

Nevada
Environmental
Restoration
Project

DOE/NV--1066



Corrective Action Investigation Plan for Corrective Action Unit 274: Septic Systems Nevada Test Site, Nevada

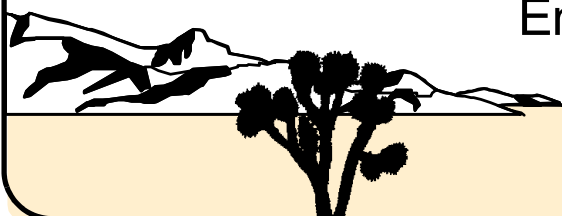
Controlled Copy No.: ____

Revision No.: 0

August 2005

Approved for public release; further dissemination unlimited.

Environmental Restoration
Division



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

Uncontrolled When Printed

Available for sale to the public from:

U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 800.553.6847
Fax: 703.605.6900
Email: orders@ntis.gov
Online ordering: <http://www.ntis.gov/ordering.htm>

Available electronically at <http://www.osti.gov/bridge>

Available for a processing fee to U.S. Department of Energy and its contractors,
in paper, from:

U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
Phone: 865.576.8401
Fax: 865.576.5728
Email: reports@adonis.osti.gov

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.



CORRECTIVE ACTION INVESTIGATION PLAN FOR CORRECTIVE ACTION UNIT 274: SEPTIC SYSTEMS NEVADA TEST SITE, NEVADA

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

Controlled Copy No.: ____

Revision No.: 0

August 2005

Approved for public release; further dissemination unlimited.

Uncontrolled When Printed

**CORRECTIVE ACTION INVESTIGATION PLAN FOR
CORRECTIVE ACTION UNIT 274: SEPTIC SYSTEMS
NEVADA TEST SITE, NEVADA**

Approved by: APPROVED SIGNATURE Date: 8/11/2005

Sabine Curtis, Acting Project Manager
Industrial Sites Project

Approved by: APPROVED SIGNATURE Date: 8/11/2005

Janet Appenzeller-Wing, Acting Division Director
Environmental Restoration Division

Table of Contents

List of Figures.....	v
List of Tables.....	vi
List of Acronyms and Abbreviations	vii
Executive Summary	ES-1
1.0 Introduction.....	1
1.1 Purpose	1
1.1.1 Corrective Action Unit History and Description	3
1.1.2 Data Quality Objective Summary	3
1.2 Scope.....	4
1.3 Corrective Action Investigation Plan Contents	5
2.0 Facility Description.....	6
2.1 Physical Setting.....	6
2.1.1 Yucca Flat.....	6
2.1.2 Pahute Mesa	7
2.2 Operational History.....	8
2.2.1 CAS 03-02-01, WX-6 ETS Building Septic System	8
2.2.2 CAS 06-02-01, Cesspool	8
2.2.3 CAS 09-01-01, Spill Site, and CAS 09-05-01, Leaching Pit	9
2.2.4 CAS 20-05-01, Septic System	10
2.3 Waste Inventory	10
2.3.1 CAS 03-02-01, WX-6 ETS Building Septic System	10
2.3.2 CAS 06-02-01, Cesspool	11
2.3.3 CAS 09-01-01, Spill Site, and 09-05-01, Leaching Pit	11
2.3.4 CAS 20-05-01, Septic System	11
2.4 Release Information	11
2.4.1 CAS 03-02-01, WX-6 ETS Building Septic System	12
2.4.2 CAS 06-02-01, Cesspool	12
2.4.3 CAS 09-01-01, Spill Site, and CAS 09-05-01, Leaching Pit	13
2.4.4 CAS 20-05-01, Septic System	13
2.5 Investigative Background	13
2.5.1 CAS 03-02-01, WX-6 ETS Building Septic System	13
2.5.2 CAS 06-02-01, Cesspool	14
2.5.3 CAS 09-01-01, Spill Site, and CAS 09-05-01, Leaching Pit	14
2.5.4 CAS 20-05-01, Septic System	14
2.5.5 National Environmental Policy Act	14
3.0 Objectives	16
3.1 Conceptual Site Model	16

Table of Contents *(Continued)*

3.1.1	Future Land Use	17
3.1.2	Contaminant Sources	19
3.1.3	Release Mechanisms	19
3.1.4	Migration Pathways	19
3.1.5	Exposure Points	20
3.1.6	Exposure Routes	20
3.1.7	Additional Information	21
3.2	Contaminants of Potential Concern	21
3.3	Preliminary Action Levels	22
3.3.1	Chemical Preliminary Action Levels	26
3.3.2	Total Petroleum Hydrocarbon Preliminary Action Levels	26
3.3.3	Radionuclide PALs	26
3.4	Data Quality Objective Process Discussion	27
4.0	Field Investigation	32
4.1	Technical Approach	32
4.2	Field Activities	33
4.2.1	Mobilization	33
4.2.2	Sample Collection	33
4.2.3	Sample Management	35
4.3	Safety	35
5.0	Waste Management	37
5.1	Waste Minimization	37
5.2	Potential Waste Streams	38
5.3	Investigation-Derived Waste Management	38
5.3.1	Sanitary Waste	40
5.3.2	Low-Level Radioactive Waste	40
5.3.3	Hazardous Waste	40
5.3.4	Hydrocarbon Waste	41
5.3.5	Mixed Low-Level Waste	41
5.3.6	Polychlorinated Biphenyls	42
5.4	Management of Specific Waste Streams	42
5.4.1	Personal Protective Equipment	42
5.4.2	Management of Decontamination Rinsate	43
5.4.3	Management of Soil	43
5.4.4	Management of Debris	44
5.4.5	Field-Screening Waste	44
6.0	Quality Assurance/Quality Control	45
6.1	Quality Control Field Sampling Activities	45

Table of Contents *(Continued)*

6.2	Laboratory/Analytical Quality Assurance	46
6.2.1	Data Validation	46
6.2.2	Data Quality Indicators	46
6.2.3	Precision	48
6.2.4	Accuracy	49
6.2.5	Representativeness	49
6.2.6	Comparability	50
6.2.7	Completeness	50
6.2.8	Sensitivity	51
7.0	Duration and Records Availability	52
7.1	Duration	52
7.2	Records Availability	52
8.0	References	53

Appendix A - Data Quality Objectives

A.1.0	Introduction	A-1
A.2.0	Background Information	A-2
A.2.1	CAS 03-02-01, WX-6 ETS Building Septic System	A-2
A.2.2	CAS 06-02-01, Cesspool	A-5
A.2.3	CAS 09-01-01, Spill Site, and CAS 09-05-01, Leach Pit	A-8
A.2.4	CAS 20-05-01, Septic System	A-11
A.3.0	Step 1 - State the Problem	A-14
A.3.1	Planning Team Members	A-14
A.3.2	Conceptual Site Model	A-14
A.3.2.1	Contaminant Release	A-17
A.3.2.2	Potential Contaminants	A-17
A.3.2.3	Contaminant Characteristics	A-20
A.3.2.4	Site Characteristics	A-20
A.3.2.5	Migration Pathways and Transport Mechanisms	A-21
A.3.2.5.1	Exposure Scenarios	A-21
A.4.0	Step 2 - Identify the Decisions	A-23
A.4.1	Decision Statements	A-23
A.4.2	Alternative Actions to the Decisions	A-23
A.4.2.1	Alternative Actions to Decision I	A-24
A.4.2.2	Alternative Actions to Decision II	A-24

Table of Contents *(Continued)*

A.5.0	Step 3 - Identify the Inputs to the Decision	A-25
A.5.1	Information Needs	A-25
A.5.2	Sources of Information	A-25
A.5.2.1	Sample Locations	A-26
A.5.2.2	Analytical Methods	A-27
A.6.0	Step 4, Define the Boundaries of the Study	A-28
A.6.1	Populations of Interest	A-28
A.6.2	Spatial Boundaries	A-28
A.6.3	Practical Constraints	A-28
A.6.4	Define the Scale of Decision Making	A-29
A.7.0	Step 5 - Develop a Decision Rule	A-30
A.7.1	Population Parameters	A-30
A.7.2	Decision Rules	A-30
A.7.3	Action Levels	A-31
A.7.3.1	Chemical PALs	A-32
A.7.3.2	Total Petroleum Hydrocarbon PALs	A-32
A.7.3.3	Radionuclide PALs	A-32
A.7.4	Measurement and Analysis Sensitivity	A-33
A.8.0	Step 6 - Tolerable Limits on Decision Errors	A-34
A.8.1	False Negative Decision Error	A-35
A.8.2	False Positive Decision Error	A-37
A.9.0	Step 7 - Optimize the Design for Obtaining Data	A-38
A.9.1	CAS 03-02-01, WX-6 ETS Building Septic System	A-39
A.9.2	CAS 06-02-01, Cesspool	A-41
A.9.3	CAS 09-01-01, Spill Site, and CAS 09-05-01, Leaching Pit	A-44
A.9.4	CAS 20-05-01, Septic System	A-47
A.10.0	References	A-50

Appendix B - Project Organization

B.1.0	Project Organization	B-1
-------	----------------------------	-----

Appendix C - Nevada Department of Environmental Protection Comment Response

List of Figures

<i>Number</i>	<i>Title</i>	<i>Page</i>
1-1	Nevada Test Site Map Showing CAU 274 CAS Locations	2
3-1	Conceptual Site Model Diagram	17
3-2	Corrective Action Unit 274, Conceptual Site Model	18
3-3	Process Used To Move from PALs to FALs.....	24
A.2-1	Nevada Test Site Map Showing CAU 274 CAS Locations	A-3
A.2-2	CAU 274, CAS 03-02-01 Site Map.	A-4
A.2-3	Corrective Action Site 06-02-01 Site Map	A-6
A.2-4	Corrective Action Site 09-01-01 Site Map	A-9
A.2-5	Corrective Action Site 09-05-01 Site Map	A-10
A.2-6	Corrective Action Site 20-05-01 Site Map	A-12
A.3-1	Corrective Action Unit 274 Conceptual Site Model	A-16
A.9-1	CAU 274, CAS 03-02-01, Proposed Sample Locations	A-40
A.9-2	CAU 274, CAS 06-02-01, Proposed Sample Locations	A-42
A.9-3	CAU 274, CASs 09-01-01 and 09-05-01, Proposed Sample Locations at CAS.	A-45
A.9-4	CAU 274, CAS 20-05-01, Proposed Sample Locations	A-48

List of Tables

<i>Number</i>	<i>Title</i>	<i>Page</i>
3-1	Analytical Program (Includes Waste Characterization Analyses)	22
3-2	Analytical Requirements for Radionuclides for CAU 274.....	29
3-3	Analytical Requirements for Chemical COPCs for CAU 274	30
5-1	Waste Management Regulations and Requirements	39
6-1	Laboratory and Analytical Performance Criteria for CAU 274 Data Quality Indicators	47
7-1	CAU 274, Activities and Duration	52
A.3-1	Final DQO Meeting Participants for CAU 274 April 27, 2005	A-14
A.3-2	Conceptual Site Model Description of Elements for Each CAS in CAU 274	A-18
A.3-3	Analytical Program (Includes Waste Characterization Analyses)	A-19
A.3-4	Future Land-Use Scenarios.....	A-22
A.6-1	Spatial Boundaries of CAU 274 CASs.....	A-29

List of Acronyms and Abbreviations

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	<i>Comprehensive Environmental Resource Conservation and Liability Act</i>
CFR	<i>Code of Federal Regulations</i>
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
DQI	Data quality indicator
DQO	Data quality objective
DRO	Diesel-range organics
EPA	U.S. Environmental Protection Agency
EQL	Estimated quantitation limit
ETS	Effects Test Support
FADL	Field activity data log
FAL	Final action level
FFACO	<i>Federal Facility Agreement and Consent Order</i>

Acronyms and Abbreviations (Continued)

FWP	Field Work Permit
ft	Foot
GPS	Global Positioning System
HASP	Health and Safety Plan
HWAA	Hazardous Waste Accumulation Area
IDW	Investigation-derived waste
in.	Inch
IRIS	Integrated Risk Information System
IS HASP	<i>Industrial Sites Health and Safety Plan</i>
ISMS	Integrated Safety Management System
LANL	Los Alamos National Laboratory
LCS	Laboratory control sample
MDC	Minimum detectable concentration
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
mi	Mile
mrem/yr	Millirem per year
MRL	Minimum Reporting Limit
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not applicable
NAC	<i>Nevada Administrative Code</i>
NCRP	National Council on Radiation Protection and Measurement
ND	Normalized difference

Acronyms and Abbreviations (Continued)

NDEP	Nevada Division of Environmental Protection
NEPA	<i>National Environmental Policy Act</i>
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NRS	<i>Nevada Revised Statutes</i>
NTS	Nevada Test Site
NTSWAC	Nevada Test Site Waste Acceptance Criteria
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
PRG	Preliminary remediation goal
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RadCon	Radiological control
RBCA	Risk-Based Corrective Action
RCRA	<i>Resource Conservation and Recovery Act</i>
RMA	Radioactive materials area
ROTC	Record of Technical Change
RPD	Relative percent difference
SDWS	<i>Safe Drinking Water Standards</i>

Acronyms and Abbreviations (Continued)

SNJV	Stoller-Navarro Joint Venture
SSTL	Site-Specific Target Level
SVOC	Semivolatile organic compound
TPH	Total petroleum hydrocarbons
TSCA	<i>Toxic Substance Control Act</i>
USGS	U.S. Geological Survey
VOC	Volatile organic compound
yd ³	Cubic yards
%R	Percent recovery

Executive Summary

The Corrective Action Investigation Plan (CAIP) for Corrective Action Unit 274, Septic Systems, has been developed in accordance with the *Federal Facility Agreement and Consent Order* (1996) that was agreed to by the State of Nevada, the U.S. Department of Energy, and the U.S. Department of Defense. The purpose of the investigation is to ensure that adequate data are collected to provide sufficient and reliable information to identify, evaluate, and select technically viable corrective actions.

Corrective Action Unit (CAU) 274 is located in Areas 3, 6, 9, and 20 of the Nevada Test Site, which is 65 miles northwest of Las Vegas, Nevada. Corrective Action Unit 274 is comprised of the five Corrective Action Sites (CASs) listed below:

- 03-02-01, WX-6 ETS Building Septic System
- 06-02-01, Cesspool
- 09-01-01, Spill Site
- 09-05-01, Leaching Pit
- 20-05-01, Septic System

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. A corrective action investigation (CAI) will be conducted and the information obtained during the investigation will be used to evaluate corrective action alternatives prior to 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.

A conceptual site model has been developed for this CAU to assist in the design of the sampling strategy to be implemented during the CAI. Potential sources of contamination at this CAU include the effluent associated with the septic systems, cesspool, underground piping, injection wells, leaching pits, and spill site. The conceptual site model has identified the following four potential release mechanisms:

- Releases and/or possible leaks from collection features (septic tanks, leachfield, cesspool, injection wells, and leaching pit)

- Overflow from septic tanks, cesspool, injection wells, or other CAS-related features
- Leaks from connections, junctions, or breaches in subsurface piping
- Leaks to surface soil from surface spills

The sites will be investigated based on the data quality objectives (DQOs) developed on April 27, 2005, 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 Bechtel Nevada. The DQO process was used to identify and define the type, amount, and quality of data needed to develop and evaluate appropriate corrective actions for CAU 274. [Appendix A](#) provides a detailed discussion of the DQO methodology and the DQOs specific to each CAS.

The scope of the CAI for CAU 274 includes the following activities:

- Removing surface debris at CASs 09-01-01, 09-05-01, and 20-05-01.
- Conducting visual surveys at all CASs to identify biasing factors that may include staining, discoloration, disturbance of native soil, or any other indication of potential contamination.
- Performing field screening for volatile organic compounds, total petroleum hydrocarbons, radioactive contamination, and fecal coliform (when applicable).
- Conducting video-mole surveys of injection wells and septic system/cesspool piping to assess physical layout; identifying possible residual materials; locating any breaches; and determining whether source drains are plugged or sealed, if possible.
- Performing geophysical surveys to locate previously unidentified features at CAS 20-05-01.
- Collecting and submitting environmental samples for laboratory analysis to determine whether contaminants of concern are present.
- Collecting additional step-out samples to assess the extent of contamination if contaminants of concern are present.
- Staking or flagging sample locations in the field and recording coordinates through global positioning systems surveying.
- Collecting quality control samples for laboratory analyses to evaluate the performance of measurement systems and controls based on the requirements of the data quality indicators.

- Complying with regulatory requirements for waste disposal through the collection and analysis of investigation-derived waste samples and conducting inspections and surveys, as needed, to support waste management decisions.

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) 274: 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 274 is located in Areas 3, 6, 9, and 20 of the NTS, which is approximately 65 miles (mi) northwest of Las Vegas, Nevada ([Figure 1-1](#)). Corrective Action Unit 274 is comprised of the five Corrective Action Sites (CASs) shown on [Figure 1-1](#) and listed below:

- CAS 03-02-01, WX-6 ETS Building Septic System
- CAS 06-02-01, Cesspool
- CAS 09-01-01, Spill Site
- CAS 09-05-01, Leaching Pit
- CAS 20-05-01, Septic System

The corrective action investigation (CAI) will include field inspections, video-mole surveys, geophysical surveys, backhoe excavation, drilling, sampling of environmental media, analysis of samples, and assessment of investigation results, where appropriate. Data will be obtained to support corrective action alternative evaluations and waste management decisions.

1.1 Purpose

The CASs in CAU 274 are being investigated because hazardous and/or radioactive constituents may be present in 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. The CAI will be conducted, and the information obtained during the investigation will be used to evaluate corrective action alternatives before selecting the appropriate corrective action for each CAS.

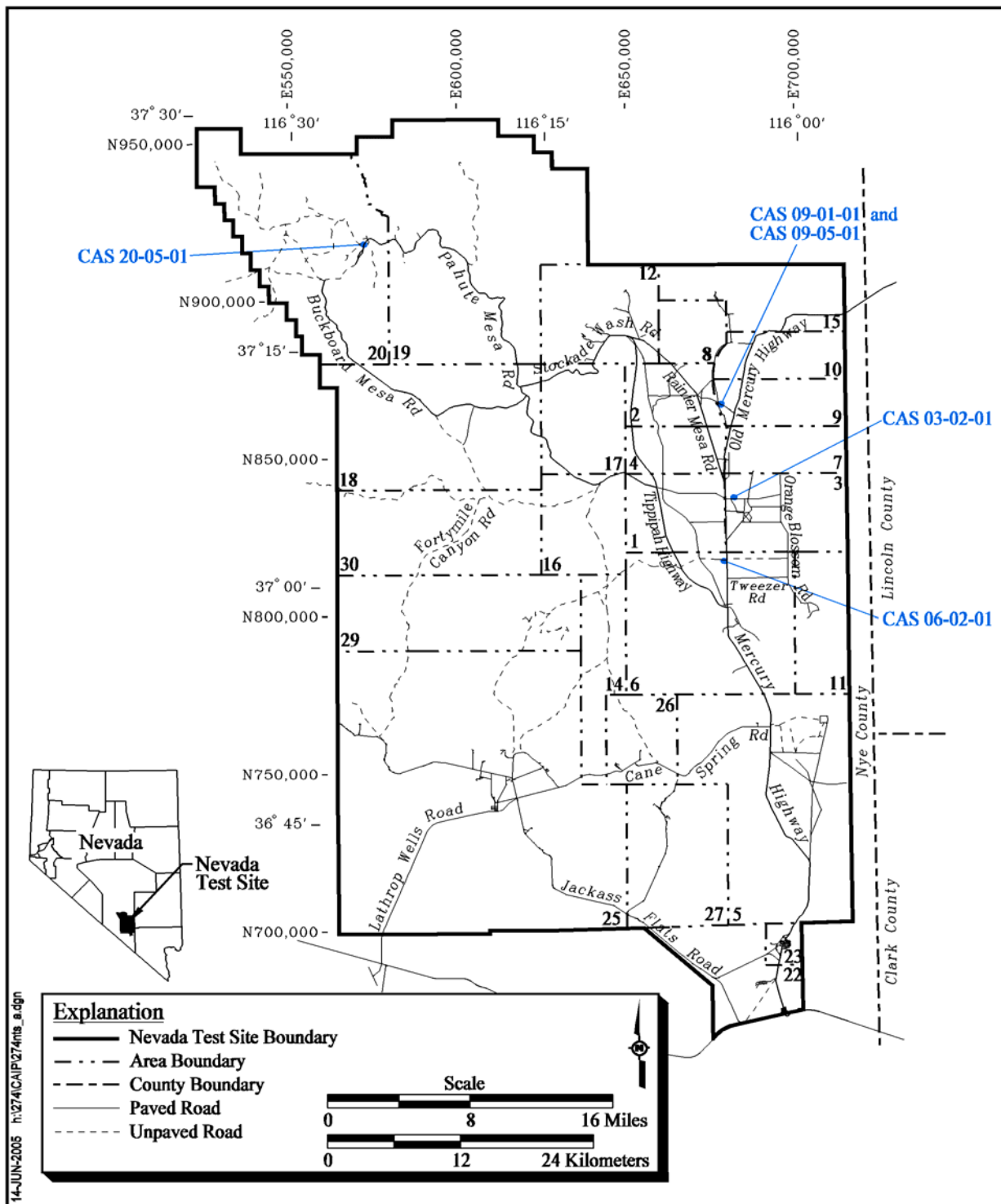


Figure 1-1
Nevada Test Site Map Showing CAU 274 CAS Locations

1.1.1 Corrective Action Unit History and Description

Corrective Action Unit 274, Septic Systems, consists of five inactive sites located in the Areas 3, 6, 9, and 20 on the NTS. The five CAU 274 sites consist of septic tanks, cesspool, injection wells, associated piping, leaching pit, leachfield, stained wooden plank, and surface/subsurface soils beneath and adjacent to these features. The CAU 274 sites were all used to support nuclear testing conducted from the 1950s through the 1970s. Operational histories for each CAU 274 CAS are detailed in [Section 2.2](#).

1.1.2 Data Quality Objective Summary

The sites will be investigated based on data quality objectives (DQOs) developed by representatives of the Nevada Division of Environmental Protection (NDEP); DOE, National Nuclear Security Administration Nevada Site Office (NNSA/NSO); Stoller-Navarro Joint Venture (SNJV); and Bechtel Nevada (BN). 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 274. 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 274 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 274.” The informational inputs and data needs to resolve the problem statement 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 obtained for each CAU 274 CAS by analyzing samples collected during the CAI. 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. If while defining the nature of contamination it is determined that COCs are present at a CAS, that CAS will be investigated further to determine 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 274 includes the following activities:

- Removing surface debris at CASs 09-01-01, 09-05-01, and 20-05-01.
- Conducting visual surveys at all CASs to identify biasing factors that may include staining, discoloration, disturbance of native soil, or any other indication of potential contamination.
- Performing field screening for volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), radioactive contamination, and fecal coliform (when applicable).
- Conducting video-mole surveys of injection wells and septic system/cesspool piping to assess physical layout; identifying possible residual materials; locating any breaches; and determining whether sources are plugged or sealed, if possible.
- Performing geophysical surveys to locate previously unidentified features at CAS 20-05-01.
- Collecting and submitting environmental samples for laboratory analysis to determine whether contaminants of concern (COCs) are present.
- Collecting additional step-out samples to assess the extent of contamination if COCs are present.
- Recording the coordinates of sample locations through global positioning system (GPS) surveying.
- Collecting quality control (QC) samples for laboratory analyses to evaluate the performance of measurement systems and controls based on the requirements of the data quality indicators (DQIs).
- Complying with regulatory requirements for waste disposal through the collection and analysis of investigation-derived waste (IDW) samples and conducting inspections and surveys, as needed, to support waste management decisions.

Contamination of environmental media originating from activities not associated with the CAS will not be considered as part of CAU 274 unless the conceptual site model (CSM) and the DQOs are modified to include the release. As such, contamination originating from these sources will not be considered for sample location selection, and/or will not be considered COCs for Decision II. If such contamination is present, the contamination will be identified as part of another CAS (either new or existing).

1.3 Corrective Action Investigation Plan Contents

[Section 1.0](#) presents the purpose and scope of this CAIP, while [Section 2.0](#) provides background information about CAU 274. 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, 2002). The project schedule and records availability are discussed in [Section 7.0](#). [Section 8.0](#) provides a list of references.

[Appendix A](#) provides a detailed discussion of the DQO methodology and the DQOs specific to each CAS, [Appendix B](#) contains information on the project organization, and [Appendix C](#) contains the NDEP comments to the draft version of this document.

The health and safety aspects of this project are documented in the *Industrial Sites Health and Safety Plan* (IS HASP) (SNJV, 2004) and will be supplemented with a site-specific Field Work Plan (FWP) developed before the start of field work.

Public involvement activities are documented in the “Public Involvement Plan” contained in Appendix V of the FFACO (1996). The managerial aspects of this project are discussed in the *Project Execution Plan* (SNJV, 2005) and will be supplemented with a site-specific field management plan that will be developed prior to field activities.

2.0 Facility Description

Corrective Action Unit 274 is comprised of five CASs that were grouped together based on the geographical location, technical similarities (subsurface/surface components of a discharge system), and the agency responsible for closure. Three CASs (03-02-01, 06-02-01, and 20-05-01) are components of a septic system and/or associated with domestic sewage. Corrective Action Sites 09-01-01 and 09-05-01 are adjacent to each other in Area 9 and consist of a spill site and leaching pit, respectively.

2.1 Physical Setting

The following sections describe the general physical settings of Areas 3, 6, 9, and 20 of the NTS. General background information pertaining to topography, geology, hydrogeology, and climatology are provided for these specific areas or the NTS region in the *Geologic Map of the Nevada Test Site, Southern Nevada* (USGS, 1990); *Comprehensive Environmental Resource Conservation and Liability Act (CERCLA) Preliminary Assessment for DOE's Nevada Operations Office Nuclear Weapons Testing Areas* (DRI, 1988); the *Nevada Test Site Final Environmental Impact Statement* (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).

The NTS lies within the Death Valley groundwater flow system. The Death Valley flow system covers an approximate area of 15,800 square miles of the southern Great Basin. The flow system consists of volcanic rock in the west and carbonate rock in the east and is estimated to transmit more than 70,000 acre-feet of groundwater annually. The region is characterized by low rainfall; intermittent streams; internal surface drainages; and large, sparsely-distributed springs (ERDA, 1977). The geologic and hydrologic settings, as they relate to the investigation of each CAS, are provided in the following sections according to the hydrogeographic area in which they are located.

2.1.1 Yucca Flat

Corrective Action Sites 03-02-01, 06-02-01, 09-01-01, and 09-05-01 are located within the Yucca Flat hydrogeographic area of the NTS. Yucca Flat is a closed basin that is slowly being filled with

alluvial deposits eroding from the surrounding foothills (Laczniak et al., 1996). The average thickness of the alluvium in Yucca Flat is approximately 1,000 feet (ft) but can be as thick as 6,500 ft in some places (LLNL, 1982).

The average annual precipitation rate for Areas 3, 6, and 9 is approximately 4 to 6.62 inches (in.) per year (ARL/SORD, 2004). The closest groundwater well to CAS 03-02-01 is the U.S. Geological Survey (USGS) Water Well A, located approximately 1 mi southeast of the site. The depth to groundwater has been measured in this well at approximately 1,610 ft below ground surface (bgs) (USGS, 1961; Wuellner, 1994). The closest groundwater well to CAS 06-02-01 is the USGS Water Well 3, located approximately 0.25 mi northeast of the CAS. The depth to groundwater has been measured in this well at approximately 1,530 ft bgs (DOE/NV, 1996). The closest groundwater well to CASs 09-01-01 and 09-05-01 is the USGS Water Well 2, located approximately 3 mi northwest of the CASs. The depth to groundwater was measured in this well at a depth of approximately 1,530 ft bgs on November 12, 2003 (USGS and DOE, 2004). The transmissivity of the alluvium within the Yucca Flat basin is approximately 800 gallons per day per foot (USGS, 1961).

2.1.2 *Pahute Mesa*

Corrective Action Site 20-05-01 is located within the eastern part of Pahute Mesa on the NTS. Pahute Mesa is a volcanic plateau underlain by tuffs and lavas from the Timber Mountain Oasis Valley Caldera Complex and the Silent Canyon and Black Mountain Calderas north of Timber Mountain. The major unit underlying Pahute Mesa is the Silent Canyon Caldera, which is a deep structural depression. This caldera is comprised of different types of Tertiary volcanic rocks, such as ash-flow and ash-flow tuffs. These tuffs are more than 13,000 ft thick in some places (DRI, 1988).

The average annual precipitation rate for Pahute Mesa is approximately 7.8 in. per year (ARL/SORD, 2004). The closest well to CAS 20-05-01 is Water Well U-20, located approximately 1.5 mi southwest of the site. The depth to groundwater was measured in this well at a depth of approximately 2,050 ft bgs in 2003 (USGS and DOE, 2004).

2.2 Operational History

The following subsections provide a description of the use and history of each CAS in CAU 274 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 CAS 03-02-01, WX-6 ETS Building Septic System

Corrective Action Site 03-02-01 consists of potential releases of contaminants from the septic system components associated with the WX-6 Effects Test Support (ETS) Building. The septic system components consist of a septic tank, injection well, and associated underground piping. Engineering drawings and geophysical survey data indicate that the septic tank is located approximately 70 ft east of the WX-6 ETS Building, and the injection well is located approximately 20 ft east of the septic tank. The injection well and septic tank are connected to the WX-6 ETS Building by the associated underground piping. The septic tank is estimated to be approximately 10 ft in length and constructed of reinforced concrete with a storage capacity of approximately 750 gallons. The injection well dimensions were estimated to be approximately 5 by 5 ft extending to a depth of approximately 45 ft bgs as identified during a site visit. [Figure A.2-2](#) shows the locations of the septic tank, injection well, and potential associated piping.

Corrective Action Site 03-02-01 and the site of the former WX-6 ETS Building are located within the Core Complex in Area 3. Activities were conducted by Los Alamos National Laboratory (LANL) within the Core Complex. The WX-6 ETS Building was used for the disassembly and decontamination of equipment used during underground nuclear testing. The septic tank, injection well, and associated piping were connected to the shower, lavatory sink, and water closet of the WX-6 ETS Building. The concrete slab of the building foundation and a rusted metal pipe are the only surface features that remain from the WX-6 ETS Building.

2.2.2 CAS 06-02-01, Cesspool

Corrective Action Site 06-02-01 consists of potential releases of contaminants from a cesspool, injection well, and associated underground piping located east of Building 6-388 within the Well 3 Yard in Area 6. Engineering drawings and geophysical survey data indicate that the cesspool is located approximately 15 ft east of Building 6-388. Underground piping is shown on the engineering

drawings extending south and southeast from the cesspool, connecting to a toilet trailer and office complex trailer. No underground piping is shown connecting the cesspool to the injection well or Building 6-388. The depth of the injection well was estimated during a site visit to be approximately 45 ft bgs. The cesspool and injection well are connected to the surface by vertical pipes.

[Figure A.2-3](#) shows the locations of the cesspool, injection well, and potential associated piping.

The cesspool received domestic sewage from the office trailer complex and toilet trailer previously located east of Building 6-388. The vertical pipes that connect the cesspool and injection well to the surface are covered with lids. No liquids were observed in the injection well at the time of the site visit. A connection from the cesspool to Building 6-388 and/or injection well were not identified in engineering drawings or during geophysical surveys. The concrete slab and electrical panels are the only surface features that remain from Building 6-388.

2.2.3 CAS 09-01-01, Spill Site, and CAS 09-05-01, Leaching Pit

Corrective Action Sites 09-01-01 and 09-05-01 consists of potential releases of contaminants from a spill site and leaching pit adjacent to each other in Area 9. Corrective Action Site 09-01-01 is associated with a stain on a wooden plank that measures approximately 1 by 3.5 ft ([Figure A.2-4](#)). Corrective Action Site 09-05-01 is a leaching pit that measures approximately 28 by 28 ft ([Figure A.2-5](#)).

Corrective Action Sites 09-01-01 and 09-05-01 are located northeast of the U-9y Crater and north of 9-01 Road. The spill site is located within the wooden plank area southeast of the leaching pit. The wooden plank area was the former location of a 50,000-gallon vertical water tank that operated during the 1950s and early 1960s. Water from the tank was used to rinse equipment and drilling mud haul trucks within the leach pit. The boundaries of the leaching pit are slightly mounded. There is a partially buried metal bucket with piping that may have been used as a sump. Surface debris within the leaching pit includes pipes, wood, and various metal scraps. There is also an area within the leach pit that contains light gray soil that may be bentonite or drilling mud. Details on when the tank was removed or other uses of the leach pit are not available.

2.2.4 CAS 20-05-01, Septic System

Corrective Action Site 20-05-01 consists of potential releases of contaminants from the septic system components located within the Area 20 Camp. Engineering drawings indicate that the septic tank has a storage capacity of approximately 1,760 gallons. The septic tank is identified at the surface by a vertical pipe that extends approximately 2.5 ft above ground surface. The leachfield is located to the west of the septic tank and slightly mounded. The leachfield is shown on engineering drawings having 6 clay tile distribution lines that cover an area approximately 120 by 130 ft. Various debris is located on the surface of the leachfield. [Figure A.2-6](#) shows a site sketch of the CAS.

Corrective Action Site 20-05-01 is located within the Area 20 Camp. The Area 20 Camp supported drilling activities and consisted of housing trailers, a medical support facility, and other industrial operations that included an iron workers shop and welding shop. The septic system received domestic sewage from the housekeeping trailer and medical support facility located approximately 220 ft east of the septic tank. It is uncertain whether the septic tank is connected to other industrial facilities within the Area 20 Camp. The Area 20 Camp is currently inactive and abandoned.

2.3 Waste Inventory

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

2.3.1 CAS 03-02-01, WX-6 ETS Building Septic System

Solid waste items removed from CAS 03-02-01 are potentially hazardous, radioactive, and/or mixed. These items may include residual liquid and/or sludge that exists in the septic tanks, injection well, or associated piping. Hazardous, radioactive, and mixed waste may be generated by the removal of surface and subsurface soils beneath and/or immediately adjacent to the septic system components as a result of potential breaches or overflows. Removal of material from the septic system components and associated facilities may generate industrial, radiological, and/or sanitary waste.

2.3.2 CAS 06-02-01, Cesspool

Solid waste items removed from CAS 06-02-01 are potentially hazardous, radioactive, and mixed. These items may include residual liquid and/or sludge that exists in the septic tanks, injection well, or associated piping. Hazardous, radioactive, and mixed waste may be generated by the removal of surface and subsurface soils beneath and/or immediately adjacent to the septic system components as a result of potential breaches or overflows. Removal of material from the cesspool, injection well, and associated facilities may generate industrial, radiological, and/or sanitary waste.

2.3.3 CAS 09-01-01, Spill Site, and 09-05-01, Leaching Pit

Solid waste items removed from CAS 09-01-01 and 09-05-01 are potentially hazardous, radioactive, and mixed. These items may include surface debris, abandoned pipes, and residual liquids. Hazardous, radioactive, and mixed waste may be generated by the removal of surface and subsurface soils beneath and/or immediately adjacent to the septic system components as a result of potential breaches or overflows. Removal of material from the leaching pit, stain, and nature of the historic operations at the site may generate radiological, industrial, and/or sanitary waste.

2.3.4 CAS 20-05-01, Septic System

Solid waste items removed from CAS 20-05-01 are potentially hazardous, radioactive, and mixed. These items may include residual liquid and/or sludge that exists in the septic tanks, leachfield, or associated piping. Hazardous, radioactive, and mixed waste may be generated by the removal of surface and subsurface soils beneath and/or immediately adjacent to the septic system components as a result of potential breaches or overflows. Removal of material from the septic system components and associated facilities may generate industrial, radiological, and/or sanitary waste.

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 CAU 274 CASs beyond a shallow layer of surface soil. Potentially affected media for all CASs include surface and shallow subsurface soil.

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

Corrective Action Site 06-02-01 is currently located within a use-restricted area. The use restriction was imposed because concentrations of TPH-diesel range organics (DRO) were detected above 100 milligrams per kilogram (mg/kg) within surface soil samples collected during the investigation of CAU 335, CAS 06-20-02 (NNSA/NV, 2001). The widespread surface concentrations of TPH-DRO were attributed to the use of oil for dust suppression at the site (NNSA/NV, 2001). Subsequently, surface soil at CAS 06-02-01 may potentially be impacted by TPH-DRO. This contamination is not associated with a CAU 274 release and will not be included in the subsequent evaluations of the site as it has already been addressed as part of the Closure Report for CAU 335 (NNSA/NSO, 2003a).

2.4.1 CAS 03-02-01, WX-6 ETS Building Septic System

The primary source of potential releases originates from the effluent that was previously managed in the septic system of the former WX-6 ETS Building. This effluent may have seeped into soils from potential leaks at junctions in the system, breaks in the system, and/or overflow of the tank. Residual effluent may also still be present within these features. Due to the nature of the unconsolidated soils and fill along this system, the potential for both vertical and lateral migration of the effluent exists. Although the septic system is reported to have been used strictly for sanitary purposes, the corrective action analytical program will account for the potential that other wastes may have been introduced to the system.

2.4.2 CAS 06-02-01, Cesspool

The primary source of potential releases originates from the effluent that was previously managed in the cesspool or injection well. This effluent may have seeped into soils from potential leaks at junctions in the system, breaks in the system, and/or overflow of the tank or injection well. Residual effluent may also still be present within these features. Due to the nature of the unconsolidated soils and fill along this system, the potential for both vertical and lateral migration of the effluent exists. Although the cesspool is reported to have been used strictly for sanitary purposes, the corrective

action analytical program will account for the potential that other wastes may have been introduced to the system and/or injection well.

2.4.3 CAS 09-01-01, Spill Site, and CAS 09-05-01, Leaching Pit

The primary source of potential releases at CAS 09-01-01 is the spill associated with the stained wooden plank. The primary source of potential contamination associated with CAS 09-05-01 is the rinse water and material generated from rinsing of equipment and drilling mud haul trucks. The spill and rinse water/residual material may have seeped into soils. These materials may migrate vertically and laterally due to the nature of the unconsolidated site soils and leach pit fill material. In addition to the contaminants associated with drill mud, the corrective action analytical program will account for the potential that other wastes may have been introduced to the leach pit or stained wooden plank. The process knowledge available for CAS 09-05-01 indicates that drilling mud may be present within the leaching pit. Subsequently, TPH-DRO will be a target analyte at this CAS.

2.4.4 CAS 20-05-01, Septic System

The primary source of potential release originates from the effluent that was previously managed in the septic system. This effluent may have seeped into soils from potential leaks at junctions in the system, breaks in the system, and/or overflow of the tank. Residual effluent may also still be present within these features. Due to the nature of the unconsolidated soils and fill along this system, the potential for both vertical and lateral migration of the effluent exists. Although the septic system is reported to have been used strictly for sanitary purposes, the corrective action analytical program will account for the potential that other wastes may have been introduced to the system.

2.5 Investigative Background

The following subsections summarize the history of prior investigations conducted at the CAU 274 sites. More detailed discussions of these investigations are found in [Appendix A](#).

2.5.1 CAS 03-02-01, WX-6 ETS Building Septic System

There are no known analytical results for this CAS. A radiological survey was conducted over the site and no areas with elevated radiological activities were identified (Nicosia, 2003). A geophysical

survey was also conducted that verified the presence of the septic tank and associated piping (SAIC, 2003).

2.5.2 CAS 06-02-01, Cesspool

Soil samples collected during the CAU 335 investigation indicate that concentrations of TPH-DRO are present in the surface soil in the vicinity of CAS 06-02-01. The highest concentration of TPH-DRO detected during the CAU 335 investigation was obtained from a surface sample collected from 0.0 to 0.5 ft bgs that was 3,100 mg/kg (NNSA/NV, 2001). There are no known soil sample analytical results from within the CAS 06-02-01 footprint. A radiological survey was conducted over the site and no areas with elevated radiological activities were identified (Alderson, 2002).

Radiological swipe samples were collected from the interior of the injection well during a recent site visit and indicated no detections of removable radiological contamination within the well. A geophysical survey was also conducted that verified the presence of the septic tank and associated piping (Shaw, 2002).

2.5.3 CAS 09-01-01, Spill Site, and CAS 09-05-01, Leaching Pit

There are no known analytical results for this CAS. A radiological survey was conducted over the site and no areas with elevated radiological activities were identified (Alderson, 2004). A geophysical survey was also conducted and identified potentially buried piping at various locations (Fahringer, 2004).

2.5.4 CAS 20-05-01, Septic System

There are no known analytical results for this CAS. A radiological survey was conducted over the site and no areas with elevated radiological activities were identified (Alderson, 2004).

2.5.5 National Environmental Policy Act

The *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996) includes site investigation activities such as those proposed for CAU 274.

In accordance with the NNSA/NSO *National Environmental Policy Act* (NEPA) Compliance Program, a NEPA checklist will be completed before commencing site investigation activities at CAU 274. This checklist requires NNSA/NSO project personnel to evaluate their proposed project activities against a list of potential impacts that include, but are not limited to: air quality, chemical use, waste generation, noise level, and land use. Completion of the checklist results in a determination of the appropriate level of NEPA documentation by the NNSA/NSO NEPA Compliance Officer. This will be accomplished prior to mobilization for the field investigation.

3.0 Objectives

This section presents an overview of the DQOs for CAU 274 and formulation of the CSM. Also presented is a summary listing of the contaminants reasonably suspected to be present at each CAS, the contaminants of potential concern (COPCs), the action levels for the investigation, and the process used to move from preliminary action levels (PALs) to final action levels (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 was developed for CAU 274 using information from the physical setting, potential contaminant sources, release information, historical background information, knowledge from similar sites, and physical and chemical properties of the potentially affected media and COPCs. [Figure 3-1](#) depicts a tabular representation of the conceptual pathways to receptors from CAU 274 sources. [Figure 3-2](#) depicts a graphical representation of the CSM.

If evidence of contamination that is not consistent with the presented CSM is identified during investigation activities, the situation will be reviewed, the CSM will be revised, the DQOs will be re-assessed, and a recommendation will be made as to how best to proceed. In such cases, the 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.

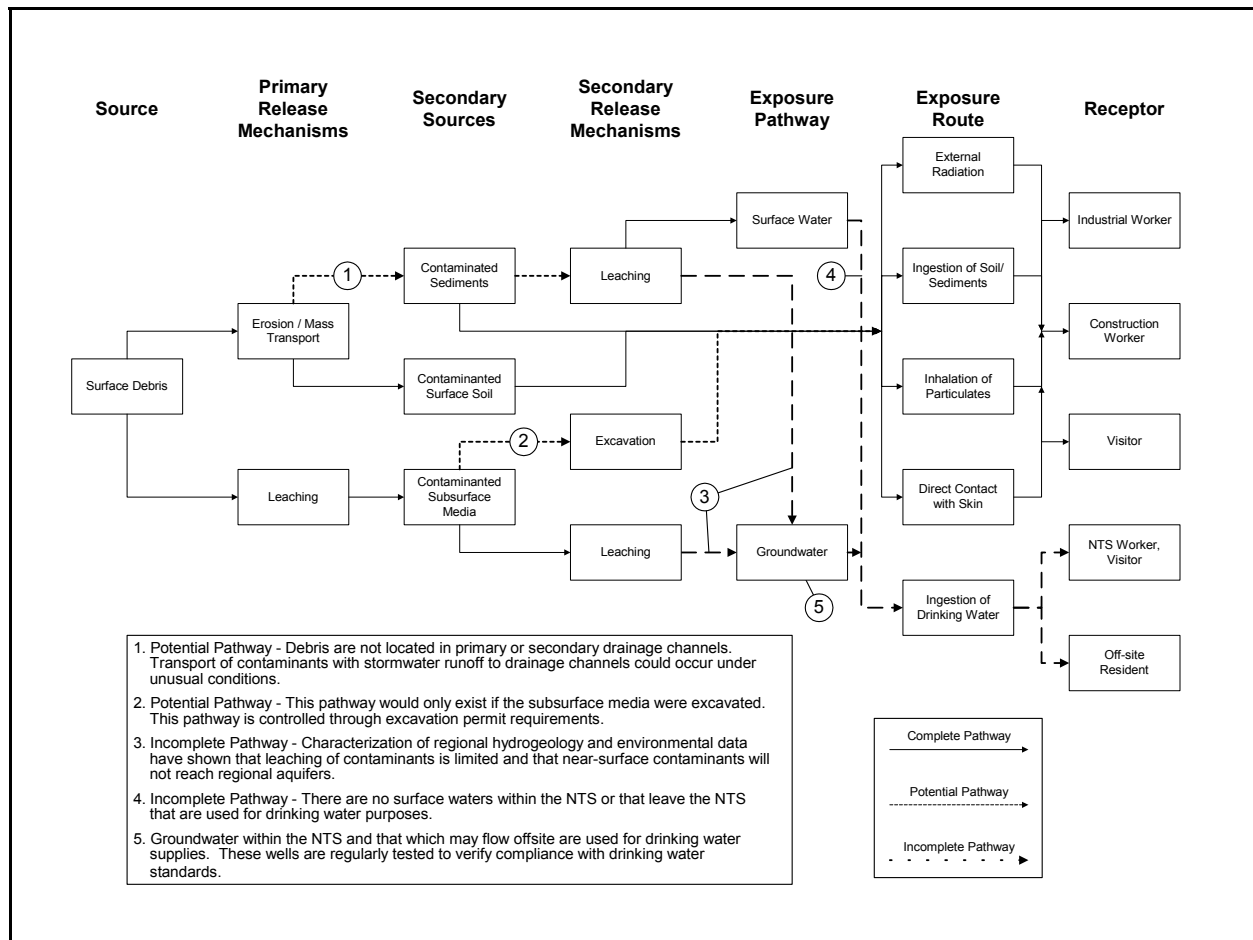


Figure 3-1
Conceptual Site Model Diagram

3.1.1 Future Land Use

Corrective Action Site 03-02-01 is located in the land-use zone described as the “Nuclear and High-Explosive Test Zone” (DOE/NV, 1998). This area is designated within the Nuclear Test Zone for additional underground nuclear weapons tests and outdoor high-explosive tests. Corrective Action Sites 06-02-01, 09-01-01, 09-05-01, and 20-05-01 are located in the land-use zone described as the “Nuclear Tests” (DOE/NV, 1998). This area is reserved for dynamic experiments, hydrodynamic tests, and underground nuclear weapons and weapons-effects tests (DOE/NV, 1998). The “Nuclear and High-Explosive Test Zone” and “Nuclear Tests” both include compatible defense and nondefense research, development, and testing activities.

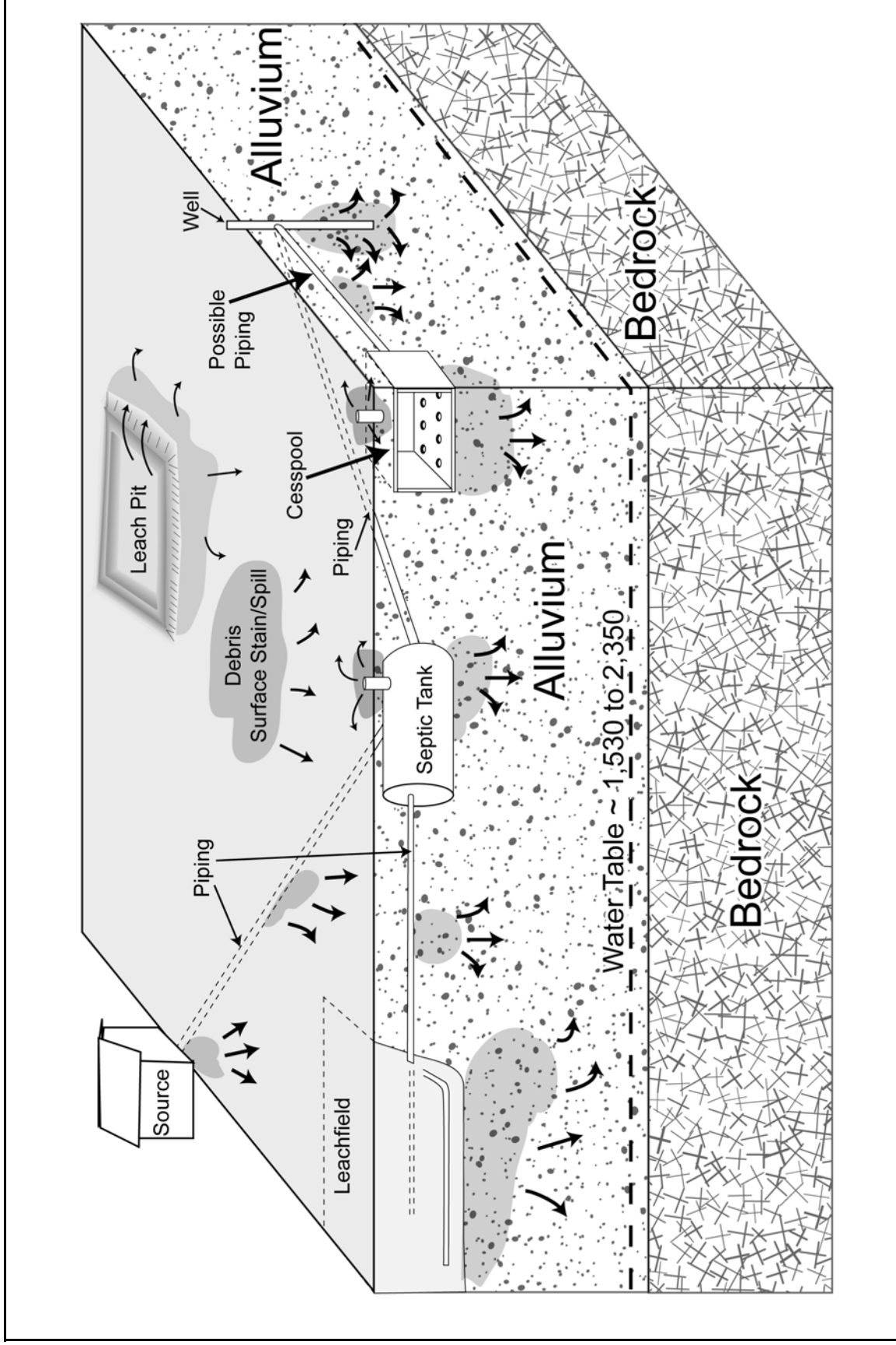


Figure 3-2
 Corrective Action Unit 274, Conceptual Site Model

All land-use zones where the CAU 274 CASs are located dictate that future land uses will be limited to nonresidential (i.e., industrial) activities.

3.1.2 Contaminant Sources

The contamination sources identified during the development of the CSM for CAU 274 are:

- The releases associated with the septic system components (septic tank, cesspool, associated underground piping, and injection wells)
- The spill material and rinse water/residual material associated with the spill site and leaching pit, respectively

3.1.3 Release Mechanisms

Release mechanisms would be attributed to:

- Releases and/or possible leaks from the septic system collection features (septic tanks, leachfield, cesspool, and injection wells)
- Overflow from septic tanks, cesspool, injection wells, or other CAS-related features
- Leaks from junctions or breaches in subsurface piping
- Leaks to surface soil from spills or equipment washing at leaching pit

3.1.4 Migration Pathways

Migration pathways at the CAU 274 CASs include lateral and vertical migration of potential contaminants across surface soils/sediments and through subsurface soils. Contaminants released from subsurface components (i.e., septic tanks, cesspool, leachfield, associated piping, and injection wells) or surface components (i.e., leaching pit and spill site) were likely released to the subsurface and/or surface within a liquid solution. The transport mechanism for the potential contaminants is the liquid solution/effluent. The extent of migration of the liquid solution/effluent is dependent on the length of time the release component was in operation. Contamination, if present, is expected to be contiguous to the release site. For subsurface migration and surface migration without scouring, it would be expected that contaminant levels decrease with horizontal and vertical distance from the point of the release.

An important element of the CSM in developing a sampling strategy is the expected fate and transport of contaminants (how contaminants migrate through media and where they can be expected in the environment). Fate and transport of contaminants are presented in the CSM as the migration pathways and transport mechanism that could potentially move the contaminants through the various media. Fate and transport are 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 (annual potential evapotranspiration at the Area 3 Radiological Waste Management Site has been estimated at 62.6 in. [Shott et al., 1997]) and limited precipitation for this region (approximately 4 in. per year [Winograd and Thordarson, 1975]), percolation of infiltrated precipitation at the NTS does not provide a significant mechanism for vertical migration of contaminants to groundwater (DOE/NV, 1992). In addition, it is unlikely that contamination associated with CAU 274 would migrate to groundwater based on the depth to groundwater information at each CAS.

3.1.5 Exposure Points

Exposure points to the potential receptors identified through the CSM are contact with soil, contaminant vapors in soil, particulates that may become airborne during excavation, surface water, and/or groundwater.

3.1.6 Exposure Routes

Exposure routes to site receptors include 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 274 CASs are available and 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 chemical COPCs for CAU 274 are defined as the analytes reported from the analytical methods stipulated in [Table 3-1](#) for which the U.S. Environmental Protection Agency (EPA) Region 9 has established Preliminary Remediation Goals (PRGs) (EPA, 2004b) or for which toxicity and carcinogenicity data are listed in the EPA *Integrated Risk Information System* (IRIS) database (EPA, 2001b). The radiological COPCs for CAU 274 are defined as the radionuclides reported from the analytical methods listed in [Table 3-1](#). The COPCs are applicable to Decision I environmental samples from each of the CASs. The list of COPCs is intended to encompass all of the contaminants that could potentially be present at each CAS. These contaminants 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 274 sites is not available, contaminants detected at other similar or other NTS sites were included in the contaminant lists to reduce the uncertainty.

During the review of site history documentation, process knowledge information, personal interviews, 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 analytes are required to meet a more stringent completeness criteria than other COPCs, thus providing greater protection against a decision error (see [Section A.3.2.2](#)). Total petroleum hydrocarbons-DRO has been identified as a target analyte at CAS 09-05-01 as a result of

**Table 3-1
Analytical Program^a
(Includes Waste Characterization Analyses)**

Analyses ^b	CAS 03-02-01	CAS 06-02-01	CAS 09-01-01	CAS 09-05-01	CAS 20-05-01
Organic Contaminants of Potential Concern (COPCs)					
Total Petroleum Hydrocarbons-Diesel-Range Organics	X	X	X	X	X
Polychlorinated Biphenyls	X	X	X	X	X
Semivolatile Organic Compounds ^c	X	X	X	X	X
Volatile Organic Compounds ^c	X	X	X	X	X
Inorganic COPCs					
Total Resource Conservation and Recovery Act Metals ^c	X	X	X	X	X
Radionuclide COPCs					
Gamma Spectroscopy ^d	X	X	X	X	X
Waste Characterization Analyses					
Asbestos	X	X	NA	NA	X

^aThe contaminants of potential concern are the analytes reported from the analytical methods listed.

^bIf the volume of material is limited, prioritization of the analyses will be necessary.

^cMay also include Toxicity Characteristic Leaching Procedure analytes if any totals results or field-screening results exceed action levels, or if samples are collected for waste management purposes.

^dResults of gamma analysis will be used to determine whether further radioanalytical analysis is warranted.

X = Required analytical method

NA = Not applicable

drilling mud that may be present within the leaching pit. No other target analytes have been identified at the CAU 274 CASSs.

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 analytes that are not present in sufficient concentrations to warrant further evaluation and, therefore, streamline the consideration of remedial alternatives. The process that will be used to move from PALs to FALs is that specified by Nevada Administrative Code (NAC) 445A.22705

(NAC, 2004e). This regulation stipulates that determination of FALs shall be established by an evaluation of the site based on the risk to public health and the environment. This evaluation will be conducted using Method E1739-95, adopted by the American Society for Testing and Materials (ASTM, 1995).

The ASTM's risk-based corrective action (RBCA) process, summarized in [Figure 3-3](#), uses a tiered approach to data collection and analysis in supporting decisions on site assessment and response to contamination. 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 RBCA procedure defines three tiers or levels of evaluation involving increasingly sophisticated levels of analyses.

- Tier 1 – sample results from source areas (highest concentrations) compared to PALs based on generic (non-site-specific) conditions
- Tier 2 – sample results from exposure points compared to site-specific target levels (SSTLs) calculated using site-specific inputs and Tier 1 formulas
- Tier 3 – sample results from exposure points compared to SSTLs and points of compliance calculated using chemical fate/transport and probabilistic modeling

A Tier 1 evaluation will be conducted to determine whether contaminant levels satisfy the criteria for a quick regulatory closure or warrant a more site-specific assessment. This is accomplished by comparing individual source area contaminant concentration results to PALs. The PALs are a tabulation of chemical- and radioisotope-specific (but not site-specific) screening levels based on potential exposure pathways, media (i.e., soil, water, and air), and potential exposure scenarios using risk information derived from the IRIS database or a dose constraint of 25 millirem per year (mrem/yr) (EPA, 2001b). If remediation to Tier 1 action levels is not practicable, a Tier 2 evaluation may be conducted. Rationale and justification for using a Tier 2 evaluation will be presented in the investigation report.

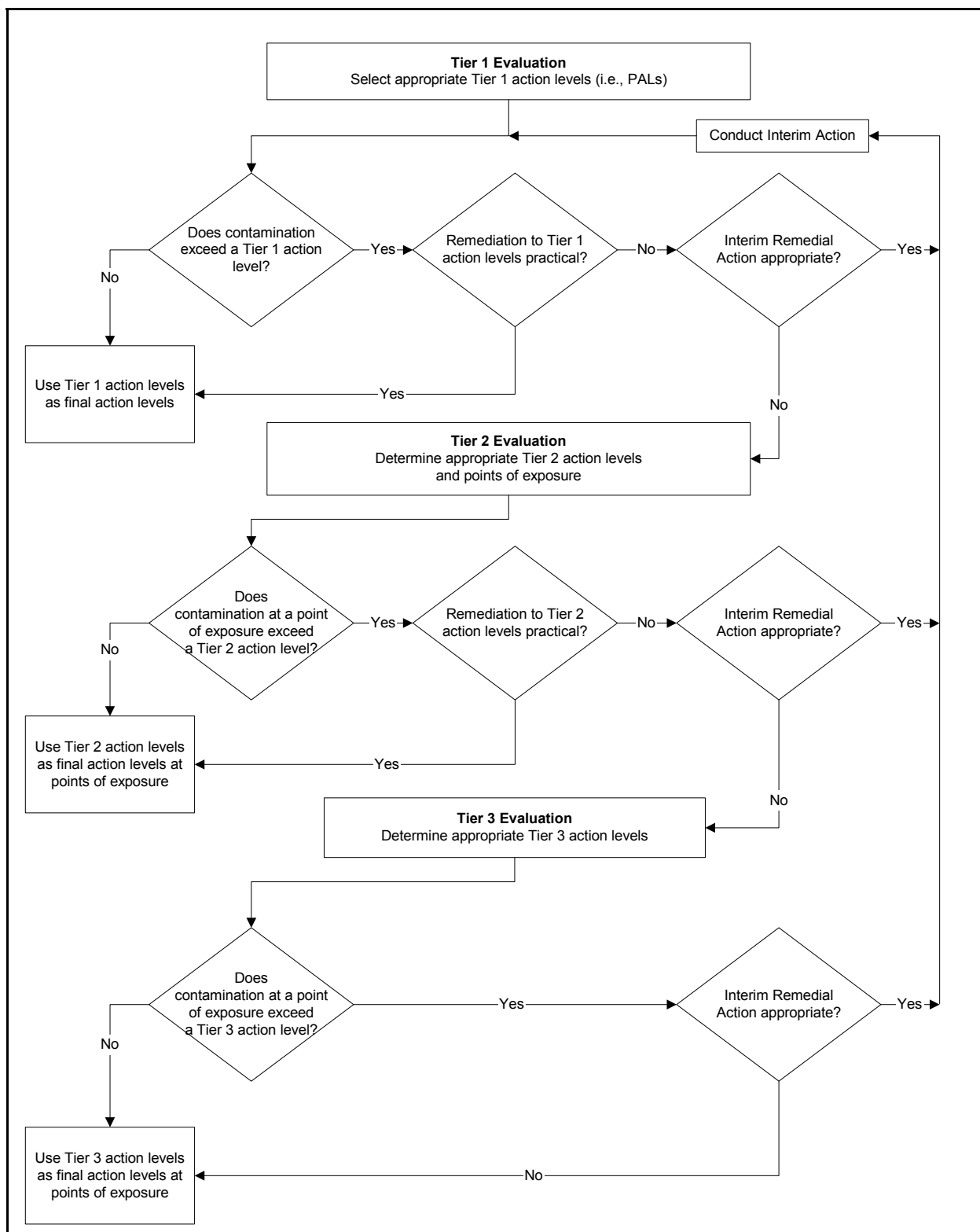


Figure 3-3
Process Used To Move from PALs to FALs

If appropriate, a Tier 2 evaluation may be 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 (ASTM, 1995).

Alternatively, the Tier 2 RBCA process SSTLs may be compared to the predicted concentration or activity of the contaminant at the point of exposure based on attenuation of the COCs away from the source using relatively simplistic mathematical models. Points of exposure are defined as those locations at which an individual or population may come in contact with a COC originating from a CAS. If a Tier 2 evaluation is conducted, the calculations used to derive the SSTLs and the contaminant attenuation calculations will be provided as an appendix to the investigation report. If remediation to Tier 2 SSTLs is not practicable, a Tier 3 evaluation may be conducted. Rationale and justification for using a Tier 3 evaluation will be presented in the investigation report.

If appropriate, a Tier 3 evaluation may be conducted by calculating Tier 3 SSTLs on the basis of more sophisticated risk analyses using methodologies described in Method E1739-95 that consider site-, pathway-, and receptor-specific parameters (ASTM, 1995). Tier 3 evaluation is much more complex than Tiers 1 and 2 because it may include additional site characterization, probabilistic evaluations, and sophisticated chemical fate/transport models. The Tier 3 SSTLs are then compared to the upper 95 percent upper confidence limit of the mean of sample results from reasonable point(s) of exposure (as opposed to individual sample results as is done in Tier 2). Contaminant concentrations exceeding Tier 3 SSTLs require corrective action. If a Tier 3 evaluation is conducted, the calculations used to derive the SSTLs and the upper confidence limit of the means will be provided as an appendix to the investigation report.

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

3.3.1 Chemical Preliminary Action Levels

Except as noted herein, the chemical PALs are defined as the EPA *Region 9 Preliminary Remediation Goals* for chemical constituents in industrial soils (EPA, 2004b). Background concentrations for arsenic will be used instead of PRGs when natural background concentrations exceed the PRG. Background is considered the mean plus two standard deviations of the mean for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (formerly the Nellis Air Force Range) (NBMG, 1998; Moore, 1999). For detected chemical COPCs without established PRGs that have toxicity and carcinogenicity data listed in the EPA IRIS database (EPA, 2001b), 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 Preliminary Action Levels

The PAL for TPH in soil is 100 mg/kg as listed in the NAC 445A.2272 (NAC, 2004e).

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) scaled to a 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, 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](#).

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* (DOE/NV, 2000).

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 274 was developed at a meeting on April 27, 2005. The DQOs were developed to identify data needs, clearly define the intended use of the environmental data, and design a data collection program that will satisfy these purposes. During the DQO discussions for this CAU, the informational inputs or data needs to resolve problem statements and decision statements were documented.

The DQO problem statement for CAU 274 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 274.” To address this question, the resolution of two decisions statements is required:

- Decision I: “Is any COC present in environmental media within the CAS?” Any contaminant associated with a release from the CAS that is present at concentrations exceeding its corresponding FAL will be defined as a COC. 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:
 - Identification of lateral and vertical extent of COC contamination in media
 - The information needed to characterize IDW for disposal
 - The information needed to determine potential remediation waste types
 - The information needed to evaluate the feasibility of remediation alternatives

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 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 if 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 equal to the corresponding PAL concentrations. Analytical methods and minimum reporting limits (MRLs) or minimum detectable concentrations (MDCs) for each CAU 274 COPC are provided in [Table 3-2](#) and [Table 3-3](#). The MRL is the lowest concentration of a particular chemical parameter that can be detected in a sample within an acceptable level of error. The MDC is the lowest concentration of a particular 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 [Table 3-2](#) and [Table 3-3](#) that varies from corresponding information in the QAPP will supersede that information in the QAPP (NNSA/NV, 2002).

Table 3-2
Analytical Requirements for Radionuclides for CAU 274

Parameter/Analyte	Matrix	Analytical Method	MDC ^a	PAL ^b	Laboratory Precision (RPD)	Percent Recovery (%R)
Gamma Spectrometry						
Americium-241	soil	HASL-300 ^d	2.0 pCi/g ^c	12.7 pCi/g	Relative Percent Difference (RPD) 35% Normalized Difference (ND) -2<ND<2 ^e	Laboratory Control Sample Recovery 80-120 ^f Percent Recovery (%R)
Cesium-137	soil	HASL-300 ^d	0.5 pCi/g ^c	12.2 pCi/g		
Cobalt-60	soil	HASL-300 ^d	0.5 pCi/g ^c	2.68 pCi/g		
Other Radionuclides						
Plutonium-238	soil	ASTM C1001-00 ^h	0.05 pCi/g	13.0 pCi/g	Relative Percent Difference (RPD) 35% Normalized Difference (ND) -2<ND<2 ^e	Laboratory Control Sample Recovery 80-120 ^f Percent Recovery (%R) Chemical Yield 30-105 ^g %R
Plutonium-239/240	soil	ASTM C1001-00 ^h	0.05 pCi/g	12.7 pCi/g		
Strontium-90	soil	HASL 300 ^d	0.5 pCi/g	838 pCi/g		
Uranium-234	soil	ASTM C1000-02 ⁱ	0.05 pCi/g	143 pCi/g		
Uranium-235	soil	ASTM C1000-02 ⁱ	0.05 pCi/g	17.6 pCi/g		
Uranium-238	soil	ASTM C1000-02 ⁱ	0.05 pCi/g	105 pCi/g		

^aThe MDC is the lowest concentration of a radionuclide, if present in a sample, that can be detected with a 95 percent confidence level.

^bThe 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) 25 mrem/yr dose and the guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993).

^cMDCs vary depending on the presence of other gamma-emitting radionuclides in the sample and are relative to the MDC for cesium-137.

^dThe Procedures Manual of the Environmental Measurements Laboratory, HASL-300 (DOE, 1997)

^eND 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)

^fEPA Contract Laboratory Program Statement of Work for Inorganic Analysis (EPA, 1988; 1994; and 1995)

^gGeneral Radiochemistry and Routine Analytical Services Protocol (GRASP) (EG&G Rocky Flats, 1991). The chemical yield only applies to plutonium, uranium, and strontium.

^hStandard Test Method for Radiochemical Determination of Plutonium in Soil by Alpha Spectroscopy (ASTM, 2002)

ⁱStandard Test Method for Radiochemical Determination of Uranium Isotopes in Soil by Alpha Spectrometry (ASTM, 2000)

ASTM = American Society for Testing and Materials

MDC = Minimum detectable concentration

PAL = Preliminary action level

pCi/g = Picocuries per gram

Table 3-3
Analytical Requirements for Chemical COPCs for CAU 274
(Page 1 of 2)

Parameter/Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit (MRL)	Laboratory Precision (RPD) ^a	Percent Recovery (%R) ^b
ORGANICS					
Total Volatile Organic Compounds	Aqueous	8260B ^C	Parameter-specific EQLs ^d	Lab-specific ^e	Lab-specific ^e
	Soil				
Total Semivolatile Organic Compounds	Aqueous	8270C ^C	Parameter-specific EQLs ^d	Lab-specific ^e	Lab-specific ^e
	Soil				
Polychlorinated Biphenyls (PCBs)	Aqueous	8082 ^C	Parameter-specific EQLs ^d	Lab-specific ^e	Lab-specific ^e
	Soil				
Total Petroleum Hydrocarbons-Diesel-Range Organics	Soil	8015B modified ^C	25 mg/kg ^g	Lab-specific ^e	Lab-specific ^e
INORGANICS					
Total RCRA Metals, plus Beryllium					
Arsenic	Aqueous	6010B ^C	0.01 mg/L ^{g, h}	20 ^h	Matrix Spike Recovery at 75-125 ^h Laboratory Control Sample Recovery at 80-120 ^h
	Soil	6010B ^C	1 mg/kg ^{g, h}	35 ^g	
Barium	Aqueous	6010B ^C	0.20 mg/L ^{g, h}	20 ^h	
	Soil	6010B ^C	20 mg/kg ^{g, h}	35 ^g	
Beryllium	Aqueous	6010B ^C	0.005 mg/L ^{g, h}	20 ^h	
	Soil	6010B ^C	0.5 mg/kg ^{g, h}	35 ^g	
Cadmium	Aqueous	6010B ^C	0.005 mg/L ^{g, h}	20 ^h	
	Soil	6010B ^C	0.5 mg/L ^{g, h}	35 ^g	
Chromium	Aqueous	6010B ^C	0.01 mg/L ^{g, h}	20 ^h	
	Soil	6010B ^C	1 mg/kg ^{g, h}	35 ^g	
Lead	Aqueous	6010B ^C	0.003 mg/L ^{g, h}	20 ^h	
	Soil	6010B ^C	0.3 mg/kg ^{g, h}	35 ^g	
Mercury	Aqueous	7470A ^C	0.0002 mg/L ^{g, h}	20 ^h	
	Soil	7471A ^C	0.1 mg/kg ^{g, h}	35 ^g	
Selenium	Aqueous	6010B ^C	0.005 mg/L ^{g, h}	20 ^h	
	Soil	6010B ^C	0.5 mg/kg ^{g, h}	35 ^g	
Silver	Aqueous	6010B ^C	0.01 mg/L ^{g, h}	20 ^h	
	Soil	6010B ^C	1 mg/kg ^{g, h}	35 ^g	

See Table 3-2 for the analytical requirements for radionuclides.

Table 3-3
Analytical Requirements for Chemical COPCs for CAU 274
(Page 2 of 2)

^aPrecision is assessed from the relative percent difference (RPD) of the laboratory or field duplicates, matrix spike duplicates, and/or laboratory control samples. It is calculated by: $RPD = 100 \times (|A_1 - A_2|) / [(A_1 + A_2) / 2]$, where A_1 = Concentration of the parameter in the initial sample aliquot, A_2 = Concentration of the parameter in the duplicate sample aliquot.

^bAccuracy 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: $\%R = 100 \times (A_s - A_u) / A_n$, 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.

^cU.S. EPA *Test Methods for Evaluating Solid Waste Physical/Chemical Methods*, 3rd Edition, Parts 1-4, (SW-846) CD ROM, Washington, DC (EPA, 1996).

^dEstimated Quantitation Limit as given in SW-846 (EPA, 1996).

^eRPD and %R Performance Criteria are developed and generated in-house by the laboratory according to approved laboratory procedures.

^fEPA *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA, 2004a)

^g*Industrial Sites Quality Assurance Project Plan* (NNSA/NV, 2002a)

^hEPA *Contract Laboratory Program Statement of Work for Inorganic Analysis* (EPA, 1995)

Definitions:

EQL = Estimated quantitation limit

mg/L = Milligrams per liter

mg/kg = Milligrams per kilogram

NA = Not applicable

RCRA = *Resource Conservation and Recovery Act*

4.0 Field Investigation

This section contains a description of the activities to be conducted to gather and document information from the CAU 274 field investigation.

4.1 Technical Approach

The information necessary to satisfy the DQO data needs will be obtained for each CAU 274 CAS by analyzing samples collected during the CAI. The presence and nature of contamination at each CAS will be evaluated by collecting samples at biased locations that are determined to be most probable to contain COCs if they are present anywhere within the CAS. These locations will be determined based on the biasing factors listed in [Section A.5.2.1](#) of [Appendix A](#). If while defining the nature of contamination it is determined that COCs are present at a CAS, that CAS will be investigated further to determine the extent of contamination before evaluating corrective action alternatives.

The Task Manager or Site Supervisor has the discretion to modify the biased locations if the modified locations meet the DQO decision needs and criteria stipulated in [Appendix A](#). 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 (ROTC) 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.

Corrective Action Site 06-02-01 is currently located within a use-restricted area. The use restriction was imposed because concentrations of TPH-DRO were detected above 100 mg/kg within surface soil samples collected from 0.0 to 0.5 ft bgs during the investigation of CAU 335, CAS 06-20-02 (NNSA/NV, 2001). This CAIP only addresses contamination originating from CAU 274; subsequently, it may be necessary to distinguish overlapping contamination originating from other sources such as the TPH-DRO contamination previously identified at CAU 335. To determine whether the TPH-DRO contamination associated with CAU 335 is present at CAS 06-02-01, additional soil samples will be collected as specified in [Section A.5.2.1](#) of [Appendix A](#). A request to

perform intrusive activities within the use-restricted area was made by the NNSA/NSO in a letter dated May 23, 2005 (Bangerter, 2005), and permission was granted by NDEP on June 2, 2005.

4.2 Field Activities

Field activities at CAU 274 include mobilization, sample collection, and sample management activities.

4.2.1 Mobilization

The following site setup activities will be conducted before initiating sample collection activities:

- Prepare site for investigation (i.e., construct decontamination pad, hazardous waste accumulation areas [HWAAs], and exclusion zones; and provide sanitary facilities).
- Perform site walk-down and visual surveys at all CASs within CAU 274 to identify any staining, discoloration, disturbance of native soils, or any other indication of potential contamination.
- Identify predetermined sample locations.
- Remove debris for disposal at CAS 09-01-01, 09-05-01, and 20-05-01.

4.2.2 Sample Collection

The CAU 274 sampling program will consist of the following activities:

- Collect and analyze samples from locations as described in this section.
- Collect required QC samples.
- Collect waste management samples.
- Collect soil samples from background locations, if necessary.
- Collect and analyze bioassessment samples, if necessary.
- Perform radiological characterization surveys of construction materials and debris as necessary for disposal purposes.
- Record sample locations coordinates using GPS at each CAS.

Biasing factors (including field-screening results) will be used to select the most appropriate samples from a particular location for submittal to the analytical laboratory. Biasing factors to be used for selection of sampling locations are listed in [Section A.5.2.1](#) of [Appendix A](#).

As biasing factors are identified and used for selection of sampling locations, they will be documented in the appropriate field documents. The CAS-specific sampling strategy and the estimated locations of biased samples for each CAS are presented in [Appendix A](#).

Decision I surface soil samples (0 to 0.5 ft bgs) will be collected from selected locations based on the CSM, biasing factors, field-screening results, and existing data. If biasing factors are present in soils below locations where Decision I samples were collected, subsurface Decision I soil samples will also be collected by hand augering, backhoe excavation, direct-push, or drilling techniques, as appropriate. Decision I subsurface soil samples will be collected at depth intervals selected by the Task Manager or Site Supervisor based on biasing factors to a depth where the biasing factors are no longer present. The content of collection features, tanks, and piping will be sampled to characterize the waste for potential disposal.

Decision II sampling will consist of further defining the extent of contamination where COCs have been confirmed. Step-out (Decision II) sampling locations at each CAS will be selected based on the CSM, biasing factors, field-screening results, 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 15 ft laterally outward from the source. If a spacial boundary is reached, the CSM is shown to be inadequate, or the Site Supervisor determines that extent sampling needs to be re-evaluated, then work will be temporarily suspended, NDEP will be notified, and the investigation strategy will be reevaluated. 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).

The number, location, and spacing of step-outs may be modified by the Task Manager or Site Supervisor, as warranted by site conditions to achieve DQO criteria. Where sampling locations are

modified by the Task Manager or Site Supervisor, the justification for these modifications will be documented in the field logbook.

4.2.3 Sample Management

All sampling activities and QC requirements for field and laboratory environmental sampling will be conducted in compliance with the Industrial Sites QAPP (NNSA/NV, 2002) and other applicable, approved procedures. [Section 3.4](#) provides the analytical methods and laboratory requirements (i.e., detection limits, precision, and accuracy requirements) to be used when analyzing the COPCs. The analytical program for each CAS is presented in [Table 3-1](#).

4.3 Safety

A current version of the Environmental Services Architect-Engineer Contractor's programmatic HASP and IS HASP will accompany the field documents. An FWP, or equivalent, will be prepared and approved prior to the field effort. As required by the DOE Integrated Safety Management System (ISMS) (DOE/NV, 1997), these documents outline 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 will protect the environment during all project activities. The following safety issues will be taken into consideration when evaluating the hazards and associated control procedures for field activities discussed in the IS HASP and FWP:

- Potential hazards to site personnel and the public include, but are not limited to: radionuclides, asbestos, chemicals (e.g., heavy metals, VOCs, semivolatile organic compounds (SVOCs), and petroleum hydrocarbons), adverse and rapidly changing weather, remote location, and motor vehicle and heavy equipment operations.
- Proper training of all site personnel to recognize and mitigate the anticipated hazards.
- Work controls to reduce or eliminate the hazards including engineering controls, substitution of less hazardous materials, and use of appropriate personal protective equipment (PPE).
- Occupational exposure monitoring to prevent overexposures to hazards such as radionuclides, asbestos, 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 potential asbestos-containing material is identified (CFR, 2003c; NAC, 2004d), it will be inspected and/or samples collected by trained personnel.

5.0 Waste Management

Management of IDW will be based on regulatory requirements, field observations, process knowledge, and laboratory results from CAU 274 investigation samples.

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

Sanitary, hazardous, radioactive, and/or mixed waste, if generated, will be managed and disposed of in accordance with 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 (e.g., 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:

- PPE 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., wood planks, pipes, or asbestos tiles/pipe)
- 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 on-site management and ultimate disposition of IDW will be determined based on a determination of the waste type (e.g., sanitary, low-level, hazardous, hydrocarbon, mixed), or the combination of waste types. A determination of the waste type will be guided by several factors, including, but not limited to: the analytical results of samples either directly or indirectly associated with the waste, historical site knowledge, knowledge of the waste generation process, field observations, field-monitoring/screening results, and/or radiological survey/swipe results. Office trash and lunch waste will be sent to the sanitary landfill by placing the waste in a dumpster. Each waste stream generated will be reviewed and segregated to the greatest extent at the point of generation.

Table 4-2 of the NV/YMP RadCon Manual (DOE/NV, 2000) shall be used to determine whether such materials may be declared nonradioactive. On-site IDW management requirements by waste type are detailed in the following sections. Applicable waste management regulations and requirements are listed in [Table 5-1](#).

**Table 5-1
Waste Management Regulations and Requirements**

Waste Type	Federal Regulation	Additional Requirements
Solid (nonhazardous)	NA	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)	NA	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	NA	DOE Orders and NTSWAC ^h
Mixed	RCRA ^f , 40 CFR 260-282	NTSWAC ^h POC ^g
Hydrocarbon	NA	NTS Landfill Permit SW13.097.02 ⁱ
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

^aNevada Revised Statutes (NRS, 2003a, b, c)

^bNevada Administrative Code (NAC, 2004a, b, c, d)

^cArea 23 Class II Solid Waste Disposal Site (NDEP, 1997a)

^dArea 9 Class III Solid Waste Disposal Site (NDEP, 1997c)

^eNevada Test Site Sewage Lagoons (NDEP, 1999)

^fResource Conservation and Recovery Act (CFR, 2003a)

^gNevada Test Site Performance Objective for the Certification of Nonradioactive Hazardous Waste (BN, 1995)

^hNevada Test Site Waste Acceptance Criteria, Revision 5 (NNSA/NSO, 2003b)

ⁱArea 6 Class III Solid Waste Disposal Site for hydrocarbon waste (NDEP, 1997b)

^jToxic Substance Control Act (CFR, 2003b, c)

CFR = Code of Federal Regulations

DOE = U.S. Department of Energy

NA = 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 = Nevada Test Site 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 Area 9 U10a 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 on the PPE and disposable sampling equipment waste streams exiting a radiologically controlled area. This allows for the immediate segregation of radioactive waste from waste that may be unrestricted regarding radiological release. Removable contamination limits, as defined in Table 4-2 of the current version of the NV/YMP RadCon Manual (DOE/NV, 2000), 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 Table 4-2 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, 2003b). Potential radioactive waste drums containing soil, PPE, disposable sampling equipment, and/or rinsate may be staged at a designated radioactive materials area (RMA) or radiologically controlled area 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, 2003b).

5.3.3 Hazardous Waste

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, 2003a). These provisions include managing the waste in containers compatible with the 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. Corrective Action Unit 274 will have waste storage areas established according to the needs of the project. Satellite accumulation areas and HWAAs will be managed consistent with the requirements of federal and state regulations (CFR, 2003a, and NAC, 2004b). They will be properly controlled for access and equipped with spill kits and appropriate spill containment.

Hazardous Waste Accumulation Areas 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 wastes will be characterized in accordance with the requirements of Title 40 CFR 261 (CFR, 2002). No RCRA “listed” wastes have been identified at CAU 274. Any waste determined to be hazardous will be transported in accordance with RCRA and DOT to a permitted treatment, storage, and disposal facility (CFR, 2003a).

5.3.4 Hydrocarbon Waste

Hydrocarbon 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 Nevada regulations.

5.3.5 Mixed Low-Level Waste

Mixed waste, if generated, shall be managed and dispositioned according to the requirements of RCRA (CFR, 2003a) 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 an approved hazardous waste/radioactive waste transporter to the NTS transuranic waste storage pad for storage pending treatment or disposal. 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, 2003b). Waste with hazardous 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 biphenyls (PCBs) is governed by the *Toxic Substances Control Act* (TSCA) (USC, 1976) and its implementing regulations at 40 CFR 761 (CFR, 2003b). Polychlorinated biphenyls 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, 2004c) guidance, and agreements with NNSA/NSO.

5.4 Management of Specific Waste Streams

The management of specific waste streams at CAU 274 may include PPE, decontamination rinsate, soil, debris, and field-screening waste.

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. Any IDW that meets this description will be segregated and managed as potentially “characteristic” hazardous waste. This segregated population of waste will either be (1) assigned the characterization of the soil/sludge that was sampled, (2) sampled directly, or (3) 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. The PPE and equipment that is not visibly stained, discolored, or grossly contaminated and that is within radiological free-release criteria will be managed as nonhazardous sanitary waste.

5.4.2 Management of Decontamination Rinsate

Rinsate at CAU 274 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 that is 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 which is 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. The preferred method for managing the soil is to place it back into the borehole or excavation in the same approximate location from which it originated. If this cannot be accomplished, the material will either be managed on site by berming and covering it next to the excavation, or by placing it in a container.

Management of soil waste for disposal consists of placing the waste in containers, labeling the containers, temporarily storing the containers until shipped, and shipping the waste to a disposal site.

The containers, labels, management of stored waste, transport to the disposal site, and disposal shall be appropriate for the type of waste (e.g., hazardous, hydrocarbon, mixed, etc.).

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 e.g., soil sampling, excavation, and/or drilling) must be characterized for proper management and disposition. Historical site knowledge, knowledge of the waste generation process, field observations, field-monitoring/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 characterize the debris. Debris will be visually inspected for stains, discoloration, and gross contamination. Debris may be deemed reusable, recyclable, sanitary waste, hazardous waste, PCB waste, or low-level waste. 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 either be managed on site by berming and covering next to the excavation, or by placement in a container(s). The disposal of debris may be 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). On radiological sites, this may increase the potential to generate mixed waste; however, the generation of a mixed waste will be minimized as much as practicable. In the event a 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 274. [Section 6.1](#) and [Section 6.2](#) discuss the collection of required QC samples in the field and QA requirements for laboratory/analytical data to achieve closure. Unless otherwise stated in this CAIP or required by the results of the DQO process (see [Appendix A](#)), this investigation will adhere to the Industrial Sites QAPP (NNSA/NV, 2002).

6.1 Quality Control Field Sampling Activities

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

- Trip blanks (1 per sample cooler containing VOC environmental samples)
- Equipment blanks (1 per sampling event for each type of decontamination procedure)
- Source blanks (1 per source lot per sampling event)
- Field duplicates (1 per 20 environmental samples or 1 per CAS per matrix, if less than 20 collected)
- Field blanks (minimum of 1 per CAS, additional if field conditions change)
- Laboratory QC samples (minimum of 1 per matrix per 20 environmental samples or 1 per CAS per matrix, if less than 20 collected)

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

6.2 Laboratory/Analytical Quality Assurance

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

6.2.1 Data Validation

Data verification and validation will be performed in accordance with the Industrial Sites QAPP (NNSA/NV, 2002), except where otherwise stipulated in this CAIP. All chemical and radiological laboratory data from samples that are collected and analyzed will be evaluated for data quality according to company-specific procedures. The data will be reviewed to ensure that all suspected samples were appropriately collected and 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 the criteria are not met. The following subsections 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 Table 3-2 and Table 3-3 that vary from corresponding information in the QAPP will supersede that information in the QAPP (NNSA/NV, 2002).

Table 6-1
Laboratory and Analytical Performance Criteria for
CAU 274 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 analyte are not qualified for precision based on the relative percent difference (RPD) criteria for each analytical method-specific and laboratory-specific criteria presented in Table 3-2 and Table 3-3 or for the field duplicate criteria of 80 percent RPD or 2 percent normalized difference.	If the performance metric is not met, the affected analytical results from each affected corrective action site (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 analyte are not qualified for accuracy based on the method-specific and laboratory-specific criteria presented in Table 3-2 and Table 3-3.	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 data quality objective (DQO) decisions.
Sensitivity	Laboratory detection limits are less than or equal to respective final action levels.	Cannot determine whether contaminants of concern (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 contaminants of potential concern analytes have valid results. 100% of CAS-specific targeted analytes have valid results.	Cannot support/defend decision on whether COCs are present.
Extent Completeness	100% of COC analytes used to define extent have valid results.	Extent of contamination cannot be accurately determined.
Clean Closure Completeness	100% of targeted analytes have valid results.	Cannot determine whether COCs remain in soil.

6.2.3 Precision

Precision is used to assess the variability between two equal samples. This is a measure of the repeatability of the analysis process from sample collection through analysis results. Precision is measured as the relative percent difference (RPD) or normalized difference (ND) of duplicate samples as presented in the Industrial Sites QAPP (NNSA/NV, 2002).

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 RPD and/or ND criteria to be used for assessment of precision for duplicates are the parameter-specific criteria listed in [Table 3-2](#) and [Table 3-3](#). The performance metric for assessing the DQI of precision on DQO decisions (see [Table 6-1](#)) is that at least 80 percent sample results for each measured analyte are not qualified due to precision based on the analytical method specific and laboratory specific criteria presented in [Table 3-2](#) and [Table 3-3](#). If this performance matrix is not met, an assessment will be conducted in the investigation report on the impacts to DQO decisions specific to affected analytes and CASs. Any RPD or ND 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.

6.2.4 Accuracy

Accuracy is a measure of the closeness of an individual measurement or the average of a number of measurements to the true value. It is used to assess the performance of laboratory measurement processes as well as to evaluate individual groups of analyses (i.e., sample delivery groups).

Accuracy is determined by analyzing a reference material of known parameter concentration or by reanalyzing a sample to which a material of known concentration or amount of parameter has been added (spiked). Accuracy will be evaluated based on results from three types of spiked samples: 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 for chemical analyses to be used for assessment of accuracy are the parameter-specific criteria listed in [Table 3-3](#). The percent recovery (%R) criteria for radiochemical analyses to be used for assessment of accuracy will be the control limits listed in [Table 3-2](#).

The performance metric for assessing the DQI of accuracy on DQO decisions (see [Table 6-1](#)) is that at least 80 percent of the samples are not qualified for exceeding %R criteria for each measured analyte. If this performance is not met, an assessment will be conducted in the investigation report on the impacts to DQO decisions specific to affected analytes and CASs. Any %R 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 the laboratory's 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.

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, 1987). 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, having a high degree of confidence that the sample locations selected will identify COCs if present anywhere within the CAS.
- Having a high degree of confidence that analyses conducted will be sufficient to detect any COCs 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.

The qualitative assessment of completeness is an evaluation of the sufficiency of information available to make DQO decisions. This assessment will be based on meeting the data needs identified in the DQOs and will be presented in the investigation report.

6.2.6 Comparability

Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared to another (EPA, 1987). 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.

6.2.7 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. The completeness goal for targeted analytes and the remaining COPCs is 100 and 80 percent, respectively. If these criteria are not achieved, the dataset will be assessed for potential impacts on making DQO decisions.

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, 2001a). The evaluation criteria for this parameter will be that measurement sensitivity (detection limits) will be less than or equal to the corresponding PALs. 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 presents the tentative durations (in calendar days) for corrective action investigation activities:

**Table 7-1
CAU 274, Activities and Duration**

Duration (days)	Activity
10	Site Preparation
50	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. 2004. NTS Climatological Rain Gauge Data web site. As accessed at http://www.sord.nv.gov/home_climate_rain.htm on 18 August 2004.

Alderson, S., IT Group. 2002. Letter to R. Bull (SAIC) entitled, "Radiological Land Area Surveys of 24 Corrective Action Sites (CASs) at the Nevada Test Site," August 26. Las Vegas, NV.

Alderson, S., IT Corporation. 2004. Memorandum to B.S. Bailey (SNJV) entitled, "Preliminary Assessment Radiological Survey 2004, 17 February. Las Vegas, NV.

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

American Society for Testing and Materials. 2000. *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. 2002. *Standard Test Method for Radiochemical Determination of Plutonium in Soil by Alpha Spectroscopy*, ASTM C1001-00. West Conshohocken, PA: ASTM International.

BN, see Bechtel Nevada.

Bangerter, R., NNSA/NSO. 2005. Letter to Tim Murphy (NDEP) entitled, "Request for Permission To Perform Intrusive Activities Within a Use Restriction Area in Corrective Action Unit (CAU) 335, Area 6 Injection Well and Drain Pit," May 23. Las Vegas, NV.

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

CFR, see *Code of Federal Regulations*.

Code of Federal Regulations. 2002. Title 40 CFR Part 261, "Identification and Listing of Hazardous Waste." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 2003a. Title 40 CFR, Parts 260-282, "Hazardous Waste Management System: General." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 2003b. 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. 2003c. Title 40 CFR, Part 763, "Asbestos." 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 Assessments of DOE's Nevada Operations Office, Nuclear Weapons Testing Areas*, April. 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.

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

Fahringer, P., Stoller-Navarro Joint Venture. 2004. Memorandum to B. Iverson (SNJV) entitled, "CAU 274 Geophysics - Memorandum of Findings, Winter 2004," 30 March. Las Vegas, NV.

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.

LLNL, see Lawrence Livermore National Laboratory.

Laczniak, R.J., J.C. Cole, D.A. Sawyer, and D.A. Trudeau. 1996. *Summary of Hydrogeologic Controls Ground-Water Flow at the Nevada Test Site, Nye County, Nevada*. As accessed at <http://water.usgs.gov/pubs/wri/wri964109/report.htm> on 28 January 2002.

Lawrence Livermore National Laboratory. 1982. "The Geology of Yucca Flat." In *Energy and Technology Review*, April. Livermore, CA.

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., Nevada Division of Environmental Protection. 2004. Letter to Robert M. Bangerter (NNSA/NSO) regarding "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/NV, see U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office.

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

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.

Nevada Administrative Code. 2004a. NAC 444.570 - 444.7499, "Solid Waste Disposal." Carson City, NV.

Nevada Administrative Code. 2004b. NAC 444.850 - 444.8746, "Disposal of Hazardous Waste." Carson City, NV.

Nevada Administrative Code. 2004c. NAC 444.940 - 444.9555, "Polychlorinated Biphenyl." Carson City, NV.

Nevada Administrative Code. 2004d. NAC 444.965 - 444.976, "Disposal of Asbestos." Carson City, NV.

Nevada Administrative Code. 2004e. NAC 445A, "Water Controls." Carson City, NV. As accessed at <http://www.leg.state.nv.us/nac>.

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. 1999. *State of Nevada Water Pollution Control General Permit*, No. GNEV93001. Carson City, NV.

Nevada Revised Statutes. 2003a. NRS 444.440 - 444.620, "Collection and Disposal of Solid Waste." Carson City, NV.

Nevada Revised Statutes. 2003b. NRS 459.400 - 459.600, "Disposal of Hazardous Waste." Carson City, NV.

Nevada Revised Statutes. 2003c. NRS 618.750-618.840 "Disposal of Hazardous Waste." Carson City, NV.

Nicosia, W., IT Corporation. 2003. Memorandum to M. England (IT) entitled, "Radiological Land Area Surveys of Various Locations at the Nevada Test Site for Preliminary Assessments," 3 March. Las Vegas, 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.

SAIC, see Science Applications International Corporation.

SNJV, see Stoller-Navarro Joint Venture.

Science Applications International Corporation. 2003. *Surface Geophysical Survey Final Report Corrective Action Units, Nevada Test Site*, May. Prepared for Shaw Environmental, Inc. Harrisburg, PA.

- Shaw Environmental and Infrastructure, Inc. 2002. *Results of Geophysical Survey, Selected FFACO Sites, Nevada Test Site*, 27 September. Sacramento, CA.
- Shott, G.J., V. Yucel, M.J. Sully, L.E. Barker, S.E. Rawlinson, and B.A. Moore. 1997. *Performance Assessment/Composite Analysis for the Area 3 Radioactive Waste Management Site at the Nevada Test Site, Nye County, Nevada*, Rev. 2.0. Las Vegas, NV.
- Stoller-Navarro Joint Venture. 2004. *Industrial Sites Project Health and Safety Plan*, Rev. 0. Las Vegas, NV.
- Stoller-Navarro Joint Venture. 2005. *Project Execution Plan*, Rev. 0. Las Vegas, NV.
- USC, see *United States 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. 2001. *Corrective Action Decision Document for Corrective Action Unit 335: Area 6 Injection Well and Drain Pit, Nevada Test Site, Nevada*, Rev. 0, November. DOE/NV--759. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002. *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 Site Operations Office. 2003a. *Closure Report for Corrective Action Unit 335: Area 6 Injection Well and Drain Pit, Nevada Test Site, Nevada*, Rev. 0, June. DOE/NV--910. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2003b. *Nevada Test Site Waste Acceptance Criteria*, DOE/NV--325, Rev. 5. 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 Operation 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. 2000. *NV/YMP Radiological Control Manual*, Rev. 4, DOE/NV/11718-079, UC-702. Prepared by A.L. Gile of Bechtel Nevada. Las Vegas, NV.
- 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. 1987. *Data Quality Objectives for Remedial Response Activities*, EPA/540/G-87/003. Washington, DC.
- U.S. Environmental Protection Agency. 1988. *Contract Laboratory Program Statement of Work for Inorganic Analysis*, SOW No. 788, EPA/540/R-94/093. Washington, DC.
- U.S. Environmental Protection Agency. 1994. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA/540/R-94/013. Washington, DC.
- U.S. Environmental Protection Agency. 1995. *Contract Laboratory Program Statement of Work for Inorganic Analysis*, ILMO 4.0, EPA/540/R-95/121. 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. 2001a. *Guidance on Data Quality Indicators*, EPA QA/G-5i. Washington, DC.
- U.S. Environmental Protection Agency. 2001b. *Integrated Risk Information System (IRIS) Database*, as accessed at <http://www.epa.gov/iris/index.html> on 11 February 2003.
- U.S. Environmental Protection Agency. 2004a. *Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA 540/R-99/008. Washington, DC.

- U.S. Environmental Protection Agency. 2004b. *Region 9 Preliminary Remediation Goals (PRGs)*. As accessed at <http://www.epa.gov/region09/waste/sfund/prg/index.htm>. Prepared by S.J. Smucker. San Francisco, CA.
- U.S. Geological Survey. 1961. *Groundwater Test Well A, Nevada Test Site, Nye County, Nevada, a Summary of Lithologic Data, Aquifer Test, and Construction*, 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 and U.S. Department of Energy. 2004. "USGS/DOE Nevada WW-2 Site Page." As accessed at http://nevada.usgs.gov/doe_nv/area2/ww-2.asp on 6 April.
- Wuellner, J.W., Reynolds Electrical & Engineering Co., Inc. 1994. Memorandum to J.P. Bielawski (REECo) entitled, "Historical Information - Area 3 Waste Mud Impoundment," 2 May. Las Vegas, NV.
- 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 A

Data Quality Objectives

A.1.0 Introduction

The DQO process described in this appendix is a seven-step strategic systematic planning method based on the scientific method that was used to plan data collection activities and define performance criteria for the CAU 274, 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 274 is insufficient to evaluate and select preferred corrective actions; therefore, a CAI will be conducted.

The CAU 274 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 [Section A.3.0](#) through [Section A.9.0](#) were developed in accordance with the *EPA Guidance for the Data Quality Objectives Process* (EPA, 2000b) and the *EPA Guidance for Quality Assurance Project Plans*, (EPA, 2004). The DQO process presented herein is based on the EPA Quality System Document for DQOs entitled *Data Quality Objectives Process for Hazardous Waste Site Investigations*, (EPA, 2000a) and the CAS-specific information presented in [Section A.2.0](#).

The DQO process presents a judgmental sampling approach in accordance with the EPA DQOs for hazardous waste site investigations (EPA, 2000a) and the EPA Guidance for QAPPs (EPA, 2002). In general, the procedures used in the DQO process provide:

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

A.2.0 Background Information

The following five CASs that comprise CAU 274 are located in Areas 3, 6, 9, and 20 of the NTS ([Figure A.2-1](#)). The CASs are:

- 03-02-01, WX-6 ETS Building Septic System
- 06-02-01, Underground Storage Tank
- 09-01-01, Spill Site
- 09-05-01, Leaching Pit
- 20-05-01, Septic System

The following sections ([Section A.2.1](#) through [Section A.2.4](#)) provide a CAS description, physical setting and operational history, release information, and previous investigation results for each CAS in CAU 274. 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 analytes are defined as those contaminants that are known or that could be reasonably suspected to be present within the CAS based on previous sampling or process knowledge.

A.2.1 CAS 03-02-01, WX-6 ETS Building Septic System

Corrective Action Site 03-02-01 consists of a septic tank, injection well, and associated underground piping. The septic system formerly serviced the WX-6 ETS Building located within the Core Complex in Area 3. Engineering drawings and geophysical survey data indicate that the septic tank is located approximately 70 ft east of the WX-6 ETS Building and the injection well is located approximately 20 ft east of the septic tank. The injection well and septic tank are connected to the WX-6 ETS Building by the associated underground piping. Engineering drawings and geophysical survey data were also used to obtain dimensions of the septic tank and estimate the storage capacity. The septic tank is estimated to be approximately 10 ft in length with a storage capacity of approximately 750 gallons. The injection well dimensions were estimated to be approximately 5 by 5 ft extending to a depth of approximately 45 ft bgs. [Figure A.2-2](#) shows a site sketch of the CAS.

Physical Setting and Operational History - Corrective Action Site 03-02-01 and the WX-6 ETS Building are located within the Core Complex in Area 3. The WX-6 ETS Building was used for the

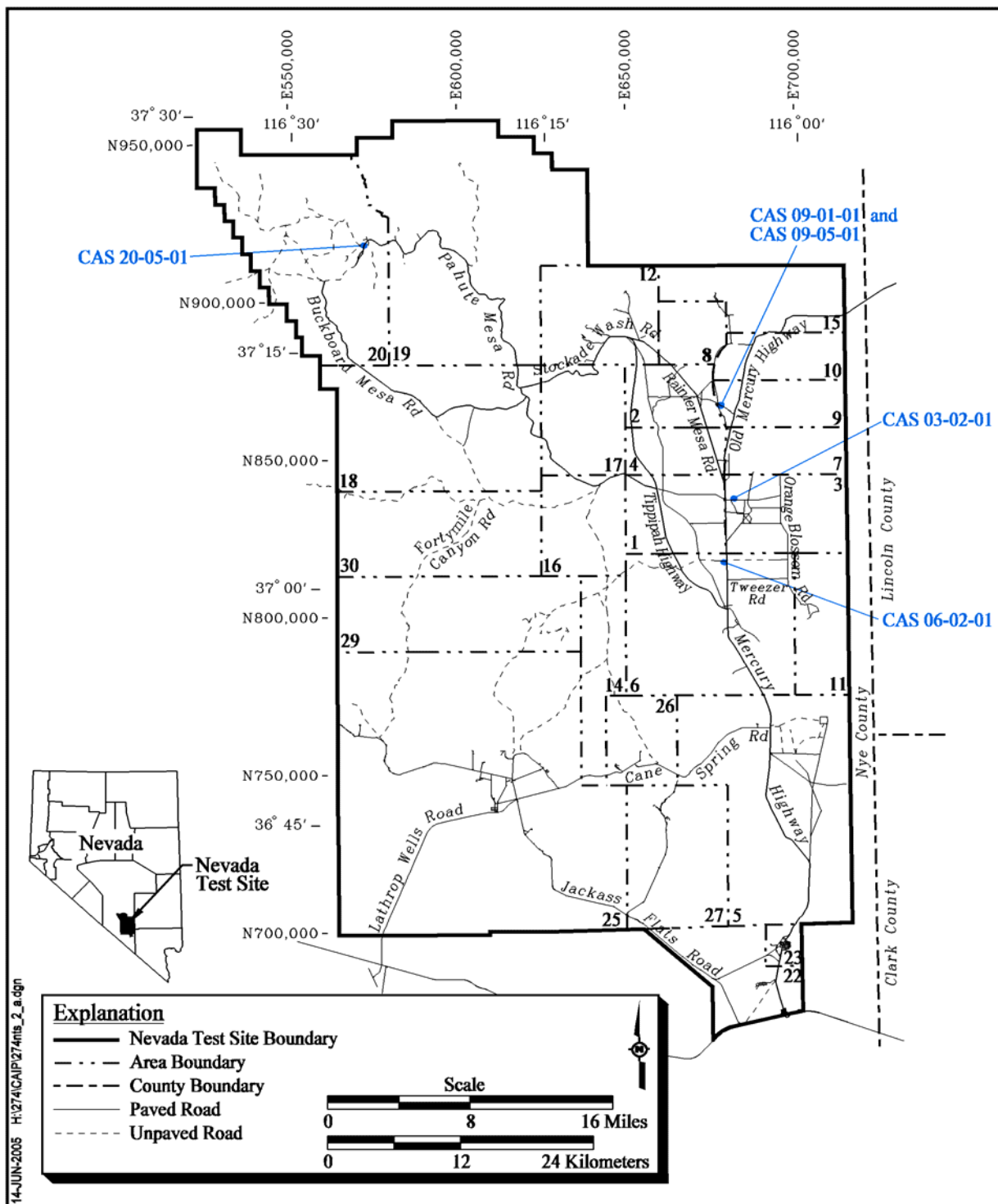


Figure A.2-1
Nevada Test Site Map Showing CAU 274 CAS Locations

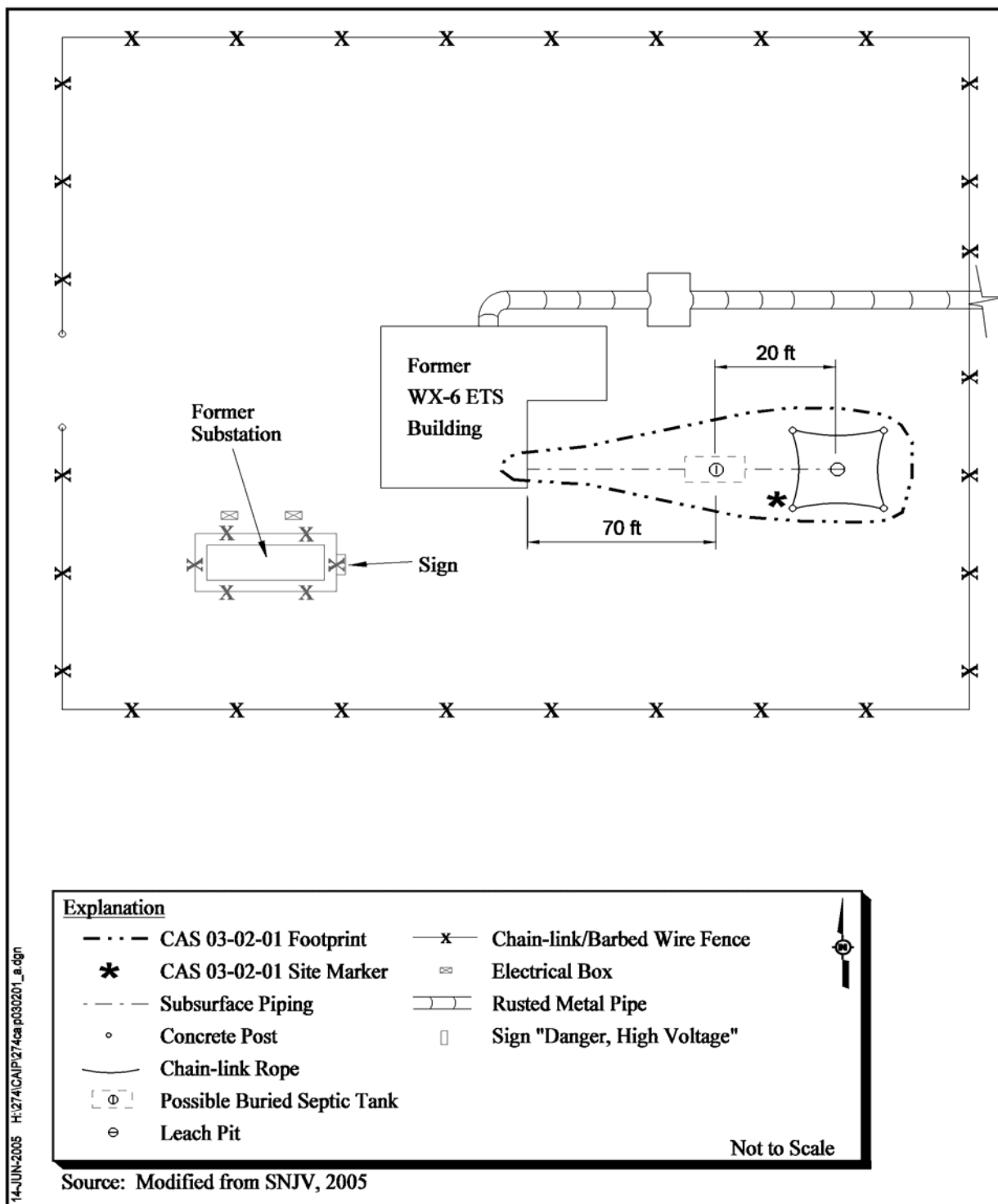


Figure A.2-2
CAU 274, CAS 03-02-01 Site Map

disassembly and decontamination of equipment used during underground nuclear testing. The septic tank, injection well, and associated piping were connected to the shower, lavatory sink, and water closet of the WX-6 ETS Building. The concrete slab of the building foundation and a rusted metal pipe are the only surface features that remain from the WX-6 ETS Building.

Release Information - The primary source of potential contamination originates from the effluent that was previously discharged through the septic system components of the former WX-6 ETS Building. This effluent may have seeped into soils from potential leaks at junctions in the system, breaks in the system, and/or overflow of the tank. Residual effluent may also still be present within these features. Due to the nature of the unconsolidated soils and fill along this system, the potential for both vertical and lateral migration of the effluent exists. Although the septic system is reported to have been used strictly for sanitary purposes, the corrective action analytical program will account for the potential that other wastes may have been introduced to the system.

There are no known documented releases of hazardous or radioactive contaminants associated with the CAS that would initiate identification of target analytes. However, due to the incomplete site history, a comprehensive suite of COPCs have been identified for this CAS.

Previous Investigation Results - There are no known analytical results for this CAS. A radiological survey was conducted over the site and no areas with elevated radiological activities were identified (Nicosia, 2003). A geophysical survey was also conducted that verified the presence of the septic tank and associated piping (SAIC, 2003).

A.2.2 CAS 06-02-01, Cesspool

Corrective Action Site 06-02-01, Cesspool, consists of a cesspool, injection well, and associated underground piping. Engineering drawings and geophysical survey data indicate that the cesspool is located approximately 15 ft east of Building 6-388, and two pipes extend south and southeast from the cesspool. The pipes are shown in engineering drawings connecting to a toilet trailer and an office complex trailer. A connection between the cesspool and injection well is not shown on these drawings. The depth of the injection well was estimated during a recent site visit to be approximately 45 ft bgs. The cesspool and injection well are connected to the surface by vertical pipes.

Figure A.2-3 shows a site sketch of the CAS.



Uncontrolled When Printed

Corrective Action Site 06-02-01 is currently located within a use-restricted area. The use restriction was imposed because concentrations of TPH-DRO were detected above 100 mg/kg within surface soil samples collected during the investigation of CAU 335. The widespread surface concentrations of TPH-DRO were attributed to the use of oil for dust suppression at the site. The CAS associated with CAU 335 is located approximately 80 ft north of CAS 06-02-01. No soil samples were collected from within CAS 06-02-01.

Physical Setting and Operational History - Corrective Action Site 06-02-01 is located east of Building 6-388 within the Well 3 Yard in Area 6. The cesspool received domestic sewage from the office trailer complex and toilet trailer previously located east of Building 6-388. The vertical pipes that connect the cesspool and injection well to the surface are covered with lids. A connection from the cesspool to Building 6-388 and/or injection well were not identified in engineering drawings or during geophysical surveys. The concrete slab and electrical panels are the only surface features that remain from Building 6-388.

Release Information - The primary source of potential contamination originates from the effluent that was previously discharged through the cesspool and potentially through the injection well if connected. This effluent may have seeped into soils from potential leaks at junctions in the system, breaks in the system, and/or overflow of the cesspool. Residual effluent may also still be present within these features. Due to the nature of the unconsolidated soils and fill along this system, the potential for both vertical and lateral migration of the effluent exists. Although the cesspool is reported to have been used strictly for sanitary purposes, the corrective action analytical program will account for the potential that other wastes may have been introduced to the cesspool and/or injection well. The source of potential contamination for the injection well is unknown.

There are no known documented releases of hazardous or radiological contamination associated with the CAS that would initiate identification of target analytes. However, due to the incomplete site history, a comprehensive suite of COPCs have been identified for this CAS.

Previous Investigation Results - Soil samples collected during the CAU 335 investigation indicate that concentrations of TPH-DRO are present at the surface above the PALs in the vicinity of CAS 06-02-01. However, there are no known soil sample analytical results from samples collected within this CAS. A radiological survey was conducted over the site and no areas with elevated

radiological activities were identified (Alderson, 2002). Radiological swipe samples were collected from the interior of the injection well during a recent site visit and indicated no detections of removable radiological contamination within the well. A geophysical survey was also conducted that verified the presence of the septic tank and associated piping (Shaw, 2002).

A.2.3 CAS 09-01-01, Spill Site, and CAS 09-05-01, Leach Pit

Corrective Action Site 09-01-01, Spill Site, and CAS 09-05-01, Leach Pit, are located adjacent to each other in Area 9. Corrective Action Site 09-01-01 consists of a stain on a wooden plank that measures approximately 1 by 3.5 ft (Figure A.2-4). Corrective Action Site 09-05-01 is a leach pit that measures approximately 28 by 28 ft (Figure A.2-5).

Physical Setting and Operational History - Corrective Action Sites 09-01-01 and 09-05-01 are located northeast of the U-9y Crater and north of 9-01 Road. The spill site is located within the wooden plank area southeast of the leach pit. The wooden plank area was the location of a former 50,000-gallon vertical water tank that was operated during the 1950s and early 1960s. Reports indicate that water from the tank may have been used for the rinsing of equipment and drilling mud haul trucks within the leach pit. The boundaries of the leach pit are slightly mounded and identified by a downed yellow rope. There is a partially buried metal bucket with piping that may have been used as a sump. Surface debris is present within the leach pit that includes pipes, wood, and various metal scraps. There is also an area within the leach pit that contains light gray soil that may be bentonite or drilling mud. Details on when the tank was removed or other uses of the leach pit are not available.

Release Information - The primary source of potential contamination at CAS 09-01-01 is the material that stained the wooden plank. The primary source of potential contamination at CAS 09-05-01 is the material generated from rinsing of equipment and drilling mud hauling trucks. The material that stained the wooden planks and the residual material may have seeped into soils. These materials may migrate vertically and laterally due to the nature of the unconsolidated site soils and leach pit fill material. In addition to the contaminants associated with drilling mud, the corrective action analytical program will account for the potential that other wastes may have been introduced to the leach pit or stained wooden plank.

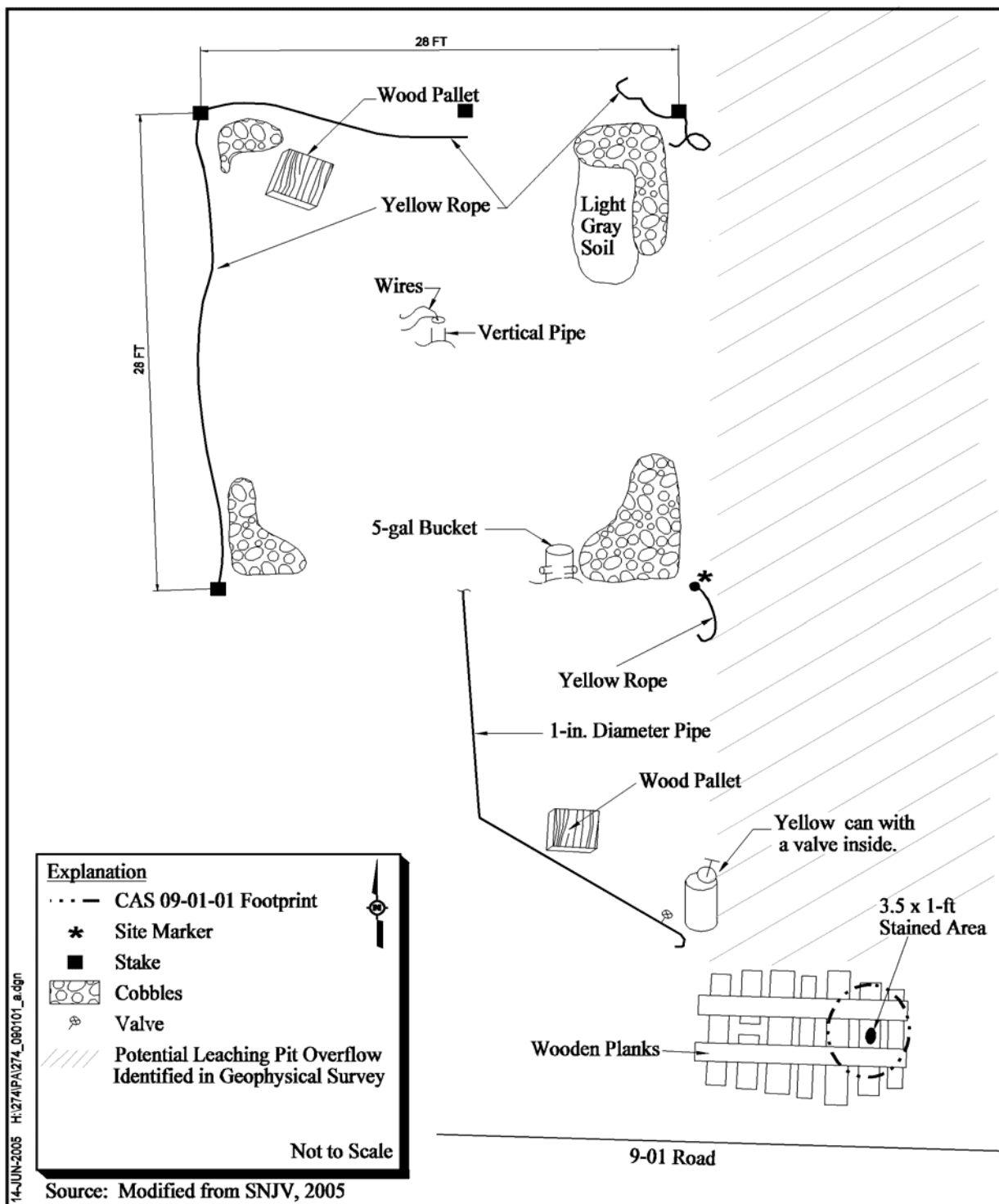


Figure A.2-4
Corrective Action Site 09-01-01 Site Map

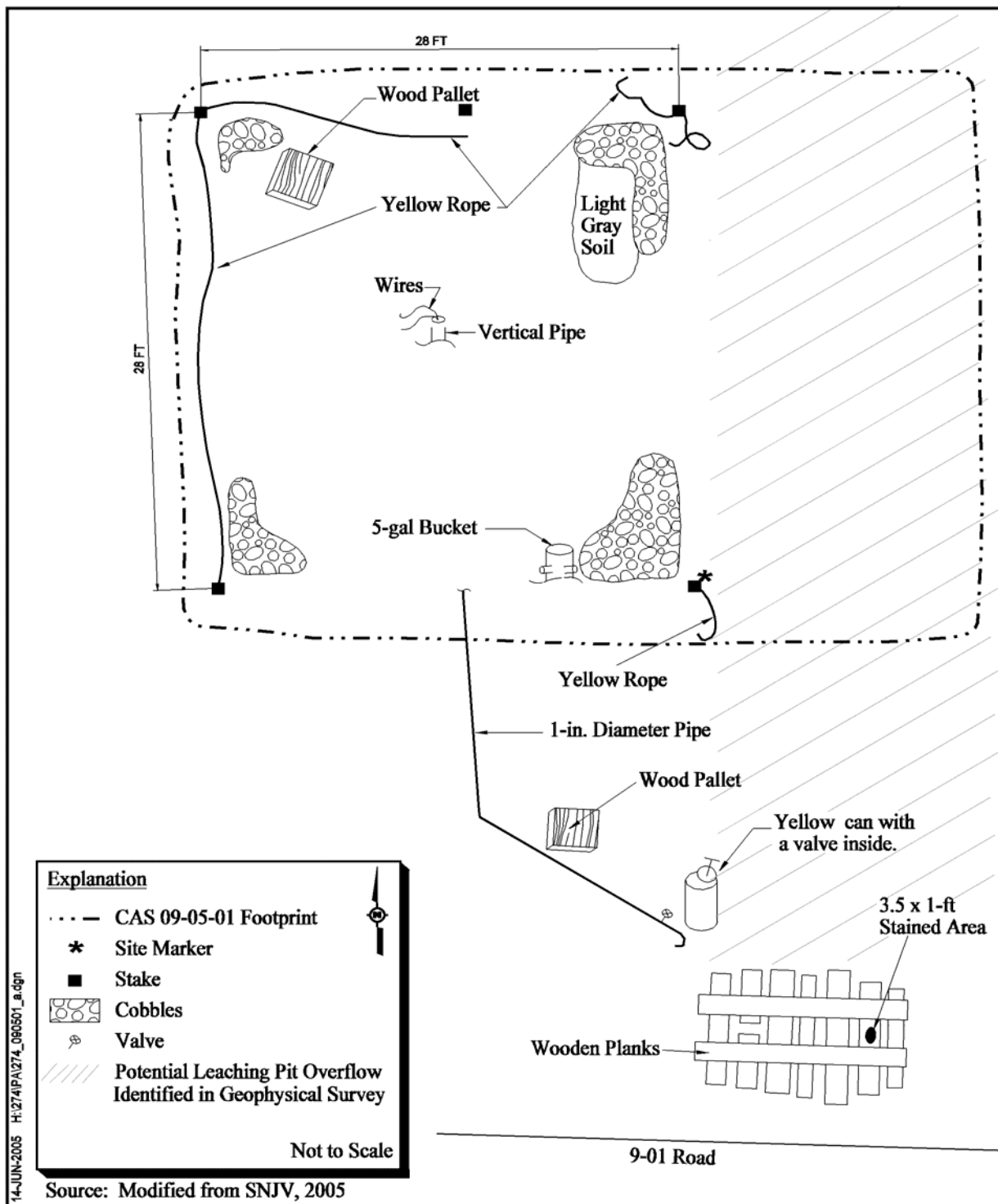


Figure A.2-5
Corrective Action Site 09-05-01 Site Map

The process knowledge available for CAS 09-05-01 indicates that drilling mud may be present within the leach pit; subsequently, TPH-DRO will be a target analyte at this CAS. Process knowledge available for CAS 09-01-01 is limited; however, there are no known documented releases of hazardous or radiological contamination associated with this CAS. Due to the incomplete site history, a comprehensive suite of COPCs have been identified for this CAS.

Previous Investigation Results - There are no known analytical results for this CAS. A radiological survey was conducted over the site and no areas with elevated radiological activities were identified (Alderson, 2004). A geophysical survey was also conducted that potentially identified buried piping at various locations (Fahringer, 2004).

A.2.4 CAS 20-05-01, Septic System

Corrective Action Site 20-05-01 consists of a septic tank, leachfield, and subsurface piping located within the Area 20 Camp. Engineering drawings indicate that the septic tank has a storage capacity of approximately 1,760 gallons. The septic tank is identified at the surface by a vertical pipe that extends approximately 2.5 ft above ground surface. The leachfield is located to the west of the septic tank and slightly mounded. The leachfield is shown on engineering drawings having six clay tile distribution lines that cover an area approximately 120 by 130 ft. Various debris is located on the surface of the leachfield. [Figure A.2-6](#) shows a site sketch of the CAS.

Physical Setting and Operational History - Corrective Action Site 20-05-01 is located within the Area 20 Camp. The Area 20 Camp supported drilling activities and consisted of housing trailers, a medical support facility, and other industrial operations that included an iron workers shop and welding shop. The septic system received domestic sewage from the housekeeping trailer and medical support facility located approximately 220 ft east of the septic tank. It is uncertain whether the septic tank is connected to other industrial facilities within the Area 20 Camp. An environmental compliance inspection indicated that the septic tank associated with the medical facility in Area 20 was closed pending an NDEP-approved closure plan (Author Unknown, 1995). No documentation was identified confirming the closure of the septic tank. The Area 20 Camp is currently inactive and abandoned.

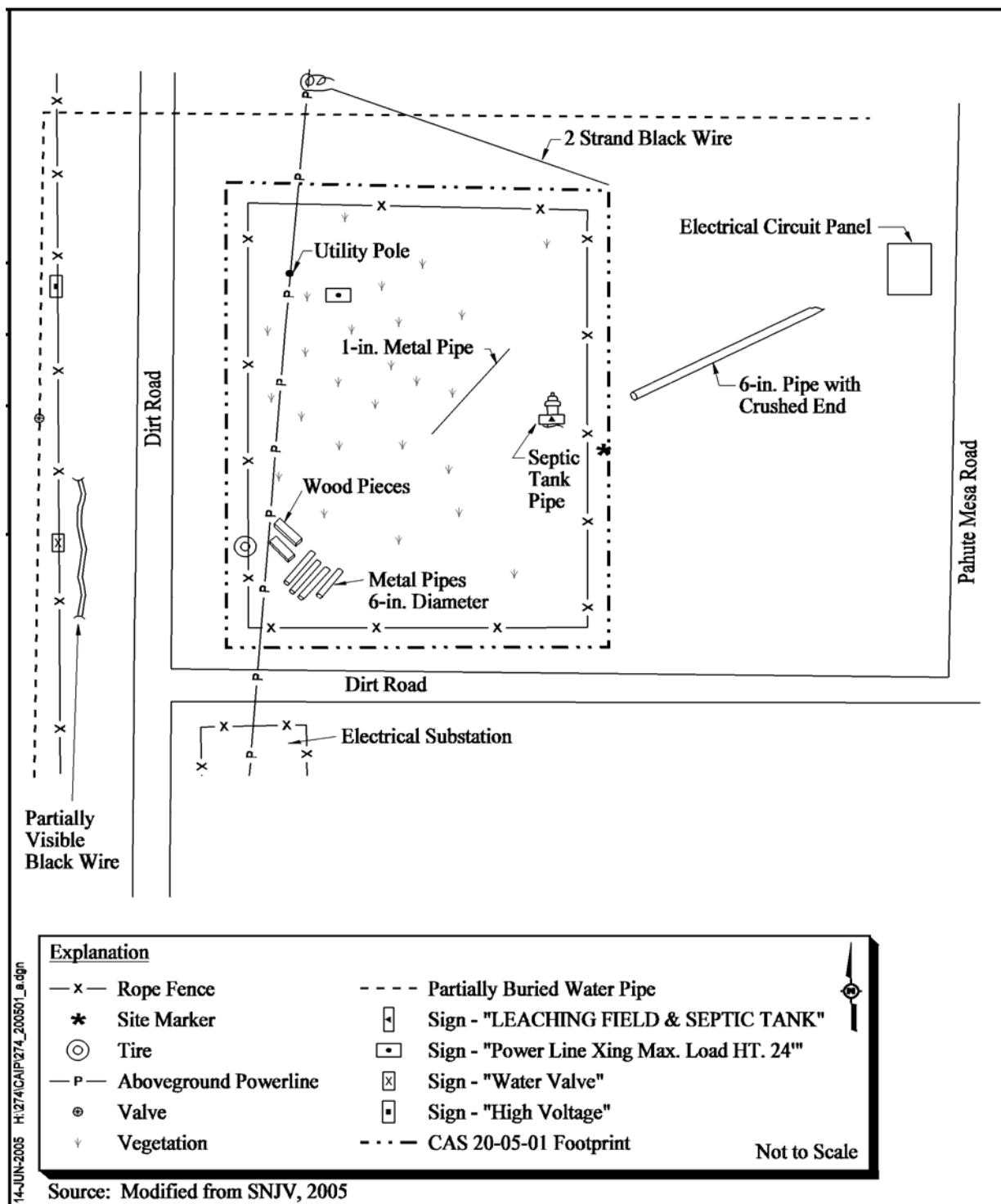


Figure A.2-6
Corrective Action Site 20-05-01 Site Map

Release Information - The primary source of potential contamination originates from the effluent that was previously discharged through the septic system components. This effluent may have seeped into soils from potential leaks at junctions in the system, breaks in the system, and/or overflow of the tank. Residual effluent may also still be present within these features. Due to the nature of the unconsolidated soils and fill along this system, the potential for both vertical and lateral migration of the effluent exists. Although the septic system is reported to have been used strictly for sanitary purposes, the corrective action analytical program will account for the potential that other wastes may have been introduced to the system.

There are no known documented releases of hazardous or radioactive contaminants associated with the CAS that would initiate identification of target analytes. However, due to the incomplete site history, a comprehensive suite of COPCs have been identified for this CAS.

Previous Investigation Results - There are no known analytical results for this CAS. A radiological survey was conducted over the site. No areas with elevated radiological activities were identified (Fahringer, 2004).

A.3.0 Step 1 - State the Problem

The problem statement for CAU 274 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 274.”

A.3.1 Planning Team Members

The DQO planning team consists of representatives from NDEP, NNSA/NSO, SNJV, and BN. The primary decision-makers are the NDEP and NNSA/NSO representatives. [Table A.3-1](#) lists representatives from each organization in attendance for the April 27, 2005, DQO meeting.

**Table A.3-1
Final DQO Meeting Participants
for CAU 274
April 27, 2005**

Participant	Affiliation
Jeff MacDougall	Nevada Division of Environmental Protection
Kevin Cabble	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
Grant Evenson	Stoller-Navarro Joint Venture
Rick Findlay	Stoller-Navarro Joint Venture
Rob Boehlecke	Stoller-Navarro Joint Venture
Ralph Smith	Stoller-Navarro Joint Venture
Rene Robles	Stoller-Navarro Joint Venture
Julie Snelling-Young	Stoller-Navarro Joint Venture
Joe Hutchinson	Stoller-Navarro Joint Venture
Syl Hersh	Stoller-Navarro Joint Venture
Chao-Hsiung Tung	Stoller-Navarro Joint Venture
David Nacht	Bechtel Nevada

A.3.2 Conceptual Site Model

The CSM is used to organize and communicate information about site characteristics. It reflects the best interpretation of available information at any point in time. The CSM is a primary vehicle for communicating assumptions about release mechanisms, potential migration pathways, or specific

constraints. It provides a good summary of how and where contaminants are expected to move and what impacts such movement may have. It is the basis for assessing how contaminants could reach receptors both in the present and future. The CSM describes the most probable scenario for current conditions at each site and defines the assumptions that are the basis for identifying appropriate sampling strategy and data collection methods. Accurate CSMs are important as they serve as the basis for all subsequent inputs and decisions throughout the DQO process.

The CSM for CAU 274 was developed 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. This CSM has been developed to address surface and subsurface features within CAU 274 that may have released contaminants to the adjacent soils through breaches, overflow, and/or intended use. The following sections address the characteristics of the CSM for the DQOs as they apply to the features within CAU 274. [Figure A.3-1](#) represents site conditions applicable to the CSM.

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.

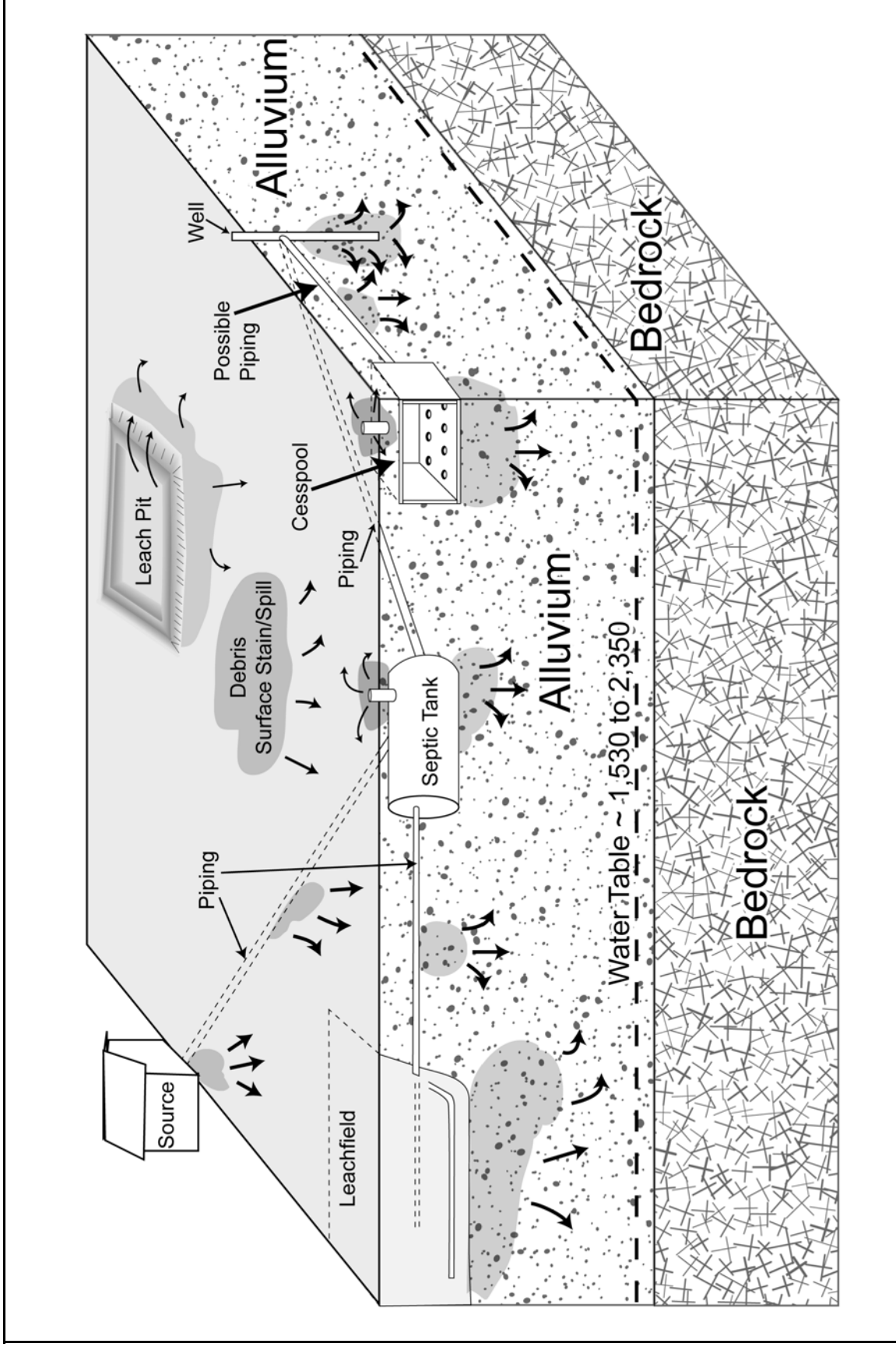


Figure A.3-1
Corrective Action Unit 274 Conceptual Site Model

The applicability of the CSM to each CAS is summarized in [Table A.3-2](#) and discussed in the following sections. [Table A.3-2](#) provides information on CSM elements that will be used throughout the remaining steps of the DQO process.

A.3.2.1 Contaminant Release

The most likely locations of the contamination and releases to the environment are the soils directly below or adjacent to the CSM's surface and subsurface components (i.e., septic tanks, cesspool, associated underground piping, leaching pit, leachfield, and injection wells). The CSM accounts for potential releases resulting from overflow of system components that are present at the ground surface (e.g., fill pipes for septic tanks, cesspool, and/or injection wells) and surface spills. Any contaminants migrating from CASs, regardless of physical or chemical characteristics, are expected to exist at interfaces, and in the soil adjacent to disposal feature's in lateral and vertical directions.

A.3.2.2 Potential Contaminants

The chemical COPCs for CAU 274 are defined as the analytes reported from the analytical methods stipulated in [Table A.3-3](#) for which the U.S. Environmental Protection Agency (EPA) Region 9 has established *Preliminary Remediation Goals* (PRGs) (EPA, 2004) or for which toxicity and carcinogenicity data are listed in the EPA *Integrated Risk Information System* (IRIS) database (EPA, 2001). The radiological COPCs for CAU 274 are defined as the radionuclides reported from the analytical methods listed in [Table A.3-3](#). The COPCs are applicable to Decision I environmental samples from each of the CASs. The list of COPCs is intended to encompass all of the contaminants that could potentially be present at each CAS. These contaminants 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 274 sites is not available, contaminants detected at other similar or other NTS sites were included in the contaminant lists to reduce the uncertainty.

During the review of site history documentation, process knowledge information, personal interviews, 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

Table A.3-2
Conceptual Site Model
Description of Elements for Each CAS in CAU 274

CAU 274 Conceptual Site Model					
CAS Identifier	03-02-01	06-02-01	09-01-01	09-05-01	20-05-01
CAS Description	WX-6 ETS Building Septic System	Underground Storage Tank	Spill Site	Leaching Pit	Septic System
Site Status	Sites are inactive and/or abandoned				
Future Land Use	Nuclear and High-Explosive Test	Nuclear Tests			
Sources of Potential Soil Contamination	Surface and subsurface release of effluent during operations		Spill material at spill site and rinse water/material generated during the rinsing of equipment and drilling mud hauling trucks in leach pit	Surface and subsurface release of effluent during operations	
Location of Contamination/Release Point	Soil beneath and adjacent to septic system components		Surface soil below stain and surface soil adjacent to and below leach pit	Soil beneath and adjacent to septic system components	
Amount Released	Unknown; no documented releases				
Affected Media	Surface and shallow subsurface soil; debris such as concrete, steel, and wood				
Potential Contaminants	Refer to Table A.3-3				
Transport Mechanisms	Percolation of precipitation through subsurface media serves as a driving force for migration of contaminants. However, due to the arid environment of the Nevada Test Site, percolation of precipitation is very small and migration of contaminants has been shown to be limited. Evaporation potentials significantly exceed available soil moisture from precipitation (i.e., approximately 4 in. per year) (Winograd and Thordarson, 1975). Releases of process water and effluent may have contributed to the downward migration of Contaminants of potential concern (COPCs). Surface water runoff may provide for the transportation of some contaminants within or outside of the footprints of the corrective action sites (CASs).				
Migration Pathways	Vertical through subsurface soils from surface spills or releases through the septic systems/injection wells, and lateral migration from overfills and or spills to the surface.				
Lateral and Vertical Extent of Contamination	Unknown. Contamination plumes, if present, are expected to be contiguous to the release points and concentrations are expected to decrease with distance from the release point. Groundwater contamination is not expected. Depth to groundwater at the CASs varies from 1,530 to 2,350 ft bgs. Surface migration may occur as a result of runoff.				
Exposure Scenario	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.				

Table A.3-3
Analytical Program^a
(Includes Waste Characterization Analyses)

Analyses^b	CAS 03-02-01	CAS 06-02-01	CAS 09-01-01	CAS 09-05-01	CAS 20-05-01
Organic Contaminants of Potential Concern (COPCs)					
Total Petroleum Hydrocarbons-Diesel-Range Organics	X	X	X	X	X
Polychlorinated Biphenyls	X	X	X	X	X
Semivolatile Organic Compounds ^c	X	X	X	X	X
Volatile Organic Compounds ^c	X	X	X	X	X
Inorganic COPCs					
Total Resource Conservation and Recovery Act Metals ^c	X	X	X	X	X
Radionuclide COPCs					
Gamma Spectroscopy ^d	X	X	X	X	X
Waste Characterization Analyses					
Asbestos	X	X	NA	NA	X

^aThe contaminants of potential concern are the analytes reported from the analytical methods listed.

^bIf the volume of material is limited, prioritization of the analyses will be necessary.

^cMay also include Toxicity Characteristic Leaching Procedure analytes if sample is collected for waste management purposes.

^dResults of gamma analysis will be used to determine whether further radioanalytical analysis is warranted.

X = Required analytical method

NA = Not Applicable

available site and process information suggests that they may be reasonably suspected to be present at a given CAS. The targeted analytes 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](#)). Total petroleum hydrocarbons-DRO has been identified as a target analyte at CAS 09-05-01 as a result of drilling mud that may be present within the leaching pit. No other target analytes have been identified at the CAU 274 CASs.

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 constituents.

The solubility and mobility of TPH as a group of organic compounds is dependent upon the type of product released. Diesel fuel has a low solubility and tends to form a viscous layer around soil particles.

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. The site characteristics for the CASs are as follows:

- CAS 03-02-01 is located in the Core Complex in Area 3 of the NTS. The site is surrounded by a chain-link fence, and the ground has been disturbed by vehicle activity. The area inside the fence is relatively flat, and vegetation is sparse as a result of past vehicle activity. The area outside the fence slopes to the east.
- CAS 06-02-01 is located in the Well 3 Yard in Area 6 of the NTS. The site is generally flat with gravel at the surface. Vegetation exists along the eastern side of Building 6-388 and near the vertical pipe of the cesspool.
- CASs 09-01-01 and 09-05-01 are located in Area 9 of the NTS. The site is generally flat with the exception of the boundaries of the leaching pit, which is slightly mounded. The area surrounding the site slopes to the northeast. Vegetation at the site is generally sparse, and debris is present at the surface.
- CAS 20-05-01 is located in Area 20 camp in Area 20 of the NTS. The site is slightly mounded and sloped toward the boundaries of the site. The site is well vegetated and slightly overgrown with debris present at the surface.

A.3.2.5 Migration Pathways and Transport Mechanisms

Migration pathways at the CAU 274 CASs include lateral and vertical migration of potential contaminants across surface soils/sediments and through subsurface soils. Contaminants released from subsurface components (i.e., septic tanks, cesspool, leachfield, associated piping, and well) or surface components (i.e., leach pit) were likely released to the subsurface and/or surface as liquid or effluent. The transport mechanism for the potential contaminants is the liquid solution/effluent. The extent of migration of the liquid solution/effluent is dependent on the length of time the release component was in operation. Exposure points to the potential receptors identified through the CSM are contact with soil, contaminant vapors in soil, particulates that may become airborne during excavation, surface water, and/or groundwater.

An important element of the CSM in developing a sampling strategy is the expected fate and transport of contaminants (how contaminants migrate through media and where they can be expected in the environment). Fate and transport of contaminants are presented in the CSM as the migration pathways and transport mechanism that could potentially move the contaminants throughout the various media. Fate and transport are influenced by physical and chemical characteristics of the contaminants and media described in [Section A.3.2.3](#) and [Section A.3.2.4](#).

Infiltration and percolation of precipitation serves as a driving force for downward migration of contaminants. However, due to high potential evapotranspiration (annual potential evapotranspiration at the Area 3 Radiological Waste Management Site has been estimated at 62.6 in. (Shott et al., 1997) and limited precipitation for this region (approximately 4 in. per year [Winograd and Thordarson, 1975]), percolation of infiltrated precipitation at the NTS does not provide a significant mechanism for vertical migration of contaminants to groundwater (DOE/NV, 1992).

A.3.2.5.1 Exposure Scenarios

Human receptors may be exposed to COPCs through oral ingestion, inhalation, and dermal contact (absorption) of soil or debris due to inadvertent disturbance of these materials or irradiation by radioactive materials. The exposure scenarios for sites located within the NTS boundaries are limited by the future land-use scenarios and to site workers who may be exposed to COPCs. The future land-use scenarios for CAU 274 are Nuclear and High-Explosive Test Zones and Nuclear Tests

(DOE/NV, 1998). Therefore, the potential for exposure to contamination at the CAU 274 CASs is limited to industrial and construction workers as well as military personnel conducting training. The future land-use scenarios for CAU 274 are provided in [Table A.3-4](#).

**Table A.3-4
Future Land-Use Scenarios**

CAS	Zone	Zone Description
03-02-01	Nuclear and High-Explosive Test	This area is designated within the Nuclear Test Zone for additional underground nuclear weapons tests and outdoor high-explosive tests. This zone includes compatible defense and nondefense research, development, and testing activities.
06-02-01, 09-01-01, 09-05-01, and 20-05-01	Nuclear Tests	This area is reserved for dynamic experiments, hydrodynamic tests, and underground nuclear weapons and weapons effects tests. This zone includes compatible defense and nondefense research, development, and testing activities.

Source: (DOE/NV, 1998)

A.4.0 Step 2 - Identify the Decisions

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

A.4.1 Decision Statements

The Decision I statement is: “Is any COC present in environmental media within the CAS?” Any contaminant associated with a release from a CAS that is present at concentrations exceeding its corresponding FAL defined in [Section A.7.3](#) will be defined as a COC. The presence of a contaminant within a CAS will be defined by the analytical detection of a COPC. If a COC is detected, then Decision II must be resolved.

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

- Identification of the volume of media containing any COC bounded by analytical sample results in lateral and vertical directions.
- The information needed to characterize IDW for disposal.
- The information needed to determine potential remediation waste types.
- The information needed to evaluate the feasibility of remediation alternatives.

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

A.4.2 Alternative Actions to the Decisions

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

A.4.2.1 Alternative Actions to Decision I

If no COC associated with a release from the CAS is detected, then further assessment of the CAS is not required.

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.

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

A.5.1 Information Needs

To resolve Decision I (determine whether a COC is present at a given CAS), samples need to be collected and analyzed following these two criteria: (1) samples must be collected in areas most likely to contain a COC; and (2) 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 action levels.
- Samples of the waste or environmental media must provide sufficient information to characterize the IDW for disposal.
- Samples of the waste or environmental media must provide sufficient information to determine potential remediation waste types.
- Appropriate samples must be submitted to evaluate the feasibility of remediation alternatives (e.g., bioassessment if natural attenuation or biodegradation is considered, and geotechnical data if construction or evaluation of barriers is considered).
- The analytical suites selected must be sufficient to detect contaminants at concentrations equal to or less than their corresponding action levels.

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, backhoe excavation, drilling, 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, 2002). 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

Decision I samples must be collected at locations most likely to contain a COC, if present. These locations will be selected based on field-screening techniques, biasing factors, the CSM, and existing information. Analytical suites for Decision I samples will include all COPCs identified in [Table A.3-3](#).

Field-screening techniques may be used to select appropriate sampling locations by providing semiquantitative data that can be used to comparatively select samples to be submitted for laboratory analyses from several screening locations. Field screening may also be used for health and safety monitoring and to assist in making certain health and safety decisions. The following field-screening methods may be used to select analytical samples at CAU 274:

- TPH - a gas chromatograph, or equivalent equipment or method, will be used at CASs 06-02-01, 09-01-01, and 09-05-01.
- VOCs - a flame-ionization detector, or an equivalent instrument or method, will be used to conduct headspace analysis at all CASs.
- Walkover surface area radiological surveys - a plastic scintillator will be used over approximately 100 percent of the CAS boundaries, as permitted by terrain and field conditions to detect hot spots of radiological contamination.
- Alpha and Beta/Gamma Radiation - an NT Technology Electra, or equivalent instrument or method, may be used at all CASs. The gamma spectroscope will also be used, if needed.
- Fecal coliform samples may be analyzed on site to determine whether it is present in the tanks, piping, or cesspool at CASs 03-02-01, 06-02-01, and 20-05-01.

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 be considered in selecting locations for analytical samples at CAU 274:

- Documented process knowledge on source and location of release (e.g., volume of release)
- Previous sample or screening results
- Experience and data from investigations of similar sites

- Visual indicators such as discoloration, textural discontinuities, disturbance of native soils, or any other indication of potential contamination
- Presence of debris, waste, or equipment
- Odor
- Physical and chemical characteristics of contaminants
- Radiological survey results

Decision II sample step-out locations will be selected based on the CSM, biasing factors, and existing data. Analytical suites will include those parameters that exceeded action levels (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 [Table 3-2](#) and [Table 3-3](#) of the CAIP along with specific analyses required for the disposal of IDW.

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

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

A.6.1 Populations of Interest

The population of interest to resolve Decision I (“Is any COC present in environmental media within the CAS?”) is any single location within the site that is contaminated with any contaminant above an action level. The populations of interest to resolve Decision II (“If a COC is present, is sufficient information available to evaluate potential corrective action alternatives?”) are:

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

A.6.2 Spatial Boundaries

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

A.6.3 Practical Constraints

Training and/or other activities performed at the NTS may affect the ability to investigate this CAU. Underground utilities may exist at the site, which may limit intrusive sampling locations. Other practical constraints include rough terrain and access restrictions. Access restrictions include scheduling conflicts on the NTS with other entities, maintaining access to the use-restricted area of CAS 06-02-01, areas posted as contamination areas requiring appropriate work controls, physical

Table A.6-1
Spatial Boundaries of CAU 274 CASs

Corrective Action Site	Spatial Boundaries
CAS 03-02-01	100 feet laterally and vertically from associated piping and septic tank; 200 feet laterally and vertically from injection well
CAS 06-02-01	100 feet laterally and vertically from associated piping; 200 feet laterally and vertically from cesspool and injection well
CAS 09-01-01	100 feet laterally and vertically from spill site
CAS 09-05-01	100 feet laterally and vertically from leaching pit
CAS 20-05-01	100 feet laterally and vertically from septic tank, leachfield, and associated piping

barriers (e.g., fences, buildings, steep slopes), and areas requiring authorized access. Underground utilities surveys will be conducted at each CAS before the start of investigation activities to determine whether utilities exist, and, if so, determine the limit of spatial boundaries for intrusive activities. Wet weather may also place time constraints on sampling and field screening of soil because of the effect moisture has on VOCs and/or alpha-emitting radionuclides.

A.6.4 Define the Scale of Decision Making

The scale of decision making in Decision I is defined as the CAS. Any COC 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 a Decision Rule

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

A.7.1 Population Parameters

Each sample result representing each population of interest defined in Step 4 will be compared to the action levels to determine the appropriate resolution to Decision I and Decision II. For the Decision I population of interest, a single analytical sample result above action levels would cause a determination that a COC is present within the CAS. For the Decision II population of interest, a single analytical sample result above action levels would cause a determination that the contamination is not bounded in one direction.

Because this approach does not use a statistical average for comparison to the action levels, but rather a point-by-point comparison, the population parameter for both populations of interest is the observed concentration of each analyte from individual analytical sample results.

A.7.2 Decision Rules

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

- If COC contamination is inconsistent with the CSM or extends beyond the spatial boundaries identified in [Section A.6.2](#), then work will be suspended and the investigation strategy will be reconsidered. If a COC is present, is consistent with the CSM, and is within spatial boundaries, then the decision will be to continue sampling to define the extent.

The decision rules for Decision I are:

- If the population parameter (the observed concentration of each analyte) of any COPC in the Decision I population of interest (defined in Step 4) exceeds the corresponding FAL, then that analyte is identified as a COC, and Decision II samples will be collected. If all COPC concentrations are less than the corresponding action levels, then the decision will be no further action.

The decision rules for Decision II are:

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

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

A.7.3 Action Levels

The PALs presented in this section are to be used for site-screening purposes. They are not necessarily intended to be used as cleanup action levels or FALs. However, they are useful in screening out analytes that are not present in sufficient concentrations to warrant further evaluation and, therefore, streamline the consideration of remedial alternatives. The process that will be used to move from PALs to FALs is that specified by NAC 445A.22705 (NAC, 2004). This regulation stipulates that determination of FALs shall be established by an evaluation of the site based on the risk it poses to public health and the environment. This evaluation will be conducted using Method E1739-95, adopted by the ASTM (ASTM, 1995). The ASTM RBCA process is summarized in [Section 3.3](#) of the CAIP. The Tier I action levels for Decision I and Decision II are the PALs defined below and in [Section 3.3](#) of the CAIP. If necessary, a Tier 2 or Tier 3 evaluation will be conducted by calculating SSTLs. If a Tier 2 or Tier 3 evaluation is conducted for TPH, the hazardous constituents of TPH will be compared to the SSTLs as the general measure of TPH provides insufficient information about the amounts of individual chemicals of concern within the TPH measurement.

At a given CAS, each COC that is detected in a sample at concentrations exceeding the corresponding action levels becomes a COC. The comparison of laboratory results to FALs and the evaluation of potential corrective actions will be included in the investigation report. The FAL will be defined (along with the basis for their definition) in the investigation report.

A.7.3.1 Chemical PALs

Except as noted herein, the chemical PALs are defined as the EPA *Region 9 Risk-Based Preliminary Remediation Goals* for chemical constituents in industrial soils (EPA, 2004). Background concentrations for arsenic will be used instead of PRGs when natural background concentrations exceed the PRG. Background is considered the mean plus two standard deviations of the mean for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (formerly the Nellis Air Force Range) (NBMG, 1998; Moore, 1999). For detected chemical COPCs without established PRGs that have toxicity and carcinogenicity data listed in the EPA IRIS database (EPA, 2001), 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. The specific chemical PALs for CAU 274 are listed in [Table 3-3](#) of the CAIP.

A.7.3.2 Total Petroleum Hydrocarbon PALs

The PAL for TPH in soil is 100 mg/kg as listed in NAC 445A.2272 (NAC, 2004).

A.7.3.3 Radionuclide PALs

The PALs for radiological contaminants (other than tritium) are based on the NCRP Report No. 129 recommended screening limits for construction, commercial, industrial land-use scenarios (NCRP, 1999) scaled to a 25 mrem per year dose constraint (NDEP, 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, 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 specific radiological PALs for CAU 274 are listed in [Table 3-2](#) of the CAIP.

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 (DOE/NV, 2000).

A.7.4 Measurement and Analysis Sensitivity

The measurement and analysis methods listed in [Section A.5.2.2](#) and in the IS QAPP (NNSA/NV, 2002) are capable of measuring analyte concentrations at or below the corresponding action levels for each COPC. See [Section 6.2.8](#) of the CAIP for additional details.

A.8.0 Step 6 - Tolerable Limits on Decision Errors

The purpose of this step is to specify performance criteria for the decision rule. Setting tolerable limits on decision errors is neither obvious nor easy. It requires the planning team to weigh the relative effects of threat to human health and the environment, expenditure of resources, and consequences of an incorrect decision. Section 7.1 of the EPA DQO guidance states that if judgmental sampling approaches are used, quantitative statements about data quality will be limited to measurement error (EPA, 2000). Measurement error is influenced by imperfections in the measurement and analysis system. Random and systematic measurement errors are introduced in the measurement process during physical sample collection, sample handling, sample preparation, sample analysis, and data reduction. If measurement errors are not controlled, they may lead to errors in making the DQO decisions.

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

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

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

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

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

Decisions and/or criteria have false rejection (false negative) or false acceptance (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:

- Developing and concurring 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.8.1 False Negative Decision Error

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

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

1. 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.
2. Having a high degree of confidence that analyses conducted will be sufficient to detect any COCs present in the samples.
3. 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 action levels). 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](#) of the CAIP. 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 PALs. 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, 2002) and in [Section 6.2.2](#) of the CAIP. 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 analyte 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 analyte performance criteria based on an assessment of the data. The DQI of completeness will be assessed to ensure that all data needs identified in the DQO have been met. The DQI of comparability will be assessed to ensure that all analytical methods used are equivalent to standard EPA methods so that results will be comparable to regulatory action levels that have been established using those procedures. Site-specific DQIs are discussed in more detail in [Section 6.2.2](#) of the CAIP. Strict adherence to established procedures and QA/QC protocol protects against false negatives. To provide information for the assessment of the DQIs of precision and accuracy, the following QC samples will be collected as required by the IS QAPP (NNSA/NV, 2002):

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

A.8.2 False Positive Decision Error

The false positive (beta) 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.

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

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

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

This section provides the general approach for obtaining the information necessary to resolve Decision I and Decision II. A judgmental (nonprobabilistic) sampling scheme will be implemented to select sample locations and evaluate analytical results. Judgmental sampling allows the methodical selection of sample locations that target the populations of interest (defined in Step 4) rather than non-selective random locations. Random sample locations are used to generate average contaminant concentrations that estimate the true average (“characteristic”) contaminant concentration of the site to some specified degree of confidence.

Because individual sample results, rather than an average concentration, will be used to compare to action levels, statistical methods to generate site characteristics will not be necessary. Section 0.4.4 of the EPA’s DQOs for Hazardous Waste Site Investigations guidance states that the use of statistical methods may not be warranted by program guidelines or site-specific sampling objectives (EPA, 2002). The need for statistical methods is dependent upon the decisions being made.

Section 7.1 of the EPA DQO guidance states that a nonprobabilistic (judgmental) sampling design is developed when there is sufficient information on the contamination sources and history to develop a valid CSM and to select specific sampling locations. This design is used to confirm the existence of contamination at specific locations and provide information (such as extent of contamination) about specific areas of the site.

All sample locations will be selected to satisfy the DQI of representativeness in that samples collected from selected locations will best represent the populations of interest as defined in [Section A.6.1](#). To meet this criterion, a biased sampling strategy will be used for Decision I to target areas with the highest potential for contamination, if present 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](#). At CAS 09-05-01 three additional surface sample locations will be selected based on biasing factors identified during the investigation. In the absence of biasing factors these samples will be collected from random locations within the leaching pit. If biasing factors are present in soils below locations where Decision I samples were removed, additional Decision I soil samples will be collected at additional depth intervals until the biasing factors are no longer present. The Site

Supervisor has the discretion to modify the sample locations, but only if the modified locations meet the decision needs and criteria stipulated in this DQO.

To meet the DQI of representativeness for step-out (Decision II) samples (that Decision II sample locations represent the population of interest as defined in [Section A.6.1](#)), the sample locations at each CAS will be selected based on the outer boundary sample locations where COCs were detected, field-screening results, biasing factors as specified in [Section A.5.2.1](#), and the limits of the CSM. In general, sample locations will be arranged in a triangular pattern around the Decision I location 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 the extent of contamination in that direction. The number, location, and spacing of step-outs may be modified by the Site Supervisor, as warranted by site conditions.

The following sections discuss CAS-specific investigation activities, including proposed sample locations. As the sampling strategy for each CAS is developed, specific biasing factors will be described. In the absence of biasing factors, samples will be collected from the default sampling locations described for each CAS. If radiological soil contamination is detected in surface soil samples during the investigation of CAU 274, the analytical results will be evaluated and if necessary, additional background samples collected to determine whether the surface contamination is wide spread and attributed to atmospheric nuclear testing. If radiological contamination is determined to be associated with atmospheric testing it will then be excluded from the investigation.

A.9.1 CAS 03-02-01, WX-6 ETS Building Septic System

Proposed locations for collecting Decision I samples at CAS 03-02-01 are provided on [Figure A.9-1](#). The exact sample locations will be biased to those locations most likely to be impacted by COPCs based on process knowledge, historical information, and environmental assessments of similar sites.

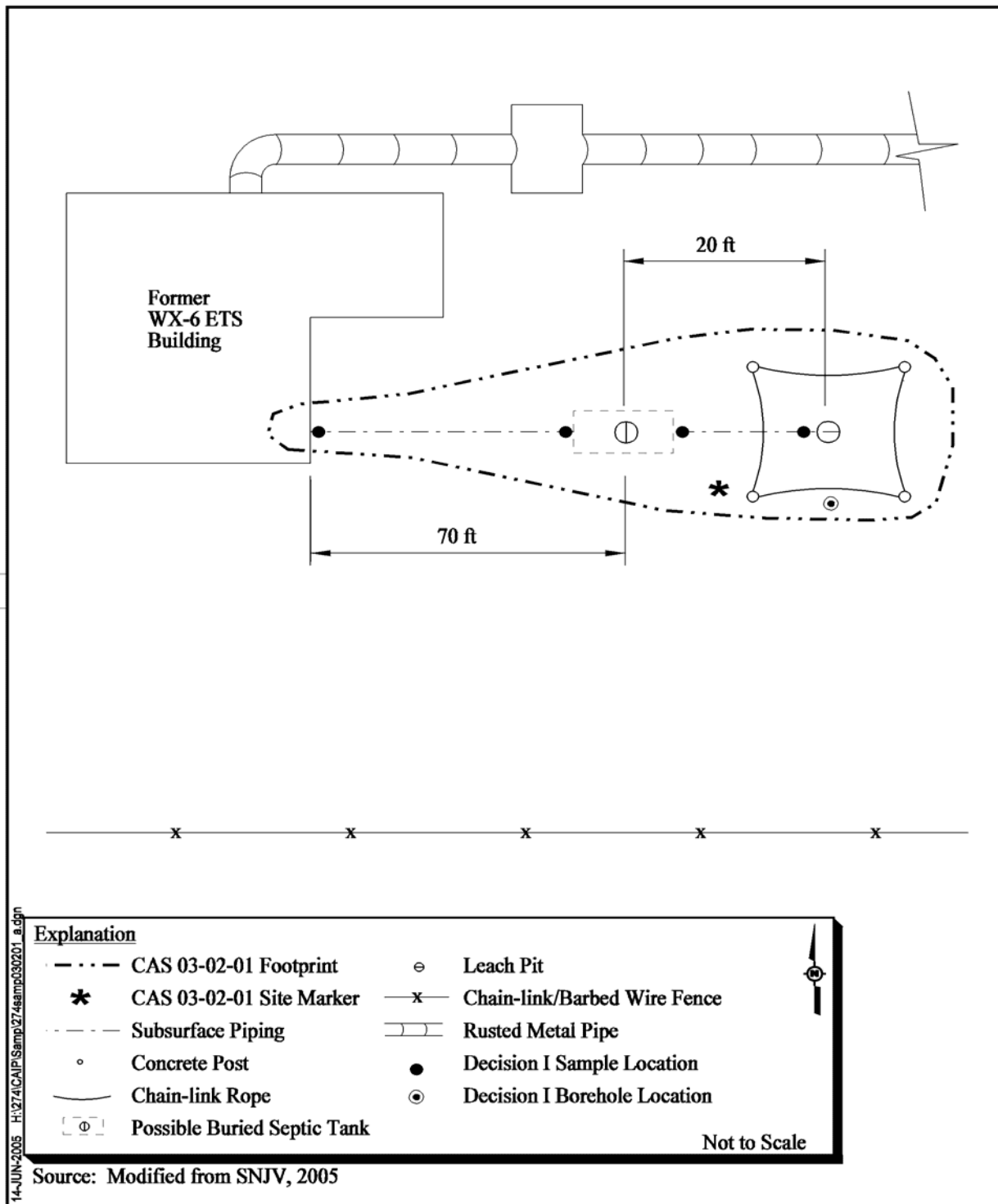


Figure A.9-1
CAU 274, CAS 03-02-01, Proposed Sample Locations

A minimum of one surface soil sample will be collected at the base of the access pipe that connects the injection well to the surface. This sample will be analyzed to determine whether COPCs are present in surface soil resulting from spills or overfills of the injection well. A minimum of four subsurface samples will be collected from below piping inlets/outlets to the septic tank, injection well, and base of WX-6 ETS Building foundation. These samples will be collected from below the piping and analyzed to determine whether COPCs are present within subsurface soils resulting from effluent that may have leaked at the connections. A minimum of two additional subsurface samples will be collected from below the ends of the septic tank at the inlet/outlet sides. These samples will be analyzed to determine whether COCs were present in subsurface soils resulting from effluent that may have leaked from the septic tank.

A borehole will be advanced at a location adjacent to the injection well. This location will be within approximately 2 ft from the outside diameter of the injection well (estimated to be approximately 5 ft). This borehole will be advanced to a minimum depth that is 10 ft below the total depth of the injection well (estimated during a field visit to be approximately 45 ft bgs). Samples will be collected at approximate 5-ft intervals for field screening and lithologic description. A minimum of two subsurface samples will be selected for laboratory analysis based on field-screening results, biasing factors, and sample depth. These samples will be analyzed to determine whether COPCs are present within soil adjacent to and/or below the injection well.

A video-mole survey will be conducted on subsurface piping that is accessible and determined to be technically feasible. This survey will be performed to verify the integrity of the piping and injection well. If breaches are identified within the piping, Decision I samples will be collected from below the breaches. These samples will be collected by excavation. The septic tank will be opened at the surface and if residual material is present, a sample will be collected of all phases (solid, liquid, and sludge) for waste characterization purposes. If access to the septic tank is not possible at the surface, excavation will be conducted to gain access to the tank for inspection and sampling, as needed.

A.9.2 CAS 06-02-01, Cesspool

Proposed locations for collecting Decision I samples at CAS 06-02-01 are provided on [Figure A.9-2](#). The exact sample locations will be biased to those locations most likely to be impacted by COPCs based on process knowledge, historical information, and environmental assessments of similar sites.

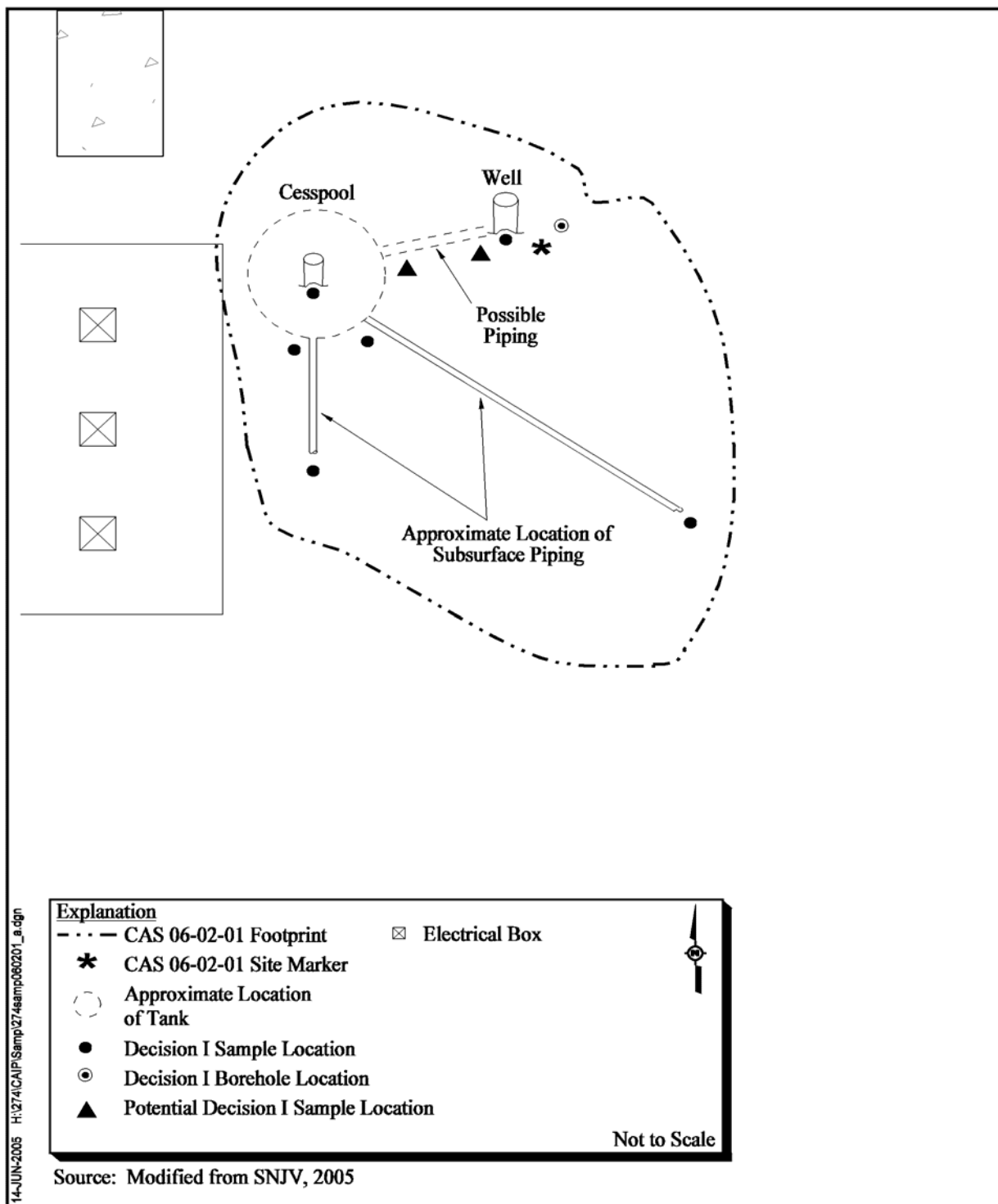


Figure A.9-2
CAU 274, CAS 06-02-01, Proposed Sample Locations

Before initiating the field-sampling activities at this CAS, written authorization will be obtained from the NDEP to conduct intrusive activities within the use-restricted area associated with CAU 335.

A minimum of one surface soil sample will be collected at the base of each access pipe that connects the cesspool and injection well to the surface. These samples will be analyzed to determine whether COPCs are present in surface soil as a result of spills or overflow of the cesspool and/or injection well. A minimum of two subsurface samples will be collected at these surface locations at depths of approximately 1.5 to 2 ft bgs to be analyzed for TPH-DRO. These samples will be collected to determine whether TPH-DRO contamination previously identified during the CAU 335 investigation extends to a depth greater than 6-in. bgs. A minimum of four subsurface samples will be collected, one below each piping inlet/outlet to the cesspool and one below each piping end/connection to former trailers. These samples will be collected from below the piping and analyzed to determine whether COPCs are present in subsurface soils resulting from effluent that may have leaked at the connections. A minimum of three additional subsurface samples will be collected from around the base of the cesspool. These samples will be analyzed to determine whether COPCs are present within subsurface soils resulting from the discharge of effluent from the cesspool. If a connection from the cesspool to the injection well is identified, then subsurface soil samples will be collected from below the inlet/outlet connections from the injection well to the cesspool. These samples will be analyzed to determine whether COPCs were present in subsurface soil resulting from effluent that may have leaked from the connections.

A borehole will be advanced at a location adjacent to the injection well. This location will be within approximately 2 ft from the outside diameter of the injection well (estimated to be approximately 5 ft). The borehole will be advanced to a minimum depth that is 10 ft below the total depth of the injection well (measured during a field visit to be approximately 45 ft bgs). Samples will be collected at approximate 5-ft intervals for field screening and lithologic description. A minimum of two subsurface samples will be selected for laboratory analysis based on field-screening results, biasing factors, and sample depth. These samples will be analyzed to determine whether COPCs are present within soil adjacent to and/or below the injection well.

A video-mole survey will be conducted on subsurface piping that is accessible and determined to be technically feasible. This survey will be performed to verify the integrity of the piping and injection

well. If breaches are identified within the piping, Decision I samples will be collected from below the breaches for analysis. These samples will be collected by excavation. The cesspool will be opened at the surface and if residual material is present, a sample will be collected of all phases (solid, liquid, and sludge) for waste characterization purposes. If access to the cesspool is not possible at the surface, excavation will be conducted to gain access to the tank for inspection and sampling, as needed.

A.9.3 CAS 09-01-01, Spill Site, and CAS 09-05-01, Leaching Pit

This section provides a strategy for the investigation and sampling of the following CASs located in Area 9:

- 09-01-01, Spill Site
- 09-05-01, Leaching Pit

These CASs are combined for discussion because they are located in close proximity and adjacent to each other. Proposed locations for collecting Decision I samples at these CASs are provided on [Figure A.9-3](#). The exact sample locations will be biased to those locations most likely to be impacted by COPCs based on process knowledge, historical information, and environmental assessments of similar sites.

A minimum of one surface soil sample will be collected from below the stained plank at CAS 09-01-01. This sample will be analyzed to determine whether COPCs are present in the surface soil below the stained plank.

A minimum of eight surface soil samples will be collected at CAS 09-05-01. Five of the surface locations have been identified and include the current topographic low, the presumed historic topographic low (middle), the light gray soil area, the possible overflow area, and the metal bucket. These locations are identified on [Figure A.9-3](#). Three additional surface sample locations will be selected based on biasing factors identified at the time of the investigation. If no additional biasing factors are observed at the time of the investigation, then the remaining three sample locations will be identified randomly in the field. The random sample locations will be identified by establishing and measuring the x and y axis and calculating a random number within each axis. The x and y coordinates will then be plotted and each sample location will be flagged. If two or more random

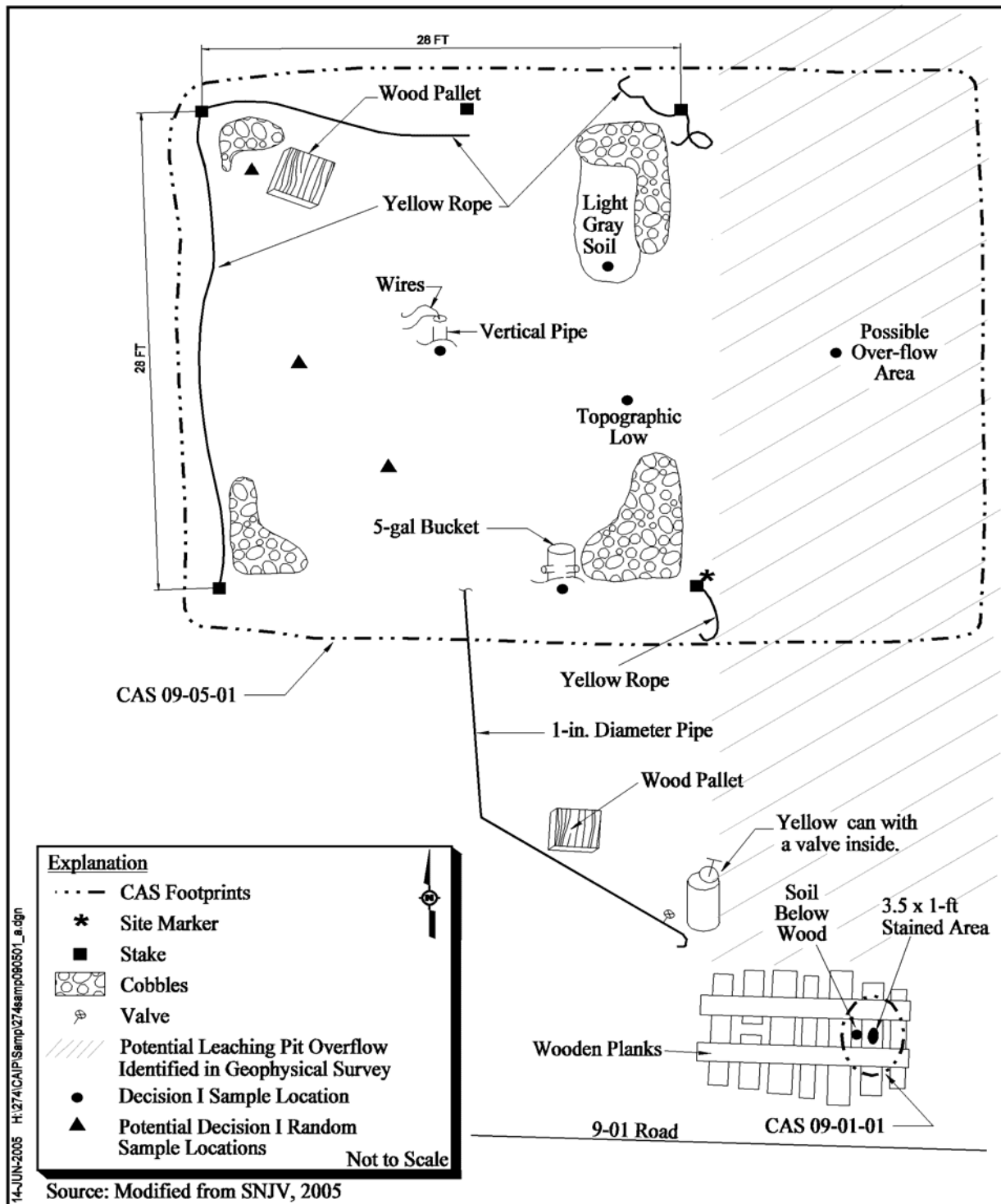


Figure A.9-3
CAU 274, CASs 09-01-01 and 09-05-01, Proposed Sample Locations at CAS

sample locations are identified within the same quadrant, then that random sample locations will be regenerated to ensure an adequate spacing between random sample locations within the leaching pit.

The surface samples collected during the investigation will be analyzed to identify COPCs that are present in the leach pit or possible overflow area. Subsurface samples will be collected at all surface-sample locations. The subsurface samples will be collected from native soil below the native soil/leach pit material contact or at a maximum depth of 5 ft bgs in the absence of native soil/leach pit material contact. These samples will be analyzed to determine whether COPCs are present in native soil beneath the leach pit.

A considerable amount of surface debris is currently located within and in the vicinity of the CASs. As a best management practice, the debris will be removed from the CASs in accordance with a housekeeping work plan. Due to the nature of the debris and the lack of a known contaminant source, removal of the material underlying the debris (e.g., soil) is not expected. An attempt will be made to determine the purpose of the piping and valves. The following housekeeping activities will be conducted at this CAS:

- If there is residual material identified inside any of the debris, that media will be sampled for waste management purposes. If no residual material is present, the debris will be disposed of as solid or salvageable waste.
- Verification samples will be collected from the underlying soil if the debris is suspected of contaminating the soil. The removal of debris will be documented in the field activity data log (FADL).
- The debris will be surveyed for potential radiological contamination, and a copy of the results will be maintained in the project files. Results of the survey will be reported in the CADD and/or closure report.
- Photographs will be taken to document the condition of the site before and after the removal of the debris and GPS coordinates will be obtained from debris removal locations.
- The proper waste documentation will be completed and included in the CADD.

If verification samples detect the presence of COPCs underlying the debris, the investigation will be expanded to delineate the extent of contamination under Decision II protocol (i.e., step-out sampling). If less than 30 cubic yards (yd³) of soil are impacted by contamination, the soil may be removed

under housekeeping activities. Alternatively, if impacted soil is greater than 30 yd³, other site closure alternatives will be evaluated.

A.9.4 CAS 20-05-01, Septic System

Proposed locations for collecting Decision I samples at CAS 20-05-01 are provided on [Figure A.9-4](#). The exact sample locations will be biased to those locations most likely to be impacted by COPCs based on process knowledge, historical information, and environmental assessments of similar sites.

A minimum of one surface soil sample will be collected at the base of the access pipe that connects the septic tank to the surface. This sample will be analyzed to determine whether COPCs are present in surface soil resulting from possible spills or overfills of the septic tank. A minimum of two subsurface samples will be collected from below piping inlets/outlets to the septic tank. These samples will be collected from below the piping and analyzed to determine whether COPCs are present in subsurface soil resulting from effluent that may have leaked at the connections. A minimum of two subsurface samples will be collected from below the ends of the septic tank at the inlet and outlet ends. These samples will be analyzed to determine whether COPCs were present in subsurface soils resulting from effluent that may have leaked from the septic tank. A minimum of 30 additional subsurface soil samples will be collected at 10 locations within the leachfield. These samples will be collected from above the leachfield distribution piping, below leachfield distribution piping and/or native soil/leachfield material contact and approximately 2.5 ft for the proximal and distal ends of the distribution piping (three sample horizons/location). These samples will be analyzed to determine whether COPCs were present in the effluent.

A video-mole survey will be conducted on subsurface piping that is accessible and determined to be practical, including piping from all potential source drains and collection system connecting to the septic tank and leachfield. This survey will be performed to verify the integrity of the piping. If breaches are identified within the piping, Decision I samples will be collected from below the breaches. These samples will be collected by excavation. The septic tank will be opened at the surface and if residual material is present, a sample will be collected of all phases of the liquid for waste characterization purposes. If access to the septic tank is not possible at the surface, excavation will be conducted to gain access to the tank for inspection and sampling, as needed.

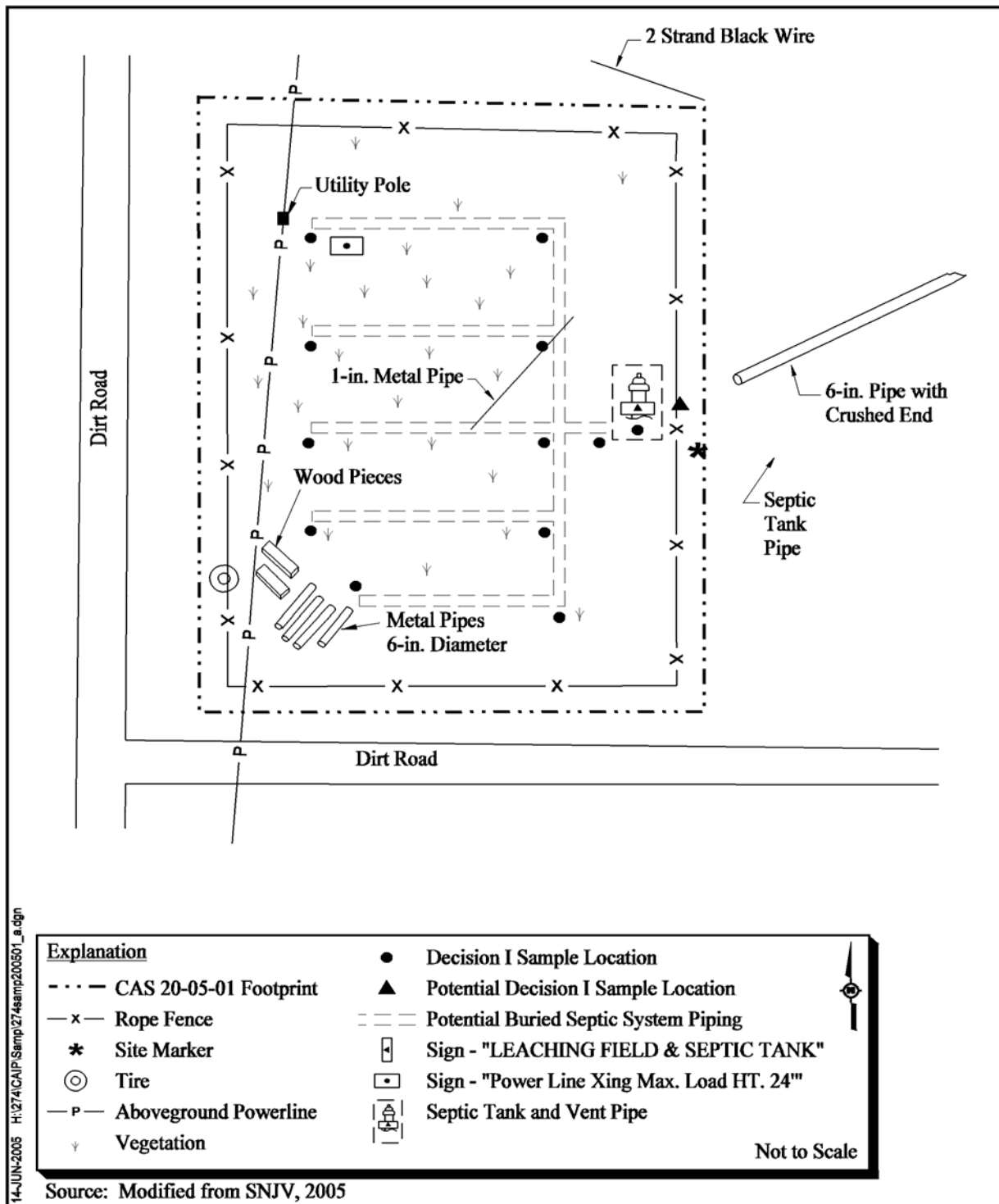


Figure A.9-4
CAU 274, CAS 20-05-01, Proposed Sample Locations

A considerable amount of surface debris is currently located within and in the vicinity of the CASs. As a best management practice, the debris will be removed from the CASs in accordance with a housekeeping work plan. Due to the nature of the debris and the lack of a known contaminant source, removal of the material underlying the debris (e.g., soil) is not expected. An attempt will be made to determine the purpose of the piping and valves. The following housekeeping activities will be conducted at this CAS:

- If there is residual material identified inside any of the debris, that media will be sampled for waste management purposes. If no residual material is present, the debris will be disposed of as solid or salvageable waste.
- Verification samples will be collected from the underlying soil if the debris is suspected of contaminating the soil. The removal of debris will be documented in the FADL.
- The debris will be surveyed for potential radiological contamination and a copy of the results will be maintained in the project files. Results of the survey will be reported in the CADD and/or closure report.
- Photographs will be taken to document the condition of the site before and after the removal of the debris and GPS coordinates will be obtained from debris removal locations.
- The proper waste documentation will be completed and included in the CADD.

If verification samples detect the presence of COPCs underlying the debris, the investigation will be expanded to delineate the extent of contamination under Decision II protocol (i.e., step-out sampling).

A.10.0 References

ASTM, see American Society for Testing and Materials.

Alderson, S., IT Group. 2002. Letter to R. Bull (SAIC) entitled, "Radiological Land Area Surveys of 24 Corrective Action Sites (CASs) at the Nevada Test Site," August 26. Las Vegas, NV.

Alderson, S., IT Corporation. 2004. Memorandum to B.S. Bailey (SNJV) entitled, "Preliminary Assessment Radiological Survey 2004, 17 February. Las Vegas, NV.

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

Author Unknown. 1995. "Active/Inactive Sewage Disposal System Environmental Compliance Department Inspection," 21 February. Las Vegas, NV.

DOE, see U.S. Department of Energy.

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

EPA, see U.S. Environmental Protection Agency.

Fahringer, P., Stoller-Navarro Joint Venture. 2004. Memorandum to B. Iverson (SNJV) entitled, "CAU 274 Geophysics - Memorandum of Findings, Winter 2004," 30 March. 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., Nevada Division of Environmental Protection. 2004. Letter to Robert M. Bangerter (NNSA/NSO) regarding "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.

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

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

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>.

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

Nicosia, W., IT Corporation. 2003. Memorandum to M. England (IT) entitled, "Radiological Land Area Surveys of Various Locations at the Nevada Test Site for Preliminary Assessments," 3 March. Las Vegas, NV.

SAIC, see Science Applications International Corporation.

Shaw, see Shaw Environmental and Infrastructure, Inc.

SNJV, see Stoller-Navarro Joint Venture.

Science Applications International Corporation. 2003. *Surface Geophysical Survey Final Report Corrective Action Units, Nevada Test Site*, May. Prepared for Shaw Environmental, Inc. Harrisburg, PA.

Shaw Environmental and Infrastructure, Inc. 2002. *Results of Geophysical Survey, Selected FFACO Sites, Nevada Test Site*, 27 September. Sacramento, CA.

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

Stoller-Navarro Joint Venture. 2005. *Project Execution Plan*, S-N/99205--048, Rev. 0. Las Vegas, NV.

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

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002. *Industrial Sites Quality Assurance Project Plan, Nevada Test Site, Nevada*, Rev. 3, DOE/NV--372. 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. 1998. *Nevada Test Site Resource Management Plan*, DOE/NV-518. Las Vegas, NV.
- U.S. Department of Energy, Nevada Operations Office. 2000. *NV/YMP Radiological Control Manual*, Rev. 4, DOE/NV/11718-079. Prepared by Bechtel Nevada. Las Vegas, NV.
- U.S. Environmental Protection Agency. 2000. *Data Quality Objectives Process for Hazardous Waste Site Investigations*. EPA QA/G-4HW. Washington, DC.
- U.S. Environmental Protection Agency. 2001. *Integrated Risk Information System (IRIS) Database*, as accessed at <http://www.epa.gov/iris/index.html> on June 7, 2005.
- 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 23 May 2005. Prepared by S.J. Smucker. San Francisco, CA.
- 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 Acting Project Manager is Sabine Curtis. She can be contacted at (702) 295-0542.

The NNSA/NSO Task Manager is Kevin Cabble. He can be contacted at (702) 295-5000.

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 or DTRA Project Manager be contacted for further information.

Appendix C

Nevada Department of Environmental Protection Comment Response

LEO M. DROZDOFF, *Administrator*
(775) 687-4670

Administration
Facsimile (775) 687-5856

Water Quality Planning
Water Pollution Control
Facsimile (775) 687-4684

Mining Regulations and Reclamation
Facsimile (775) 684-5259

Las Vegas Office
Facsimile (702) 486-2863

STATE OF NEVADA
KENNY C. GUINN
Governor



DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION

Las Vegas Office

1771 E. Flamingo Road, Suite 121-A

Las Vegas, Nevada 89119-0837

(702) 486-2850

ALLEN BIAGGI, *Director*
Air Pollution Control
Air Quality Planning
Facsimile (775) 687-6396

Waste Management
Facsimile (775) 687-6396

Corrective Actions
Facsimile (775) 687-8335

Federal Facilities
Facsimile (702) 486-2863

Webpage <http://ndep.nv.gov>

July 6, 2005

Ms. Janet Appenzeller-Wing
Acting Director, Environmental Restoration Division
National Nuclear Security Administration
Nevada Site Office
P. O. Box 98518
Las Vegas, NV 89193-8518

RE: Review of Draft Corrective Action Investigation Plan For
Corrective Action Unit 274: Septic Systems, Nevada Test Site, Nevada
Revision 0, June 2005

The Nevada Division of Environmental Protection, Bureau of Federal Facilities (NDEP) staff reviewed the draft Corrective Action Investigation Plan for Corrective Action Unit (CAU) 274: Septic Systems, Nevada Test Site, Nevada. NDEP has not found any immediate issues or concerns.

If you have any questions, please contact Jeff MacDougall, Ph.D. at (702) 486-2865, or me at (702) 486-2874.

Sincerely,

A handwritten signature in black ink, appearing to read "Don Elle".

Don Elle, Ph.D.
Bureau of Federal Facilities

DRE/JJM/jjm

(NSPO Rev. 3-05)

ACTION	_____
INFO	_____
NSO/MGR	_____
AMEM	_____
AMNS	_____
AMSO	_____
AMSP	_____
AMSS	_____

Janet Appenzeller-Wing
Page 2
July 6, 2005

cc: K. A. Hoar, ESHD, NNSA/NSO, Las Vegas, NV
E. E. Shanholtz, DTRA/TDTNS, M/S 645, Mercury, NV
P. L. Hall, TD, NNSA/NSO, Las Vegas, NV
W. R. Griffin, SNJV/DTRA, M/S 645, Mercury, NV
D. Loewer, DTRA/TDTN, M/S 645, Mercury, NV
K. B. Campbell, BN, Mercury, NV
W. F. Johnson, BN, Las Vegas, NV
G. M. Romano, SNJV, Las Vegas, NV
T. A. Lantow, DTRA/TDTNS, M/S 645, Mercury, NV
K. Cabbie, ERD, NNSA/NSO, Las Vegas, NV
J. L. Smith, BN, Las Vegas, NV
B. C. Hoenes, SNJV, Las Vegas, NV

Library Distribution List

Copies

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office
Technical Library
P.O. Box 98518, M/S 505
Las Vegas, NV 89193-8518

1 (Uncontrolled)

U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062

1 (Uncontrolled, electronic copy)

Southern Nevada Public Reading Facility
c/o Nuclear Testing Archive
P.O. Box 98521, M/S 400
Las Vegas, NV 89193-8521

2 (Uncontrolled, electronic copies)

Manager, Northern Nevada FFACO
Public Reading Facility
c/o Nevada State Library & Archives
100 N Stewart Street
Carson City, NV 89701-4285

1 (Uncontrolled, electronic copy)