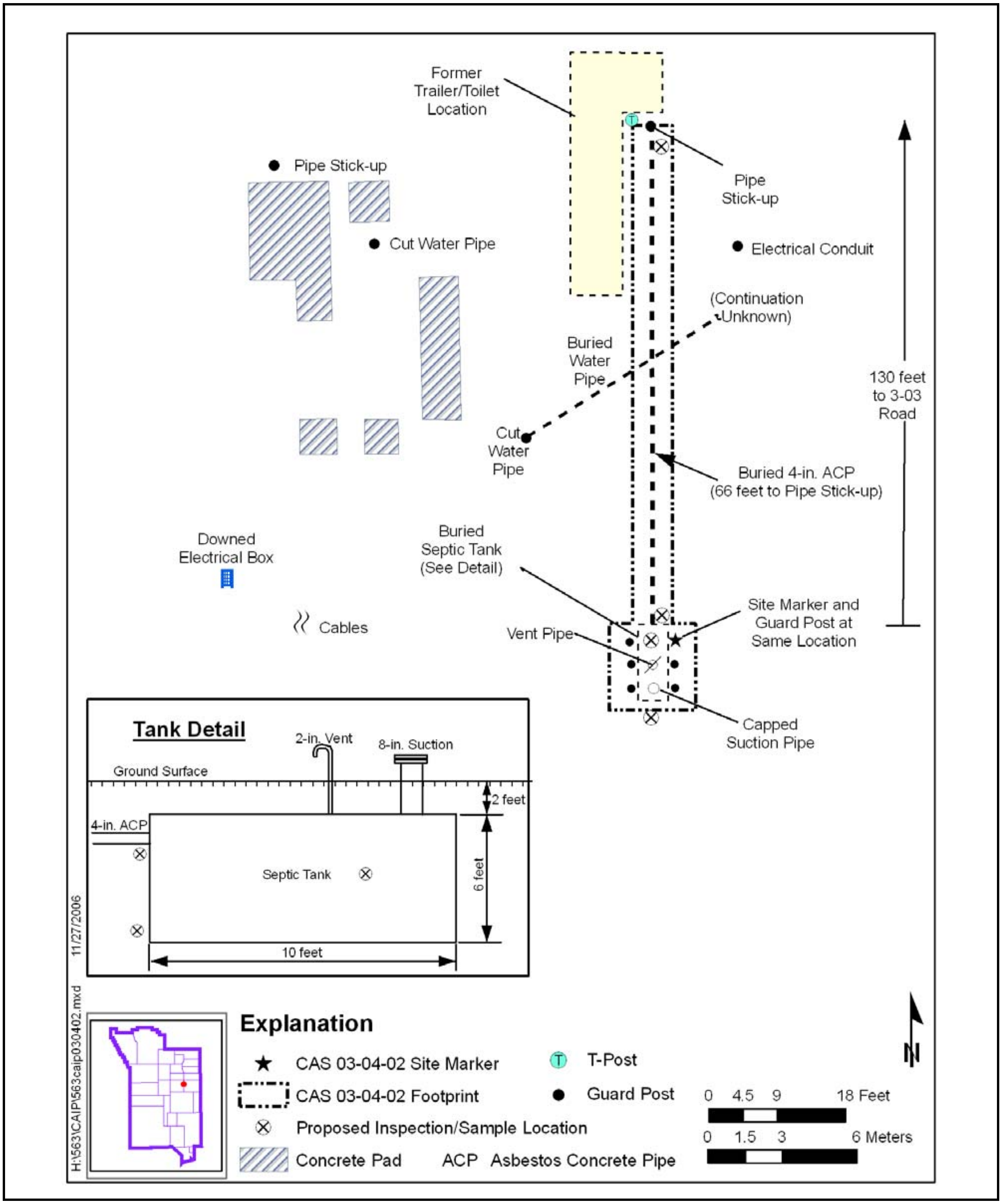

Figure A.2-2
CAS 03-04-02, Area 3 Subdock Septic Tank

Physical Setting and Operational History **–** Corrective Action Site 03-04-02 is located in the former Area 3 Subdock-South. This area formerly housed a series of trailers that interviewees and engineering drawings indicate were used as office buildings, support trailers, and toilet trailers for the former Area 3 Subdock Complex. The Area 3 Subdock-South was in operation from the 1970s to 1985, when it was relocated to Area 1. All of the buildings at the Subdock-South have been removed and only the concrete foundations remain.

Release Information **–** Sanitary waste from the Fenix & Scisson toilet trailer was disposed into the septic tank of CAS 03-04-02. There was a potential for an overflow/surface release related to pumping of the septic tank, or a subsurface release related to leaks in the tank or breaches in the associated piping. Contaminants would have been limited in volume and are expected to be located in the soil within close proximity to the septic tank. An NTS worker recalls a toilet trailer of typical design being present at this location. The toilet trailer had men's and women's facilities including a bed and multiple toilets. The interviewee did not recall any additional trailers adjacent to the toilet trailer and is unaware of any activities performed that may have introduced contaminants other than sanitary waste into the associated septic system (Patton, 2006).

Previous Investigation Results **–** A geophysical survey conducted in March 2004 at the Area 3 Subdock-South confirmed the presence of a buried septic tank at CAS 03-04-02. A large metallic below-ground anomaly was detected at the expected location of the buried septic tank and is labeled "septic tank location with vent pipe at surface" in the report. The report also identifies additional anomalies in the area due to the presence of surface and subsurface metallic structures and debris. No linear anomalies typical of metallic pipelines or utilities were identified (Fahringer, 2004).

A.2.2 Corrective Action Site 03-59-05, Area 3 Subdock Cesspool

Corrective Action Site 03-59-05 is located approximately 70 ft southeast of the intersection of Mercury Highway and the 3-03 Road at the Area 3 Subdock-South. The site consists of the potential environmental releases associated with a buried cesspool and associated piping. The cesspool consists of a small volume open-bottom tank or a large-diameter pipe casing; however, the actual dimensions and geometry are unknown. A 1998 environmental survey report describes the cesspool as a dry tank with sediment present at a depth of 6 ft bgs and also indicates that a capped pipe is surrounded by four posts (DOE, 1988). Engineering drawings indicate that the cesspool serviced the

Reynolds Electrical and Engineering Co., Inc. (REECo) toilet trailer, which is no longer present at the site. Approximately 100 ft of 4-in. vitrified clay pipe (VCP) connected the cesspool to the southern end of the toilet trailer (REECo, 1967a). The cesspool location is identified on the surface by the presence of four striped guard posts that surround a 4- by 4-ft area. The capped pipe described in the 1988 DOE report was not observed. See Figure A.2-3 for a diagram of the CAS.

***Physical Setting and Operational History* –** Refer to Section A.2.1 for a description of the physical setting and operational history of the Area 3 Subdock.

***Release Information* –** Sanitary wastes from the REECo toilet trailer were disposed of in the cesspool of CAS 03-59-05. There is no documentation indicating the design of the cesspool; however, it is expected that it was designed to release sanitary waste from the REECo toilet trailer either directly to subsurface media or to a tank (if present), as described in a previous environmental survey (DOE, 1988). There is a potential for an overflow/surface release related to potential pumping of the cesspool, and/or a subsurface release that may have been direct or from leakage of a tank (if present). Contaminants would have been limited in volume and are expected to be located in the soil within close proximity to the cesspool.

***Previous Investigation Results* –** A geophysical survey was conducted in March 2004 at the Area 3 Subdock-South. A large below-ground metallic anomaly was detected at the expected location of the buried cesspool and is labeled “Septic Tank” in the report. The report also identifies additional anomalies in the area due to the presence of surface and subsurface metallic structures and debris. No linear anomalies typical of metallic pipelines or utilities were identified (Fahringer, 2004).

A.2.3 Corrective Action Site 12-59-01, Drilling/Welding Shop Septic Tanks

Corrective Action Site 12-59-01 consists of the potential environmental releases associated with two septic systems associated with the Drilling/Welding Shop in Area 12; located southwest of the intersection of Rainier Mesa Road and E-Tunnel Road. The two septic systems are separate and include a north septic tank with associated piping, a south septic tank with associated piping, and impacted soil at outwash areas. Associated piping is 6-in. VCP and includes numerous potential tie-in pipes (i.e., stick-ups). The apparent length of associated piping ranges from approximately 500 ft (north tank) to 1,000 ft (south tank). The piping associated with both tanks is believed to

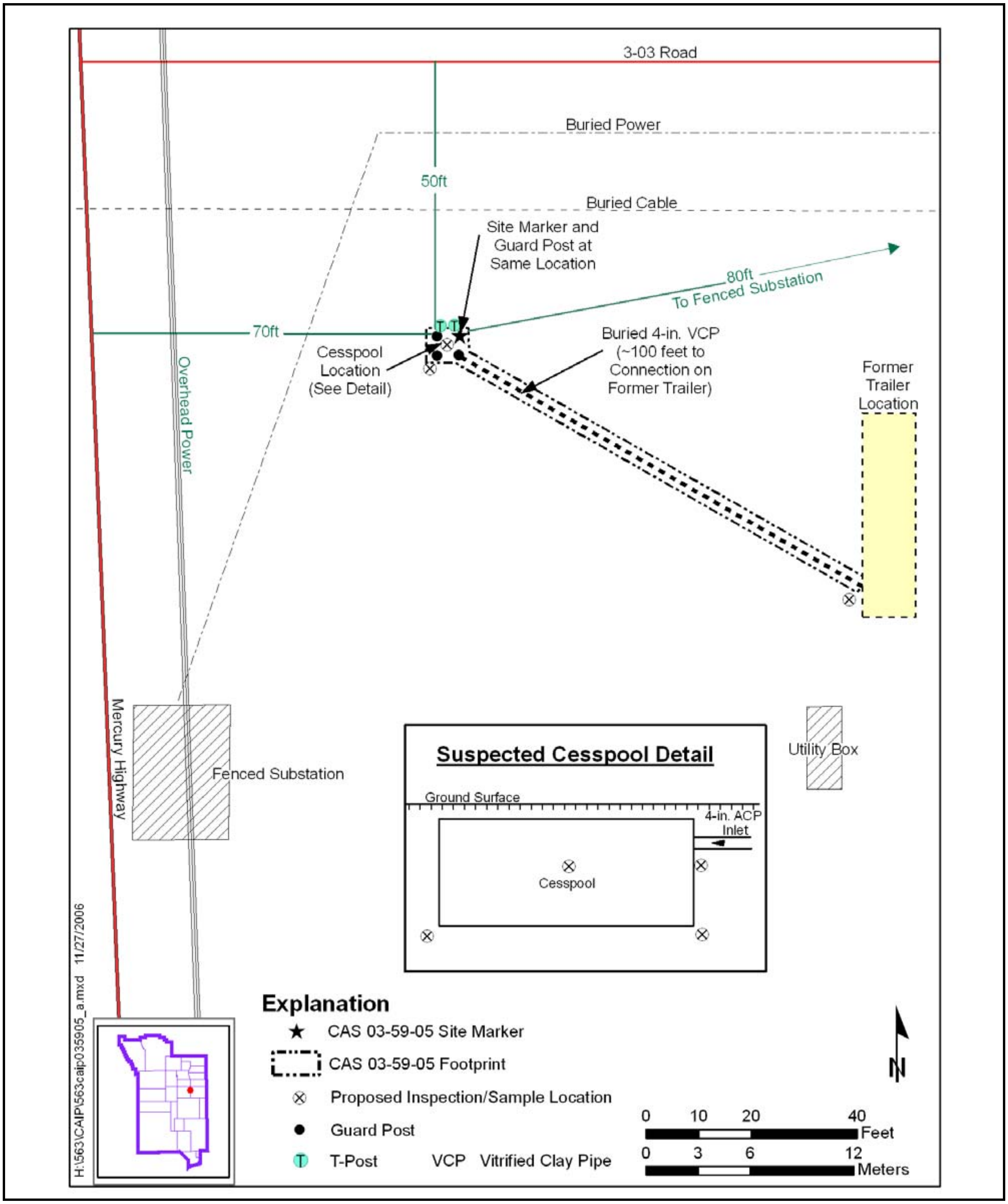

Figure A.2-3
CAS 03-59-05, Area 3 Subdock Cesspool

terminate at separate outwash areas where soil may be impacted. No lagoons or leachfields have been identified. See Figure A.2-4 for a diagram of the CAS.

Engineering drawings show that piping associated with the north septic tank extends 500 ft northwest to the former Saw Cover Building (REECo, 1971b). The north septic tank (32 x 5 ft) is above grade and has an outlet pipe that appears to have discharged effluent to a drainage channel that flows downgradient to the southeast. There is breached and broken VCP pipe debris surrounding the north tank. An as-built engineering drawing shows a toilet located at the northwest corner of the Drilling/Welding Shop that may have been connected to the north septic tank (REECo, 1967b).

Piping associated with the south septic tank (36 x 5 ft) is only partially shown on an engineering drawing (REECo, 1971b). This sewer line is shown to begin at a cleanout and extends to the southeast and off the drawing. It is unknown whether this sewer line connected to the Drilling/Welding Shop or other buildings. Three potential tie-in pipes were identified in the field near the location of the labeled cleanout. It is believed that this sewer line leads to the south septic tank and continues to the southeast where piping opens to daylight at an outfall area. The south tank is almost completely buried, and the top portion (including two manhole covers) is exposed.

***Physical Setting and Operational History* –** The Area 12 Drilling/Welding Shop was primarily used to maintain the locomotives that were used in the E-Tunnel from the late 1960s through early 1980s (Griffin, 2005). Engines would be pulled from the locomotives with the overhead cranes that were formerly located on the property. Mucking machines and other equipment may also have been brought to the shop for maintenance. This equipment was likely steam-cleaned to remove soil, gravel or grease before maintenance occurs. Trichloroethene was also used as a degreasing agent and may have entered the septic system piping. Another likely, common activity was changing oil (Soong, 2005).

***Release Information* –** The septic tanks were designed to release effluent to the surface soils via their respective outfalls. Contaminants would have been limited in volume and are expected to be located within the soil in close proximity to the tanks, subsurface piping, or outfall areas.

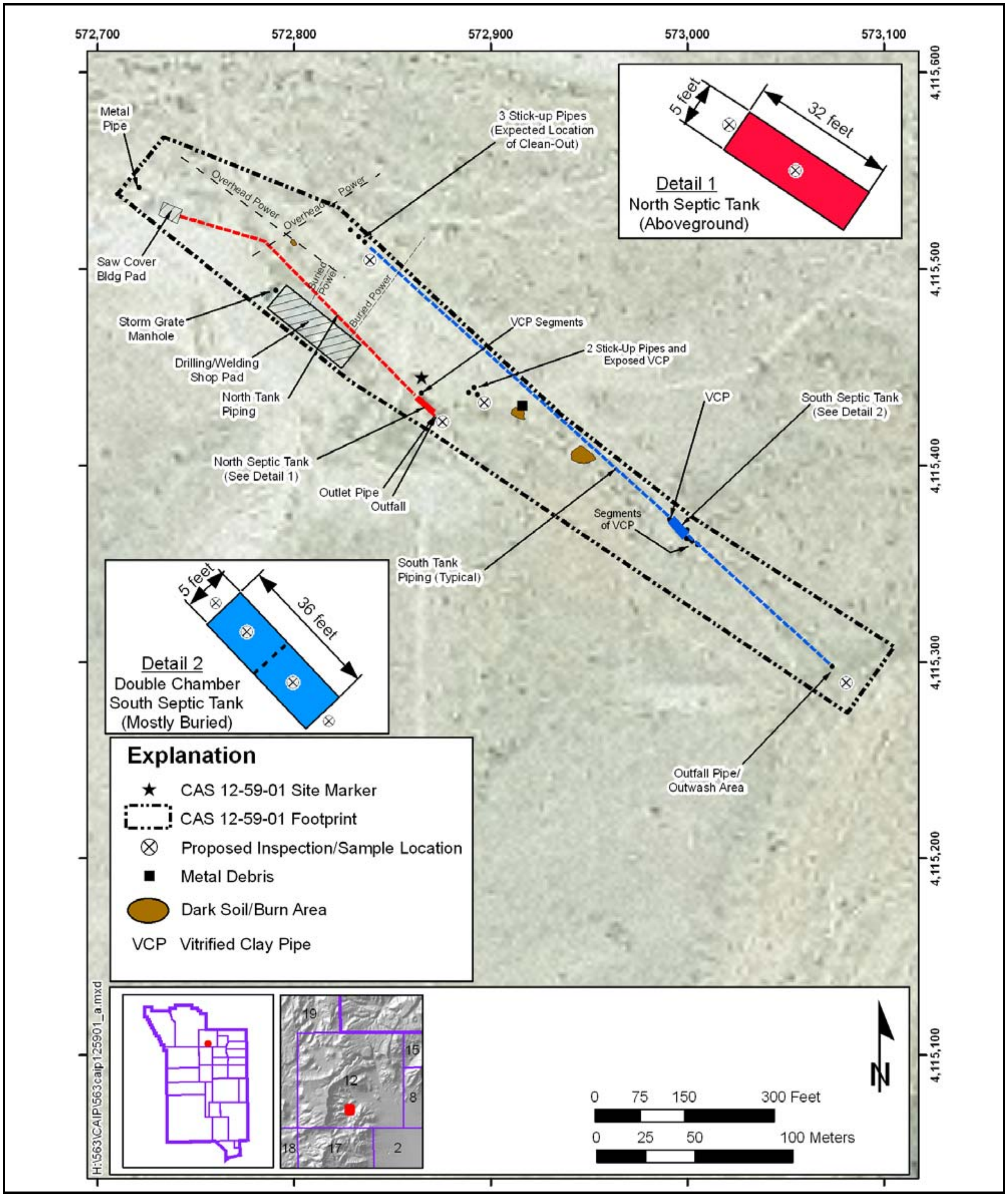

Figure A.2-4
CAS 12-59-01, Area 12 Drilling/Welding Shop Septic Tanks

Previous Investigation Results – A radiological survey of the tanks was conducted by BN personnel in 2003. Elevated alpha readings of 300 to 800 dpm/100 cm^2 (fixed plus removable) were reported for the south tank (BN, 2003).

A geophysical survey was conducted in 2006 at CAS 12-59-01 to determine the extent of subsurface piping associated with the north and south septic tanks (Weston, 2006). A buried pipe which originates near the Saw Cover Building is interpreted to represent the 3/4-in. water pipe that coincides with the 6-in. VCP pipe associated with the north septic tank. The pipe direction becomes unclear approximately 66 m from its origin at a location where it may have branched off to service the former building. From this location, the VCP appears to continue towards the north septic tank; however, the geophysical survey was not conclusive and the identifiable anomaly may be an underground utility. Results of the survey also indicate two suspected underground pipes (labeled "Pipe 4" and "Pipe 7") that appear to originate at the location of daylighting pipe and trend southeast to the south tank. Pipe 4 is mapped as a suspect location based on the observed surface expression because data did not show a response from the expected buried VCP. Pipe 7 was mapped based on an analysis of Global Position Receiver (GPR) profiles, which show consistent hyperbolic signatures at a depth of approximately 1 m bgs. Pipe 4 is also mapped to continue from the south tank southeast to the outfall area.

A.2.4 Corrective Action Site 12-60-01, Drilling/Welding Shop Outfalls

Corrective Action Site 12-60-01 consists of the potential environmental releases associated with three outfall pipes (two 6-in. and one 12-in.) associated with the Drilling/Welding Shop in Area 12 located near the intersection of Rainier Mesa Road and E-Tunnel Road. An engineering drawing (REECo, 1971b) shows that a 6-in. drain pipe (60 ft long) ties in to a 2-in. water line to the southwest side of the concrete pad. This 2-in. water line appears to tie in to a water holding tank that was located up slope of the pad to the northwest. A manhole cover that is in line with the 6-in. drain pipe is located on an access road at the southwest side of the Drilling/Welding Shop foundation. The 12-in. drain pipe (60 ft long) is not shown to tie in to any other piping. The other 6-in. outfall pipe (length unknown) is believed to be associated with a hydraulic pipe cutter. The boundaries of the outfall areas could not be determined because there is no evidence of a defined drainage channel. See Figure A.2-5 for a diagram of the CAS.

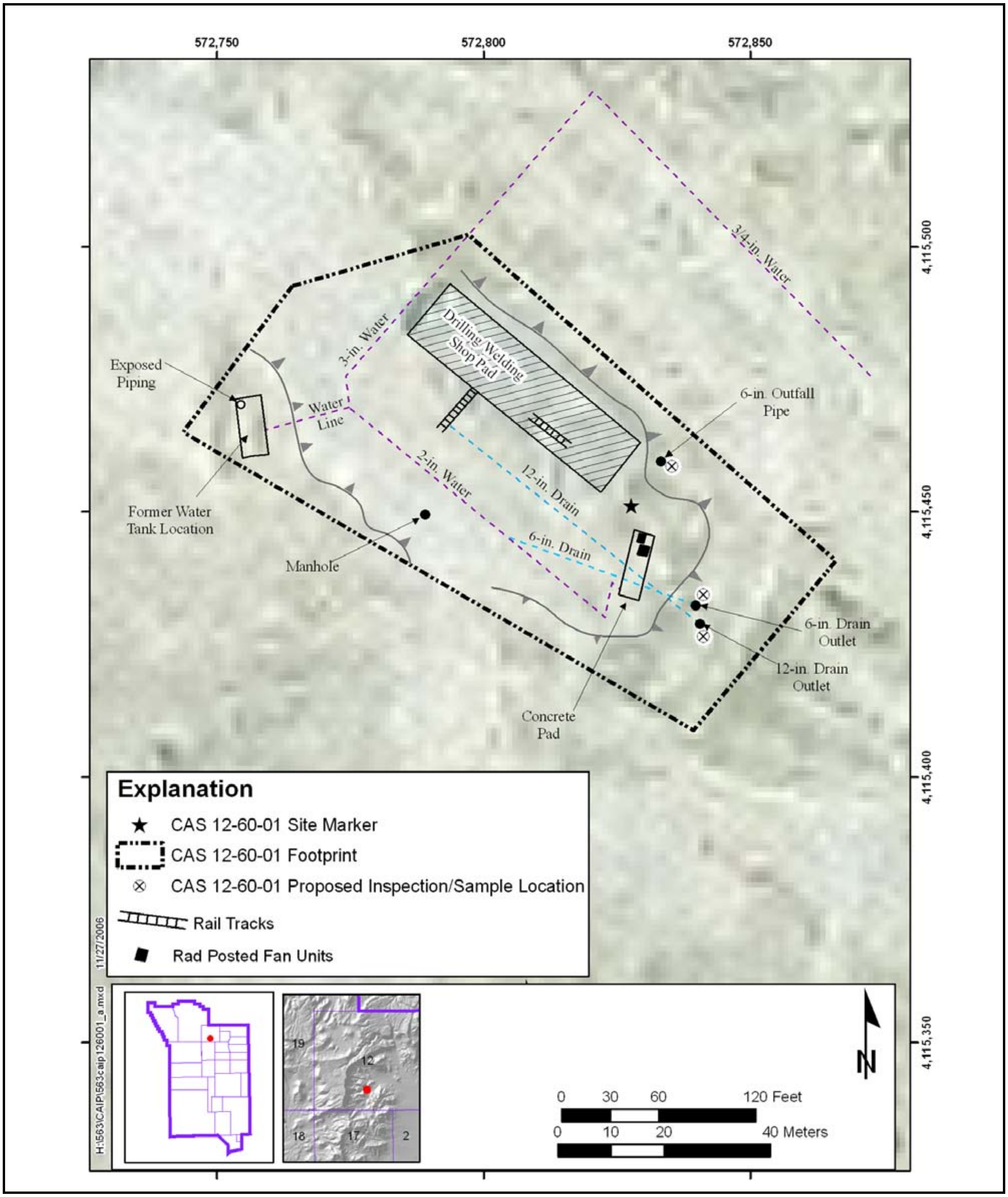

Figure A.2-5
CAS 12-60-01, Area 12 Drilling/Welding Shop Outfalls

Physical Setting and Operational History **–** See above description for CAS 12-59-01. The function of the outfall pipes is uncertain; however, they are believed to have been used to drain wastewater related to a steam cleaner and a hydraulic pipe cutter that were used at the Drilling/Welding Shop. It is also possible that a water holding tank formerly located at the site was periodically flushed and that one of the drain pipes was used to discharge this water. Trichloroethene was used as a degreaser in the Drilling/Welding Shop and may have been included in the effluent from the holding tank discharge (Soong, 2005).

Release Information **–** The outfall pipes of this CAS were designed to release effluent to the surface soils via their respective outfalls. There is a potential for industrial wastes (e.g., paints, solvents, degreasers) that consist of unknown contaminants to have been introduced to the system. If a release is determined to have occurred, contaminants would have been limited in volume and are expected to be located within the soil in close proximity to the tanks, subsurface piping, or outfall areas.

Previous Investigation Results **–** A geophysical survey was conducted in 2006 at CAS 12-60-01 to determine the extent of subsurface piping associated with the three drain pipes of this CAS (Weston, 2006). The survey maps show a suspected pipe that is mapped based on a correlation between multiple low amplitude responses and the hyperbolic signature present on a GPR profile (number 26). This pipe, which is interpreted to represent the 6-in. drain pipe that is shown on engineering drawings, is confirmed to tie-in to another buried pipe. This pipe is shown to extend approximately 15 m parallel to the concrete foundation of the Drilling/Welding Shop and is interpreted to represent the 2-in. water pipe that originated at the top of the hill where a former water holding tank was located. An additional suspected pipe is mapped in a location that correlates with the 12-in. drain pipe shown on engineering drawings. The drain pipe associated with the hydraulic pipe cutter is not shown or described in the Weston geophysical survey report.

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 563 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 563."

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 October 19, 2006. 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 the 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, because they serve as the basis for all subsequent inputs and decisions throughout the DQO process.

The CSM was developed for CAU 563 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 and NNSA/NSO 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 this CSM.

Table A.3-1
Conceptual Site Model Description of Elements for Each CAS in CAU 563

CAS Number	**03-04-02**	**03-59-05**	**12-59-01**	**12-60-01**
CAS Description	**Area 3 Subdock Septic Tank**	**Area 3 Subdock Cesspool**	**Drilling/Welding Shop Septic Tanks**	**Drilling/Welding Shop Outfalls**
Site Status	All CASs are inactive and/or abandoned.			
Exposure Scenario	All CASs are located in Occasional Use Areas.			
Sources of Potential Soil Contamination	Leaking tanks/pipes and surface spills during bi-weekly pumping.		Pipe outfall and leaking above-ground tank to surface; Leaking below-ground tank and pipes in subsurface. Effluent discharged Lubrication and cleaning of equipment; leaking tanks/pipes.	
Location of Contamination/ Release Point	Surface and subsurface soil at or near location of tanks and piping.		Surface soil at or near outfalls; Surface and subsurface soil at or near location of tanks and below piping.	
Amount Released	Unknown			
Affected Media	Surface and shallow subsurface soils.			
Potential Contaminants	Biological, chemical and radiological.			
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 of the footprints of the CASs. Liquids released over time (e.g., leaks from tanks) may also have provided a hydraulic driver for percolation and migration of contaminants.			
Migration Pathways	Vertical transport is expected to dominate over lateral transport due to small surface gradients.		Vertical and lateral transport due to high relief and surface gradients.	
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 of the CAS.			
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.			

CAS = Corrective action site
COC = Contaminant of concern
COPC = Contaminant of potential concern

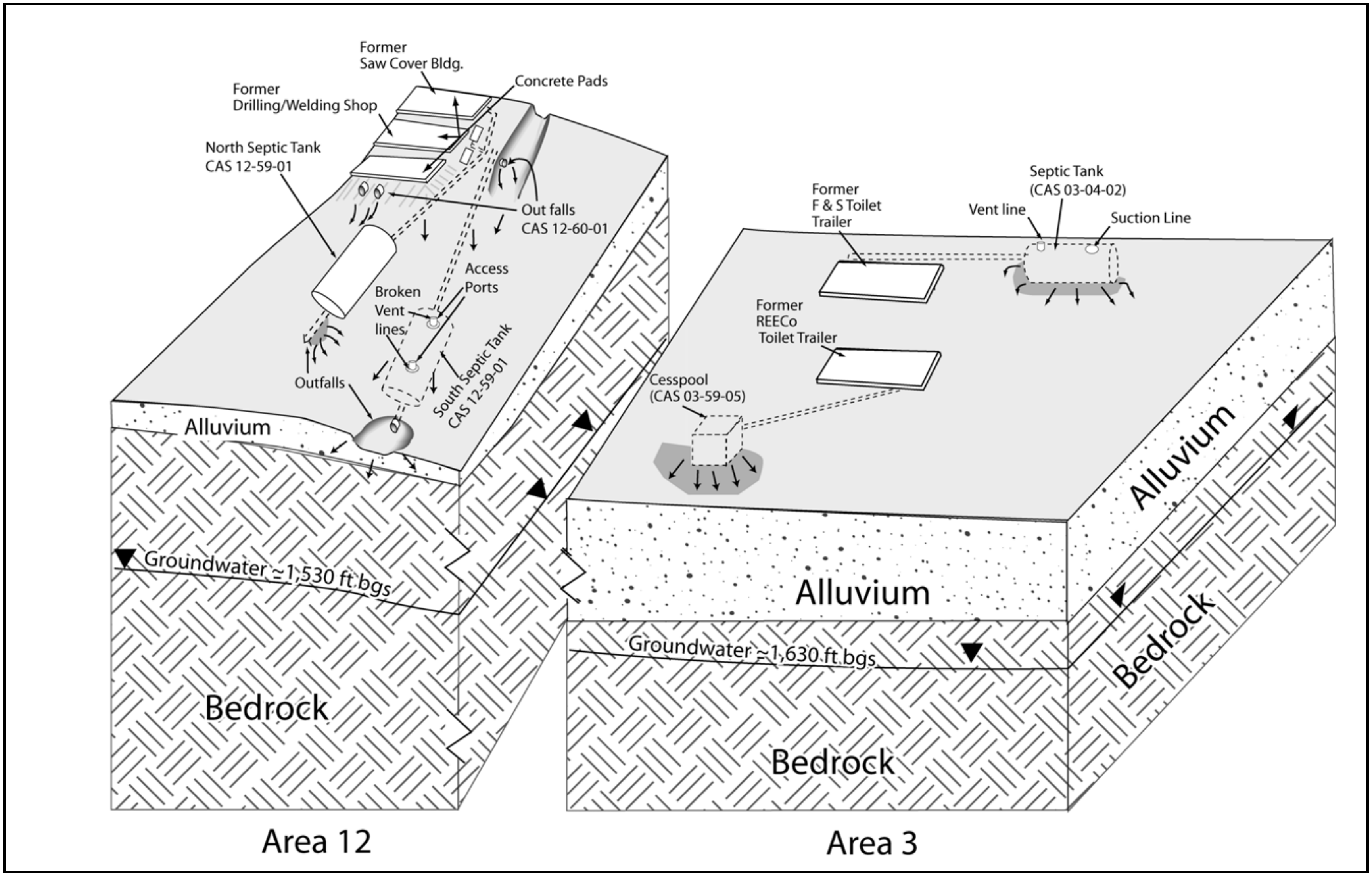

Figure A.3-1
Conceptual Site Model for CAU 563

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 surface and subsurface components (i.e., septic tanks, cesspool, associated underground piping, and outfalls). Any contaminants migrating from a CAS, regardless of physical or chemical characteristics, are expected to exist at interfaces and in the soil, adjacent to disposal features in lateral and vertical directions.

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 563 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 563 are defined as the constituents reported from the analytical methods stipulated in Table A.3-2.

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 Section A.3.2). Targeted contaminants for each CAU 563 CAS are identified in Table A.3-3.

Table A.3-2
Analytical Program[a]
(Includes Waste Characterization Analyses)

Analyses	CAS 03-04-02	CAS 03-59-05	CAS 12-59-01	CAS 12-60-01
Organic COPCs				
Volatile Organic Compounds[b]	X	X	X	X
Semivolatile Organic Compounds[b]	X	X	X	X
Total Petroleum Hydrocarbons-Diesel-Range Organics	X	X	X	X
Polychlorinated Biphenyls	X	X	X	X
Inorganic COPCs				
Total RCRA Metals[b]	X	X	X	X
Radionuclide COPCs				
Gamma Spectroscopy	X	X	X	X
Isotopic Uranium	X	X	X	X
Isotopic Plutonium	X	X	X	X
Strontium-90	X	X	X	X
Waste Characterization Analyses				
Gross Alpha	(x)	(x)	(x)	(x)
Gross Beta	(x)	(x)	(x)	(x)
Tritium	(x)	(x)	(x)	(x)

[a]The COPCs are the constituents reported from results of the analyses listed.
[b]If sample(s) are collected for waste management purposes, analysis may also include *Toxicity Characteristic Leaching Procedure*.

CAS = Corrective action site
COPC = Contaminant of potential concern
RCRA = *Resource Conservation and Recovery Act*

X = Required analyses on all samples
(x) = Required analyses on samples taken from material(s) slated for disposal

Table A.3-3
Targeted Contaminants for CAU 563

Corrective Action Site	Chemical Targeted Contaminant(s)	Radiological Targeted Contaminant(s)
03-04-02	--	--
03-59-05	--	--
12-59-01	Trichloroethene	--
12-60-01	Trichloroethene	--

-- = No targeted analytes identified

A.3.2.3 Contaminant Characteristics

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

A.3.2.4 Site Characteristics

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

A.3.2.5 Migration Pathways and Transport Mechanisms

Migration pathways at the CAU 563 CASs include the lateral migration of potential contaminants across surface soils/sediments at the Area 12 sites and vertical migration of potential contaminants through subsurface soils at both Area 3 and Area 12 sites. 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 in the near surface (concrete pads, gravel trenches along pipelines), and in the shallow subsurface (e.g., bedrock, caliche layers).

Surface migration pathways at the Area 3 CASs are expected to be minor, as the land in which they are situated is relatively flat and the potential release sites are not located in or near drainages. Subsurface migration pathways at the Area 3 CASs are expected to be predominately vertical, although spills or leaks below the ground surface (e.g., base of septic tank, subsurface piping) may also have limited lateral migration before infiltration. Surface migration pathways for the Area 12 CASs are expected to be more prominent than vertical migration, because of the initial design, and the land in which they are situated is sloped, and the potential release points include outfalls and drainage channels extending downslope to the Tongue Wash.

Contaminants potentially released into the Tongue Wash are subject to higher lateral transport mechanisms than contaminants released to less sloped surface areas and to the subsurface. The Tongue Wash is generally dry but is subject to infrequent, potentially intense, stormwater flows. These stormwater 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 typically areas along the drainage path when the gradient lessons and sediments can accumulate. The Tongue Wash eventually drains to the Yucca Lake where the potentially contaminated sediments would be deposited.

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 potential evapotranspiration and limited precipitation for this region, percolation of infiltrated precipitation at the NTS does not provide a significant mechanism for vertical migration of contaminants to groundwater (DOE/NV, 1992).

Annual potential evapotranspiration at the Area 3 Radiological Waste Management Site has been estimated at 62.6 in. (Shott et al., 1997), while the annual average precipitation at the Yucca Flat dry lake bed is 6.62 to 6.7 in. (Winograd and Thordarson, 1975; ARL/SORD, 2006). At the Area 12 CASs, the annual potential evapotranspiration has been estimated at 24.0 in. (Shott. et al., 1997), while the annual average precipitation at Rainier Mesa is approximately 13.8 in. (Winograd and Thordarson, 1975; ARL/SORD, 2006).

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 563 CASs are listed in Table A.3-4. These are based on NTS current and future land use.

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

CAS Number	Record of Decision Land-Use Zone	Exposure Scenario
03-04-02 03-59-05 12-59-01 12-60-01	<u>Nuclear and High Explosives Test</u> 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.	<u>Occasional Use Area</u> 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.

CAS = Corrective action site

Corrective Action Sites 03-04-02, 03-59-05, 12-59-01, and 12-60-01 are located in the land-use zone described as the “Nuclear and High Explosives Test Zone” (DOE/NV, 1998). This area is designated within the “Nuclear Test Zone” reserved for compatible defense and nondefense research, development, and testing activities. The “Nuclear and High Explosives Test Zone” is used for potential additional underground nuclear weapons tests and outdoor high-explosives tests. In addition, the land-use zone where the CAU 563 CASs are located are restricted and dictate future land uses will be limited to nonresidential activities (i.e., industrial).

The exposure scenario designation for the CAU 563 CASs have been categorized into the following type based on the current and projected future land uses:

- Occasional Use Area: This exposure scenario assumes exposure to industrial workers who are not assigned to the area as a regular worksite but may occasionally use the site for intermittent or short-term activities. A site worker under this scenario is assumed to be on the site for an equivalent of 8 hours per day, 10 days per year, over 5 years.

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:

- Identifying the volume of media containing any COC bounded by analytical sample results in lateral and vertical directions.
- Information needed to characterize IDW for disposal.
- Information needed to determine potential remediation waste types.
- 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 septic tank contents to result in the introduction of a COC to the surrounding environmental media, the following conservative assumptions were made:

- The tank containment would fail at some point and the contents would be released to the surrounding media.
- The resulting concentration of contaminants in the surrounding media would be equal to the concentration of contaminants in the tank waste.

- Any liquid contaminant in the septic tanks exceeding the RCRA toxicity characteristic concentration can result in a COC introduction to the surrounding media.

Sludge containing a contaminant exceeding an equivalent FAL concentration would be considered to be potential source material and would require a corrective action. Septic tank liquids with contaminant concentrations exceeding an equivalent toxicity characteristic action level would be considered to be potential source material and would require a corrective action.

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

A.4.2 Alternative Actions to the Decisions

Depending on the possible outcomes of the investigation, alternative actions to the decisions may be taken to identify and solve the problem.

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 criteria: samples must be collected in areas most likely to contain a COC (judgmental sampling), and the analytical suite selected must be sufficient to identify any COCs present in the samples.

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

- Samples must be collected in areas contiguous to the contamination but where contaminant concentrations are below FALs.
- Samples of the waste or environmental media must provide sufficient information to characterize the IDW for disposal.
- Samples of the waste in tanks must provide sufficient information to determine if they contain potential source material.
- 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 563 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 (judgmental), and properly represent any contamination at the CAS. These sample locations, therefore, can be selected by means of biasing factors used in judgmental sampling (e.g., a stain, likely containing a spilled substance). A judgmental sampling design has been developed for CAU 563 due to the presence and significance of biasing factors.

The implementation of the judgmental approach for sample location selection for CAU 563 is discussed in the following sections.

A.5.2.1.1 Judgmental Approach for Sampling Location Selection

Decision I sample locations at CAS 03-04-02, CAS 03-59-05, CAS 12-59-01, and CAS 12-60-01 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-screening techniques may be used to select appropriate sampling locations by providing semiquantitative data that can be used to comparatively select samples to be submitted for laboratory analyses from several screening locations. Field screening may also be used for health and safety monitoring and to assist in making certain health and safety decisions. The following field-screening methods may be used to select analytical samples at CAU 563:

- Alpha and beta/gamma radiation – A radiological survey instrument will be used at all CASs.
- Gamma emitting radionuclides – A dose rate instrument will be used at all CASs.

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 563:

- 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 (e.g, an oil) has reached the soil and may have spread out vertically and horizontally.
- Elevated radiation – Any location identified during radiological surveys that had alpha/beta/gamma levels significantly higher than surrounding background soil.
- Geophysical anomalies – Any location identified during geophysical surveys that had results indicating surface or subsurface materials existed and were not consistent with the natural surroundings (e.g., buried concrete or metal, surface metallic objects).
- Lithology – Locations where variations in lithology (soil or rock) indicate that different conditions or materials exist (interface between disturbed and undisturbed soils/rocks).
- Preselected areas based on process knowledge of the site – Locations for which evidence such as historical photographs, experience from previous investigations, or interviewee input, exists that a release of hazardous or radioactive substances may have occurred.
- Preselected areas based on process knowledge of the contaminant(s) – Locations that may reasonably have received contamination, selected on the basis of the chemical and/or physical properties of the contaminant(s) in that environmental setting.
- Previous sample results – Locations that may reasonably have been contaminated based upon the results of previous field investigations.
- Previous Experience – Experience and data from investigations of similar sites.
- Visual indicators – Discoloration, textural discontinuities, disturbance of native soils, or any other indication of potential contamination.
- Presence of debris, waste, or equipment.
- Odor.
- Physical and chemical characteristics of contaminants.

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

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 any location within the site that is contaminated with any contaminant above a FAL (judgmental sampling). The populations of interest to resolve Decision II ("If a COC is present, is sufficient information available to evaluate potential corrective action alternatives?") are:

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

A.6.2 Spatial Boundaries

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

A.6.3 Practical Constraints

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. The practical constraints associated with the investigation of the CAU 563 CASs are summarized in Table A.6-2.

Table A.6-1
Spatial Boundaries of CAU 563 CASs

CAS Number	Spatial Boundaries
03-04-02	The footprint of the septic tank and associated subsurface piping, plus a 15-foot (ft) lateral buffer, and a 15-ft below ground surface (bgs) vertical boundary.
03-59-05	The footprint of the cesspool and associated subsurface piping, plus a 15-ft lateral buffer, and a 15-ft bgs vertical boundary.
12-59-01	The footprint of each septic tank outfall and associated subsurface piping, plus a 15-ft lateral buffer and a 100-ft buffer downgradient of any outfalls, and a 15-ft bgs vertical boundary.
12-60-01	The footprint of each outfall and associated subsurface piping (excluding beneath concrete pads), plus a 15-ft lateral buffer and a 100-ft buffer downgradient of outfalls, and a 15-ft bgs vertical boundary.

CAS = Corrective action site

Table A.6-2
Practical Constraints for the CAU 563 Field Investigation

CAS Number	Practical Constraints
03-04-02 and 03-59-05	Weather (i.e., high winds, rain, lightning, extreme heat), underground utilities, energized power substation, concrete pads are located in general area; located within the habitat range of the desert tortoise.[a]
12-59-01 and 12-60-01	Weather (i.e., high winds, rain, lightning, extreme heat) causing steep road uphill to site to be slippery; site is underlain by bedrock, limiting excavation methods; concrete building foundation, and loose and unconsolidated terrain located along subsurface piping; located where coyotes and wild horses frequent.

[a]Mojave Desert population of the desert tortoise is listed as a threatened species by the U.S. Fish and Wildlife Service (DOE/NV, 1996).

CAS = Corrective action site

A.6.4 Scale of Decision-Making

The scale of decision-making in Decision I is defined as the CAS. Contaminants of concern detected at any location within the CAS 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. 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 which 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 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. For the evaluation of corrective actions, NAC Section 445A.22705 requires the use of ASTM Method E 1739-95 to "conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards (i.e., FALs) or to establish that corrective action is not necessary" (ASTM, 1995).

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

- **Tier 1 –** 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 –** 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 –** 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 investigation report. The FALs will be defined (along with the basis for their definition) in the investigation report.

A.7.2.1 Chemical PALs

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

A.7.2.2 Total Petroleum Hydrocarbon PALs

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

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). These PALs are based on the construction, commercial, and industrial land-use scenario provided in the guidance and are appropriate for the NTS based on future land-use scenarios as presented in Section A.3.2. The PAL for tritium is based on the UGTA Project limit of 400,000 pCi/L for discharge of water containing tritium (NNSA/NV, 2002b).

Solid media such as concrete and/or structures may pose a potential radiological exposure risk to site workers if contaminated. The radiological PAL for solid media will be defined as the unrestricted-release criteria defined in the NV/YMP RadCon Manual (NNSA/NSO, 2004).

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

- Testing the validity of CSMs based on investigation results.

- Evaluating the quality of the data 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 investigation report will present an assessment on the DQI of representativeness that samples were collected from those locations that best represent the populations of interest as defined in Section A.6.1.

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

To satisfy the third criterion, the entire dataset, as well as individual sample results, will be assessed against the DQIs of precision, accuracy, comparability, and completeness as defined in the Industrial Sites QAPP (NNSA/NV, 2002a) and in Section 6.2.2. The DQIs of precision and accuracy will be used to assess overall analytical method performance as well as to assess the need to potentially "flag" (qualify) individual contaminant results when corresponding QC sample results are not within the established control limits for precision and accuracy. Data qualified as estimated for reasons of precision or accuracy may be considered to meet the constituent performance criteria based on an assessment of the data. The DQI 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 quality control samples will be collected as required by the Industrial Sites QAPP (NNSA/NV, 2002a):

- Field duplicates (minimum of 1 per matrix per CAS)
- Laboratory QC samples (minimum of 1 per matrix per CAS)

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

- Trip blanks (1 per sample cooler containing VOC environmental samples)
- Equipment blanks (1 per sampling event for each type of decontamination procedure)
- Source blanks (1 per uncharacterized source lot per sampling event)
- Field blanks (minimum of 1 at Area 3 CASs, and minimum of 1 at Area 12 CASs – additional if field conditions change)

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. Judgmental sampling schemes will be implemented to select sample locations and evaluate analytical results for CAU 563. Sections A.9.1 and A.9.2 contain general information about collecting Decision I and Decision II samples under judgmental sampling designs, while the subsequent sections provide CAS-specific sampling activities, including proposed sample locations.

A.9.1 Decision I Sampling

A judgmental sampling design will be implemented for CAU 563. Because individual sample results, rather than an average concentration, will be used to compare to FALs at the CASs, 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 known 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 SS, based on biasing factors, to a depth where the biasing factors are no longer present. The SS 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 number, location, and spacing of step-outs may be modified by the SS, as warranted by site conditions.

A.9.3 Corrective Action Site 03-04-02, Area 3 Subdock Septic Tank

No surface soil staining or tank contents were observed at this CAS during recent site visits. The septic tank was designed as a holding tank and the domestic wastes were removed via bi-weekly pumping. According to historical documents and interviews, there is no evidence that the septic tank has ever leaked or released contaminants into the environment. Based on this information, Decision I sampling will consist of inspecting the septic tank; and, if contents are encountered, a sample will be collected of the material(s). The septic tank will be exposed and the subsurface soil surrounding the tank will be inspected; and, if biasing factors are present, a minimum of one soil sample will be collected for analyses. If no biasing factors are present, a minimum of two Decision I samples will be collected at the base of the tank and below the inlet pipe. All Decision I samples will be submitted to an offsite laboratory and analyzed for the parameters identified on Table A.3-2.

If any COPC is detected in the Decision I samples above the minimum detectable limit (MDL), then a video mole will be used to inspect the inlet pipe to the tank for possible breaches and additional pipe tie-ins. If pipe tie-ins are encountered and access is possible, they will also be inspected with the video mole. If broken sections of pipe are encountered, the soil beneath and surrounding the breach will be inspected. If biasing factors are present, a soil sample will be collected at this location and analyzed for the parameters that were detected above the MDLs.

Based on the Decision I sampling results for this CAS, Decision II samples may be collected at locations surrounding the Decision I sampling point and analyzed for the parameters that were detected above the MDLs. Figure A.9-1 shows a site layout and the proposed Decision I inspection/sampling locations. As discussed in Section A.2.0, radiological soil contamination at this site originating from nuclear testing is specifically excluded from this investigation. If such contamination exists, it will be addressed by the Soils Program.

A.9.4 Corrective Action Site 03-59-05, Area 3 Subdock Cesspool

No surface soil staining was observed at this CAS during recent site visits. Based on historical documentation for this site, the design of the cesspool is uncertain. During Decision I sampling, the top of the cesspool will be exposed and inspected to determine the configuration of the vessel; and, if contents remain, a sample of the material(s) will be collected. If it is determined that the design of the cesspool was to release contaminants to the environment, a minimum of one soil sample will be collected beneath the cesspool. If the cesspool is a closed tank, the septic tank will be exposed and the subsurface soil surrounding the tank will be inspected; and, if biasing factors are present, a minimum of one soil sample will be collected for analyses. If no biasing factors are present, a minimum of two Decision I samples will be collected at the base of the tank and below the inlet pipe. All Decision I samples will be submitted to an offsite laboratory and analyzed for the parameters identified on Table A.3-2.

If any COPC is detected in the Decision I samples above the MDL, then a video mole will be used to inspect the inlet pipe to the cesspool for possible breaches and additional pipe tie-ins. If pipe tie-ins are encountered, and access is possible, they will also be inspected with the video mole. If broken sections of pipe are encountered, the soil beneath and surrounding the breach will be inspected; and if biasing factors are present, a soil sample will be collected at this location for analyses.

Based on the Decision I sampling results for this CAS, Decision II samples may be collected at locations surrounding the Decision I sampling point. Figure A.9-2 shows a site layout and the proposed Decision I inspection/sampling locations. As discussed in Section A.2.0, radiological soil

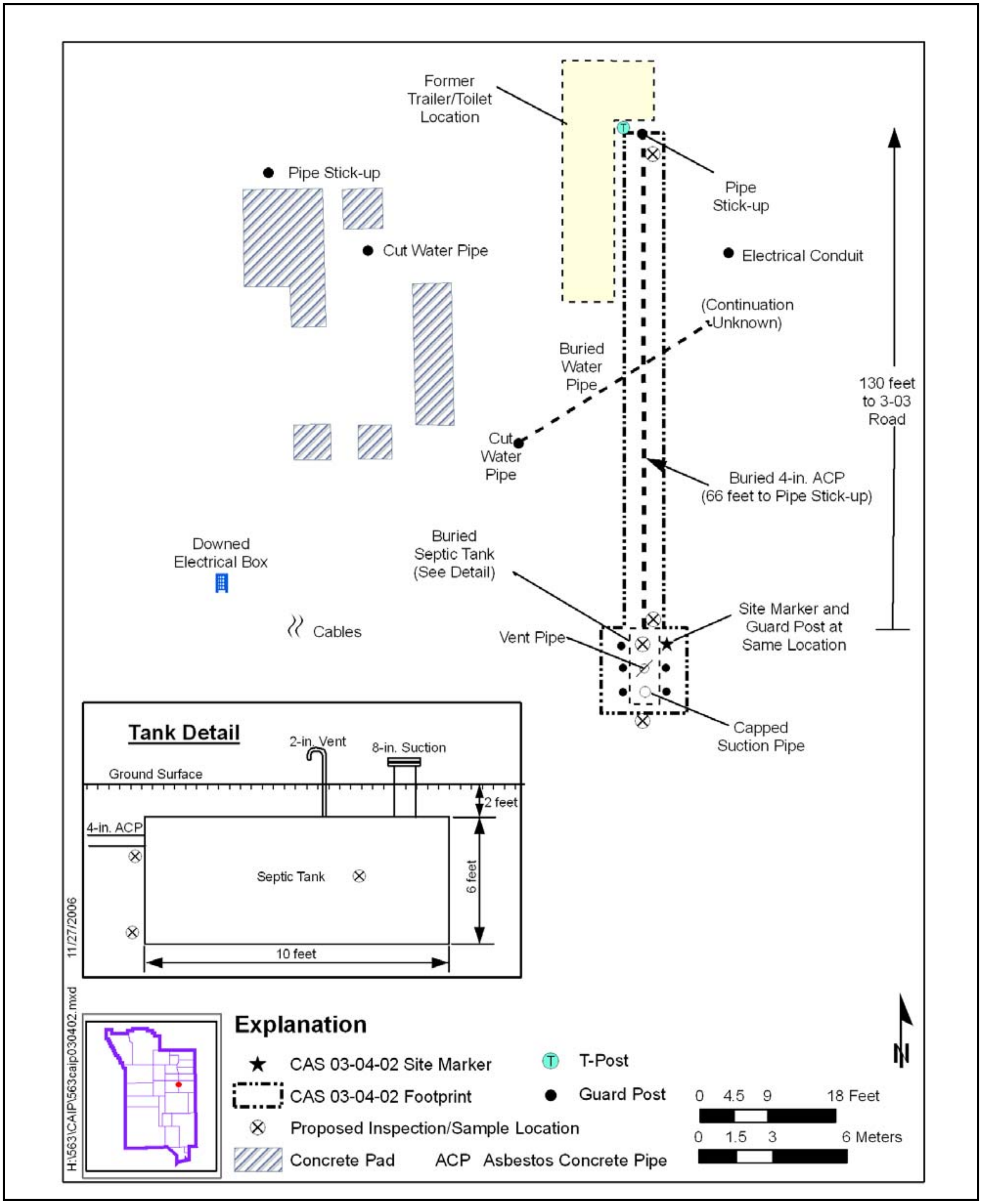

Figure A.9-1
Proposed Inspection/Sampling Locations at CAS 03-04-02, Area 3 Subdock Septic Tank

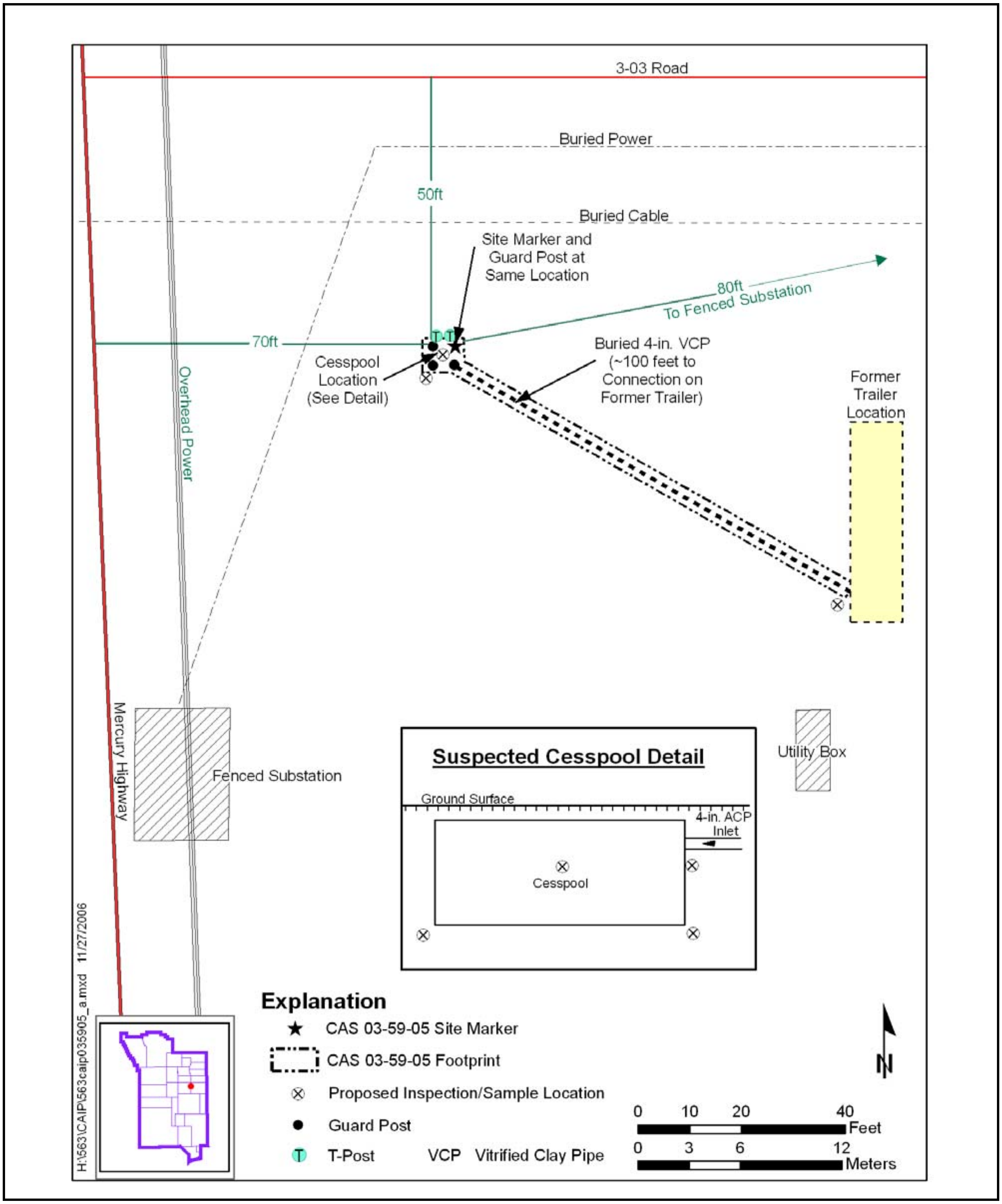

Figure A.9-2
Proposed Inspection/Sampling Locations at CAS 03-59-05, Area 3 Subdock Cesspool

contamination at this site originating from nuclear testing is specifically excluded from this investigation. If such contamination exists, it will be addressed by the Soils Program.

A.9.5 Corrective Action Site 12-59-01, Drilling/Welding Shop Septic Tanks

North Tank – It is uncertain if the septic tank contains material. No access ports were observed, and it appears that the tank may have rolled at some point. A partially exposed outlet pipe was observed on the downgradient end of the tank during a recent site visit. The soil will be sampled beneath this location. If possible, the tank will be rolled to determine if access ports exist and to provide a point of inspection for contents. If contents are observed, and if feasible, a minimum of one sample will be collected of each material or phase of material encountered. In addition, a surface soil sample will be taken at the nearest downgradient depression or catchment, and/or at locations of stained soil in the drainage path. All Decision I samples will be submitted to an offsite laboratory and analyzed for the parameters identified on Table A.3-2.

South Tank – Liquid contents were observed in both chambers of this tank. A previous radiological survey (Simonsen, 2003) showed elevated alpha readings near the tank access ports. During Decision I sampling, a radiological survey will be performed at these openings to access the current status. The liquid contents of the tank chambers will be sampled, and if a separate phase is encountered, samples will be taken of all separate phase(s). The soil surrounding the tank will be inspected for biasing factors; and if found, a minimum of one soil sample each will be collected beneath the tank, and inlet, and outlet pipes. In addition, a surface soil sample will be taken beneath the location of the downgradient pipe outfall. All Decision I samples will be submitted to an offsite laboratory and analyzed for the parameters identified on Table A.3-2.

If any COPC is detected in the Decision I samples above the MDL, the soil beneath and surrounding the breached and broken pipe segments will be inspected for biasing factors; and if present, a soil sample will be collected at each location and analyzed for the parameters that exceeded its MDL.

Based on the Decision I sampling results for this CAS, Decision II samples may be collected at locations surrounding the Decision I sampling point. Figure A.9-3 shows a site layout, the North and South Tank locations, and the proposed Decision I inspection/sampling locations.

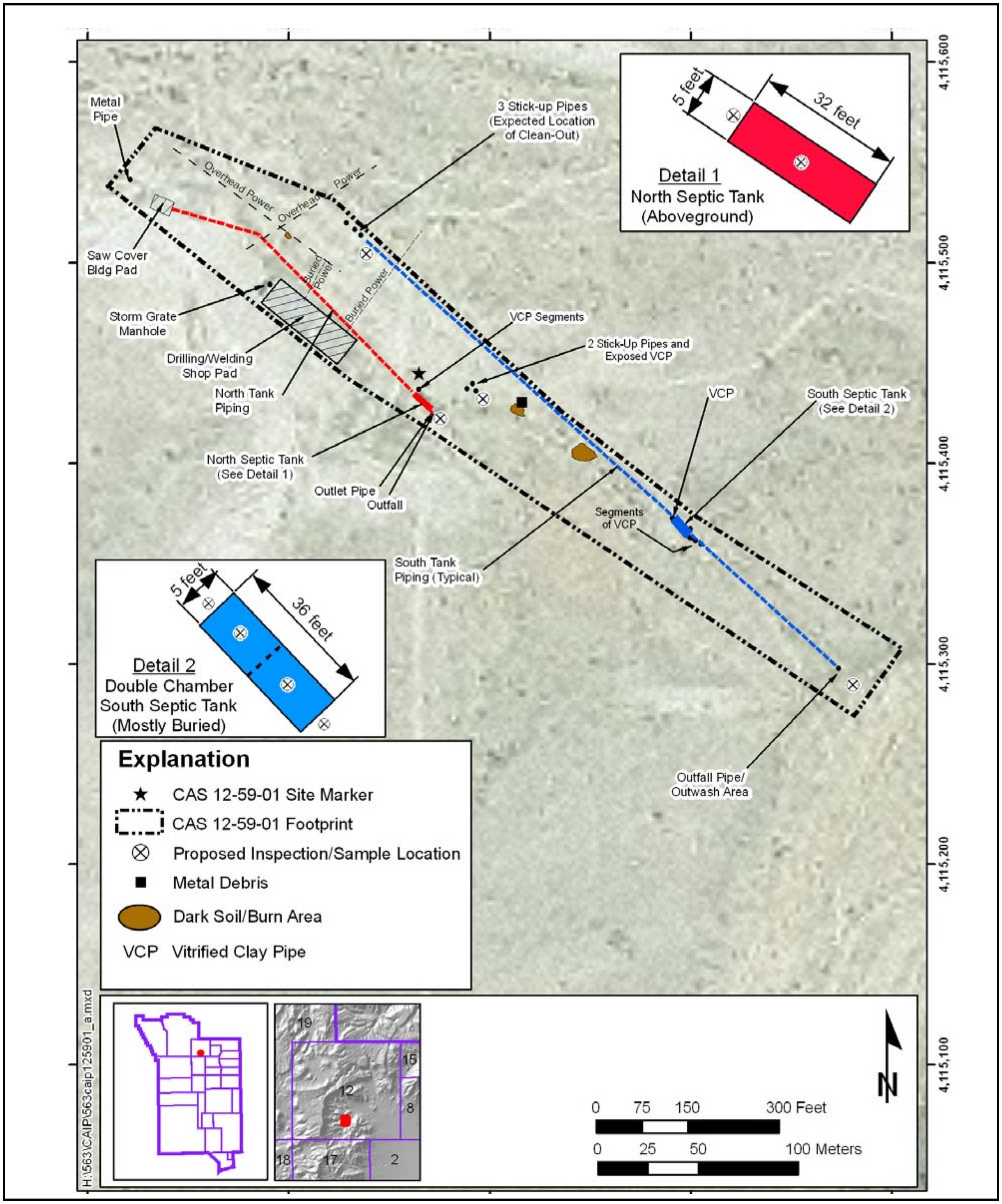

Figure A.9-3
Proposed Sampling Locations at CAS 12-59-01,
Area 12 Drilling/Welding Shop Septic Tanks

A.9.6 Corrective Action Site 12-60-01, Drilling/Welding Shop Outfalls

During Decision I sampling, the three outfall pipes will be inspected for any residual contents; and if detected, a sample will be collected of the material(s). In addition, the soil directly below each pipe outfall will be inspected and a minimum of two samples will be collected at each location: one surface soil sample from 0 to 6 in., and one soil sample from either 6 to 12 in., or 12 to 18 in., depending on biasing factors encountered. All Decision I samples will be submitted to an offsite laboratory and analyzed for the parameters identified on Table A.3-2.

If any COPC is detected in the Decision I samples above the MDL, the surface soil in the drainage channels downgradient of the outfalls will be inspected; and if biasing factors are present, a soil sample will be collected at this location and analyzed for the parameters that exceeded its MDL.

Based on the Decision I sampling results for this CAS, Decision II samples may be collected at locations surrounding the Decision I sampling point or at obvious recumbent accumulation areas within the CAS boundary. Figure A.9-4 shows a site layout of the pipe outfall locations and the proposed Decision I inspection/sampling locations.

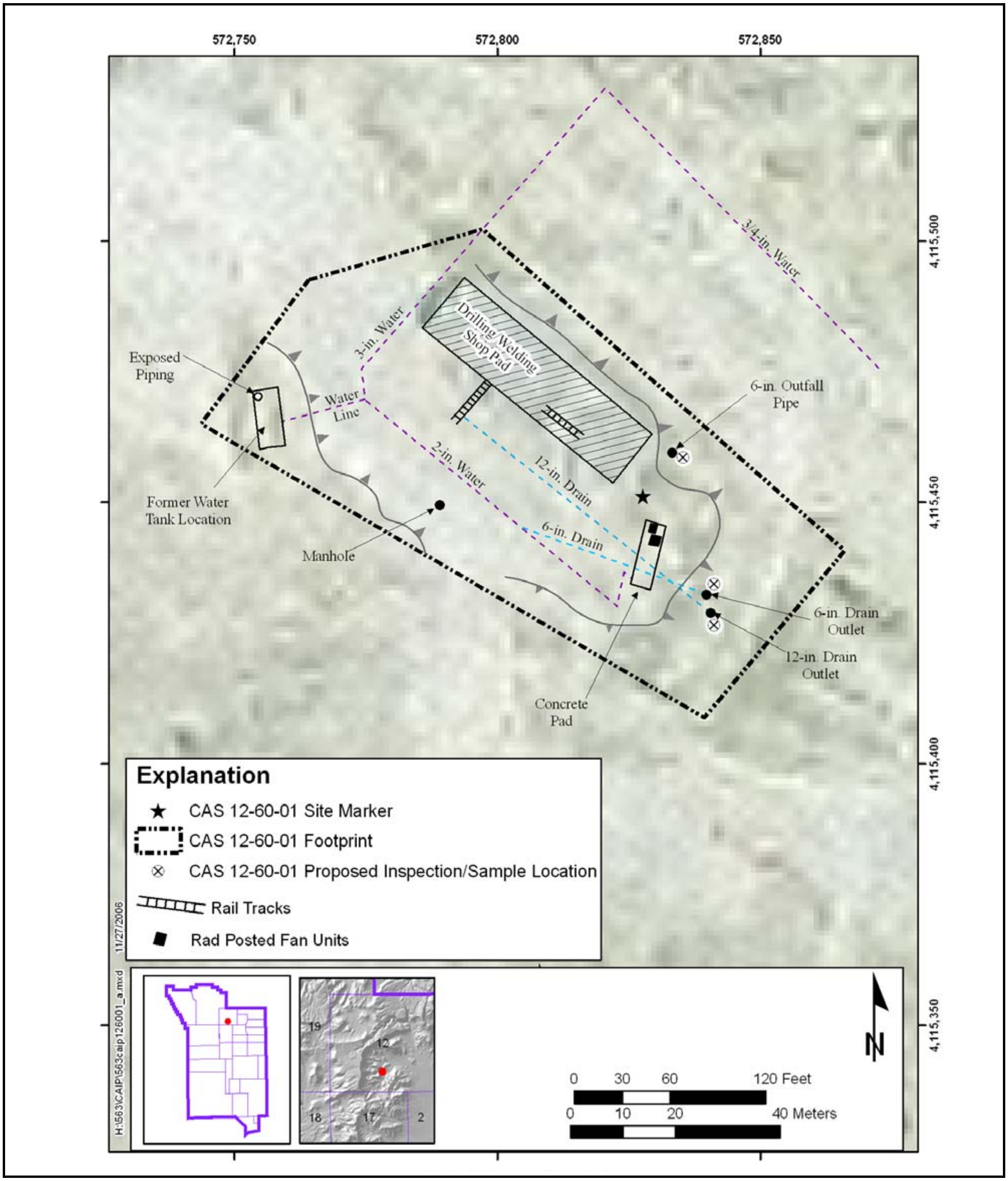

Figure A.9-4
Proposed Sampling Locations at CAS 12-60-01,
Area 12 Drilling/Welding Shop Outfalls

A.10.0 References

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

Air Resources Laboratory/Special Operations and Research Division. 2006. NTS Climatological Rain Gauge Data website. As accessed at http://www.sord.nv.goe/home_climate_rain.htm on 7 August.

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

Author Unknown. 1991. Location of Tanks Pumped by Septic Pumper Trucks at the Nevada Test Site. 25 February.

BN, see Bechtel Nevada.

Bechtel Nevada. 2003. Sample results for sample number 96MWL0708-2, 19 April. Las Vegas, NV.

DOE, see U.S. Department of Energy.

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

DRI, see Desert Research Institute.

DRI and Carey & Co., see Desert Research Institute and Carey & Co., Inc.

EPA, see U.S. Environmental Protection Agency.

Fahringer, P., Stoller-Navarro Joint Venture. 2004. Memorandum to E. Shupp (SNJV) entitled, “Area 3 Sub Dock South Geophysics - Memorandum of Finding, Winter 2004,” 5 April. Las Vegas, NV.

Griffin, W., Stoller-Navarro Joint Venture. 2005. Record of Telecon with N. Nastanski (SNJV) regarding the Area 12 Drilling Maintenance Shop and CASs 12-59-01/12-60-01, 30 November. Las Vegas, NV.

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

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

NAC, see *Nevada Administrative Code.*

NBMG, see Nevada Bureau of Mines and Geology.

NCRP, see National Council on Radiation Protection and Measurements.

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

Nevada Administrative Code. 2004. NAC 445A, "Water Controls." Carson City, NV. As accessed at http://www.leg.state.nv.us/nac on 7 August 2006.

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

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

Patton, K., Bechtel Nevada. 2006. Record of Telecon with D. Cummings (SNJV) regarding CAS 03-04-02, 3 January. Las Vegas, NV.

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

Reynolds Electrical & Engineering Co., Inc. 1967a. Engineering Drawing 3-DF-C1 entitled, "Nevada Test Site Area 3 Drilling Facility Office Trailer Compound Plan." 20 September. Las Vegas, NV.

Reynolds Electrical & Engineering Co., Inc. 1967b. Engineering Drawing 12-17-E7 entitled, "Drilling Facilities Civil & Electrical Plan," 10 April. Mercury, NV.

Reynolds Electrical & Engineering Co., Inc. 1971a. Engineering Drawing 3-DC-S1 entitled, "Area 3 Drilling Compound F&S Trailer Relocation Plan, Details & Notes," 12 May. Las Vegas, NV.

Reynolds Electrical & Engineering Co., Inc. 1971b. Engineering Drawing 12-17-C6 entitled, "Drilling Maintenance Shop Grading Plan," 12 May. Mercury, NV.

Simonsen, R.J., Bechtel Nevada. 2003. Radiological Survey Report - Map, April, 03-FAC-1712-150. Las Vegas, NV.

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

Soong, C., Bechtel Nevada. 2005. Record of Telecon with N. Nastanski (SNJV) regarding the Area 12 Drilling Maintenance Shop and CASs 12-59-01/12-60-01, 14 December. Las Vegas, NV.

U.S. Department of Energy. 1988. *Environmental Survey Sampling and Analysis Plan*, Washington, DC: Environment, Safety, and Health Office of Environment Audit.

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

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

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

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2004. *NV/YMP Radiological Control Manual*, Rev. 5, DOE/NV/11718-079. Prepared by Bechtel Nevada. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2006. *Nevada Test Site Waste Acceptance Criteria*, DOE/NV--325, Rev. 6-01. Las Vegas, NV.

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

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

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

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

U.S. Environmental Protection Agency. 2004. *Region 9 Preliminary Remediation Goals (PRGs)*. As accessed at http://www.epa.gov/region09/waste/sfund/prg/index.htm on 8 August 2006. Prepared by S.J. Smucker. San Francisco, CA.

U.S. Environmental Protection Agency. 2006. *EPA Guidance on Systematic Planning Using the Data Quality Objectives Process,* EPA QA/G-4. Washington, DC.

Weston, see Weston Solutions, Inc.

Weston Solutions, Inc. 2006. "After Action Report, Technical Services for Preliminary Assessment Geophysical Investigations, Nevada Test Site, Six Corrective Action Sites, Nye County, Nevada." Task Order No. IS07 610. October. West Chester, PA.

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

Appendix B

Project Organization

B.1.0 Project Organization

The NNSA/NSO Federal Sub-Project Director is Kevin Cabble, and he can be contacted at (702) 295-5000. The NNSA/NSO Task Manager is Sabine Curtis, and she can be contacted at (702) 295-0542.

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 appropriate DOE Project Manager be contacted for further information.

The SNJV 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

(1 Page)

ndep NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Kenny C. Guinn, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

December 20, 2006

Wilhelm R. Wilborn
Acting Environmental Restoration Federal Project Director
Environmental Restoration Project
National Nuclear Security Administration
Nevada Site Office
P. O. Box 98518
Las Vegas, NV 89193-8518

RE: Review of the draft Corrective Action Investigation Plan (CAIP) Corrective Action Unit (CAU) 563: Septic Systems *Federal Facility Agreement and Consent Order*

Dear Mr. Wilborn,

The Nevada Division of Environmental Protection, Bureau of Federal Facilities (NDEP) staff has received and reviewed the draft Corrective Action Investigation Plan (CAIP) for Corrective Action Unit (CAU) 563: Septic Systems. NDEP's review of this document did not indicate any deficiencies.

Address any questions regarding this matter to Jeff MacDougall at (702) 486-2850 ext 233 or to me at (702) 486-2850 ext 229.

Sincerely,

Don Elle, Ph.D.
Supervisor
Bureau of Federal Facilities

DRE/JJM/jjm

cc: E.F. DiSanza, WMP, NNSA/NSO
FFACO Group, PSG, NNSA/NSO, Las Vegas, NV
Tiffany Lantow, DTRA/CXT1, M/S 645, Mercury, NV
Jeff Smith, NSTec, Las Vegas, NV
Kevin Cabble, ERP, NNSA/NSO, Las Vegas, NV
Pete Sanders, ERP, NNSA/NSO, Las Vegas, NV
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