Nevada
Environmental
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Project

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National Nuclear Security Administration

Corrective Action Decision Document for Corrective Action Unit 165: Area 25 and 26 Dry Well and Washdown Areas, Nevada Test Site, Nevada

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Environmental Restoration
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CORRECTIVE ACTION DECISION DOCUMENT FOR CORRECTIVE ACTION UNIT 165: AREA 25 AND 26 DRY WELL AND WASHDOWN AREAS, NEVADA TEST SITE, NEVADA

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

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CORRECTIVE ACTION DECISION DOCUMENT
FOR CORRECTIVE ACTION UNIT 165:
AREA 25 AND 26 DRY WELL AND WASHDOWN AREAS,
NEVADA TEST SITE, NEVADA

Approved by: Signature Approved Date: 8/12/04

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Monica Sanchez, Acting Division Director
Environmental Restoration Division

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List of Acronyms and Abbreviations

ALARA	As-low-as-reasonably-achievable
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
Cd	Cadmium
CFR	*Code of Federal Regulations*
CLP	Contract Laboratory Program
cm^2	Square centimeter
Co	Cobalt
COC	Contaminants of concern
COLIWASA	Composite Liquid Waste Sampler
COPC	Contaminants of potential concern
Cs	Cesium
CSM	Conceptual site model
DOE	U.S. Department of Energy
dpm	Disintegrations per minute
DQI	Data quality indicator
DQO	Data quality objective
DRO	Diesel-range organics
E-MAD	Engine, maintenance, assembly, and disassembly
EPA	U.S. Environmental Protection Agency
ETS-1	Engine Test Stand-1

List of Acronyms and Abbreviations *(Continued)*

ETSM	Engine Transport System Maintenance
FADL	Field activity daily log
FD	Field duplicate
FFACO	*Federal Facility Agreement and Consent Order*
FSL	Field-screening level
FSR	Field-screening results
ft	Foot
FY	Fiscal year
gal	Gallon
GPS	Global positioning system
GRO	Gasoline-range organics
HCIP	Heavy cast-iron pipe
HWAA	Hazardous waste accumulation area
ICP	Inductively coupled plasma
IDL	Instrument detection limit
IDW	Investigation-derived waste
in.	Inch(es)
K	Potassium
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LD	Laboratory duplicate
m	Meter
m^2	Square meter
MCS	Media cleanup standards
MDC	Minimum detectable concentrations
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter

List of Acronyms and Abbreviations *(Continued)*

mi	Mile
mrem/yr	Millirems per year
MRL	Minimum reporting limit
MS/MSD	Matrix spike/matrix spike duplicate
NAC	*Nevada Administrative Code*
NBMG	Nevada Bureau of Mines and Geology
NCRP	National Council on Radiation Protection and Measurements
ND	Normalized difference
NDEP	Nevada Division of Environmental Protection
NIST	National Institute for Standards and Technology
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NRS	*Nevada Revised Statutes*
NTTR	Nevada Test and Training Range
NTS	Nevada Test Site
NTSWAC	Nevada Test Site Waste Acceptance Criteria
PAL	Preliminary action level
PB	Preparation blank
PCB	Polychlorinated biphenyls
pCi	Picocuries
pCi/g	Picocuries per gram
POC	Performance Objective for Certification
PPE	Personal protective equipment
ppm	Parts per million
PRG	Preliminary remediation goal
Pu	Plutonium
QA	Quality assurance

List of Acronyms and Abbreviations *(Continued)*

QAPP	Quality Assurance Project Plan
QC	Quality control
RCP	Reactor Control Point
RCRA	*Resource Conservation and Recovery Act*
ROTC	Record of Technical Change
RPD	Relative percent difference
RRF	Relative response factors
SAA	Satellite accumulation area
SCL	Sample collection log
SDG	Sample delivery group
SNJV	Stoller-Navarro Joint Venture
Sr	Stronium
SSHASP	Site-specific health and safety plan
SVOC	Semivolatile organic compounds
TCLP	Toxicity characteristic leaching procedure
TPH	Total petroleum hydrocarbons
U	Uranium
VCP	Vitrified clay pipe
VOC	Volatile organic compound
yd^3	Cubic yards
µg/kg	Micrograms per kilogram
%R	Percent recovery

Executive Summary

This Corrective Action Decision Document (CADD) has been prepared for Corrective Action Unit (CAU) 165: Area 25 and 26 Dry Well and Washdown Areas, Nevada Test Site (NTS), Nevada, in accordance with the *Federal Facility Agreement and Consent Order* (1996). Corrective Action Unit 165 is located within Areas 25 and 26 of the NTS and is comprised of the following corrective action sites (CASs):

- CAS 25-20-01 - Lab Drain Dry Well
- CAS 25-51-02 - Drywell
- CAS 25-59-01 - Septic System
- CAS 26-59-01 - Septic System
- CAS 25-07-06 - Train Decontamination Area
- CAS 25-07-07 - Vehicle Washdown
- CAS 26-07-01 - Vehicle Washdown Station
- CAS 25-47-01 - Reservoir and French Drain

The purpose of this CADD is to identify and provide a rationale for the recommendation of a corrective action alternative for each CAS within CAU 165. Corrective action investigation (CAI) activities were performed from May 20 through July 18, 2002; August 28, 2002; and March 11, 2003, as set forth in the Corrective Action Investigation Plan for CAU 165.

Analytes detected during the CAI were evaluated against appropriate preliminary action levels to determine contaminants of concern (COCs) for each CAS. Radiological measurements were compared to free-release criteria. Assessment of the data generated from investigation activities revealed the following:

- CAS 25-20-01 contains the COCs total petroleum hydrocarbons (TPH) (diesel-range organics [DRO]) and volatile organic compounds (tetrachloroethene) in the soil beneath the dry well.
- CAS 25-51-02 contains the COC TPH (DRO) in soil at the outfall and polychlorinated biphenyls (Aroclor-1254) in the pipe.
- CAS 25-59-01 contains the COCs TPH (DRO) and gasoline-range organics in the influent and effluent septic tank.
- CAS 26-59-01 contains the COC TPH (DRO) in the septic tank.

- CAS 25-07-06 contains the COCs lead and TPH (DRO) in surface soil, and cesium-137 in surface and subsurface soil surrounding the train decontamination area. The concrete decontamination pad, its surface attachments (e.g., rails), and adjacent railroad ties exceeded free-release criteria.

- CAS 25-07-07 contains the COC TPH (DRO) in surface soil surrounding the vehicle washdown area.

- No COCs were identified at CAS 26-07-01. The concrete decontamination pad did not exceed free-release criteria.

- No COCs were identified at CAS 25-47-01.

Based on the evaluation of analytical data from the CAI, review of future and current operations in Areas 25 and 26 of the NTS, and the detailed and comparative analysis of the potential corrective action alternatives, the following corrective actions were recommended for the CAU 165 CASs.

No Further Action is the preferred corrective action for CASs 25-47-01 and 26-07-01.

Clean Closure is the preferred corrective action for the following CASs:

- CAS 25-51-02 - Remove dry-well collection system pipe, pipe contents, and COC-impacted soil.

- CAS 25-59-01 - Remove septic tank contents; remove or fill cesspool and septic tank with inert material.

- CAS 26-59-01 - Remove septic tank contents; fill septic tank with inert material.

- CAS 25-07-06 - Remove train decontamination area and related surface attachments, and surrounding COC-impacted soil.

- CAS 25-07-07 - Remove vehicle washdown pad and surrounding COC-impacted soil.

Alternative 3, Closure-in-Place, is the preferred corrective action for the following sites:

- CAS 25-20-01 - Lab Drain Dry Well

The preferred corrective action alternatives were evaluated on technical merit focusing on performance, reliability, feasibility, and safety. The alternatives were judged to meet all requirements for the technical components evaluated. The alternatives meet all applicable state and federal

regulations for closure of the sites and will eliminate potential future exposure pathways to the contaminated media at CAU 165.

1.0 Introduction

This Corrective Action Decision Document (CADD) has been prepared for Corrective Action Unit (CAU) 165: Area 25 and 26 Dry Well and Washdown Areas, Nevada Test Site (NTS), Nevada, in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) that was agreed to by the State of Nevada, U.S. Department of Energy (DOE), and the U.S. Department of Defense (FFACO, 1996). This CADD provides or references the specific information necessary to recommend corrective actions for the eight corrective action sites (CASs) of CAU 165 (see Table 1-1) located within Areas 25 and 26 of the NTS, as provided in the FFACO. The NTS is approximately 65 miles (mi) north of Las Vegas, in Nye County, Nevada (Figure 1-1). The CASs within CAU 165 are shown on Figure 1-2 and Figure 1-3.

Table 1-1
CAU 165 Corrective Action Sites and Associated Facilities

Nevada Test Site Area	Corrective Action Site	CAS Description[a]	Facility Association
Area 25	25-20-01	Lab Drain Dry Well	Central Support Area
	25-51-02	Drywell	Engine Test Stand
	25-59-01	Septic System	E-MAD Facility
	25-07-06	Train Decontamination Area	
	25-07-07	Vehicle Washdown	Reactor Control Point
	25-47-01	Reservoir and French Drain	
Area 26	26-59-01	Septic System	Pluto Facility
	26-07-01	Vehicle Washdown Station	

[a]CAS description from the FFACO (1996)

1.1 Purpose

The CAU consists of a variety of CASs, including a dry well, surface outfall, two septic systems, three decontamination pads, and a reservoir with an earthen drain. All CASs within CAU 165 were found to be as described in the Corrective Action Investigation Plan (CAIP) with the exception of CASs 25-20-01 and 25-51-02. An additional inlet pipe was discovered entering the CAS 25-20-01 dry well from the east. The collection system pipe associated with CAS 25-51-02 was found to have a surface outfall rather than a dry well for a release point. The updates to these CASs are addressed in Record of Technical Change (ROTC) Number 3 to the CAIP.

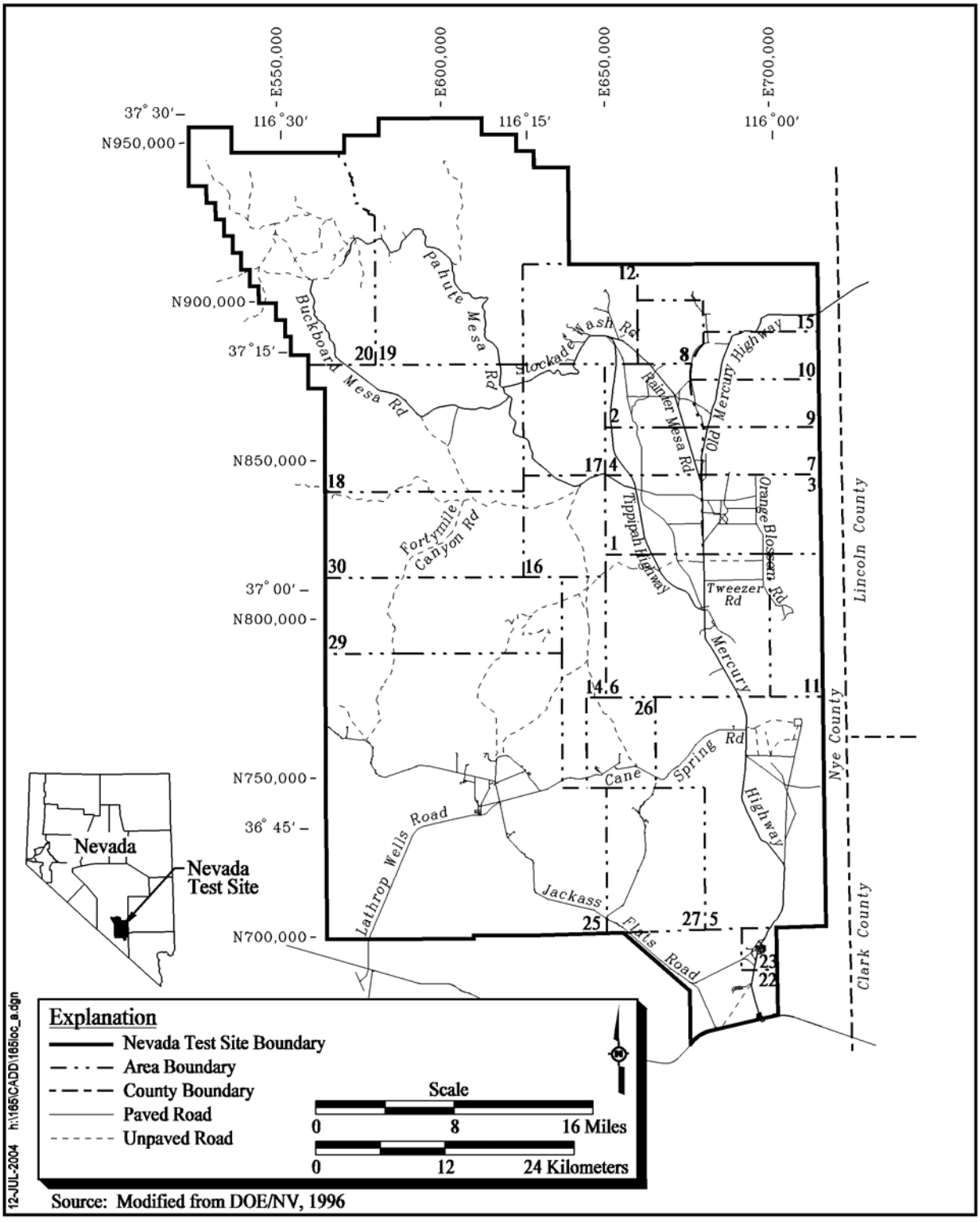

Figure 1-1
Nevada Test Site

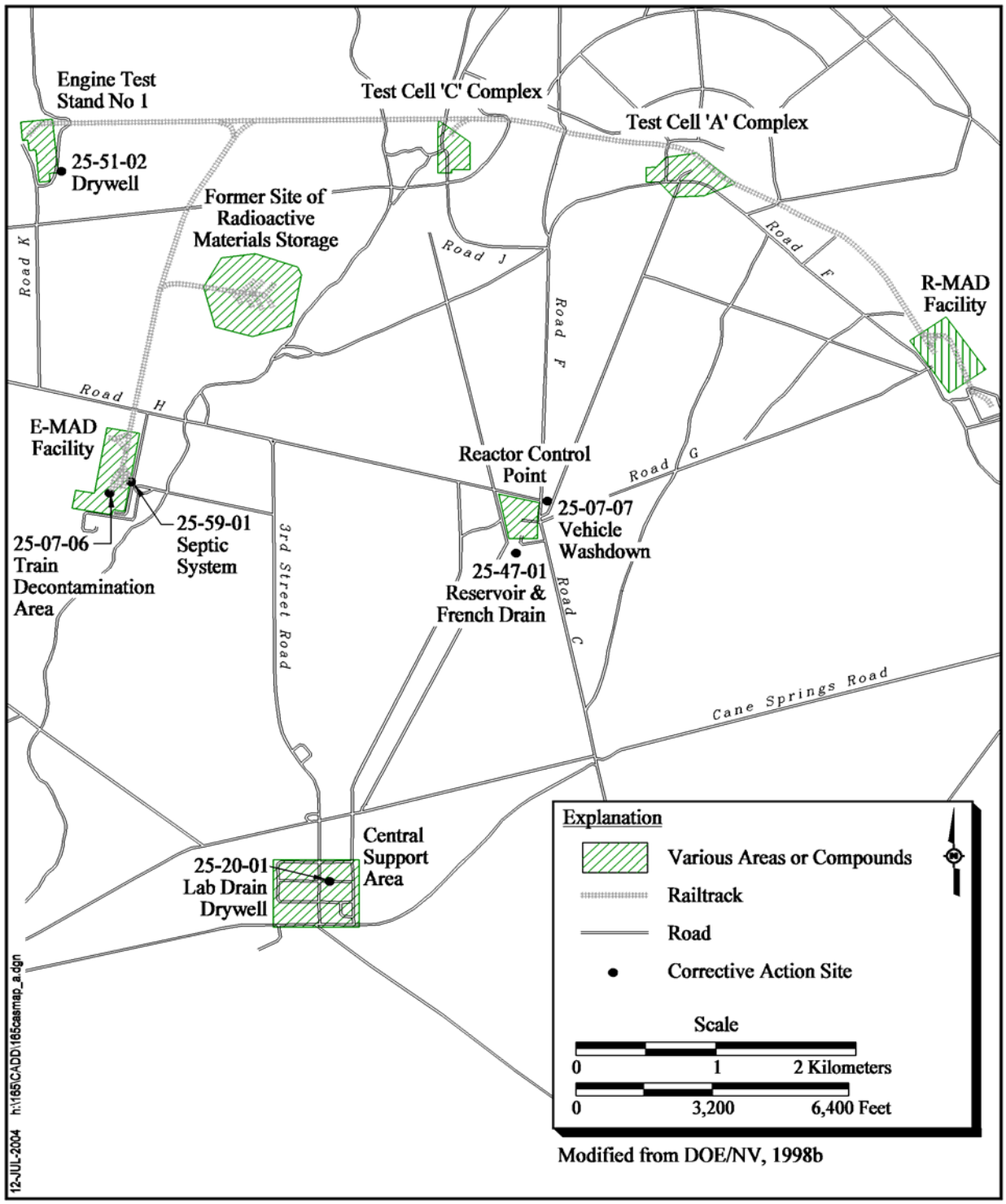

Figure 1-2
CAU 165: Area 25 Corrective Action Sites,
Nevada Test Site, Nye County, Nevada

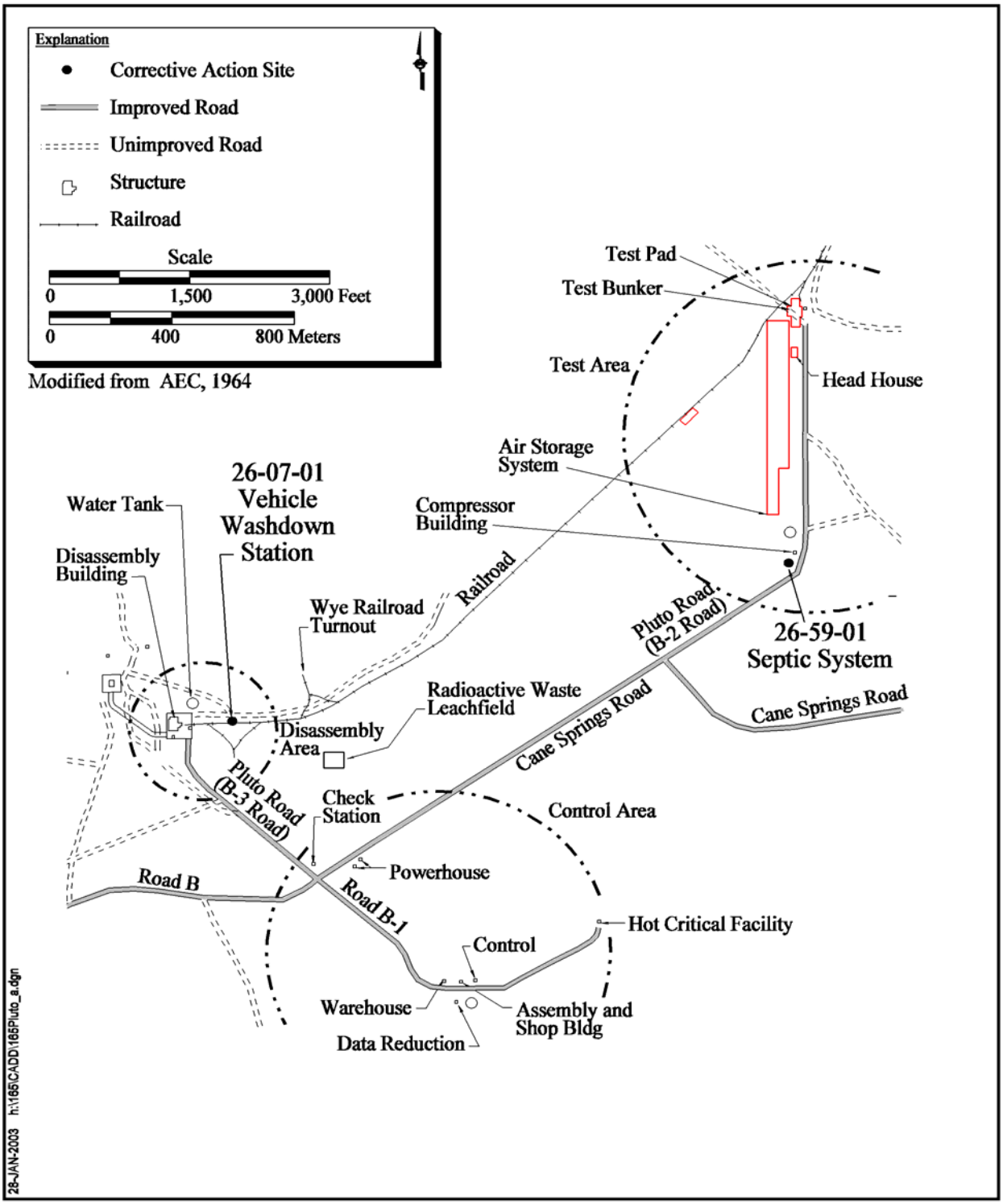

Figure 1-3
CAU 165: Area 26 Corrective Action Sites,
Nevada Test Site, Nye County, Nevada

This CADD develops and evaluates potential corrective action alternatives and provides a rationale for the selection of a recommended corrective action alternative for each CAS within CAU 165. The need for evaluation of corrective action alternatives is based on process knowledge and the results of investigative activities conducted in accordance with the CAIP. The *Corrective Action Investigation Plan for Corrective Action Unit 165: Areas 25 and 26 Dry Well and Washdown Areas, Nevada Test Site, Nevada* (NNSA/NV, 2002) provides information relating to the history, planning, and scope of the investigation that will not be repeated in this CADD.

1.2 Scope

The scope of the activities used to justify and recommend a preferred corrective action alternative for each CAS within CAU 165 includes the following:

- Evaluation of current site conditions, including the concentration and extent of contaminants of concern (COCs)
- Development of corrective action objectives commensurate with the complexity of each CAS
- Identification of corrective action alternative screening criteria
- Performance of detailed and comparative evaluations of corrective action alternatives in relation to corrective action objectives and screening criteria

1.3 Corrective Action Decision Document Contents

This CADD is divided into the following sections and appendices:

Section 1.0 - Introduction: Summarizes the purpose, scope, and contents of this CADD.

Section 2.0 - Corrective Action Investigation Summary: Summarizes the field investigation activities, the results of the investigation, and the need for corrective action at CAU 165.

Section 3.0 - Evaluation of Alternatives: Describes, identifies, and evaluates the steps taken to determine a preferred corrective action alternative for each CAS.

Section 4.0 - Recommended Alternatives: Presents the preferred corrective action alternative for each CAS and the rationale based on the corrective action objectives and screening criteria.

Section 5.0 - References: Provides a list of all references in the preparation of this CADD.

Appendix A - *Corrective Action Investigation Report for CAU 165:* Provides a description of the project objectives, field investigation and sampling activities, investigation results, waste management, and quality assurance (QA) practices.

Appendix B - *Data Assessment for CAU 165:* Provides an assessment of data obtained during the CAU 165 investigation. Also summarizes and compares the investigation results to the requirements set forth during the data quality objective (DQO) process.

Appendix C - *Cost Estimates for CAU 165:* Presents cost estimates for the construction, operation, and maintenance of each corrective action alternative evaluated for each CAS within CAS 165.

Appendix D - *Sample Location Coordinates for CAU 165:* Provides coordinates for investigation sample locations and system features.

Appendix E - *Evaluation of Risk*

Appendix F - *Project Organization for CAU 165:* Identifies the CAU 165 Project Manager and other appropriate personnel involved with the CAU 165 corrective action investigation (CAI) and closure activities for each CAS.

Appendix G - *NDEP Comments:* Contains responses to NDEP comments on the draft CADD.

The CAI was performed in accordance with the following documents:

- CAU 165 CAIP (NNSA/NV, 2002)
- Record of Technical Change No. 4 to the CAIP, which documents changes to the radiological preliminary action levels (PALs) agreed to by the Nevada Division of Environmental Protection (NDEP) and U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) (Maize, 2004).
- *Industrial Sites Quality Assurance Project Plan* (QAPP) (DOE/NV, 2002)
- FFACO (1996)

- *Project Management Plan* (DOE/NV, 1994)
- Approved standard quality practices and detailed operating procedures

2.0 Corrective Action Investigation Summary

The following sections summarize the CAU 165 investigation activities, investigation results, and identify the need for corrective action at each CAS. Detailed investigation activities and results for CAU 165 are presented in Appendix A of this document.

2.1 Investigation Activities

Corrective action investigation activities were performed as set forth in the CAU 165 CAIP (NNSA/NV, 2002) from May 20 through July 18, 2002; August 28, 2002; and March 11, 2003. The purpose of the investigation was to:

- Identify the presence and nature of contaminants of potential concern (COPCs).
- Determine whether COPCs exceed PALs, thereby becoming COCs.
- Determine the vertical and lateral extent of COCs, if present.
- Ensure adequate data have been collected to close the sites under NDEP, *Resource Conservation and Recovery Act* (RCRA), and DOE requirements.

Sufficient information was obtained to develop and evaluate corrective action alternatives for each CAS located within CAU 165. The scope of the CAI for CAU 165 included the following activities to address the decision statements:

- Removing surface materials at CASs 25-07-06, 25-07-07, and 26-07-01
- Performing surface radiological surveys at CASs 25-07-06, 25-07-07, and 26-07-01
- Collecting Global Positioning System (GPS) coordinates at sample locations and points of interest at each CAS
- Visually inspecting portions of the collection system pipes using a combination of excavations, video moles, and/or radiological surveys, as appropriate, at CASs 25-20-01, 25-51-02, 25-59-01, and 26-59-01
- Collecting and analyzing contents from the collection system pipe at CAS 25-51-02 and septic tanks at CASs 25-59-01 and 26-59-01

- Conducting exploratory excavations to confirm system configurations at CASs 25-20-01, 25-51-02, 25-59-01, and 26-59-01
- Collecting and analyzing integrity samples from the influent and effluent ends of septic tanks at CASs 25-59-01 and 26-59-01
- Collecting and analyzing soil samples from the leachrock/native soil interface at CASs 25-20-01, 25-59-01, 26-59-01, and 25-07-07
- Field-screening soil samples for volatile organic compounds (VOCs) and alpha and beta/gamma radiation at each CAS
- Collecting and analyzing soil samples to determine lateral and vertical extent of COCs, as appropriate
- Collecting and analyzing samples of investigation-derived waste (IDW), as needed, and from potential remediation waste at CAS 25-07-06 to ensure waste characterization

Conceptual Site Models

Conceptual site models (CSMs) were developed for each CAS as provided in the CAIP. With the exception of CASs 25-51-02 and 25-20-01, the system configurations and CSMs were consistent with those provided in the CAIP. At CASs 25-51-02 and 25-20-01, the configurations were determined to be different than anticipated and CAS 25-51-02 required a change in the sampling locations. These modifications are addressed in ROTC Number 3 to the CAIP (NNSA/NV, 2002). The actual configuration of CAS 25-51-02 is shown on Figure A.4-1 in Appendix A to this document. The necessary revisions are also discussed in Section A.3.4 and Section A.4.4.

Section 2.1.1 through Section 2.1.8 summarize the investigative activities conducted at each of the CAU 165 CASs. Results of the investigation validate the CSMs outlined above and presented in the CAIP for CAU 165 (NNSA/NV, 2002). Refer to Appendix B for a discussion of the CSMs with respect to data assessment.

2.1.1 Lab Drain Dry Well (CAS 25-20-01)

One variation to the dry well configuration was identified. A previously unknown 6-inch (in.) diameter vitrified clay pipe (VCP) was discovered coming into the dry well from the east. This change in configuration did not invalidate the CSM for this CAS. Biased soil samples were collected

in accordance with the CAIP. The following investigative field work was conducted at CAS 25-20-01:

- A total of 13 soil samples were collected from intervals beneath the dry well at two initial locations adjacent to the dry well and three step-out locations. Samples were collected at the leachrock/native soil interface (9 feet [ft] below ground surface [bgs]); 2.5 ft below the interface (11.5 ft bgs); and 5 ft below the interface (14 ft bgs). Three step-out locations were selected 15 ft radially from the dry well. Soil samples were collected from the step-out locations at 9 and 14 ft bgs.

- The collection system pipes were inspected for contents.

- One verification soil sample was collected from the base of a spoil pile that was not staged on a plastic liner.

- Soil samples were field screened for VOCs and alpha and beta/gamma radiation. Readings were compared to the field-screening levels (FSLs).

- Soil samples were shipped to an off-site laboratory for analyses outlined in Table A.3-1.

Investigation activities associated with CAS 25-20-01 are further detailed in Section A.3.0.

2.1.2 Drywell (CAS 25-51-02)

One variation to the drywell configuration was identified. A 6-in. VCP outfall was discovered to be the release point instead of a dry well as expected. Changes were made to the CSM and planned sampling scheme accordingly as presented in ROTC Number 3 in the CAIP. The following investigative field work was conducted at CAS 25-51-02:

- A total of 13 soil samples were collected from the vicinity of the pipe outfall at two initial locations and three step-out locations. Soil samples collected at the initial locations were from 0 to 0.5 ft, 2.5 ft, and 7.5 ft bgs, and one additional sample was collected from a whitish-colored soil layer at a depth of 1 ft bgs. The step-out locations were selected 15 ft radially from the second initial surface sample. Soil samples were collected from the step-out locations at 2.5 and 7.5 ft bgs.

- The collection system pipes were inspected for contents. Two content samples were collected and analyzed for waste management parameters.

- Soil samples were field screened for VOCs and alpha and beta/gamma radiation. Results were compared to the FSLs.
- Soil samples were shipped to an off-site laboratory for analyses as outlined in Table A.4-1.

Investigation activities associated with CAS 25-51-02 are further detailed in Section A.4.0.

2.1.3 Septic System (CAS 25-59-01)

No variations to the septic system configuration were identified. The CSM remains valid for this CAS. Biased soil samples were collected in accordance with the CAIP. The following investigative field work was conducted at CAS 25-59-01:

- A total of four soil samples were collected and analyzed. Two integrity soil samples were collected beneath the base (9 ft bgs) of the septic tank at the influent and effluent ends. One biased soil sample was collected from beneath the cesspool at the leachrock/native soil interface (16 ft bgs), and one biased soil sample was collected from 3 ft below the interface (19 ft bgs).
- The collection system piping was inspected for contents.
- A total of three septic tank content samples were collected and analyzed for waste management parameters; two from the influent chamber and one from the effluent chamber. A sample was also analyzed in the field for fecal coliform.
- Soil samples were field screened for VOCs and alpha and beta/gamma radiation. Results were compared to the FSLs.
- Soil samples were shipped to an off-site laboratory for analyses outlined inTable A.5-1.

Investigation activities associated with CAS 25-59-01 are further detailed in Section A.5.0.

2.1.4 Septic System (CAS 26-59-01)

No variations to the septic system configuration were identified. The CSM remains valid for this CAS. Biased soil samples were collected in accordance with the CAIP. The following investigative field work was conducted at CAS 26-59-01:

- A total of six soil samples were collected and analyzed. Two integrity soil samples were collected beneath the base (8 ft bgs) of the septic tank at the influent and effluent ends. Soil

samples were collected from the leachrock/native soil interface (~2.5 ft bgs) and from 2.5 ft below the interface (~5 ft bgs) at the proximal and distal ends of the leachfield.

- The collection system pipe was inspected for contents.
- One sample was collected from the contents of the single-chambered septic tank and analyzed for waste management parameters. A sample was also analyzed in the field for fecal coliform.
- Soil samples were field screened for VOCs and alpha and beta/gamma radiation. Readings were compared to the FSLs.
- Soil samples were shipped to an off-site laboratory for analyses outlined in Table A.6-1.

Investigation activities associated with CAS 26-59-01 are further detailed in Section A.6.0.

2.1.5 Train Decontamination Area (CAS 25-07-06)

No variations to the train decontamination area configuration were identified. The CSM remains valid for this CAS. Biased soil samples were collected in accordance with the CAIP. The following investigative field work was conducted at CAS 25-07-06:

- Surface radiological surveys were performed at this site. A walk-over survey was performed to provide locations for biased soil sampling. A survey of the concrete pad was conducted to determine if radiological contamination exceeded Table 4-2 of the *NV/YMP Radiological Control Manual's* unrestricted release criteria (1,000 disintegrations per minute per 100 square centimeters [dpm/100 cm^2] over background) (DOE/NV, 2000).
- A total of 29 soil samples were collected from four initial locations and 11 step-out locations. These samples were collected from 0 to 0.5 and 2.5 to 3.5 ft bgs.
- A total of 13 samples were collected and analyzed for waste management parameters: 1 composite paint sample (from three locations on the pad); 6 discreet concrete pad samples; 3 wood railroad tie samples; and 3 swipe samples of the pad surface.
- Inspection of the radioactive waste line was not performed because the access point was grouted. See Appendix A, Section A.7.1.1, for additional information.
- Soil samples were field screened for VOCs and alpha and beta/gamma radiation. Readings were compared to the FSLs.
- Soil samples were shipped to an off-site laboratory for analyses outlined in Table A.7-1.

Investigation activities associated with CAS 25-07-06 are further detailed in Section A.7.0.

2.1.6 Vehicle Washdown (CAS 25-07-07)

No variations to the vehicle washdown configuration were identified. The CSM remains valid for this CAS. Biased soil samples were collected in accordance to with the CAIP. The following investigative field work was conducted at CAS 25-07-07:

- Surface radiological surveys were performed at this site. A walk-over survey was performed to provide locations for biased soil sampling. A survey of the concrete pad was conducted to determine if radiological contamination exceeded the unrestricted release criteria of 1,000 dpm/100 cm^2 over background.
- A total of 21 biased soil samples were collected on each side of the decontamination pad, including a soil sample at the native soil/gravel interface (3 ft bgs) and one from 2.5 ft below the native soil/gravel interface (5.5 ft bgs).
- Inspection of the pipe was not performed due to lack of access points.
- Soil samples were field screened for VOCs and alpha and beta/gamma radiation. Results were compared to the FSLs.
- Soil samples were shipped to an off-site laboratory for analyses outlined in Table A.8-1.

Investigation activities associated with CAS 25-07-07 are further detailed in Section A.8.0.

2.1.7 Vehicle Washdown Station (CAS 26-07-01)

No variations to the vehicle washdown station configuration were identified. The CSM remains valid for this CAS. Biased soil samples were collected in accordance with the CAIP. The following investigative field work was conducted at CAS 26-07-01:

- Surface radiological surveys were performed at this site. Walk-over surveys were performed to provide locations for biased soil sampling. Surveys of the concrete pad were conducted to determine if radiological contamination exceeded the unrestricted release criteria of 1,000 dpm/100 cm^2 over background. Additional surveys were performed due to the presence of carbonized flecks that had elevated radiological activity. This discrete radioactive median was collected and removed, and the site was surveyed again.
- A total of 25 biased soil samples were collected and analyzed from around the perimeter of the decontamination pad. The selection of the biased soil samples were based on radiological surveys and previous analytical results. These samples were collected from 0 to 0.5 and 2.5 to 3.5 ft bgs at four initial locations, eight step-out locations, and three background locations.

- Soil samples were field screened for VOCs and alpha and beta/gamma radiation. Results were compared to the FSLs.
- Soil samples were shipped to an off-site laboratory for analyses outlined in Table A.9-1.

Investigation activities associated with CAS 26-07-01 are further detailed in Section A.9.0.

2.1.8 Reservoir and French Drain (CAS 25-47-01)

No variations to the CSM were identified at this CAS. The following investigative field work was conducted at CAS 25-47-01:

- A total of seven soil samples were collected from the reservoir and french drain at and below the historical bases of these features based on known and observed site conditions (e.g., stratigraphy, adjacent systems).
- Soil samples were field screened for VOCs and alpha and beta/gamma radiation. Readings were compared to the FSLs.
- Soil samples were shipped to an off-site laboratory for analyses outlined in Table A.10-1.

Investigation activities associated with CAS 25-47-01 are further detailed in Section A.10.0.

2.2 Results

A summary of investigation data from the CAI are provided in Section 2.2.1. This information illustrates the degree of evaluation accomplished through the CAI and identifies those COPCs that exceeded PALs for soil and regulatory action levels for disposal of concrete, wood, paint, and pipe/septic tank contents. Section 2.2.2 summarizes the assessment made in Appendix B, which demonstrates the correlation between the investigation results and the DQOs.

2.2.1 Summary of Investigation Data

Chemical and radiological results for sample concentrations exceeding PALs in each of the CASs are presented in Section 2.2.1.1 through Section 2.2.1.8. Discussion of the PALs are presented in Section 3.1.

Pipe contents, septic tank contents, concrete, wood, and paint were sampled and analyzed to support disposal of these contents and media during anticipated closure activities. Content and other media samples were analyzed to compare analytical results to the established NTS Waste Acceptance Criteria (NTSWAC).

Details about the methods used during the investigation and a comparison of environmental sample results to the PALs are presented in Appendix A. Sample locations that support the presence and/or extent of contamination at each site are shown in Appendix A figures. Based on these results, the nature and extent of COCs at CAU 165 have been adequately identified to develop and evaluate corrective action alternatives.

The CAI analytical results, organized by CAS, are summarized in the following sections.

2.2.1.1 Lab Drain Dry Well (CAS 25-20-01)

Analytical results for soil samples collected at this CAS indicated that COCs are present in the soil at this site.

The COCs total petroleum hydrocarbon (TPH) diesel-range organics (DRO) and tetrachloroethene were found in soils beneath the dry well. The highest concentrations were detected at the base of the dry well (i.e., leachrock/native soil interface at 9 ft bgs). The concentrations decreased with depth, and were below PALs within 2.5 ft vertically of the dry well base. The overlying soil surrounding the dry well was field screened during excavation and no elevated FSLs were observed supporting that COCs are not present above the base of the dry well. Sample results from the step-out locations (A03, A04, and A05) indicate tetrachloroethene concentrations have not migrated 15 ft laterally in significant concentrations. Tetrachloroethene has shorter carbon chains than TPH (DRO) and its specific gravity is 1.63, while that of TPH (DRO) is less than 1.0 (HHS, 1994); therefore, tetrachloroethene is more mobile than TPH (DRO). The extent of TPH (DRO) is limited to within that of the tetrachloroethene (i.e., less than 15 ft laterally).

Analytical results associated with CAS 25-20-01 are further detailed in Section A.3.0.

2.2.1.2 Drywell (CAS 25-51-02)

Analytical results for soil samples collected at this CAS indicated that COCs are present in the soil and pipe contents at this site.

Concentrations of polychlorinated biphenyls (PCBs) ranging from 1,600 to 1,800 milligrams per kilogram (mg/kg) were identified in the pipe contents at locations B01 and B02. These concentrations exceed the PAL of 1 mg/kg for soil. The TPH (DRO) at 1,800 mg/kg was identified in soil at sample location B04 at a depth of 2.5 to 3.5 ft bgs, which is above the PAL of 100 mg/kg. The concentrations decreased with depth, and were below the PAL at the next sample horizon (7.5 to 8.5 ft bgs). The overlying soil at B04 (from the surface to 2.5 ft bgs) did not indicate COCs. Sample results from the step-out locations (B03, B05, B06, and B07) indicate TPH concentrations have not migrated 15 ft laterally.

2.2.1.3 Septic System (CAS 25-59-01)

Only the contents of the septic tank contain COCs. No COCs were identified in the soil surrounding the septic tank or under the cesspool. Total petroleum hydrocarbons above the NDEP action level of 100 mg/kg for TPH (DRO and gasoline-range organics [GRO]) are located in both chambers of the septic tank. The sludge was negative for fecal coliform bacteria. A total of approximately 220 gallons (gal) of sludge remain in the two chambers of the septic tank.

2.2.1.4 Septic System (CAS 26-59-01)

Only the contents of the septic tank contain COCs. No COCs were identified in the soil surrounding the septic tank or under the leachfield. The TPHs exceeding the NDEP regulatory action level of 100 mg/kg are located within the septic tank. The sludge was positive for fecal coliform bacteria. Approximately 143 gal of sludge remain in the single-chamber tank.

2.2.1.5 Train Decontamination Area (CAS 25-07-06)

A surface radiation survey identified areas on the concrete decontamination pad, related surface attachments, and railroad ties adjacent to the pad that exceeded Table 4-2 of the *NV/YMP Radiological Control Manual's* unrestricted release criteria (1,000 dpm/100 cm^2 over background)

(DOE/NV, 2000). The pad was characterized for disposal. Wooden railroad ties immediately adjacent to the pad were sampled and a number of analytes were above minimum reporting limits (MRLs); however, all were below the sanitary NTS disposal criteria (NDEP, 1997a and b). Samples were collected from the painted surface of the pad, and cesium (Cs)-137 was detected at concentrations above the sanitary NTS disposal criteria (NDEP, 1997a and b). Painted surfaces were also swiped for PCB contamination, but no PCBs were detected. The concrete samples had a number of analytes above MRLs; however, none exceeded the sanitary NTS disposal criteria (NDEP, 1997a and b). If the concrete pad is broken for disposal and managed as waste, it will be considered low-level radioactive waste.

A surface radiation survey was also performed on the surface soils surrounding the decontamination pad to identify areas of elevated activity. The areas of elevated activity were selected for sampling. Based on analytical results, COCs were identified in the surface soil surrounding the decontamination pad. At sample location E03, lead and Cs-137 were detected from 0 to 0.5 ft bgs at concentrations exceeding the PALs and toxicity characteristic leaching procedure (TCLP) lead was detected above the disposal regulatory limit. The interval sampled at 2.5 to 3.5 ft bgs did not indicate COCs. Step-out location E09 (15 ft north) did not indicate COCs. The waste associated with location E03 will be considered mixed waste if removed/disposed.

At sample location E07, TPH (DRO) was detected above the PAL and disposal regulatory limit in the surface soil. Cesium-137 was detected at a concentration exceeding the PAL in the 2.5 to 3.5 ft bgs sample interval. Step-out locations E10 and E11, 10 ft east and west of E07, did not indicate COCs.

The COC Cs-137 was found in surface soil at locations E01, E02, E03, and E05. The interval sampled at 2.5 to 3.5 ft bgs did not indicate COCs at these locations. Step-out locations E06, E08, E09, E12, E13, E14, and E15 did not indicate COCs at 0 to 0.5 bgs or 2.5 to 3.5 ft bgs.

The decontamination pad, related surface attachments, and adjacent railroad ties are considered contaminated with COCs.

2.2.1.6 Vehicle Washdown (CAS 25-07-07)

Radiological surveys were conducted on the vehicle washdown pad to identify areas with elevated radiological activity (i.e., results in excess of the unrestricted release criteria of 1,000 dpm/100 cm^2 over background). No elevated areas were detected; therefore, additional samples were not collected.

A surface radiation survey was also performed on the soils surrounding the decontamination pad; however, no areas of elevated activity were detected to bias sample locations. The COC TPH (DRO) was found in surface soils (0 to 0.5 ft bgs) on all sides of the pad at locations F01, F02, F03, F04, and F06. The TPH concentrations decreased with depth at these locations and were below the PAL within 2.5 ft bgs. Sample results from the step-out locations (i.e., F09, F10, F11, and F12) indicate TPH concentrations do not exceed the PAL beyond 15 ft laterally from the pad.

2.2.1.7 Vehicle Washdown Station (CAS 26-07-01)

Radiological surveys were conducted on the decontamination pad and transite awning to identify elevated radiological areas of activity (i.e., results in excess of the unrestricted release criteria of 1,000 dpm/100 cm^2 over background). The presence of a discrete radioactive media (carbonized flecks) was discovered on the concrete pad during the survey process. The flecks were removed and the surface was resurveyed to verify that no residual contamination was present. Swipe samples and the verification survey results indicated that no contamination readings exceeding the *NV/YMP Radiological Control Manual* Table 4-2 limits (DOE/NV, 2000) were present; therefore, no concrete or transite was sampled for laboratory analysis.

The radiological walk-over survey was also performed to determine if radiological contamination is present in surficial soil at concentrations statistically greater than surficial soil from undisturbed background locations. The results of this survey indicate locations of radiological surface contamination. The elevated radiation emission can be directly attributed to the presence of the carbonized flecks. The radioactive media was collected and removed, and the site was surveyed again. The results did not indicate any locations of radiological surface contamination.

These data were used to focus CAI efforts on biased sampling locations. No COCs were identified in the surface soil.

2.2.1.8 Reservoir and French Drain (CAS 25-47-01)

There were no COCs identified in the soil at this CAS.

2.2.2 Data Assessment Summary

An assessment of CAU 165 investigation results determined that the data collected met the DQOs and supported its intended use in the decision-making process. This assessment, provided in Appendix B, includes an evaluation of the data quality indicators (DQIs) to determine the degree of acceptability and usability of the reported data in the decision-making process. Additionally, a reconciliation of the data with the CSMs established for this project was conducted. Conclusions were based on the results of the quality control measurements and are discussed in Section A.12.0 of Appendix A and also in Appendix B.

The overall results of the assessment indicate that the DQI goals for precision, accuracy, completeness, representativeness, and comparability have been achieved. Precision and accuracy of the datasets were demonstrated to be within acceptable limits for a high percentage of the data with the exception of mercury and metals measurements for precision. The low percent precision for mercury is attributed to sample 165B006 and the associated field duplicate (FD) (sample 165B308) being qualified as nondetect because of laboratory blank contamination. The laboratory blank contamination caused a high relative percent difference (RPD). Sample 165D001 and the associated FD sample (165D302) were analyzed at different dilutions. Accurate RPD measurements cannot be evaluated from different dilutions. The low FD percent precision for metals is attributed to the FD sample (165E305 and its sample [165E011]) failing to meet the RPD criteria.

In accordance with the CAU 165 CAIP, 100 percent completeness of critical analytes (TPH [DRO], PCBs, beryllium, cesium [Cs]-137, cobalt [Co]-60, strontium [Sr]-90, and isotopic uranium [U]) has been met and 80 percent completeness of noncritical analytes has been met. Therefore, completeness objectives for this CAU have been achieved. Rejected data were reviewed and questions concerning these data have been addressed in Appendix B.

Representativeness of site evaluation was demonstrated with the CAU 165 data. An evaluation of comparability provides high confidence that the datasets for this project are comparable to other NTS projects and other data generated by accepted industry standards. The evaluation also ensures that

project data are comparable to PALs and regulatory disposal limits. Data were analyzed per SW-846 protocol, meeting specifications noted in the CAIP (NNSA/NV, 2002). Achieving all of the DQI goals supports acceptance of the CAU 165 datasets, thereby meeting the DQOs established for this project and the subsequent use of these data in the decision-making process.

2.3 Need for Corrective Action

Analytes detected during the CAI were evaluated against PALs to determine COCs for each CAS in CAU 165. These CAS-specific COCs are provided in the following sections. Septic tanks must be closed according to the nature of any contents. Septic tanks containing regulated hazardous or hydrocarbon constituents must be closed in accordance with *Nevada Administrative Code* (NAC) 444.818 (NAC, 2000b). The NAC 444.818(9) states, "...an abandoned septic tank may be pumped, removed and disposed of. An abandoned septic tank must be filled with dirt or sand after being pumped. An excavation site created by the removal of a septic tank must be backfilled with suitable material that is compatible to the intended future use of the site."

The identification of material exceeding unrestricted release criteria, COCs in surface and subsurface soil, and contaminants of regulatory concern in septic tanks and pipes contents require that corrective action alternatives be considered and evaluated. The impacted volume/characteristics and site-specific constraints are provided in each CAS-specific section. The corrective action alternatives are identified in Section 3.0 and evaluated for their ability to ensure protection of the public and the environment in accordance with NAC 445A (NAC, 2000c), feasibility, and cost effectiveness.

2.3.1 Lab Drain Dry Well (CAS 25-20-01)

The COCs at this CAS have been identified as VOCs and TPH (DRO). Approximately 70 cubic yards (yd^3) of soil and leachrock contaminated with D039-listed hazardous material (tetrachloroethene) are present beneath the Lab Drain Dry Well. This total includes the hydrocarbon-contaminated soil volume. No COCs were identified within the collection system pipe.

Site-specific features that would constrain remediation at this CAS include nearby utilities and activities in Building 4125.

2.3.2 Drywell (CAS 25-51-02)

The COCs at this CAS have been identified as TPH (DRO) in the soil and PCBs (Aroclor-1254) in the pipe. Approximately 197 yd^3 of soil contaminated with hydrocarbons are present within the outfall area soils.

Approximately 90 linear ft of Duriron pipe and 230 linear ft of VCP contains limited volumes of PCB-impacted sediment. The PCB concentrations do not exceed land-disposal restrictions.

Site-specific features that would constrain remediation at this CAS include nearby utilities and the fence at the Engine Test Stand-1 (ETS-1).

2.3.3 Septic System (CAS 25-59-01)

No COCs were identified in the soil surrounding the septic tank or under the cesspool. Total petroleum hydrocarbons exceeding the NDEP regulatory action level of 100 mg/kg are located within the septic tank sludge. Approximately 220 gal of this material remain in both chambers of the septic tank. The influent chamber contains approximately 175 gal of sludge and the effluent chamber contains approximately 45 gal of sludge.

The septic tank contents should be removed for proper disposal and the tank must either be backfilled with inert material or removed for proper disposal and the resulting void backfilled with clean soil.

Site-specific topographic features that may constrain remediation at this CAS include a slope on the western side of the septic tank and the proximity of Building 3901.

2.3.4 Septic System (CAS 26-59-01)

No COCs were identified in the soil surrounding the septic tank or under the leachfield or in the collective system pipes. Total petroleum hydrocarbons exceeding the NDEP regulatory action level of 100 mg/kg are located within the septic tank. Approximately 143 gal of dry sludge remain in the single-chamber tank.

The septic tank contents should be removed for proper disposal. The tank must either be backfilled with inert material or removed for proper disposal and the resulting void backfilled with clean soil.

There are no site-specific issues that would constrain remediation at this CAS.

2.3.5 Train Decontamination Area (CAS 25-07-06)

The COC identified in the surface (0 to 0.5 ft bgs) and subsurface (greater than 0.5 ft bgs) soil surrounding the decontamination pad are lead (characteristic hazardous), TPH (DRO), and Cs-137. The locations and volumes of contaminated soil are estimated to be the following:

- 50 yd^3 of surface soil contaminated with Cs-137 will be removed in the area around sample locations E01 and E05. Removal of the contaminated soil will require disposing the soil as low-level waste.
- 22 yd^3 of surface soil contaminated with Cs-137 will be removed in the area around sample location E02. Removal of the contaminated soil will require disposing the soil as low-level waste.
- 31 yd^3 of surface soil contaminated with Cs-137 and characteristic hazardous lead is present in the area around sample location E03. Removal of the contaminated soil will require disposing the soil as mixed waste.
- 53 yd^3 of surface and subsurface soil contaminated with TPH (DRO) and Cs-137 is present around sample location E07. Removal of the contaminated soil will require disposing the soil as mixed waste.

In addition to the removal of contaminated soil, the following surface material exceeded unrestricted release criteria; therefore, the following estimated volumes will be removed and appropriately disposed:

- 103 yd^3 of the concrete decontamination pad will be removed and disposed of as low-level waste.
- 125 linear ft of 6-in. diameter piping and the floor drain and piping related to the former decontamination facility are also assumed to exceed unrestricted release criteria and will either be removed and disposed of as low-level waste or capped.
- 220 linear ft of 4-in. diameter, hollow, steel railing will be removed and disposed of as construction waste.
- 2.5 yd^3 of wood railroad ties will be removed and disposed of as industrial waste.
- 272 linear ft of steel railroad tracks will be removed and disposed of as construction waste.

There are no site-specific constraints that would impede remediation at this CAS.

2.3.6 Vehicle Washdown (CAS 25-07-07)

No COCs were identified within the collective system pipe. The concrete pad did not exceed unrestricted release criteria. The COC TPH (DRO) was found in surface soils on all sides of the concrete decontamination pad. Approximately 130 yd^3 of hydrocarbon-contaminated soil is present at this site. Removal of the contaminated soil will require the soil be disposed of as hydrocarbon waste.

There are no site-specific constraints that would impede remediation at this CAS.

2.3.7 Vehicle Washdown Station (CAS 26-07-01)

No COCs were identified in the soil at this site. Results of the radiological surveys of the concrete pad and transite awning (the only structures at the CAS) were below the unrestricted release criteria. Therefore, no further action is required for this site.

2.3.8 Reservoir and French Drain (CAS 25-47-01)

Based on analytical results, no COCs are present in soil at this site. Therefore, no further action is required for this site.

3.0 Evaluation of Alternatives

The purpose of this section is to present the corrective action objectives for CAU 165, describe the general standards and decision factors used to screen the corrective action alternatives, and develop and evaluate a set of corrective action alternatives that could be used to meet the corrective action objectives.

3.1 Corrective Action Objectives

The cleanup goals (e.g., media cleanup standards [MCS]) for CAU 165 are based on the PALs for organic and inorganic contaminants presented in Appendix A of the CAIP and the PALs for radiological contaminants listed in Table 3-3 of the ROTC No. 4 to the CAIP. Laboratory results equal to or greater than the PALs indicate the presence of COCs at levels that require corrective action.

For this CAU, U.S. Environmental Protection Agency (EPA) *Region IX Industrial Preliminary Remediation Goals* (PRGs) (EPA, 2000), are the basis for establishing the PALs for chemical contaminants under NAC 445A.2272 (NAC, 2000d). The PRGs are derived from the Integrated Risk Information System and are regulatory based. Background concentrations for naturally occurring metals (NBMG, 1998; Moore, 1999) that exceed PRGs were substituted for the PRGs. The PALs for radiological contaminants are dose-based and are taken from the recommended screening limits for construction, commercial, and industrial land-use scenario in Table 2.1 of the National Council on Radiation Protection and Measurements (NCRP) Report No. 129 (1999), scaled from 25- to 15-millirem per year (mrem/yr) dose, and the generic guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993).

Potassium (K)-40 is a naturally occurring unstable isotope of potassium with a half-life of 1.3 x 10E+09 years. Potassium-40 represents approximately 0.0118 percent of natural potassium. Because of the high abundance of potassium in the environment, K-40 is the predominant radionuclide in soil, foods, and human tissues. The average human male contains approximately 100,000 picocuries (pCi) of K-40. The human body strictly regulates the potassium content within the body and is not

influenced by variations in environmental levels. Therefore, the internal dose from K-40 remains constant.

In addition, the only mechanism for K-40 to be a contaminant is through concentration. There are no reported activities at the NTS that would have concentrated K-40 or released it as a contaminant. Therefore, K-40 will not be evaluated in this CADD.

3.2 Screening Criteria

The screening criteria used to evaluate and select the preferred corrective action alternatives are identified in the EPA *Guidance on RCRA Corrective Action Decision Documents* (EPA, 1991) and the *Final RCRA Corrective Action Plan* (EPA, 1994).

Corrective action alternatives will be evaluated based on four general corrective action standards and five remedy selection decision factors. All corrective action alternatives must meet the general standards to be selected for evaluation using the remedy selection decision factors.

The general corrective action standards are as follows:

- Protection of human health and the environment
- Compliance with media cleanup standards
- Control the source(s) of the release
- Compliance with applicable federal, state, and local standards for waste management

The remedy selection decision factors are as follows:

- Short-term reliability and effectiveness
- Reduction of toxicity, mobility, and/or volume
- Long-term reliability and effectiveness
- Feasibility
- Cost

3.2.1 Corrective Action Standards

The following text describes the corrective action standards used to evaluate the corrective action alternatives.

Protection of Human Health and Environment

Protection of human health and the environment is a general mandate of the RCRA statute (EPA, 1994). This mandate requires that the corrective action include any necessary protective measures. These measures may or may not be directly related to media cleanup, source control, or management of wastes. The corrective action alternatives are evaluated for the ability to meet corrective action objectives as defined in Section 3.1.

Compliance with Media Cleanup Standards

Each corrective action alternative must have the ability to meet the proposed MCSs. For the purpose of evaluating corrective action alternatives, the MCSs are defined as the corresponding PALs as set forth in applicable state and federal regulations, and as specified in the CAIP (NNSA/NV, 2002).

Control the Source(s) of the Release

An objective of a corrective action remedy is to stop further environmental degradation by controlling or eliminating additional releases that may pose a threat to human health and the environment. Unless source control measures are taken, efforts to clean up releases may be ineffective or, at best, will essentially involve a perpetual cleanup. Therefore, each corrective action alternative must use an effective source control program to ensure the long-term effectiveness and protectiveness of the corrective action.

Comply with Applicable Federal, State, and Local Standards for Waste Management

During implementation of any corrective action alternative, all waste management activities must be conducted in accordance with applicable state and federal regulations (e.g., *Nevada Revised Statues* [NRS] 459.400-459.600, "Disposal of Hazardous Waste" [NRS, 1998]; 40 *Code of Federal Regulations* [CFR] 260-282, "RCRA Regulations" [CFR, 2002a]; 40 CFR 761.61, "PCB Remediation Waste" [CFR, 2002b]; NAC 444, "Sanitation" [NAC, 2000a]; and NAC 459.9974, "Disposal and Evaluation of Contaminated Soil" [NAC, 2000e]). The requirements for management of the waste, if any, derived from the corrective action will be determined based on applicable state and federal regulations, field observations, process knowledge, analytical results and data collected and analyzed during corrective action implementation. Administrative controls (e.g., decontamination procedures and corrective action strategies) will minimize waste generated during

site corrective action activities. Decontamination activities will be performed in accordance with approved procedures and will be designated according to the COCs present at the site.

3.2.2 Remedy Selection Decision Factors

The following text describes the remedy selection decision factors used to evaluate the corrective action alternatives.

Short-Term Reliability and Effectiveness

Each corrective action alternative must be evaluated with respect to its effects on human health and the environment during implementation of the corrective action. The following factors will be addressed for each alternative:

- Protection of the community from potential risks associated with implementation, such as fugitive dusts, transportation of hazardous materials, and explosion
- Protection of workers during implementation
- Environmental impacts that may result from implementation
- The amount of time until the corrective action objectives are achieved

Reduction of Toxicity, Mobility, and/or Volume

Each corrective action alternative must be evaluated for its ability to reduce the toxicity, mobility, and/or volume of the contaminated media. Reduction in toxicity, mobility, and/or volume refers to changes in one or more characteristics of the contaminated media by the use of corrective measures that decrease the inherent threats associated with that media.

Long-Term Reliability and Effectiveness

Each corrective action alternative must be evaluated in terms of risk remaining at the CAU after the corrective action alternative has been implemented. The primary focus of this evaluation is on the extent and effectiveness of the control that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

Feasibility

The feasibility criterion addresses the technical and administrative feasibility of implementing a corrective action alternative and the availability of services and materials needed during implementation. Each corrective action alternative must be evaluated for the following criteria:

- Construction and Operation. Refers to the feasibility of implementing a corrective action alternative given the existing set of waste and site-specific conditions.
- Administrative Feasibility. Refers to the administrative activities needed to implement the corrective action alternative (e.g., permits, public acceptance, rights of way, off-site approval).
- Availability of Services and Materials. Refers to the availability of adequate off-site and on-site treatment, storage capacity, disposal services, necessary technical services and materials, and prospective technologies for each corrective action alternative.

Cost

Costs for each alternative are estimated for comparison purposes only. The cost estimate for each corrective action alternative includes both capital and operation and maintenance costs, as applicable. The following is a brief description of each component:

- Capital Costs. These costs include both direct and indirect costs. Direct costs may consist of materials, labor, mobilization, demobilization, site preparation, construction materials, equipment purchase and rental, sampling and analysis, waste disposal, and health and safety measures. Indirect costs include such items as engineering design, permits and/or fees, start-up costs, and any contingency allowances.
- Operation and Maintenance. These costs include labor, training, sampling and analysis, maintenance materials, utilities, and health and safety measures.

Cost estimates for the corrective action alternatives are provided in Appendix C.

3.3 Development of Corrective Action Alternatives

This section identifies and briefly describes the viable corrective action technologies and the corrective action alternatives considered for the affected media. Based on the review of existing data, future use, and current operations at the NTS, the following alternatives have been developed for consideration at CAU 165:

- Alternative 1 - No Further Action
- Alternative 2 - Clean Closure
- Alternative 3 - Closure in Place with Administrative Controls

Other technologies, such as bioremediation, were considered. However, it would not be effective because of the limited volume and concentrations of contaminated material. These alternatives will not receive further consideration in this CADD. Table 3-1 summarizes the corrective action alternatives evaluated for each CAS.

Table 3-1
Corrective Action Alternatives for CAU 165 CASs

Corrective Action Site	Alternative 1	Alternative 2	Alternative 3
CAS 25-20-01	X	X	X
CAS 25-51-02	X	X	X
CAS 25-59-01	X	X	
CAS 26-59-01	X	X	
CAS 25-07-06	X	X	X
CAS 25-07-07	X	X	X
CAS 26-07-01	X		
CAS 25-47-01	X		

3.3.1 Alternative 1 - No Further Action

Under the No Further Action Alternative, no corrective action activities will be implemented. This alternative is a baseline case with which to compare and assess the other corrective action alternatives and their ability to meet the corrective action standards. The No Further Action Alternative is appropriate for CASs 25-47-01 and 26-07-01, because no COCs were identified during the CAI.

3.3.2 Alternative 2 - Clean Closure

For septic tanks, Alternative 2 includes removal and proper disposal of the septic tank contents. The influent and effluent ends of the septic tanks will be grouted. The septic tanks will be rinsed and the rinsate will be analyzed. The septic tanks will then be filled with an inert material.

For contaminated surface and subsurface soil, Alternative 2 includes excavating and disposing of soil and debris with COCs. Any clean overburden soil will be removed to expose contaminated soil and all impacted soil will be removed. Contaminated media with activity exceeding the unrestricted

release criteria will also be excavated and disposed. A visual inspection will be conducted to ensure that debris and visible contamination have been removed. Verification soil samples will also be collected and analyzed for the presence of COCs. This will verify that the removal of COCs is complete.

Any contaminated material that is removed will be disposed of at an appropriate disposal facility. All excavated areas will be returned to surface conditions compatible with the intended future use of the site. Overburden soil, along with additional clean fill, will be used to backfill excavations after removal of the contaminated soil. Clean borrow soil will be removed from a nearby location for placement in voids, as necessary.

The following subsections provide appropriate CAS-specific information regarding Alternative 2, Clean Closure.

3.3.2.1 Lab Drain Dry Well (CAS 25-20-01)

Alternative 2 includes removal and proper disposal of the soil impacted by COCs, leachrock from the dry well, and the dry well structure. Pipe above the impacted soil will be removed and properly disposed and the remaining ends will be grouted. Clean overburden soil will be removed and staged on site, as feasible.

Verification samples will be collected and analyzed for site-specific COCs to ensure adequate removal of contaminated soil. All void space(s) will be backfilled with clean overburden soil. This CAS will be closed in accordance with NAC 445A (NAC, 2000c), as described in this section.

3.3.2.2 Drywell (CAS 25-51-02)

Alternative 2 includes removal and proper disposal of the collection system pipe and its contents, and removal and proper disposal of the contaminated soil from the pipe outfall location (B04).

A visual determination will be made to ensure that all contaminated soil has been removed, as applicable. Verification samples will be collected and analyzed for site-specific COCs (TPH-DRO) to ensure adequate removal of contaminated soil. All void space(s) will be backfilled with clean soil,

as necessary. This CAS will be closed in accordance with NAC 445A (NAC, 2000c), as described in this section.

3.3.2.3 Septic System (CAS 25-59-01)

Alternative 2 includes removal and proper disposal of sludge from the septic tank. The septic tank will be rinsed and the rinsate will be analyzed. The influent and effluent ends of the septic tank will be grouted. The septic tank will be filled with an inert material. The cesspool will either be removed or also be filled with an inert material (e.g., grout) and backfilled.

This CAS will be closed in accordance with NAC 445A (NAC, 2000c), as described in this section.

3.3.2.4 Septic System (CAS 26-59-01)

Alternative 2 includes removal and proper disposal of sludge waste from the septic tank. The septic tank will be rinsed and the rinsate will be analyzed. The influent and effluent ends of the septic tank will be grouted. The septic tank will be filled with an inert material.

This CAS will be closed in accordance with NAC 445A (NAC, 2000c), as described in this section.

3.3.2.5 Train Decontamination Area (CAS 25-07-06)

Alternative 2 includes removal and proper disposal of the concrete decontamination pad, safety railings, waste line, floor drain, wooden railroad ties, railroad tracks, and surrounding soil contaminated with COCs.

Verification samples will be collected and analyzed for area-specific COCs to ensure removal of contaminated soil. All void spaces will be backfilled with clean soil, as necessary. This CAS will be closed in accordance with NAC 445A (NAC, 2000c), as described in this section.

3.3.2.6 Vehicle Washdown (CAS 25-07-07)

Alternative 2 includes removal and proper disposal of the COC-contaminated soil around the concrete decontamination pad. The TPH concentrations may have migrated under the concrete decontamination pad, thus removal of the pad and underlying soil is recommended.

Verification samples will be collected and analyzed for site-specific COCs to ensure removal of contaminated soil. All void spaces will be backfilled with clean soil. This CAS will be closed in accordance with NAC 445A (NAC, 2000c), as described in this section.

3.3.3 Alternative 3 - Close in Place with Administrative Controls

Alternative 3 will use administrative controls to prevent inadvertent contact with COCs and contaminated media with activity exceeding the unrestricted release criteria. These controls would consist of use restrictions to minimize access and prevent unauthorized intrusive activities. The future use of the CAU would be restricted from any activity that would alter or modify the containment control unless appropriate concurrence was obtained from NDEP. The combination of these measures will effectively prevent inadvertent intrusive activities by humans and native wildlife and mobilization of COCs. This alternative has not been applied to CASs 25-59-01 and 26-59-01 because COCs are limited in volume and are contained within the septic tanks, and the contents would not be regulated for disposal as either PCB or hazardous waste.

The following subsections provide appropriate CAS-specific information regarding Alternative 3, Close in Place with Administrative Controls.

3.3.3.1 Lab Drain Dry Well (CAS 25-20-01)

Alternative 3 includes administrative controls, filling the dry well with an inert material to eliminate the void space, and grouting the pipes leading to the dry well.

The following evaluation of NAC 445A.227 (2) (a-k) (NAC, 2000c) supports the protection of groundwater from COCs at this CAS:

a. Depth to groundwater at the nearest well (J-11) is approximately 1,040 ft bgs (USGS, 1995). This well is located approximately 0.25 mi northeast of this CAS. Groundwater flow is generally to the southwest and may discharge at Ash Meadows (SNPO, 1970).

b. The distance to the nearest active water-supply well (J-12) is approximately 6 mi west-southwest of this CAS (DOE/NV, 1998a). Well J-12 is primarily used to provide potable water for Area 25. Groundwater flow is generally to the southwest (Laczniak et al., 1996).

c. Soil type at this site is generally poorly graded, moderately consolidated, alluvial silty sands with gravel and some cobble-sized volcanic detritus.

d. Average annual precipitation for valleys in the South-Central Great Basin ranges from 3 to 6 in. (Winograd and Thordarson, 1975). Annual evaporation is roughly 5 to 25 times the annual precipitation (Winograd and Thordarson, 1975). The high potential evaporation and low precipitation rates create a negative water balance for the area; therefore, no driving force associated with precipitation is available to mobilize COCs vertically.

e. TPH-DRO and tetrachloroethene are present in the soil underneath the dry well. Downward migration of the COCs is slowed by the following parameters:

- Volume of release – it is assumed that small volumes of these COCs were released over a long period of time rather than a large volume over a short duration.

- Soil saturation – the soil is dry, especially near the surface and shallow subsurface where the COCs are concentrated.

- Soil particle adsorption/desorption – petroleum hydrocarbons tend to adsorb to the soil particles with little desorption as suggested by the limited vertical migration of COCs.

f. The lateral extent of contamination is defined by analytical data showing the lack of COCs found in nearby sample locations, thereby demonstrating minimal lateral mobility (i.e., <15 ft). Contaminant concentrations below the upper sampling horizons were significantly lower, demonstrating minimal vertical migration. The vertical extent of contamination is confined between 9.0 and 11.5 ft bgs.

g. Presently, CAS 25-20-01 is located on a government-controlled facility. The NTS is a restricted area that is guarded on a 24-hour, 365 day-per-year basis; unauthorized personnel are not admitted to the facility. CAS 25-20-01 is contained within a restricted use zone classified as a "Research Test and Experiment Zone" (DOE/NV, 1998a) (i.e., nonresidential).

h. Preferred routes of vertical and lateral migration are nonexistent since the sources have been eliminated and driving forces are not viable.

i. See Section 2.3.1 for site-specific considerations.

j. The potential for a hazard related to fire, vapor, or explosion is nonexistent for the COCs at the site.

k. No other site-specific factors are known at this site.

Based on this evaluation, impacts to groundwater are not expected. Therefore, groundwater monitoring is not proposed for this site and is not considered an element of the alternatives.

3.3.3.2 Drywell (CAS 25-51-02)

Alternative 3 includes administrative activities and costs associated with use restriction for the collection system pipe and the soil impacted at the outfall. Additionally, installation of a perimeter fence with appropriate signage around the outfall area and redirection of surface flow is recommended for this alternative.

The following evaluation of NAC 445A.227 (2) (a-k) (NAC, 2000c) supports the protection of groundwater from COCs at this CAS:

a. Depth to groundwater at the nearest well (J-11) is approximately 1,040 ft bgs (USGS, 1995). This well is located approximately 6.5 mi to the south-southeast of this CAS. Groundwater flow is generally to the southwest and may discharge at Ash Meadows (SNPO, 1970).

b. The distance to the nearest active water-supply well (J-13) is approximately 5 mi southwest of this CAS (DOE/NV, 1998a). Well J-13 is primarily used to provide potable water for Area 25. Groundwater flow is generally to the southwest (Laczniak et al., 1996).

c. Soil type at this site is generally poorly graded, moderately consolidated, alluvial silty sands with gravel, and some cobble-sized volcanic detritus.

d. Average annual precipitation for valleys in the South-Central Great Basin ranges from 3 to 6 in. (Winograd and Thordarson, 1975). Annual evaporation is roughly 5 to 25 times the annual precipitation (Winograd and Thordarson, 1975). The high evaporation and low precipitation rates create a negative water balance for the area; therefore, no driving force associated with precipitation is available to mobilize COCs vertically.

e. Total petroleum hydrocarbons (DRO) are present in the soil at the outfall area. Polychlorinated biphenyls (Aroclor-1254) are present in the pipe. Downward migration of COCs is slowed by the following parameters:

   - Volume of release – it is assumed that small volumes of COCs were released over a long period of time rather than a large volume over a short duration.

   - Soil saturation – the soil tends to be very dry, especially near the surface and shallow subsurface where the COCs are concentrated. The PCBs in sediment are contained within the pipe.

   - Soil particle adsorption/desorption – petroleum hydrocarbons tend to adsorb to the soil particles with little desorption as suggested by the limited vertical migration of COCs. Adsorption does not apply to the PCBs in sediment because they are contained within the pipe.

f. The PCBs are contained within pipes. The lateral extent of the soil contamination is defined by analytical data indicating the lack of contamination found in the nearby sampling locations, thereby demonstrating minimal lateral mobility (i.e., <15 ft). Contaminant concentrations below the upper sampling horizons were significantly lower, demonstrating minimal vertical migration. The vertical extent of contamination is confined to the upper 7.5 ft bgs.

g. Presently, CAS 25-51-02 is located on a government-controlled facility. The NTS is a restricted area that is guarded on a 24-hour, 365-day-per-year basis; unauthorized personnel are not admitted to the facility. CAS 25-51-02 is contained within a restricted use zone classified as a "Research Test and Experiment Zone" (DOE/NV, 1998a) (i.e., nonresidential).

h. Preferred routes of vertical and lateral migration are nonexistent since the sources have been eliminated and driving forces are not viable.

i. See Section 2.3.2 for site-specific considerations.

j. The potential for a hazard related to fire, vapor, or explosion is nonexistent for the COCs at the site.

k. No other site-specific factors are known at this site.

Based on this evaluation, impacts to groundwater are not expected. Therefore, groundwater monitoring is not proposed for this site and is not considered an element of the alternatives.

3.3.3.3 Train Decontamination Area (CAS 25-07-06)

Under Alternative 3, administrative controls will be implemented to restrict inadvertent contact with the train decontamination pad, the drain line, and contaminated surface soil. This includes installation of a perimeter fence with appropriate signage around these features.

The following evaluation of NAC 445A.227 (2) (a-k) (NAC, 2000c) supports the protection of groundwater from COCs at this CAS:

a. Depth to groundwater at the nearest well (J-11) is approximately 1,040 ft bgs (USGS, 1995). This well is located approximately 1.7 mi southeast of this CAS. Groundwater flow is generally to the southwest and may discharge at Ash Meadows (SNPO, 1970).

b. The distance to the nearest active water-supply well (J-13) is approximately 5 mi west of the CAS (DOE/NV, 1998a). Well J-12 is primarily used to provide potable water for Area 25. Groundwater flow is generally to the southwest (Laczniak et al., 1996).

c. Soil at this site is generally a combination of alluvial, colluvial, and volcanic rocks of Cenozoic age. The soil appeared as a light brown, fine to silty sand, with medium and small-sized gravels.

d. Average annual precipitation for valleys in the South-Central Great Basin ranges from 3 to 6 in. (Winograd and Thordarson, 1975). Annual evaporation is roughly 5 to 25 times the annual precipitation (Winograd and Thordarson, 1975). The high evaporation and low precipitation rates create a negative water balance for the area; therefore, no driving force associated with precipitation is available to mobilize COCs vertically.

e. Contaminants of concern were identified in the surface soil surrounding the decontamination pad. Locations E01, E02, and E04 contain Cs-137 in the surface soil at concentrations exceeding the PAL. At location E03, Cs-137 and lead were detected above the PAL and TCLP lead was detected above the regulatory disposal limit. (Note: Soil associated with this location must be considered mixed waste if it is removed.) At sample location E07, TPH (DRO) was detected above the PAL in the sample interval 0 to 0.5 ft bgs and regulatory disposal limit and Cs-137 was detected above the PAL in the sample interval 2.5 to 3.5 ft bgs. The total surface radiological contamination on the decontamination pad, related surface attachments, and adjacent railroad ties exceeded the unrestricted release criteria of 1,000 dpm/100 cm^2 at 121 of the 175 static measurement locations. Downward migration of COCs is slowed by the following parameters:

- Volume of release – it is assumed that small volumes of COCs were released over a long period of time rather than a large volume over a short duration.

- Soil saturation – the soil is dry, especially near the surface where the COCs are concentrated.

- Soil particle adsorption/desorption – petroleum hydrocarbons and radionuclides tend to adsorb to the soil particles with little desorption as suggested by the limited vertical migration of COCs.

f. The lateral extent of the soil contamination is defined by analytical data indicating the lack of contamination found in the step-out locations, thereby demonstrating minimal lateral mobility. Contaminant concentrations below the upper sampling horizons were significantly lower, demonstrating minimal vertical migration. The vertical extent of contamination is confined to the upper 3.5 ft bgs.

g. Presently, CAS 25-07-06 is located on a government-controlled facility. The NTS is a restricted area that is guarded on a 24-hour, 365-day-per-year basis; unauthorized personnel are not admitted to the facility. Corrective Action Site 25-07-06 is contained within a restricted use zone classified as a "Yucca Mountain Site Characterization Zone" (DOE/NV, 1998a) (i.e., nonresidential).

h. Preferred routes of vertical and lateral migration are nonexistent since the sources have been eliminated and driving forces are not viable.

i. See Section 2.3.5 for site-specific considerations.

j. The potential for a hazard related to fire, vapor, or explosion is nonexistent for the COCs at the site.

k. No other site-specific factors are known at this site.

Based on this evaluation, impacts to groundwater are not expected. Therefore, groundwater monitoring is not proposed for this site and is not considered an element of the alternatives.

3.3.3.4 Vehicle Washdown (CAS 25-07-07)

Under Alternative 3, administrative controls will be implemented to restrict inadvertent contact with surface contaminated soil surrounding the vehicle washdown decontamination pad. Administrative controls would consist of use restrictions to prevent unauthorized intrusive activities (e.g., fencing, signage).

The following evaluation of NAC 445A.227 (2) (a-k) (NAC, 2000c) supports the protection of groundwater from COCs at this CAS:

a. Depth to groundwater at the nearest well (J-11) is approximately 1,040 ft bgs (USGS, 1995). This well is located approximately 1.6 mi to the southwest of the this CAS. Groundwater flow is generally to the southwest and may discharge at Ash Meadows (SNPO, 1970).

b. The distance to the nearest active water-supply well (J-13) is approximately 6.7 mi west of this CAS (DOE/NV, 1998a). Well J-13 is primarily used to provide potable water for Area 25. Groundwater flow is generally to the southwest (Laczniak et al., 1996).

c. Soil type at this site is generally poorly graded, moderately consolidated, alluvial silty sands, with gravel and some cobble-sized volcanic detritus.

d. Average annual precipitation for valleys in the South-Central Great Basin ranges from 3 to 6 in. (Winograd and Thordarson, 1975). Annual evaporation is roughly 5 to 25 times the annual precipitation (Winograd and Thordarson, 1975). The high evaporation and low precipitation rates create a negative water balance for the area; therefore, no driving force associated with precipitation is available to mobilize COCs vertically.

e. Total petroleum hydrocarbons are present in the soil around the vehicle washdown decontamination pad configuration. Downward migration of COCs is slowed by the following parameters:

- Volume of release – it is assumed that small volumes of COCs were released over a long period of time rather than a large volume over a short duration.
- Soil saturation – the soil is dry, especially near the surface where the COCs are concentrated.
- Soil particle adsorption/desorption – petroleum hydrocarbons tend to adsorb to the soil particles with little desorption as suggested by the limited vertical migration of COCs.

f. The lateral extent of contamination is defined by analytical data showing the lack of contamination found in step-out locations, thereby demonstrating minimal lateral mobility (i.e., <15 ft). Contaminant concentrations below the upper sampling horizons were significantly lower, demonstrating minimal vertical migration. The vertical extent of contamination is confined to the upper 2.5 ft bgs.

g. Presently, CAS 25-07-07 is located on a government-controlled facility. The NTS is a restricted area that is guarded on a 24-hour, 365 day-per-year basis; unauthorized personnel are not admitted to the facility. Corrective Action Site 25-07-07 is contained within a restricted use zone classified as a "Research Test and Experiment Zone" (DOE/NV, 1998a) (i.e., nonresidential).

h. Preferred routes of vertical and lateral migration are nonexistent since the sources have been eliminated and driving forces are not viable.

i. See Section 2.3.6 for site-specific considerations.

j. The potential for a hazard related to fire, vapor, or explosion is nonexistent for the COCs at the site.

k. No other site-specific factors are known at this site.

Based on this evaluation, impacts to groundwater are not expected. Therefore, groundwater monitoring is not proposed for this site and is not considered an element of the alternatives.

3.4 Evaluation and Comparison of Alternatives

An evaluation and comparison of alternatives is not required for CASs 25-59-01 and 26-59-01 because the septic tank contents will be removed under Alternative 2.

The general corrective action standards and remedy selection decision factors described in Section 3.2 were used to conduct detailed and comparative analyses of each corrective action alternative. The advantages and disadvantages of each alternative were assessed to select preferred alternatives for CAU 165. Table 3-2 and Table 3-3 present the detailed and comparative evaluation of closure alternatives for each CAS requiring corrective action.

Table 3-2
Detailed Evaluation of Alternatives for Corrective Action Unit 165
(Page 1 of 3)

Evaluation Criteria	Alternative 1 No Further Action	Alternative 2 Clean Closure	Alternative 3 Closure in Place with Administrative Controls
Closure Standards			
Protection of Human Health and the Environment	• Does not meet corrective action objective of preventing or mitigating exposure to soil containing COCs or media exceeding unrestricted release criteria. • Does not prevent potential spread of COCs. • Does not meet corrective action objective of preventing or mitigating exposure to tank contents containing contaminants. • No worker exposure associated with implementation.	• Meets corrective action objectives. • Low to moderate risk to workers associated with heavy equipment and potential contact with impacted media during excavation, transportation, and closure activities. • Low risk to public due to remote location and controlled access to the NTS. Low to moderate risk to public during transportation off the NTS. • Moving contaminated media to an appropriate disposal facility mitigates exposure to impacted media after closure.	• Meets corrective action objectives. • Prevents inadvertent intrusion into the contaminated media. • Low risk to workers associated with heavy equipment. • Low risk to public because of remote location and controlled access to the NTS. • NAC 445.227 (2) (a-k) analysis shows the contaminants are not expected to impact groundwater.
Compliance with Media Cleanup Standards	• Does not comply with media cleanup standards (MCSs) because COCs and media exceeding unrestricted release criteria remain.	• Complies with MCSs because media containing COCs will be excavated and disposed of at an appropriate facility. • Removal of COCs will be verified with confirmation sampling.	• Complies with MCSs by controlling exposure pathways. • NAC 445.227 (2) (a-k) analysis shows the contaminants are not expected to impact groundwater.
Control the Source(s) of Release	• The sources of each CAS have been discontinued.	• The sources of each CAS have been discontinued.	• The sources of each CAS have been discontinued.
Comply with Applicable Federal, State, and Local Standards for Waste Management	• No waste generated.	• All waste (e.g., contaminated soil, concrete, and disposable personal protective equipment) will be handled and disposed of in accordance with applicable standards.	• No waste generated.

Table 3-2
Detailed Evaluation of Alternatives for
Corrective Action Unit 165
(Page 2 of 3)

Evaluation Criteria	Alternative 1 No Further Action	Alternative 2 Clean Closure	Alternative 3 Closure in Place with Administrative Controls
Remedy Selection Decision Factors			
Short-Term Reliability and Effectiveness	• Not evaluated.	• Low risk to workers associated with heavy equipment and potential contact with impacted media during excavation, transportation, and closure activities. • Public protected during removal by remote location and NTS site-access controls. • Low to moderate risk to public during transportation off NTS. • Environmental impacts are not anticipated due to implementation. Appropriate measures will be taken at the site to protect desert tortoises. • Implementation should not require an extended period of time.	• Low risk to workers associated with heavy equipment and potential contact with impacted media during excavation, transportation, and closure activities. • Public protected by remote location and NTS site-access controls. • Environmental impacts are not anticipated due to implementation. Appropriate measures will be taken at the site to protect desert tortoises. • Implementation should not require an extended period of time.
Reduction of Toxicity, Mobility, and/or Volume	• Not evaluated.	• Clean closure would effectively eliminate associated toxicity, mobility, and volume of wastes at each CAS. • Proper disposal of the waste will result in an ultimate reduction of mobility.	• The mobility of the remaining surface and subsurface soil contamination and septic tank and septic system components is significantly reduced by administrative controls, solidification of any liquid tank contents, and lack of viable driving forces. • The volume of contaminated media in the septic tank and/or septic system components is increased through the addition of solidification material. • Toxicity and volume of the soil contamination are effectively unchanged.

Table 3-2
Detailed Evaluation of Alternatives for
Corrective Action Unit 165
(Page 3 of 3)

Evaluation Criteria	Alternative 1 No Further Action	Alternative 2 Clean Closure	Alternative 3 Closure in Place with Administrative Controls
Long-Term Reliability and Effectiveness	• Not evaluated	• All risk will be eliminated on site upon completion. • No maintenance required. • Moving contaminated media to an appropriate disposal facility will minimize future mobility.	• Controls inadvertent intrusion to remaining contaminated media. • Administrative controls must be maintained.
Feasibility	• Not evaluated	• Removal of contaminated media requires controls to protect workers. • Options for disposal of contaminated media is limited and requires coordination with multiple entities.	• Coordination of all entities is necessary to ensure compliance with administrative controls to prevent intrusion into contaminated zones.
Cost	CAS 25-07-06: $0 CAS 25-07-07: $0 CAS 25-20-01: $0 CAS 25-47-01: $0 CAS 25-51-02: $0 CAS 25-59-01: $0 CAS 26-07-01: $0 CAS 26-59-01: $0	CAS 25-07-06: $208,633 CAS 25-07-07: $93,658 CAS 25-20-01: $202,718 CAS 25-47-01: Not applicable CAS 25-51-02: $125,719 CAS 25-59-01: $70,923 CAS 26-07-01: Not applicable CAS 26-59-01: $55,167	CAS 25-07-06: $10,375 CAS 25-07-07: $10,314 CAS 25-20-01: $12,829 CAS 25-47-01: Not applicable CAS 25-51-02: $22,967 CAS 25-59-01: Not applicable CAS 26-07-01: Not applicable CAS 26-59-01: Not applicable

Table 3-3
Comparative Evaluation of Alternatives for Corrective Action Unit 165

Evaluation Criteria	Comparative Evaluation		
Closure Standards			
Protection of Human Health and the Environment	Alternatives 2 and 3 meet corrective action objectives; Alternative 1 does not. No worker exposure to risks are associated with Alternative 1. Lower short-term risks are associated with Alternative 3 and slightly higher short-term (during the excavation) risks with Alternative 2. NAC 445A.227 (2) (a-k) analysis shows the contaminants are not threatening groundwater.		
Compliance with Media Cleanup Standards	Alternative 1 does not comply with media cleanup standards (MCSs). Alternative 2 meets MCSs by removing contaminated media or media exceeding unrestricted release criteria, and eliminating exposure pathways at the site. Alternative 3 controls access to contaminants, effectively eliminating exposure pathways.		
Control the Source(s) of Release	The sources at each CAS have been discontinued. Alternative 2 would eliminate any residual contamination that is present.		
Comply with Applicable Federal, State, and Local Standards for Waste Management	Alternative 1 does not generate waste. Alternatives 2 and 3 will generate waste that will be handled in accordance with applicable MCSs and regulatory requirements.		
Remedy Selection Decision Factors			
Short-Term Reliability and Effectiveness	Low risks are associated with Alternative 3 and slightly higher risks with Alternative 2.		
Reduction of Toxicity, Mobility, and/or Volume	Alternative 2 results in an immediate reduction of all three characteristics at each CAS. Alternative 3 results in a reduction of potential inadvertent exposure, but does not reduce toxicity or volume.		
Long-Term Reliability and Effectiveness	Residual risk at each CAS is low for Alternative 3 and nonexistent for Alternative 2. Alternative 3 requires administrative measures to control intrusive activities.		
Feasibility	Alternatives 2 and 3 are feasible; however, Alternative 2 will be more resource intensive initially and Alternative 3 will require continual administrative involvement.		
Cost	CAS 25-07-06: $0 CAS 25-07-07: $0 CAS 25-20-01: $0 CAS 25-47-01: $0 CAS 25-51-02: $0 CAS 25-59-01: $0 CAS 26-07-01: $0 CAS 26-59-01: $0	CAS 25-07-06: $208,633 CAS 25-07-07: $93,658 CAS 25-20-01: $202,718 CAS 25-47-01: Not applicable CAS 25-51-02: $125,719 CAS 25-59-01: $70,923 CAS 26-07-01: Not applicable CAS 26-59-01: $55,167	CAS 25-07-06: $10,375 CAS 25-07-07: $10,314 CAS 25-20-01: $12,829 CAS 25-47-01: Not applicable CAS 25-51-02: $22,967 CAS 25-59-01: Not applicable CAS 26-07-01: Not applicable CAS 26-59-01: Not applicable

4.0 Recommended Alternatives

The preferred corrective action alternatives were evaluated on their technical merits, focusing on performance, reliability, feasibility, and safety. The selected alternatives were judged to meet all requirements for the technical components evaluated. The selected alternatives meet all applicable state and federal regulations for closure of the sites and will minimize potential future exposure pathways to the contaminated media at CAU 165.

Alternative 1, No Further Action, is the preferred corrective action for CAS 25-47-01 and CAS 26-07-01.

Alternative 2, Clean Closure is the preferred corrective action for the following CASs:

- CAS 25-51-02 - Remove dry-well collection system pipe, pipe contents, and COC-impacted soil.
- CAS 25-59-01 - Remove septic tank contents and fill tank with an inert material; remove or fill cesspool with inert material and backfill.
- CAS 26-59-01 - Remove septic tank contents; fill septic tank with inert material.
- CAS 25-07-06 - Remove train decontamination area and related surface attachments, and surrounding COC-impacted soil.
- CAS 25-07-07 - Remove vehicle washdown pad and surrounding COC-impacted soil.

Alternative 3, Closure-in-Place, is the preferred corrective action for the following CAS:

- CAS 25-20-01 - Lab Drain Dry Well

The preferred corrective action alternatives were evaluated on technical merit focusing on performance, reliability, feasibility, and safety. The alternatives were judged to meet all requirements for the technical components evaluated. The alternatives meet all applicable state and federal regulations for closure of the site and will eliminate potential future exposure pathways to the contaminated soils at CAU 165. Implementation of corrective actions may potentially present risks to site workers. Therefore, appropriate health and safety procedures will be developed and implemented.

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Appendix A

Corrective Action Investigation Report for CAU 165

A.1.0 Introduction

This appendix details the CAI activities and analytical results for CAU 165. This CAU is located in Areas 25 and 26 of the NTS (see Figure 1-1 of main document) and is comprised of eight CASs (Figure 1-2 and Figure 1-3 of main document):

- 25-20-01, Lab Drain Dry Well
- 25-51-02, Drywell
- 25-59-01, Septic System
- 26-59-01, Septic System
- 25-07-06, Train Decontamination Area
- 25-07-07, Vehicle Washdown
- 26-07-01, Vehicle Washdown Station
- 25-47-01, Reservoir and French Drain

The CASs consist of one dry well, one surface discharge point (previously thought to be a dry well), two septic systems, three decontamination areas/pads, and one reservoir and french drain system. Investigation of CAU 165 was performed because process knowledge indicated that contaminated effluent or residue might have been discharged to these systems.

Additional information regarding the history of each site, planning, and the scope of the investigation is presented in the CAIP (NNSA/NV, 2002). The CAI was conducted in accordance with the CAIP for CAU 165 as developed under the FFACO (1996).

A.1.1 Objectives

The primary objective of the investigation was to provide sufficient information and data to develop appropriate corrective action alternatives for each CAS in CAU 165. This objective was achieved by identifying the absence of, or the nature and extent of, COCs (i.e., COPCs at concentrations above PALs) and other information and data.

The selection of soil sample locations was based on site conditions and the strategy developed during the DQO process as outlined in the CAIP.

A.1.2 Content

This appendix contains information and data in sufficient detail to support the selection of a preferred corrective action alternative. The contents of this appendix are as follows:

- Section A.1.0 describes the investigation background, objectives, and report contents.
- Section A.2.0 provides an investigation overview.
- Section A.3.0 through Section A.10.0 provides CAS-specific information regarding field activities, sampling methods, and laboratory analytical results from investigation samples.
- Section A.11.0 summarizes waste management activities.
- Section A.12.0 discusses QA and QC procedures followed and results of the QA/QC activities.
- Section A.13.0 is a summary of investigation results.
- Section A.14.0 lists cited references.

The complete field documentation and laboratory data, including field activity daily logs (FADLs), sample collection logs (SCLs), analysis request/chain-of-custody forms, soil sample descriptions, laboratory certificates of analyses, analytical results, and surveillance results are retained in project files as hard copy files or electronic media.

A.2.0 Investigation Overview

The CAI consisted of soil sampling from surface locations, backhoe excavations, septic tanks, and collection system pipes. Inspections were also performed on septic tanks and collection system pipes. The field investigation was conducted from May 20 through July 18, 2002; on August 28, 2002; and on March 11, 2003.

The CAI was managed in accordance with the requirements set forth in the CAIP. Field activities were performed in accordance with the approved site-specific health and safety plan (SSHASP) (IT, 2002) which is consistent with the DOE Integrated Safety Management System. Samples were collected and documented following approved protocols and procedures indicated in the CAIP. Quality control samples (e.g., field blanks, equipment rinsate blanks, trip blanks, and field duplicates) were collected as required by the Industrial Sites QAPP (DOE/NV, 1996) and approved procedures. During the CAI, waste minimization practices were followed according to approved procedures, including segregation of waste by waste stream.

Weather conditions at the site varied and included rain, sun (moderate to high temperatures), intermittent cloudiness, and light to strong winds. High temperatures occasionally delayed site operations; otherwise, weather conditions were generally favorable.

The CASs were characterized by surface radiological surveys, surface and subsurface soil samples, and septic tank and collection system piping content samples. Samples were collected by backhoe excavation and hand tools. Investigation intervals and soil samples were field screened for VOCs and alpha and beta/gamma radiation. The results were compared against FSLs to guide the investigation. Select samples were shipped to an off-site laboratory to be analyzed for appropriate chemical and radiological parameters. Table A.2-1 summarizes activities conducted at each of the CASs.

Except for those noted in the CAS-specific sections, CAU 165 sampling locations were accessible and sampling activities at planned locations were not restricted by buildings, storage areas, active operations, or aboveground and underground utilities. Sampling step-out locations were accessible and remained within anticipated spatial boundaries.

Table A.2-1
Corrective Action Investigation Activities Conducted to Meet Planned Requirements

Activities	Corrective Action Site							
	25-20-01	25-51-02	25-59-01	26-59-01	25-07-06	25-07-07	26-07-01	25-47-01
Collected integrity samples from the influent and effluent ends of the septic tank.			X	X				
Collected content samples from the septic tank or piping.		X	X	X				
Conducted on-site coliform bacteria analysis.			X	X				
Inspected the collection system piping.	X	X	X	X				
Conducted exploratory excavations to confirm system configuration.	X	X	X	X		X		
Collected soil samples from the leachrock/native soil interface.	X		X	X		X		
Collected soil samples.	X	X	X	X	X	X	X	X
Field screened soil samples for volatile organic compounds and alpha and beta/gamma radiation.	X	X	X	X	X	X	X	X
Submitted samples for off-site laboratory analysis.	X	X	X	X	X	X	X	X
Conducted surface radiological surveys.					X	X	X	
Collect samples from potential remediation waste (e.g., concrete, paint, and wood).					X			

Sections A.2.1 through A.2.8 provide the investigation methodology, site geology and hydrology, and laboratory information. The CAS-specific investigation details are provided in Section A.3.0 through Section A.10.0.

A.2.1 Preliminary Conceptual Model

With the exception of CASs 25-51-02 and 25-20-01, the conceptual site models were consistent with the site-specific conceptual site models provided in the CAIP. At CASs 25-51-02 and 25-20-01, the configuration was determined to be different than anticipated and CAS 25-51-02 required a change in

the sampling locations. These modifications are addressed in ROTC Number 3 to the CAIP (NNSA/NV, 2002). The revised conceptual site models for these CASs are also discussed in Sections A.3.4 and A.4.4.

A.2.2 Sample Locations

Investigation locations selected for sampling were based on interpretation of engineering drawings, aerial photos, interviews with former and current site employees, and site conditions as provided in the CAIP. The planned biased sample locations are shown in the CAIP. Actual sample locations are shown in figures in the CAS-specific sections. Some locations were modified slightly from planned positions due to field conditions and observations. In some cases, field-screening results (FSRs) determined the need for step-out sampling locations. All sample locations were staked in the field, labeled appropriately, and surveyed with a GPS instrument. The actual locations have been plotted on the figures based on the GPS coordinates, and what may appear as inaccuracies are due to the limited resolution of the technology. In addition to the sampling locations, the figures also show points of interest that have associated GPS coordinates. The GPS coordinates are located in Appendix E and the figures are in the CAS-specific sections of this appendix.

A.2.2.1 Housekeeping Removal of Debris

Removal and disposition of surface materials was performed by Bechtel Nevada (BN) at CASs 25-07-06, 25-07-07, and 26-07-01. At CAS 25-07-06, the manned-control car was moved north several hundred yards from the pad. Surface materials removed include the manned-control car with drilling stem, loose railroad ties, cables, lead bricks, angle iron, stainless-steel beams, stainless-steel rings, a service pump with hoses, a stainless-steel basin, a 55-gal drum, a drum crusher, cables, hoses, snow fencing, equipment racks, steel cables, and shackles. These items were placed southwest of the site for disposition by BN.

The lead bricks are scheduled to be removed by BN in late fiscal year (FY) 2004 or early FY 2005 during closure activities. If the lead bricks meet the performance objective for certification of nonradioactive waste, they will be sent for recycling or disposed of in accordance with 40 CFR, "Hazardous Waste Regulations." If the lead bricks have elevated radiation, they will be treated and

disposed of in accordance with applicable requirements (Federal, State, and DOE Orders/ Agreements) through BN Waste Control Department.

A.2.3 Investigation Activities

The investigation activities performed at CAU 165 were based on general field investigation activities discussed in the CAIP (NNSA/NV, 2002). The technical approach consisted of the following activities:

- Excavations
- Field screening
- Surface and subsurface soil sampling
- Septic tank and collection system pipe inspections and sampling
- Collect samples to ensure full characterization of waste streams
- Perform GPS on sample locations and points of interest
- Surface radiological surveys

This investigation strategy allowed the nature and extent of COCs associated with each CAS to be established. The following sections describe the specific investigation activities that took place at CAU 165.

A.2.3.1 Surface Radiological Surveys

Surface radiological surveys were conducted at CASs 25-07-06, 25-07-07, and 26-07-01 using a TSA Model PRM-470B small plastic scintillation detector in conjunction with a Trimble Pathfinder Pro XRS™ Global Positioning Receiver with TSC1™ Datalogger to identify the presence and extent of surficial beta/gamma-emitting radiological contaminants at activities statistically greater than background. The results of these surveys were then post-processed against CAS-specific background data sets using a nonparametric test (Hollander and Wolfe, 1973) to calculate the 68 percent, 95.4 percent, 99.7 percent, and 99.9 percent confidence limits. The radiological survey data and calculated confidence limits were then used to create color-coded contour plots for each of the CAS-specific surface radiological surveys. These color-coded contour plots were then used to identify extent, contamination trends, and focus CAI efforts on biased sampling locations (i.e., sampling areas of elevated surficial activity). Additionally, radiological surveys of concrete pads were conducted using an NE Electra with a DP6 dual-alpha and beta/gamma scintillator probe, and swipes were taken to identify the presence and extent of total and removable alpha and

beta/gamma-emitting radiological contaminants. The results of these surveys were then directly compared to the Table 4-2 allowable residual surface contamination values in dpm/100 cm^2 of the *NV/YMP Radiological Control Manual* (DOE/NV, 2000).

A.2.3.2 Excavations

Excavations by backhoe were used to inspect system components and access soil sample horizons at all CASs except 26-07-01, where only hand tools were used.

More specifically, excavations served the following purposes:

- Locate system components.
- Collected integrity samples at the influent and effluent ends of septic tanks at CASs 25-59-01 and 26-59-01.
- Provided access to inspect the collection system piping to appraise the contents and integrity of the pipes at CASs 25-20-01, 25-51-02, 25-59-01, and 26-59-01.

Excavated soil was returned as near to its original location as practical. Spoils were temporarily staged next to excavations. Drilling was not required at CAU 165 because excavations were adequate to meet sample collection objectives.

A.2.3.3 Septic Tank and Collection System Pipe Inspections and Sampling

Septic tanks were inspected at CASs 25-59-01 and 26-59-01 for sludge and liquid. The planned inspections were conducted through designed access points. A distinct liquid phase was not present at either septic tank. At CAS 25-59-01, wet sludge was present in the tank. A composite liquid waste sampler (COLIWASA) was used to take a representative sample of the wet sludge, which was placed directly into the appropriate sample jars. At CAS 26-59-01, a dry sludge was present in the tank which was sampled using a scoop attached to extension rods. The VOC and TPH (GRO) sludge samples were containerized first. The remaining sludge was transferred into a stainless-steel bowl, homogenized, and placed into sample containers.

The sludge from both tanks was analyzed in accordance with CAIP requirements. The analytical results will support disposal of the contents during anticipated closure activities. The CAS-specific

sections list the analyses and the analytical results comparison to waste acceptance criteria for disposal pathways.

Select samples were analyzed on site for fecal coliform bacteria. Excess sludge was returned to the septic tanks after fecal coliform bacteria analysis and sampling.

Collection system pipes were inspected for contents. When appropriate and adequate material was present, a sample was collected for analyses. The planned inspections were conducted through septic tank manholes and by breaking pipes.

Results of septic tank and collection system pipe inspections and conditions, sampling, and content volumes are provided in the CAS-specific sections.

A.2.3.4 Backhoe and Hand Sampling Methodology

During backhoe sampling, soil was initially screened in the bucket for health and safety parameters prior to the start of sampling. Additional screening was conducted during sample collection to guide the investigation. Labeled sample containers were filled according to the following sequence. The total VOCs and GRO sample containers were filled with soil directly from the backhoe bucket, followed by collection of soil for VOC field screening using headspace analysis. Additional soil was transferred into a stainless-steel bowl, homogenized, and screened for alpha and beta/gamma radiation.

Surface soil samples were collected by hand in the same sequence. The total VOCs and GRO sample containers were filled with soil directly from the surface locations, followed by collection of soil for VOC field screening using headspace analysis. Additional soil was transferred into a stainless-steel bowl, homogenized, and screened for alpha and beta/gamma radiation. Excess soil was returned to the sampling locations and custody seals were applied to the samples.

A.2.3.5 Septic Tank Integrity Sampling

Septic tank integrity samples were collected from CASs 25-59-01 and 26-59-01. Distribution boxes were not present at these systems. The integrity samples were collected from the soil below the base

of the influent and effluent ends of septic tanks. Results of septic tank integrity sampling are provided in the CAS-specific sections.

A.2.3.6 Leachfield, Cesspool, and Dry Well Sampling

Corrective Action Unit 165 had one leachfield at CAS 26-59-01. A backhoe was used to excavate a linear trench from the septic tank along the main distribution manifold to the perpendicular distribution pipes of the leachfield. Biased samples were collected at two locations with the backhoe from soil underlying the distribution pipes at the proximal and distal ends of the leachfield. Soil samples were collected directly from the backhoe bucket. Consistent with the CAIP, the first sample horizon was collected from the interval 0 to 1 ft below the leachrock/native soil interface and the second sample horizon was collected from 2.5 to 3.5 ft below the interface. All soil samples were submitted for laboratory analyses.

Sampling at the CAS 25-20-01, dry well, and the CAS 25-59-01, cesspool, consisted of excavating down along the outside edge of the dry well/cesspool to expose the native soil beneath the leachrock. Biased samples were collected at these locations directly from the backhoe bucket. Consistent with the CAIP, the first sample was collected from the interval 0 to 1 ft below the leachrock/native soil interface, and the second sample was collected from 2.5 to 3.5 ft below the interface. All soil samples were submitted for laboratory analyses. At CAS 25-51-02, exploratory excavations were used to determine that the effluent discharged to the surface rather than a dry well.

A.2.4 Field-Screening Methodology

Field-screening activities for VOC and alpha and beta/gamma radiation were performed in accordance with the CAIP. The FSL for VOC headspace was established at 20 parts per million (ppm) or 2.5 times background, whichever was greater. The site-specific FSLs for alpha and beta/gamma radiation were defined as the mean background activity level plus two times the standard deviation of readings from 20 background locations. The radiation FSLs are instrument-specific and were established for each instrument prior to use. Field screening was conducted using a photoionization detector for VOCs and an NE Technologies Electra with a DP6 dual-alpha and beta/gamma radiation scintillation probe.

A.2.5 Geology

Leachrock in leachfields, the dry well, and sumps consist of reworked and compacted sand and gravel fill overlying native soils. Regional native surface soil consists of poorly graded, moderately consolidated, alluvial silty sands with gravel, and some cobble-sized volcanic detritus. Soil below the leachrock ranged from gravelly sands with fines to well-graded sands. The percentage of organic matter in the soil is low and decreases with depth beyond the native soil interface. Caliche was encountered during excavation sampling at several CASs. In places where the caliche was significant, the sampling intervals specified in the CAIP could not be reached, and the intervals were modified. All modifications were documented on SCLs. A general field description for each sample was recorded on SCLs. A description of the regional geology is provided in the CAIP (NNSA/NV, 2002).

A.2.6 Hydrology

Dry washes provide channels that concentrate surface runoff; however, there is no perennial stream flow in the region. Surface topography at all of the CASs ranged from nearly flat to sites where distribution planes slope gently in the down-flow direction. The CAS 25-51-02 outfall pipe is located in a dry wash. No other CAS discharge points were located in washes.

Hydrologic conditions beneath the CASs are less important to the evaluation of the site because individual discharge points are less than 15 ft below grade and alluvium is likely to reach depths greater than 100 ft bgs (NNSA/NV, 2002). Due to the depth to groundwater and climatic conditions, groundwater at the NTS Areas 25 and 26 is not expected to have been impacted by COPCs. In Area 25, the depth to groundwater is estimated to be between 928 and 1,041 ft bgs (USGS, 1995). No saturated zones (e.g., perched water, contaminant saturation) were found anywhere in the subsurface adjacent to, or below, the discharge points. In Area 26, a perched water table occurs in a zone of the highly fractured rock at depths ranging from 81 to 167 ft bgs (Johnson and Ege, 1964). The perched water may extend to depths exceeding 261 ft before encountering rocks with a low-fracture permeability. The regional water table is thought to be at a depth of about 1,700 ft bgs (DRI, 1988).

A.2.7 Laboratory Analytical Information

Chemical and radiological analyses were performed by Paragon Analytics, Inc., Fort Collins, Colorado. The analytical parameters and laboratory analytical methods used to analyze CAU 165 investigation samples are listed in Table A.2-2. Organic and inorganic analytical results are compared to the MRLs established in Table 3-2 in the CAIP (NNSA/NV, 2002). The analytical results for gamma-emitting radionuclides, isotopic U, isotopic plutonium (Pu), Sr-90, and tritium are compared to the MRLs. The MRLs for radionuclides are set equal to 5 times the minimum detectable concentrations (MDCs), or if 5 times the MDC is greater than the PAL, the MRL is set equal to the MDC. The MDC is provided by the laboratory and is the smallest amount of activity of a particular analyte that can be detected in a sample with an acceptable level of error. The pH analyses were performed in the field using the approved EPA methodology specified in the CAIP.

The validated analytical results of samples collected from the CAU 165 investigation have been compiled and evaluated to determine the presence and/or extent of COCs in Section A.3.0 through Section A.10.0. The complete laboratory data packages are available in the project central files.

The analytical parameters are CAS-specific and were selected through the application of site process knowledge according to the EPA's *Guidance for the Data Quality Objectives Process* (EPA, 1994a). Samples collected during follow-up (step-out) sampling were only analyzed for the COPCs that exceeded PALs in the original samples. Bioassessment and geotechnical samples were not collected because FSRs and observations did not indicate the need.

A.2.8 Comparison to Preliminary Action Levels

Chemicals and radionuclides detected in samples at concentrations equal to or greater than PALs are termed COCs. If COCs are present, a corrective action must be considered for the CAS. The PALs for the CAU 165 investigation were identified during the DQO process and listed in the CAIP. The radiological PALs for the CAU 165 CAI are listed in Table 3-3 of ROTC No. 4 to the CAU 165 CAIP. For organic and inorganic COPCs, PALs are based on EPA Region 9 PRGs (EPA, 2000). The PAL for TPH is 100 mg/kg per the NAC 445A.2272 (NAC, 2000). Radionuclide concentrations measured in CAU 165 environmental samples were compared to isotope-specific PALs. The PALs for radiological contaminants are taken from the recommended screening limits for construction,

Table A.2-2
Laboratory Analytical Parameters and Methods, CAU 165 Investigation Samples

Analytical Parameter	Analytical Method
Total volatile organic compounds	SW-846 8260B [a]
Total semivolatile organic compounds	SW-846 8270C [a]
Total petroleum hydrocarbons - gasoline-range organics	SW-846 8015B (modified) [a]
Total petroleum hydrocarbons - diesel-range organics	SW-846 8015B (modified) [a]
Polychlorinated biphenyls	SW-846 8082 [c]
Total RCRA metals	Water - SW-846 6010B/7470A [a, b] Soil - SW-846 6010B/7471A [a, b]
Total beryllium	
pH/Corrosivity	Water 9040B
	Soil 9045C
TCLP volatile organic compounds	SW-846 1311/8260B [a, k]
TCLP semivolatile organic compounds	SW-846 1311/8270C [a, k]
TCLP RCRA metals	SW-846 1311/6010B/7470A [a, b, k]
Gamma-emitting radionuclides	Water - EPA 901.1 [c, d] Soil - HASL-300 [c, e]
Isotopic uranium	Water - ASTM D3972-02 [c, f] Soil ASTM C1000-02 [c, g]
Isotopic plutonium	Water - ASTM D3865-02 [c, h] Soil - ASTMC1001-00 [c, i]
Strontium-90	Water -ASTM D5811-00 [c, j] Soil - HASL-300 [c, e]
Tritium	Water - EPA 906.0 [d] Soil [k] - PAI 754/704 [l]

[a]U.S. Environmental Protection Agency (EPA), *Test Methods for Evaluating Solid Waste*, Physical/Chemical Methods, 3rd Edition, Parts 1-4, SW-846 (EPA, 1996)
[b]Arsenic, barium, cadmium, lead, mercury, selenium, silver, and chromium
[c]Or equivalent laboratory method
[d]Prescribed *Methods for Measurement of Radioactivity in Drinking Water* (EPA, 1980)
[e]*Environmental Measurements Laboratory Procedure Manual,* HASL-300 (DOE, 1997)
[f]*Standard Test Methods for Isotopic Uranium in Water by Radiochemistry* (ASTM, 2002a)
[g]*Standard Test Methods for Radiochemical Determination of Uranium in Soil by Alpha Spectroscopy* (ASTM, 2002c)
[h]*Standard Test Methods for Plutonium in Water* (ASTM, 2002b)
[i]*Standard Test Methods for Radiochemical Determination of Plutonium in Soil by Alpha Spectroscopy* (ASTM, 2000a)
[j]*Standard Test Methods for Strontium-90 in Water* (ASTM, 2000b)
[k]Sludge sample
[l]Paragon Analytics, Inc.

commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129 (NCRP, 1999), scaled from 25- to 15-mrem/yr dose, and the generic guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993).

Potassium-40 is a naturally occurring unstable isotope of potassium with a half-life of 1.3 x 10E+09 years. Potassium-40 represents approximately 0.0118 percent of natural potassium. Because of the abundance of potassium in the environment, K-40 is the predominant radionuclide in soil, foods, and human tissues. The average human male contains approximately 100,000 pCi of K-40. The human body strictly regulates the potassium content within the body and is not influenced by variations in environmental levels. Therefore, the internal dose from K-40 remains constant.

In addition, the only mechanism for K-40 to be a contaminant is through concentration. There are no reported activities at the NTS that would have concentrated K-40 or released it as a contaminant. Therefore, K-40 will not be evaluated in the CADD.

Sample data that are equal to or greater than MRLs are tabulated in the CAS-specific sections that follow (Section A.3.0 through Section A.10.0). Results that are equal to or greater than PALs (a subset of those that exceed MRLs) are identified by bold text in the corresponding tables and discussed in Section A.3.0 to Section A.10.0. Nondetected results and those below MRLs have been excluded to minimize the size of this document. However, the unedited datasets for CAU 165 are retained in an electronic format in the project files.

A.3.0 Lab Drain Dry Well (CAS 25-20-01)

The Lab Drain Dry Well is located approximately 55 ft north of Building 4215 in the Central Support Area of Area 25 on the NTS. System components include a concrete dry well and two waste pipes. The chemical waste pipe includes 55 ft of 6-in. VCP from the north side of Building 4215 to the dry well. Another waste pipe was discovered during field activities. This waste pipe is also a 6-in. VCP and is 60-ft long running east-west from a pipe stickup into the dry well. This pipe was unknown prior to the investigation; however, personnel that work in Building 4215 reported that there used to be trailers in the vicinity of the stick-up and that it was probably a sanitary pipe. The dry well is a 4- x 8-ft precast concrete manhole ring with an open bottom and is filled with 0.75- to 1.5-in. gravel to a minimum depth of 4 ft. The manhole to the dry well is set to surface grade (Figure A.3-1). Additional detail is provided in the CAIP (NNSA/NV, 2002).

A.3.1 Corrective Action Investigation

Thirteen soil samples were collected during investigation activities at this CAS. They are listed in Table A.3-1. The planned sample locations are shown in Figure 4-1 of the CAIP. The actual sample locations are shown in Figure A.3-1. The specific CAI activities conducted to meet CAIP requirements at CAS 25-20-01 are described in the following sections.

A.3.1.1 Deviations

There were no significant deviations to the CAIP requirements. A minor deviation was made in that step-out samples were not analyzed for TPH (DRO) after it was identified as a COC in the interface sample. Tetrachloroethene was also identified as a COC in the interface samples. Sample results collected from step-out locations determined the extent of tetrachloroethene. Tetrachloroethene is less mobile than TPH (DRO); therefore, this deviation did not impact closure decisions.

Headspace was noted by the laboratory in the VOC and GRO jars from the samples at location A01; therefore, this data could not be used and additional samples had to be collected from the interface and below the dry well. Location A02, on the west side of the dry well, was excavated and sampled for this purpose. The CAIP requirements were met despite the two deviations.

Table A.3-1
Samples Collected at CAS 25-20-01, Lab Drain Dry Well

Sample Number	Sample Location	Depth (ft bgs)	Sample Matrix	Purpose	Analyses
165A001	A01	9 - 10	Soil	Environmental	Set 1
165A002	A01	11.5 - 12.5	Soil	Environmental	Set 1
165A003	A01	14.5 - 15.5	Soil	Environmental	Set 1
165A004	Spoil Pile	0 - 0.5	Soil	Environmental	Set 1
165A005	A02	9 - 10	Soil	Environmental	Total VOCs, TCLP VOCs
165A006	A02	11.5 - 12.5	Soil	Environmental	Total VOCs, TCLP VOCs
165A007	A02	14 - 15	Soil	Environmental	Total VOCs, TCLP VOCs
165A008	A05	9 - 10	Soil	Environmental	Total VOCs
165A308	A05	14 - 15	Soil	Environmental MS/MSD	Total VOCs
165A010	A04	9 - 10	Soil	Environmental	Total VOCs
165A011	A04	14 - 15	Soil	Environmental	Total VOCs
165A012	A03	9 - 10	Soil	Environmental	Total VOCs
165A013	A03	14 - 15	Soil	Environmental	Total VOCs
165A301	Sample Table	NA	Water	Field Blank	Set 1
165A302	Sample Table	NA	Water	Trip Blank	Total VOCs
165A303	A01	NA	Water	Equipment Rinsate Blank	Set 1
165A304	A01	NA	Water	Trip Blank	Total VOCs
165A305	Sample Table	NA	Water	Trip Blank	Total VOCs
165A306	Sample Table	NA	Water	Trip Blank	Total VOCs
165A307	A05	9 - 10	Soil	Field Duplicate of #165A008	Total VOCs

Set 1 = Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO and GRO), PCBs, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, and Strontium-90

MS/MSD = Matrix spike/matrix spike duplicate
ft bgs = Feet below ground surface
NA = Not applicable

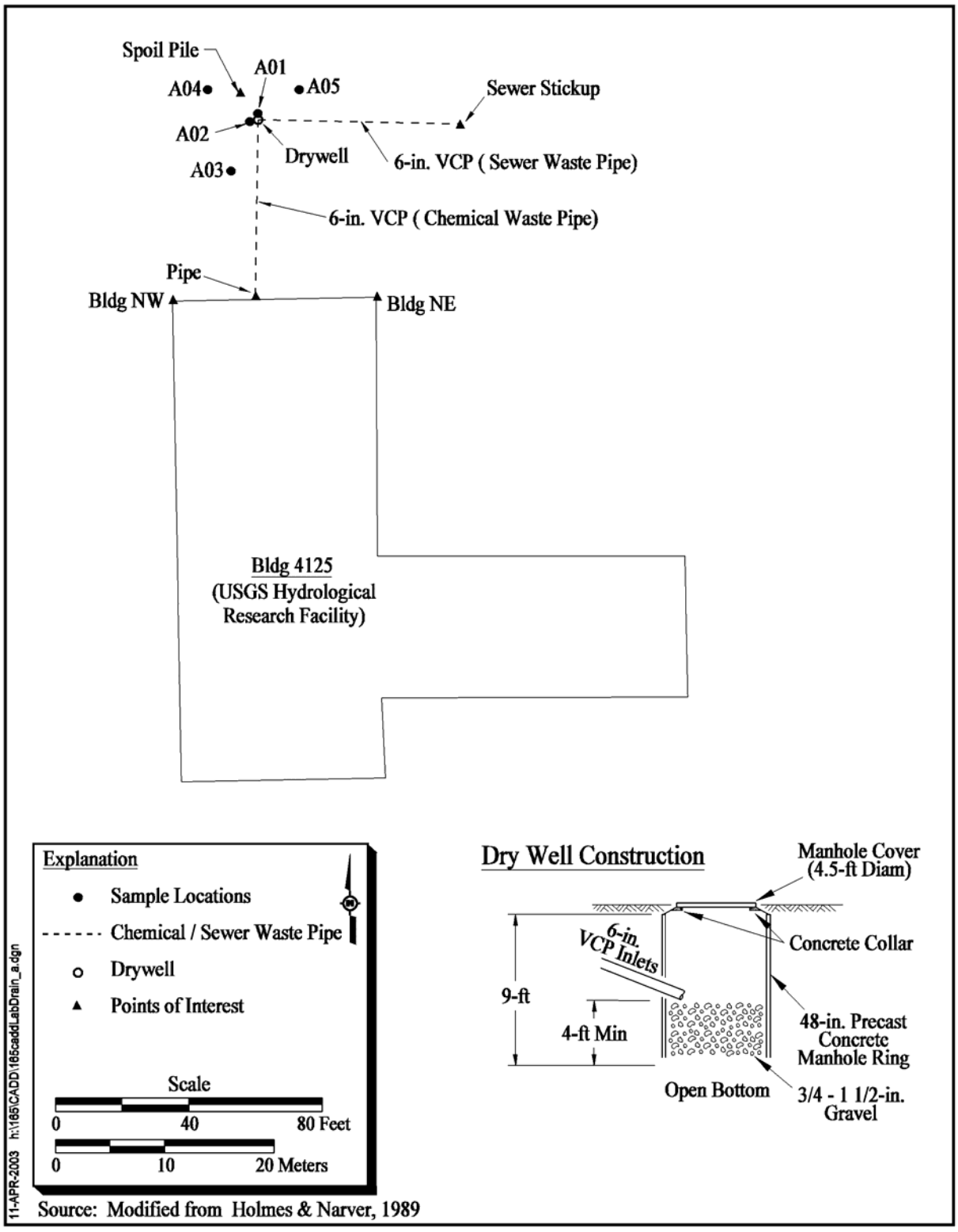

Figure A.3-1
Sample Locations and Points of Interest at CAS 25-20-01, Lab Drain Dry Well

A.3.2 Investigation Results

The following sections provide specific details of the inspection and sampling of system features, FSRs, and sample selection and analysis.

A.3.2.1 Dry Well Sampling

Backhoe excavations were conducted to access sampling horizons and collect samples at the biased locations presented in the CAIP. Excavations provided a visual verification of the dry well configuration (Figure A.3-1). Thirteen soil samples were collected from beneath the dry well at two locations and at three step-out locations as specified in the CAIP. Samples collected adjacent to the leachrock/native soil interface were submitted for laboratory analyses. Samples collected at 2.5 ft and 5 ft below the interface were also submitted for laboratory analyses due to exceeding FSLs for VOCs at the interface. The interface at the base of the dry well was found at 9 ft bgs.

Three step-out locations were selected approximately 15 ft from the dry well due to analytical results exceeding PALs beneath the dry well. Samples were collected from the step-out locations at 9 ft and 15 ft bgs and submitted to the laboratory for analysis. In addition, one QC soil duplicate was collected and analyzed. One matrix spike/matrix spike duplicate (MS/MSD) was performed on one sample.

Minor delays were encountered when a phone line was discovered during excavation. Excavation activities at this location were temporarily suspended until health and safety and utility officials were notified of the condition. This line was not shown on available engineering drawings. After an additional utility survey, the line was determined to be inactive and excavation was allowed to resume.

A.3.2.2 Inspection and Sampling of Collection System Components

The collection system pipes were inspected. An additional pipe was found coming into the dry well from the east. In order to inspect the collection system pipes for contents, a video survey was conducted in the collection system pipes from the open manhole. The video mole met refusal 50 ft from the dry well due to a whitish-colored plug (e.g., grout) that was within 5 ft of Building 4125. The eastern pipe survey met refusal after 5 ft by a similar whitish-colored plug. An excavation was

made 20 ft east of the dry well to access this pipe. The video mole was run towards the dry well to the plug and in the opposite direction to the sewer stickup. The video surveys did not show contents or breaches in the collection system pipes. The excavated video access location was grouted prior to backfilling.

Delays were experienced when high VOC FSLs were encountered during video survey of the pipes from the dry well. The decision to allow video inspection of the pipe was later made with provisions to protect worker health and safety. This did not cause any deviation from the planned investigation.

A.3.2.3 Additional Sampling

One verification sample (165A004) was collected from the base of a spoil pile (Figure A.3-1) that was not put on plastic when FSLs were exceeded. This sample was taken to verify that the spoil pile did not spread COCs at the surface. The sample was analyzed for the full suite of analyses and results did not indicate the presence of COCs.

A.3.2.4 Field-Screening Results

Soil samples were field screened for VOCs and alpha and beta/gamma radiation. The FSRs were compared to FSLs to guide sampling decisions. The VOC headspace FSLs were exceeded during excavations at locations A01 and A02, which prompted deeper sample collections at these locations. No samples had elevated FSRs for alpha and beta/gamma radiation.

A.3.2.5 Sample Analyses

Investigation samples were analyzed for CAIP-specified COPCs which included total VOCs, total semivolatile organic compounds (SVOCs), total RCRA metals, TPH (DRO and GRO), PCBs, isotopic U, isotopic Pu, Sr-90, and gamma-emitting radionuclides. The analytical parameters and laboratory analytical methods used to analyze the investigation samples are listed in Table A.2-2. Table A.3-1 lists the sample-specific analytical parameters.

A.3.2.6 Analytes Detected Above Minimum Reporting Limits

The analytical results detected at concentrations exceeding the correlated MRLs (NNSA/NV, 2002) are summarized in the following sections. These results are compared to PALs that are a subset of those that exceed MRLs. All of the analytical results obtained through sample analysis are usable.

A.3.2.6.1 Total Volatile Organic Compound Analytical Results for Soil Samples

The total VOCs detected in soil samples at concentrations exceeding MRLs are listed in Table A.3-2 and discussed below. Only tetrachloroethene exceeded the PAL.

Tetrachloroethene was detected above the PAL of 19,000 micrograms per kilogram (µg/kg) in sample 165A005. This sample was collected at location A02 from a depth of 9 to10 ft bgs and had a concentration of 110,000 µg/kg. The TCLP was performed on samples from this location to ensure full waste characterization within the hazardous waste regulations and results above MRLs are shown in Table A.3-3. A tetrachloroethene concentration of 1.2 milligrams per liter (mg/L) was detected in sample 165A005 at 9 to 10 ft bgs, which is above the regulatory level of 0.7 mg/L. Therefore, if soils associated with this sample location are removed for disposition, they will carry the hazardous waste code D039 and must be managed appropriately.

A.3.2.6.2 Total Semivolatile Organic Compound Analytical Results for Soil Samples

Total SVOCs analytical results for soil exceeding the MRLs are shown in Table A.3-4. Results did not exceed the PALs for total SVOCs, as established in the CAIP.

A.3.2.6.3 Total Petroleum Hydrocarbon Analytical Results for Soil Samples

The TPH detected in soil samples at concentrations exceeding MRLs are listed in Table A.3-5. Total petroleum hydrocarbons (DRO) were detected in sample 165A001 at 170 mg/kg, which exceeds the NDEP action level of 100 mg/kg. This sample was collected at location A01 from a depth of 9 to10 ft bgs. Step-out samples were not analyzed for TPH, and this discrepancy is discussed in Section B.1.1.3 of Appendix B.

Table A.3-2
Soil Sample Results for Total VOCs Detected Above the Minimum Reporting Limits at CAS 25-20-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)		
			1,1,1,2-Tetrachloroethane	Methylene Chloride	Tetrachloroethene
Preliminary Action Levels[a,b,c]			**7,000**	**21,000**	**19,000**
165A001	A01	9 - 10	5.5 (J)[b]	--	13,000 (J)[b]
165A002		11.5 - 12.5	--	--	220 (J)[b]
165A003		14.5 - 15.5	--	--	190 (J)[b]
165A004	Spoil Pile	0 - 0.5	--	6.4	30
165A005	A02	9 - 10	15	33	**110,000**
165A006		11.5 - 12.5	--	20	14,000
165A007		14 - 15	--	--	1,400
165A008	A05	9 - 10	--	--	120
165A010	A04	9 - 10	--	--	9.5
165A011		14 - 15	--	--	7.4
165A012	A03	9 - 10	--	--	54
165A013		14 - 15	--	--	28
165A307	A05	9 - 10	--	--	14
165A308		14 - 15	--	--	9.7

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).
[b]Qualifier added to laboratory data; record accepted. Volatile/reactive sample vial contained headspace.
[c]Results exceeding the PALs are in bold text.

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
-- = Not detected above MRLs
J = Estimated value

A.3.2.6.4 Total RCRA Metals Analytical Results for Soil Samples

Total RCRA metals analytical results exceeding MRLs are shown in Table A.3-6. These results did not exceed the PALs.

A.3.2.6.5 Polychlorinated Biphenyl Analytical Results for Soil Samples

The PCB analytical results exceeding MRLs are shown in Table A.3-7. These results did not exceed the PALs.

Table A.3-3
Soil Sample Results for TCLP VOCs Detected at CAS 25-20-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/L)
			Tetrachloroethene
Regulatory Limit			0.7[a]
165A005	A02	9 - 10	1.2
165A006		11.5 - 12.5	0.17
165A007		14 - 15	0.049

[a]*Code of Federal Regulations*. 2002b. Title 40 CFR 260-268, "Hazardous Waste Management." Washington, DC: U.S. Government Printing Office.

J = Estimated value. Qualifier added to laboratory data; record accepted. Value exceeded linear range of instrument. The reported value is from the dilution run.
-- = Not detected above MRLs
mg/L = Milligrams per liter
ft bgs = Feet below ground surface

Table A.3-4
Soil Sample Results for Total SVOCs Detected Above Minimum Reporting Limits at CAS 25-20-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)
			Butyl Benzyl Phthalate
Preliminary Action Level			100,000,000[a]
165A004	Spoil Pile	0 - 0.5	16,000

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram

A.3.2.6.6 Gamma Spectroscopy Results for Soil Samples

Gamma spectroscopy analytical results for soil did not exceed the MRLs.

A.3.2.6.7 Isotopic Uranium Analytical Results for Soil Samples

Isotopic U analytical results for soil samples detected above MRLs are shown in Table A.3-9. These results did not exceed PALs.

Table A.3-5
Soil Sample Results for TPH (DRO and GRO) Detected Above Minimum Reporting Limits at CAS 25-20-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
			Diesel-Range Organics	Gasoline-Range Organics
Preliminary Action Level[a,b]			**100**	**100**
165A001	A01	9 - 10	**170 (D, M, Z)**	0.78 (J)
165A002		11.5 - 12.5	43 (D, M)	--
165A003		14.5 - 15.5	29 (D)	--
165A004	Spoil Pile	0 - 0.5	61 (D, M)	--

[a]Results exceeding the PAL are in bold text.
[b]*Nevada Administrative Code* 445A.2272(b) (NAC, 2000)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above MRLs
J = Estimated value. Qualifier added to laboratory data; record accepted. Surrogate recovery exceeded the lower limits.
D = Indicates that a pattern resembling diesel was detected in the sample.
M = Motor oil
Z = The reported results did not resemble the patterns of the following petroleum hydrocarbon products: gasoline, JP-4, JP-8, diesel, mineral spirits, motor oil, Stoddard solvent, and Bunker C.

Table A.3-6
Soil Sample Results for Total RCRA Metals Detected Above Minimum Reporting Limits at CAS 25-20-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)					
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury
Preliminary Action Levels			**23[a]**	**100,000[b]**	**810[b]**	**450[b]**	**750[b]**	**610[b]**
165A001	A01	9 - 10	2.1	59 (J)	--	12	53	0.31
165A002		11.5 - 12.5	2.2	87 (J)	0.62	85	7.9	--
165A003		14.5 - 15.5	2.5	88 (J)	1.4	54	6.3	0.11
165A004	Spoil Pile	0 - 0.5	2.5	86	0.84	26	23	--

[a]Mean plus two times the standard deviation of the mean for sediment samples collected by the Nevada Bureau of Mines and Geology (NBMG) throughout Nevada Test and Training Range (NTTR) (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above MRLs
J = Estimated value. Qualifier added to laboratory data; record accepted. Duplicate precision analyses were outside control limits.

Table A.3-7
Soil Sample Results for PCBs Detected Above Minimum Reporting Limits at CAS 25-20-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)
			Aroclor-1254
Preliminary Action Level[a]			**1,000**
165A001	A01	9 - 10	150
165A002		11.5 - 12.5	49
165A003		14.5 - 15.5	68
165A004	Spoil Pile	0 - 0.5	130

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram

Table A.3-8
Soil Sample Results for Gamma Spectroscopy Detected Above Minimum Reporting Limits at CAS 25-20-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)									
			Actinium-228		Bismuth-214		Lead-212		Lead-214		Thallium-208	
Preliminary Action Levels[a]			**5**	**15**	**5**	**15**	**5**	**15**	**5**	**15**	**5**	**15**
165A001	A01	9 - 10	NA	1.37	NA	0.8	NA	1.68	NA	0.89	NA	0.55
165A002		11.5 - 12.5	NA	1.28	NA	0.78	NA	1.66	NA	0.78	NA	0.49
165A003		14.5 - 15.5	NA	1.65	NA	0.79	NA	1.72	NA	0.86	NA	0.49
165A004	Spoil Pile	0 - 0.5	1.23	NA	0.83	NA	1.27	NA	0.92	NA	0.51	NA

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, and thallium-208 as found in Chapter IV of DOE Order 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The PALs for these isotopes are specified as 5 pCi/g averaged over the first 15 centimeters of soil and 15 pCi/g for deeper soils (DOE, 1993). For the purpose of this document, 15 centimeters is assumed to be equivalent to 0.5 ft (6 in.); therefore, 5/15 pCi/g represents the PALs for these radionuclides in the surface soil (0 to 0.5 ft depth) and in the subsurface soil (> 0.5 ft depth), respectively.

ft bgs = Feet below ground surface
NA = Not applicable
pCi/g = Picocuries per gram

A.3.2.6.8 Isotopic Plutonium Analytical Results for Soil Samples

Isotopic Pu analytical results for soil samples did not exceed the MRLs.

Table A.3-9
Soil Sample Results for Isotopic Uranium
Detected Above Minimum Reporting Limits at CAS 25-20-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)		
			Uranium-234	Uranium-235	Uranium-238
Preliminary Action Levels[a]			**85.9**	**10.5**	**63.2**
165A001	A01	9 - 10	1.05	0.149	0.96
165A002		11.5 - 12.5	0.89	0.087	0.88
165A003		14.5 - 15.5	0.86	0.127	0.85
165A004	Spoil Pile	0 - 0.5	0.83	0.051	0.86

[a]Taken from the construction, commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document was scaled to a 15-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram

A.3.2.6.9 Strontium-90 Analytical Results for Soil Samples

Strontium-90 was not detected in soil samples above the MRLs.

A.3.2.7 Contaminants of Concern

Based on the aforementioned analytical results, COCs are present in the soils under the dry well. The COCs are TPH (DRO) and tetrachloroethene.

A.3.3 Nature and Extent of COCs

The COCs TPH (DRO) and tetrachloroethene were found in soils beneath the dry well. The highest concentrations were detected at the base of the dry well (i.e., leachrock/native soil interface at 9 ft bgs). The concentrations decreased with depth, and were below PALs within 2.5 ft vertically of the dry well base. The overlying soil surrounding the dry well was field screened during excavation, and no elevated FSLs were observed supporting that COCs are not present above the base of the dry well. Sample results from the step-out locations (A03, A04, and A05) indicate tetrachloroethene

concentrations have not migrated more than 15 ft laterally in significant concentrations. Tetrachloroethene has shorter carbon chains than TPH (DRO) and its specific gravity is 1.63, while that of TPH (DRO) is less than one (HHS, 1994); therefore, tetrachloroethene is more mobile than TPH. The extent of TPH (DRO) is limited to within that of the tetrachloroethene (i.e., less than 15 ft laterally).

A.3.4 Revised Conceptual Model

One variation to the dry well configuration was identified. The originally assumed configuration is depicted in Figure 4-1 of the CAIP. The actual configuration showing the discovered 6-in. VCP outfall going into the dry well from the west is depicted in Figure A.3-1. This change in configuration did not invalidate the conceptual site model for this CAS. Biased soil samples were collected in accordance with the CAIP.

A.4.0 Drywell (CAS 25-51-02)

The dry well was not present at this CAS, resulting in changes to the CSM and sample locations. After exploratory trenching to locate the dry well was unsuccessful, a pipe was found and traced to a surface outfall which discharged into a drainage ditch south of the presumed location of the dry well. This modification is addressed in ROTC Number 3 to the CAIP (NNSA/NV, 2002). Originally, the dry well was expected to be encountered east of Building 3320 (Utility Equipment Building) at the ETS-1, approximately 65 ft east of the fence line. The site presently consists of an acid and caustic drain pipe connected to an inside floor drain and an outside drain by a 6-in. Duriron pipe. The Duriron pipe extends approximately 90 ft from Building 3320 where it connects to approximately 230 ft of 6-in. VCP. The 6-in. VCP bends to the south and discharges into the drainage ditch (Figure A.4-1). Additional detail is provided in the CAIP (NNSA/NV, 2002).

A.4.1 Corrective Action Investigation

Fifteen investigation samples, listed in Table A.4-1, were collected during investigation activities conducted at CAS 25-51-02. The planned locations, based on the revised CSM, are shown on Figure 4-2 of the CAIP and actual sample locations are shown in Figure A.4-1. The specific CAI activities conducted to meet CAIP requirements at CAS 25-51-02 are described in the following sections.

A.4.1.1 Deviations

Based on actual site conditions, the CSM was revised and the CAIP requirements were modified as reflected in ROTC Number 3 to the CAIP (NNSA/NV, 2002). There were no deviations to the revised requirements; therefore, the CAIP requirements were met.

A.4.2 Investigation Results

The following sections provide CAS-specific details of the inspection and sampling of system features, FSRs, and sample selection and analysis.

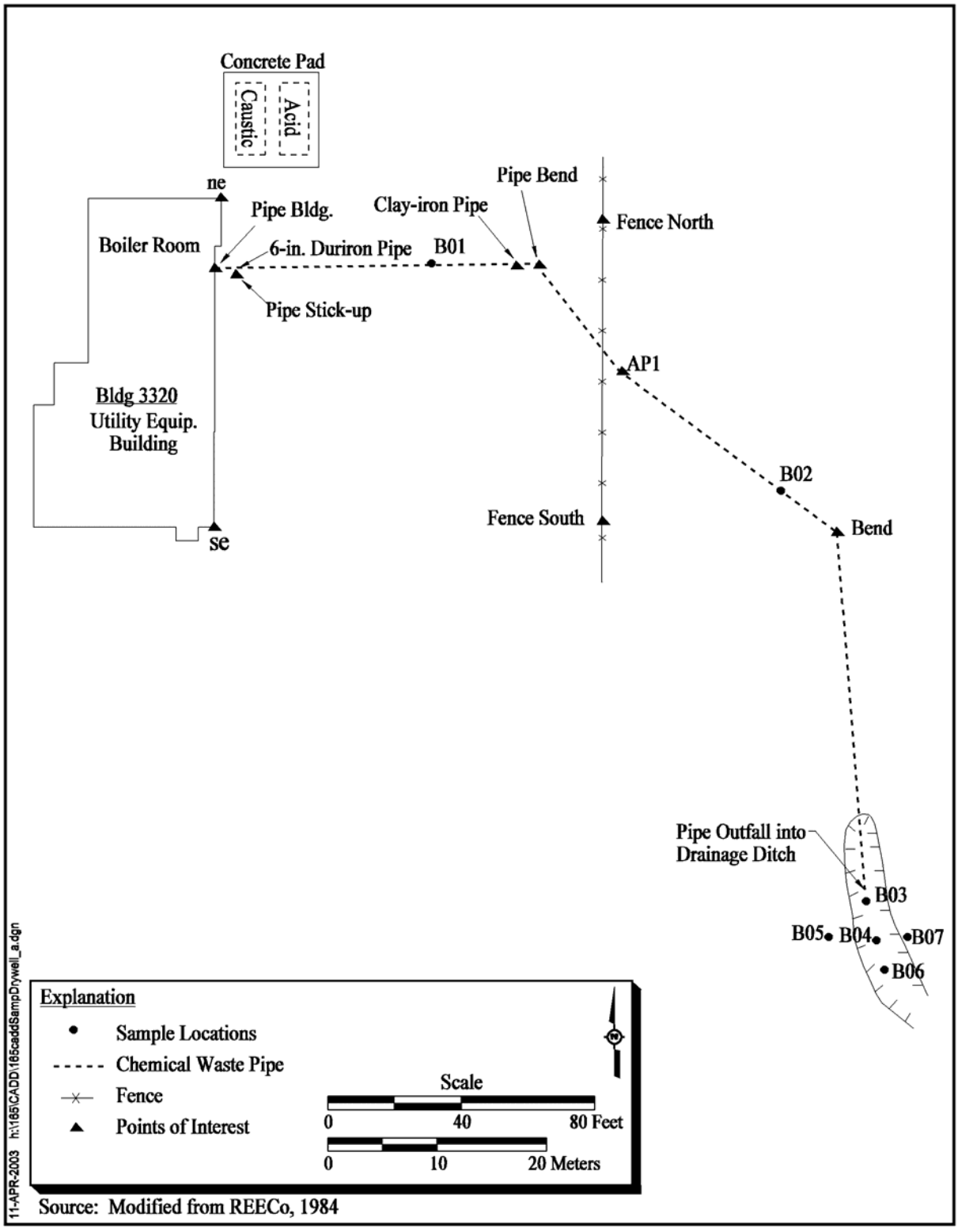

Figure A.4-1
Sampling Locations and Points of Interest at CAS 25-51-02, Drywell

Table A.4-1
Samples Collected at CAS 25-51-02, Drywell

Sample Number	Sample Location	Depth (ft bgs)	Sample Matrix	Purpose	Analyses
165B001	B01	2	Sediment (pipe contents)	WM	Set 1
165B002	B02	3	Sediment (pipe contents)	WM	Set 1, Set 2
165B003	B04	2.5 - 3.5	Soil	Environmental	Set 1
165B004	B04	0 - 0.5	Soil	Environmental	Set 1
165B005	B03	2.5 - 3.5	Soil	Environmental	Set 1
165B006	B03	0 - 0.5	Soil	Environmental	Set 1
165B007	B04	7.5 - 8.5	Soil	Environmental	TPH-DRO, PCBs
165B008	B03	0.5 - 1.5	Soil	Environmental	TPH-DRO, PCBs
165B009	B07	2.5 - 3.5	Soil	Environmental	TPH-DRO, PCBs
165B010	B07	7.5 - 8.5	Soil	Environmental	TPH-DRO, PCBs
165B011	B06	2.5 - 3.5	Soil	Environmental	TPH-DRO, PCBs
165B012	B06	7.5 - 8.5	Soil	Environmental	TPH-DRO, PCBs
165B013	B05	2.5 - 3.5	Soil	Environmental	TPH-DRO, PCBs
165B014	B05	7.5 - 8.5	Soil	Environmental	TPH-DRO, PCBs
165B301	B01	NA	Water	Trip Blank	Total VOCs
165B303	B03	NA	Water	Trip Blank	Total VOCs
165B304	B01	NA	Water	Field Blank	Set 1
165B305	B01	NA	Water	Trip Blank	Total VOCs
165B306	B03	NA	Water	Trip Blank	Total VOCs
165B308	B03	0 - 0.5	Soil	Field Duplicate of #165B006	Set 1
165B309	B03	0.5 - 1.5	Soil	Environmental, MS/MSD	TPH-DRO, PCBs
165B310	Sample Table	NA	Water	Field Blank	Set 1
165B311	Sample Table	NA	Water	Trip Blank	Total VOCs

Set 1 = Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO and GRO), PCBs, pH/corrosivity, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, and Strontium-90
Set 2 = TCLP VOCs, TCLP SVOCs, and TCLP RCRA Metals

MS/MSD = Matrix spike/matrix spike duplicate
ft bgs = Feet below ground surface
NA = Not applicable

A.4.2.1 Pipe Outfall Sampling

Backhoe excavations were conducted to access sampling horizons and collect samples at the biased locations presented in Figure 4-2 of ROTC Number 3 to the CAIP (NNSA/NV, 2002). Thirteen soil samples were collected from the outfall at two locations (B03 and B04) and at three step-out locations (B05, B06, and B07) as specified in the CAIP. Samples were collected at B03 and B04 from the surface, 2.5 ft bgs and 7.5 ft bgs. These samples were submitted for laboratory analyses. A COC was identified at B04. An additional sample was collected at B03 from 0.5 to 1.5 ft bgs because a whitish layer of soil was identified at that horizon. The coloration resembled the residue that was sampled from the pipe. Three step-out locations were also sampled and submitted to the laboratory from 2.5 ft and 7.5 ft bgs. In addition, one QC soil duplicate was collected and analyzed. One MS/MSD was performed on one sample.

A.4.2.2 Inspection and Sampling of Collection System Components

The collection system pipe was inspected and two samples of pipe contents, at locations B01 and B02 (Figure A.4-1), were collected and submitted for laboratory analysis. Access to the pipe was made by backhoe excavations at locations B01, AP1, and B02. In order to inspect the collection system pipe for contents, a video survey was conducted in the collection system pipe beginning at these access points and run in both directions. A video mole run of 60 ft was made from B01 to Building 3320. The video mole was also run from B01 towards the east. The Duriron pipe was observed to be connected to VCP 25 ft from B01 and bending southeast 30 ft from B01. This run met refusal after 60 ft at location AP1. Pipe contents were observed and sampled at the beginning of this run at location B01. The video mole was run from AP1 to B01, which verified it was the same pipe. The video mole was run from AP1 to B02 (60 ft) and the only contents seen were inside the pipe at B02. An excavation was also made at B02 and the contents were sampled. A final video mole run was made from B02 towards the surface pipe outfall to the south. The pipe was observed to be clean VCP; however, the video mole run did not reach the pipe outfall. A fish-tape wire was introduced into the access point at B02 and was observed coming out of the surface pipe outfall. Breaches in the collection system pipes were not observed during any video survey. All excavated video access locations were grouted prior to backfilling.

A.4.2.3 Field-Screening Results

Soil samples were field screened for VOCs and alpha and beta/gamma radiation. The FSRs were compared to FSLs to guide sampling decisions. The VOC headspace FSLs were exceeded during hand auguring at location B03 on sample 165B005 at a depth of 2.5 ft bgs; however, a deeper sample could not be collected at that time. The sample analytical results did not indicate VOC COCs. No samples had elevated FSRs for alpha and beta/gamma radiation.

A.4.2.4 Sample Analyses

Investigation samples were analyzed for CAIP-specified COPCs which included total VOCs, total SVOCs, total RCRA metals, TPH (DRO and GRO), PCBs, pH, isotopic U, isotopic Pu, Sr-90, and gamma-emitting radionuclides. The analytical parameters and laboratory analytical methods used to analyze the investigation samples are listed in Table A.2-2. Table A.4-1 lists the sample-specific analytical parameters.

A.4.2.5 Analytes Detected Above Minimum Reporting Limits

The analytical results detected at concentrations exceeding the correlated MRLs (NNSA/NV, 2002) are summarized in the following sections. These results are compared to PALs which are a subset of those that exceed MRLs. All of the analytical results obtained through sample analysis are usable.

A.4.2.5.1 Total Volatile Organic Compound Analytical Results for Soil Samples

Total VOC analytical results exceeding MRLs are shown on Table A.4-2. These results for soil samples did not exceed the PALs.

A.4.2.5.2 Total Semivolatile Organic Compound Analytical Results for Soil Samples

Total SVOCs analytical results for soil samples did not exceed the MRLs.

A.4.2.5.3 Total Petroleum Hydrocarbon Analytical Results for Soil Samples

The TPH analytical results for soil exceeding the MRLs are shown in Table A.4-3. Soil sample 165B003 taken from location B04 had a TPH (DRO) concentration of 1,800 mg/kg, which exceeded the PAL of 100 mg/kg. No other analytical results exceeded the PAL.

Table A.4-2
Soil Sample Results for Total VOCs Detected Above Minimum Reporting Limits at CAS 25-51-02

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)	
			Acetone	Methylene Chloride
Preliminary Action Levels[a]			**6,200,000**	**21,000**
165B003	B04	2.5 - 3.5	--	8
165B308	B03	0.5 - 1.5	27 (J)	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
-- = Not detected above MRLs
J = Estimated value. Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05. Continuing calibration verification percent >25.

Table A.4-3
Soil Sample Results for TPH (DRO and GRO) Detected Above Minimum Reporting Limits at CAS 25-51-02

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
			Diesel-Range Organics	Gasoline-Range Organics
Preliminary Action Level[a, b]			**100**	**100**
165B003	B04	2.5 - 3.5	**1,800** (J)	15 (H)
165B008	B03	0.5 - 1.5	55 (D, H)	--
165B011	B06	2.5 - 3.5	12 (D, H)	--
165B309	B03	0.5 - 1.5	42 (D, H)	--

a Results exceeding the PALs are in bold text.
[b]*Nevada Administrative Code* 445A.2272(b) (NAC, 2000)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
D = Indicates that a pattern resembling diesel was detected in the sample.
J = Estimated value. Qualifier added to laboratory data; record accepted. Surrogates diluted out.
H = The fuel pattern was in the heavier end of the retention time window for the analyte of interest.
-- = Not detected above MRLs

A.4.2.5.4 Total RCRA Metals Analytical Results for Soil Samples

Total RCRA metal analytical results for soil exceeding the MRLs are presented in Table A.4-4. The PALs established in the CAIP were not exceeded in any sample.

Table A.4-4
Soil Sample Results for Total RCRA Metals Detected Above Minimum Reporting Limits at CAS 25-51-02

Sample Number	Sample Location	Depths (ft bgs)	Contaminants of Potential Concern (mg/kg)				
			Arsenic	Barium	Chromium	Lead	Selenium
Preliminary Action Levels			**23[a]**	**100,000[b]**	**450[b]**	**750[b]**	**10,000[b]**
165B003	B04	2.5 - 3.5	--	--	5.5	3.6	--
165B004		0 - 0.5	2	50	2.8	5.2	0.53
165B005	B03	2.5 - 3.5	1.4	26	9.3	4.5	--
165B006		0 - 0.5	1.8	49	2.8	5.1	0.52
165B308		0 - 0.5	1.6	48	3	4.9	--

[a]Mean plus two times the standard deviation of the mean for sediment samples collected by the NBMG throughout NTTR (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above MRLs

A.4.2.5.5 Polychlorinated Biphenyl Analytical Results for Soil Samples

The PCB analytical results exceeding MRLs are reported on Table A.4-5. These results did not exceed the PALs.

Table A.4-5
Soil Sample Results for PCBs Detected Above Minimum Reporting Limits at CAS 25-51-02

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)	
			Aroclor-1254	Aroclor-1260
Preliminary Action Levels[a]			**1,000**	**1,000**
165B008	B03	0.5 - 1.5	--	59
165B309		0.5 - 1.5	61	59

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
-- = Not detected above MRLs

A.4.2.5.6 pH Results for Soil Samples

The pH analysis was run on soil samples in the field following established procedures. No pH analytical results for soil exceeded the PALs. The pH analytical results ranged from 7.05 to 8.59.

A.4.2.5.7 Gamma Spectroscopy Results for Soil Samples

Gamma spectroscopy analytical results were not detected above the MRLs.

A.4.2.5.8 Isotopic Uranium Analytical Results for Soil Samples

Isotopic U analytical results exceeding MRLs are presented in Table A.4-7. These results did not exceed PALs.

Table A.4-6
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 25-51-02

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)									
			Actinium-228		Bismuth-214		Lead-212		Lead-214		Thallium-208	
Preliminary Action Levels[a]			**5**	**15**	**5**	**15**	**5**	**15**	**5**	**15**	**5**	**15**
165B003	B04	2.5 - 3.5	NA	1.25	NA	0.84	NA	1.7	NA	0.88	NA	0.45
165B004		0 - 0.5	1.21	NA	0.55	NA	1.41	NA	0.56	NA	0.38	NA
165B005	B03	2.5 - 3.5	NA	1.02	NA	0.66	NA	1.38	NA	0.79	NA	0.328
165B006		0 - 0.5	1.12	NA	0.52	NA	1.34	NA	0.58	NA	0.4	NA
165B308		0 - 0.5	1.29	NA	0.56	NA	1.42	NA	0.63	NA	0.45	NA

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, and thallium-208, as found in Chapter IV of DOE Order 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The PALs for these isotopes are specified as 5 pCi/g averaged over the first 15 centimeters of soil and 15 pCi/g for deeper soils (DOE, 1993). For the purpose of this document, 15 centimeters is assumed to be equivalent to 0.5 ft (6 in.); therefore, 5/15 pCi/g represents the PALs for these radionuclides in the surface soil (0 - 0.5 ft depth) and in the subsurface (> 0.5 ft depth), respectively.

ft bgs = Feet below ground surface
NA = Not applicable
pCi/g = Picocuries per gram

Table A.4-7
Soil Sample Results for Isotopic Uranium Detected Above Minimum Reporting Limits at CAS 25-51-02

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)	
			Uranium-234	Uranium-238
Preliminary Action Levels[a]			**85.9**	**63.2**
165B003	B04	2.5 - 3.5	0.84	0.77
165B004		0 - 0.5	0.7	0.69
165B005	B03	2.5 - 3.5	0.65	0.72
165B006		0 - 0.5	0.57	0.56
165B308		0 - 0.5	0.56	0.56

[a]Taken from the construction, commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem/yr dose.

ft bgs = Feet below ground surface
NA = Not applicable
pCi/g = Picocuries per gram

A.4.2.5.9 Isotopic Plutonium Analytical Results for Soil Samples

Isotopic Pu analytical results for soil samples did not exceed MRLs.

A.4.2.5.10 Strontium-90 Analytical Results for Soil Samples

Strontium-90 analytical results did not exceed the MRLs.

A.4.2.6 Pipe Content Samples

Results of collected pipe content samples were compared to PALs for soil. The PAL for PCBs was exceeded; therefore, the results are also compared to regulatory limits based on disposal options. If the waste has no hazardous component, the regulatory level is based on NTS disposal options at landfills and lagoons (BN, 1995; CFR, 2002b; NDEP, 1997a, b, and c). If the waste is hazardous, the release criteria are based on interpretation of the guidelines presented in the Performance Objective for Certification (POC) (BN, 1995; Alderson, 1999). For waste destined for off-site disposal, the POC radiological levels must be met to certify that the waste has no added radioactivity.

Samples 165B001 and 165B002 were analyzed for total VOCs, total SVOCs, total RCRA metals, TPH (DRO and GRO), PCBs, pH, gamma spectroscopy, isotopic U, isotopic Pu, Sr-90. Sample 165B002 was also analyzed for TCLP VOCs, TCLP SVOCs, and TCLP RCRA metals. The samples taken from inside the Duriron pipe at locations B01 and B02, showed PCBs detected above the PAL of 1,000 µg/kg, but well below the regulatory disposal limit of 50,000 µg/kg. Aroclor-1254 was detected at these locations at concentrations of 1,800 µg/kg (B01) and 1,600 µg/kg (B02) (Table A.4-8).

A.4.2.7 Contaminants of Concern

Based on the aforementioned analytical results, only the contents of the distribution pipe and soil at B04 contain COCs. The PCBs were identified in the pipe at B01 and B02. The PCB concentrations in the pipe did not exceed the action level of 50 ppm for disposal purposes. The TPH (DRO) was identified in soil at sample location B04 at a depth of 2.5 to 3.5 ft bgs, which is above PAL of 100 mg/kg.

A.4.3 Nature and Extent of COCs

Total petroleum hydrocarbons were found in soils beneath the pipe outfall at one horizon (2.5 to 3.5 ft bgs) at location (B04). The concentrations decreased with depth, and were below PALs at the next sample horizon (7.5 to 8.5 ft bgs). The overlying soil at B04 was field screened during excavation and no elevated FSLs were observed. Sample results from the step-out locations (B03, B05, B06, and B07) indicate TPH concentrations have not migrated 15 ft laterally.

A.4.4 Revised Conceptual Site Model

A variation to the conceptual site model was made due to the absence of the dry well at this CAS. The originally assumed configuration showing the dry well is depicted in Figure 4-2 of the CAIP. The actual configuration showing the discovered 6-in. VCP outfall going into the drainage ditch is depicted in Figure A.4-1. Biased soil samples were collected in accordance with the ROTC Number 3 in the CAIP.

Table A.4-8
Pipe Content Sample Results Detected Above Minimum Reporting Limits at CAS 25-51-02

Sample Number	Matrix	Analyte	Result[e]	Units	PAL	Regulatory Limit	Regulatory Reference
165B001	Sediment	Arsenic	2.5	mg/kg	23	NA	CFR, 2002b
165B001	Sediment	Barium	47	mg/kg	100,000	NA	CFR, 2002b
165B001	Sediment	Chromium	13	mg/kg	450	NA	CFR, 2002b
165B001	Sediment	Lead	15	mg/kg	750	NA	CFR, 2002b
165B001	Sediment	Methylene Chloride	64	µg/kg	21,000	NA	CFR, 2002b
165B001	Sediment	Aroclor-1254	1,800 (J)[a]	µg/kg	1,000	50,000	CFR, 2002c
165B001	Sediment	Actinium-228	0.99	pCi/g	5[c]	100	NDEP, 1997c
165B001	Sediment	Bismuth-214	0.45	pCi/g	5[c]	100	NDEP, 1997c
165B001	Sediment	Lead-212	1.13	pCi/g	5[c]	100	NDEP, 1997c
165B001	Sediment	Lead-214	0.63	pCi/g	5[c]	100	NDEP, 1997c
165B001	Sediment	Thallium-208	0.322	pCi/g	5[c]	100	NDEP, 1997c
165B001	Sediment	Uranium-234	0.61	pCi/g	85.9[d]	100	NDEP, 1997c
165B001	Sediment	Uranium - 238	0.59	pCi/g	63.2[d]	100	NDEP, 1997c
165B002	Sediment	Bis(2-Ethylhexyl)Phthalate	12,000	µg/kg	180	NA	CFR, 2002b
165B002	Sediment	Actinium-228	1.02	pCi/g	5[c]	100	NDEP, 1997c
165B002	Sediment	Lead-212	0.98	pCi/g	5[c]	100	NDEP, 1997c
165B002	Sediment	Lead-214	0.61	pCi/g	5[c]	100	NDEP, 1997c
165B002	Sediment	Thallium-208	0.33	pCi/g	5[c]	100	NDEP, 1997c
165B002	Sediment	Uranium-234	0.61	pCi/g	85.9[d]	100	NDEP, 1997c
165B002	Sediment	Uranium-238	0.52	pCi/g	63.2[d]	100	NDEP, 1997c
165B002	Sediment	Aroclor-1254	1,600 (J)[b]	µg/kg	1,000	50,000	CFR, 2002c
165B002	Sediment	Arsenic	1.5	mg/kg	23	NA	CFR, 2002b
165B002	Sediment	Barium	38	mg/kg	100,000	NA	CFR, 2002b
165B002	Sediment	Chromium	13	mg/kg	450	NA	CFR, 2002b
165B002	Sediment	Lead	31	mg/kg	750	NA	CFR, 2002b
165B002	Sediment	Selenium	0.53	mg/kg	10,000	NA	CFR, 2002b
165B002	Sediment	TCLP Lead	0.03	mg/L	37.5	5	CFR, 2002b

[a]Qualifier added to laboratory data; record accepted. Surrogates diluted out.
[b]Qualifier added to laboratory data; record accepted. Value exceeded linear range of instrument.
[c]Taken from Chapter IV of DOE 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993)
[d]Taken from the construction, commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999).
[e]Results exceeding regulatory limits are in bold text.

J = Estimated value
N = No limit established for the NTS Industrial Landfill
NA = Not applicable

A.5.0 Septic System (CAS 25-59-01)

Corrective Action Site 25-59-01, Septic System, is located in Area 25 of the NTS in the Engine Maintenance, Assembly, and Disassembly (E-MAD) facility. The gravity-fed system was designed for sanitary wastes and serviced two toilets, two urinals, and two sinks in the Engine Transport System Maintenance (ETSM) Building (Building 3901). The CAS consists of a cast-iron cleanout riser, a 1,000-gal capacity concrete septic tank with cast-iron cleanout plugs on top, a perforated wall leaching cesspool with a gravel leachbed, and associated piping. The piping includes 16 ft of 4-in. extra heavy cast-iron pipe (HCIP) from the toilet facility to the septic tank and 10 ft of 4-in. HCIP from the septic tank to the cesspool (Figure A.5-1). More detail about this CAS is provided in the CAIP (NNSA/NV, 2002).

A.5.1 Corrective Action Investigation

Seven investigation samples were collected during investigation activities and are listed in Table A.5-1. The planned sample locations are shown in Figure 4-3 of the CAIP. The actual sample locations are shown in Figure A.5-1. The specific CAI activities conducted to meet CAIP requirements at CAS 25-59-01 are described in the following sections.

A.5.1.1 Deviations

There were no deviations to the CAIP requirements; therefore, the CAIP requirements were met.

A.5.2 Investigation Results

The following sections provide CAS-specific details of the inspection and sampling of system features, FSRs, and sample selection and analysis.

A.5.2.1 Septic Tank Integrity Sampling

Two integrity soil samples were collected from two locations (C04 and C05) adjacent to the influent and effluent ends of the septic tank. The samples were collected from the soil horizons underlying the base of the septic tank, both at 9 to 10 ft bgs.

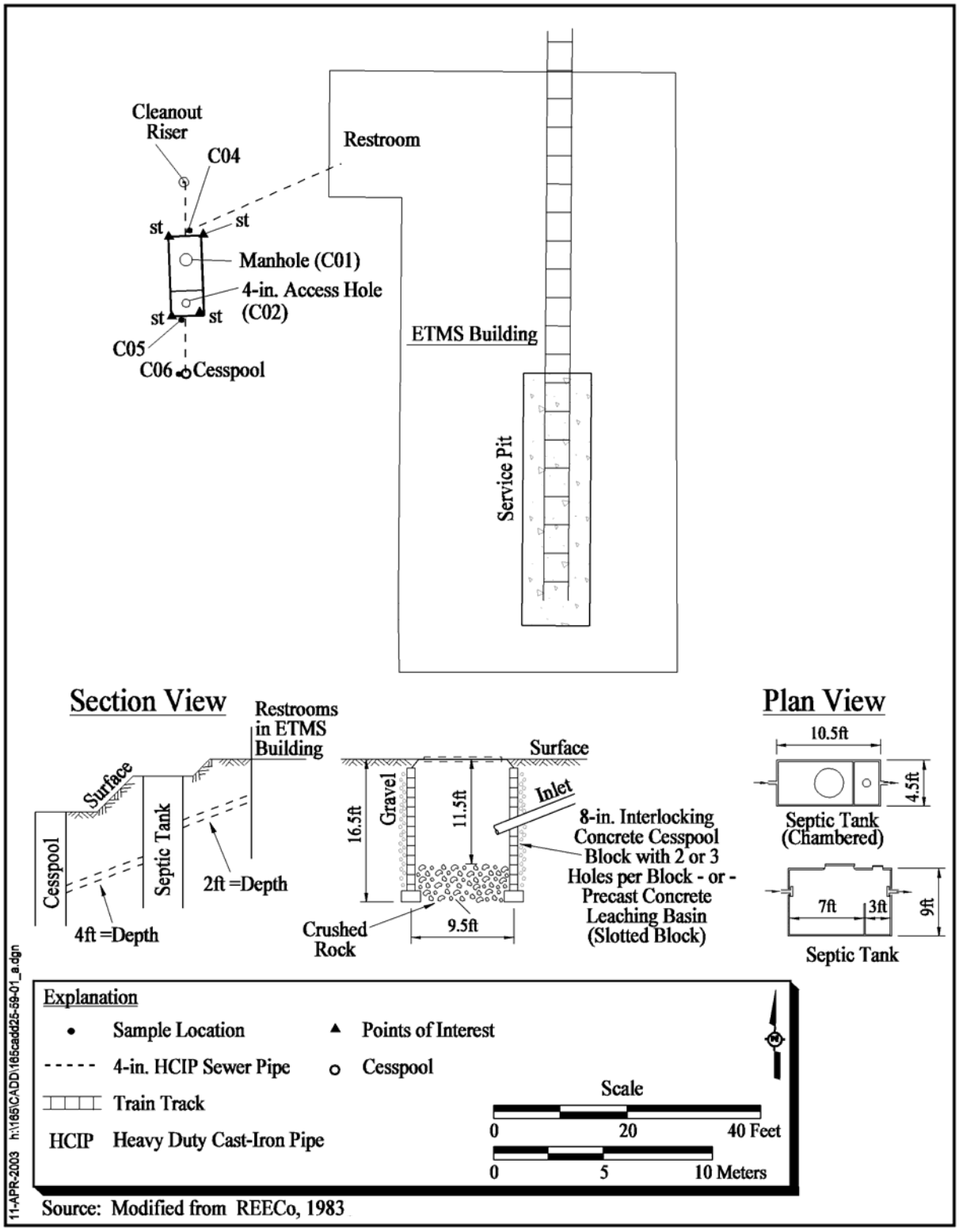

Figure A.5-1
Sampling Locations and Points of Interest at CAS 25-59-01, Septic System

Table A.5-1
Samples Collected for CAS 25-59-01, Septic System

Sample Number	Sample Location	Depth (ft bgs)	Sample Matrix	Purpose	Analyses
165C001	C01	Septic Tank	Sludge	WM, MS/MSD	Set 2
165C002	C01	Septic Tank	Sludge	WM, MS/MSD	Set 1
165C003	C02	Septic Tank	Sludge	WM	Set 1, Set 2
165C004	C04	9 - 9.5	Soil	Environmental, MS/MSD	Set 1
165C005	C05	9 - 9.5	Soil	Environmental	Set 1
165C006	C06	16.5 - 17	Soil	Environmental	Set 1
165C007	C06	19.5 - 20.5	Soil	Environmental	Set 1
165C304	C06	NA	Water	Trip Blank	Total VOC
165C306	C04	NA	Water	Field Blank	Set 1
165C307	C04	NA	Water	Trip Blank	Total VOC
165C308	C04	NA	Water	Equipment Rinsate Blank	Set 1
301C001	C02	NA	Water	Equipment Rinsate Blank	Set 1, Tritium, Gross Alpha/Beta
301C002	C02	NA	Water	Field Blank	Set 1, Tritium, Gross Alpha/Beta
301C003	NA	NA	Water	Trip Blank	Total VOC
301C004	C02	NA	Water	Trip Blank	Total VOC
301C005	C02	NA	Water	Trip Blank	Total VOC

Set 1 = Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO and GRO), PCBs, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, and Strontium-90
Set 2 = TCLP VOCs, TCLP SVOCs, and TCLP RCRA Metals

MS/MSD = Matrix spike/matrix spike duplicate
NA = Not applicable
WM = Waste management
ft bgs = Feet below ground surface

A.5.2.2 Inspection of Collection System Components

The septic tank and collection system pipe were inspected. The concrete, rectangular-shaped septic tank has a 1,000-gal capacity and two chambers. Most of the tank's upper surface is exposed at the ground surface and is accessed by one manhole and a 4-in. access hole. The exterior dimensions of the tank are 10.5 (length) by 4.5 (width) by 9 ft (depth). The interior dimensions of the tank are 10 (length) by 4 (width) by 8 ft (depth). The influent chamber is 7 ft and the effluent chamber is 3 ft

in length. Three sludge samples were collected from the septic tank (two from the influent and one from the effluent end) in accordance with the CAIP. Visual inspection revealed that a maximum of 10 in. (approximately 175 gal) of sludge in the influent side and 6 in. (approximately 30 gal) of sludge in the effluent side remained in the bottom of the tank. Photographs of the interior of the septic tank were taken to document the visual inspection and are in project files.

Portions of the collection system pipe were inspected for breaks and pipe contents. A video survey of the pipe accessed through the influent end of the septic tank towards Building 3901 was run for approximately 21 ft. The pipe was observed with no breaks or sample media present. A plug was observed at the end of this run at 21 ft. The cleanout riser pipe was observed during this run; however, the cleanout riser was too small for the video mole to be run. The video mole was run through the effluent end of the septic tank and met refusal at 1 ft. The video mole was then fed through the cesspool toward the septic tank and met refusal at the same point near the septic tank. The pipe appears to have been broken at the effluent end of the septic tank. The soil beneath this pipe at the base of the septic tank was sampled and no COCs were identified. The video survey showed no contents to sample or additional breaches in the collection system pipes. All excavated video access locations were grouted prior to backfilling.

A.5.2.3 Cesspool Sampling

Backhoe excavations were conducted to access sampling horizons and collect samples from the biased location at the base of the cesspool as presented in the CAIP. Excavations provided a visual verification (16.5 x 7 ft diameter) of the cesspool configuration (Figure A.5-1). One soil sample was collected from beneath the cesspool at the leachrock/native soil interface as specified in the CAIP. A sample was collected at 3 ft below the interface. Both samples were submitted for laboratory analyses. The interface was found at a depth of 16.5 ft bgs. In addition, one MS/MSD was performed on one sample.

A.5.2.4 Field-Screening Results

Soil samples were field screened for VOCs and alpha and beta/gamma radiation. The FSRs were compared to FSLs to guide sampling decisions. The VOC headspace FSLs were not exceeded during

excavations and sampling activities. No samples had elevated FSRs for alpha and beta/gamma radiation.

A.5.2.5 Sample Analyses

Soil and sludge samples were analyzed for CAIP-specified COPCs which included total VOCs, total SVOCs, total RCRA metals, TPH (DRO and GRO), PCBs, isotopic U, isotopic Pu, Sr-90, and gamma-emitting radionuclides. In addition, the sludge samples were analyzed according to the TCLP for VOCs, SVOCs, and RCRA metals. A sample of the septic tank content (sludge) was also collected from the influent side and analyzed for fecal coliform bacteria. The analytical parameters and laboratory analytical methods used to analyze the investigation samples are listed in Table A.2-2. Table A.5-1 lists the sample-specific analytical parameters.

A.5.2.6 Analytes Detected Above Minimum Reporting Limits

The analytical results detected at concentrations exceeding the correlated MRLs (NNSA/NV, 2002) are summarized in the following sections. These results are compared to PALs which are a subset of those that exceed MRLs. A portion of the analytical results were rejected; however, these rejected data did not impact closure decisions as discussed in Section B.1.1.3 of Appendix B.

A.5.2.6.1 Total Volatile Organic Compound Analytical Results for Soil Samples

Total VOC analytical results exceeding the MRLs are listed in Table A.5-2. These results did not exceed the PALs.

A.5.2.6.2 Total Semivolatile Organic Compound Analytical Results for Soil Samples

Total SVOCs analytical results for soil did not exceed the MRLs.

A.5.2.6.3 Total Petroleum Hydrocarbon Analytical Results for Soil Samples

The TPH (DRO and GRO) analytical results for soil did not exceed the MRLs.

Table A.5-2
Soil Sample Results for Total VOCs Detected Above Minimum Reporting Limits at CAS 25-59-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)
			Methylene Chloride
Preliminary Action Level[a]			21,000
165C004	C04	9 - 9.5	21
165C005	C05	9 - 9.5	23
165C006	C06	16.6 - 17	21
165C007		19.5 - 20.5	21

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram

A.5.2.6.4 Total RCRA Metals Analytical Results for Soil Samples

Total RCRA metals analytical results exceeding MRLs are listed in Table A.5-3. These results did not exceed the PALs.

Table A.5-3
Soil Sample Results for Total RCRA Metals Detected Above Minimum Reporting Limits at CAS 25-59-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)					
			Arsenic	Barium	Cadmium	Chromium	Lead	Selenium
Preliminary Action Levels			23[a]	100,000[b]	810[b]	450[b]	750[b]	10,000[b]
165C004	C04	9 - 9.5	1.6	79	--	2.1	4.1	--
165C005	C05	9 - 9.5	3.9	120	0.77	6.4	110	1.4
165C006	C06	16.6 - 17	2.1	88	--	2.8	4.6	--
165C007		19.5 - 20.5	2.2	81	--	2.8	3.9	--

[a]Mean plus two times the standard deviation of the mean for sediment samples collected by the NBMG throughout NTTR (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above MRLs

A.5.2.6.5 Polychlorinated Biphenyl Results for Soil Samples

Analytical results for PCBs in soil did not exceed the MRLs.

A.5.2.6.6 Gamma Spectroscopy Results for Soil Samples

Gamma spectroscopy analytical results exceeding the MRLs are listed in Table A.5-4. These results did not exceed the PALs.

Table A.5-4
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 25-59-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)				
			Actinium-228	Bismuth-214	Lead-212	Lead-214	Thallium-208
Preliminary Action Levels[a]			**15**	**15**	**15**	**15**	**15**
165C004	C04	9 - 9.5	1.13	0.58	1.15	0.7	0.34
165C005	C05	9 - 9.5	1.09	0.58	1.19	0.74	0.44
165C006	C06	16.6 - 17	1.35	0.64	1.27	0.64	0.418
165C007		19.5 - 20.5	1.39	0.71	1.5	0.71	0.58

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, and thallium-208, as found in Chapter IV of DOE Order 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The PALs for these isotopes are specified as 5 pCi/g averaged over the first 15 centimeters of soil and 15 pCi/g for deeper soils (DOE, 1993). For the purpose of this document, 15 centimeters is assumed to be equivalent to 0.5 ft (6 in.); therefore, 15 pCi/g represents the PALs for these radionuclides in the subsurface (> 0.5 ft depth).

ft bgs = Feet below ground surface

A.5.2.6.7 Isotopic Uranium Results for Soil Samples

Isotopic U analytical results exceeding MRLs are presented in Table A.5-5. These results did not exceed PALs.

A.5.2.6.8 Isotopic Plutonium Results for Soil Samples

Isotopic Pu analytical results for soil samples did not exceed MRLs.

Table A.5-5
Soil Sample Results for Isotopic Uranium Detected Above Minimum Reporting Limits at CAS 25-59-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)	
			Uranium-234	Uranium-238
Preliminary Action Levels[a]			**85.9**	**63.2**
165C004	C04	9 - 9.5	0.62	0.63
165C005	C05	9 - 9.5	0.77	0.72
165C006	C06	16.6 - 17	0.65	0.72
165C007		19.5 - 20.5	0.89	0.76

[a]Taken from the construction, commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram

A.5.2.6.9 Strontium-90 Results for Soil Samples

Strontium-90 was not detected in soil samples above MRLs.

A.5.2.7 Septic Tank Sludge Sample Results

Results of collected septic tank content samples were compared to regulatory limits based on disposal options. These results are not compared to PALs because septic tank contents are typically removed for disposal. If the waste has no hazardous component, the regulatory level is based on NTS disposal options at landfills and lagoons (BN, 1995; CFR, 2000c; NDEP, 1997a, b, and c). Any sludge or liquid waste must be solidified before disposal at the NTS landfills (NDEP, 1997b). If the waste is hazardous, the release criteria are based on interpretation of the guidelines presented in the POC (BN, 1995; Alderson, 1999). For waste destined for off-site disposal, the POC radiological levels must be met to certify that the waste has no added radioactivity.

Analytical results exceeding MRLs are listed in Table A.5-6. Three sludge samples (165C001, 165C002, and 165C003) were obtained from inside the septic tank. Samples 165C001 and 165C002 were collected from the influent side of the septic tank at location C01. Sample 165C001 was analyzed for TCLP VOCs, TCLP SVOCs, and TCLP RCRA metals. Sample 165C002 was analyzed for total VOCs, total SVOCs, total RCRA metals, TPH (DRO and GRO), PCBs, gamma

Table A.5-6
Sludge Sample Results Detected Above Minimum Reporting Limits at CAS 25-59-01
(Page 1 of 2)

Sample Number	Matrix	Analyte	Result[h]	Units	Regulatory Limits	Regulatory Reference
165C001	Sludge	TCLP Cadmium	0.059	mg/L	1	CFR, 2002b
165C001	Sludge	TCLP 1,4-Dichlorobenzene	0.72	mg/L	7.5	CFR, 2002b
165C001	Sludge	TCLP Lead	0.03	mg/L	5	CFR, 2002b
165C002	Sludge	Diesel-Range Organics	**10,000 (J)[a]**	mg/kg	100	NDEP, 1997b
165C002	Sludge	Gasoline-Range Organics	**170 (J)[a]**	mg/kg	100	NDEP, 1997b
165C002	Sludge	1,3,5-Trimethylbenzene	3,800 (J)[b]	µg/kg	NA	CFR, 2002b
165C002	Sludge	Chlorobenzene	1,000 (J)[b]	µg/kg	NA	CFR, 2002b
165C002	Sludge	Isopropylbenzene	440 (J)[b]	µg/kg	NA	CFR, 2002b
165C002	Sludge	N-Butylbenzene	580 (J)[c]	µg/kg	NA	CFR, 2002b
165C002	Sludge	N-Propylbenzene	1,200 (J)[b]	µg/kg	NA	CFR, 2002b
165C002	Sludge	P-Isopropyltoluene	1,700 (J)[b]	µg/kg	NA	CFR, 2002b
165C002	Sludge	Sec-Butylbenzene	760 (J)[b]	µg/kg	NA	CFR, 2002b
165C002	Sludge	1,2,4-Trimethylbenzene	5,200	µg/kg	NA	CFR, 2002b
165C002	Sludge	1,4-Dichlorobenzene	30,000	µg/kg	NA	CFR, 2002b
165C002	Sludge	Naphthalene	76,000	µg/kg	NA	CFR, 2002b
165C002	Sludge	Uranium-234	2.64	pCi/g	100	NDEP, 1997c
165C002	Sludge	Uranium-238	0.47	pCi/g	100	NDEP, 1997c
165C002	Sludge	Plutonium-239	0.287	pCi/g	10	NDEP, 1997c
165C002	Sludge	Aroclor-1016	2,100	µg/kg	50,000	CFR, 2002c
165C002	Sludge	Aroclor-1260	620 (J)[d]	µg/kg	50,000	CFR, 2002c
165C002	Sludge	Mercury	0.18 (J)[a]	mg/kg	NA	CFR, 2002b
165C002	Sludge	Arsenic	22	mg/kg	NA	CFR, 2002b
165C002	Sludge	Barium	110	mg/kg	NA	CFR, 2002b
165C002	Sludge	Cadmium	23	mg/kg	NA	CFR, 2002b
165C002	Sludge	Chromium	42 (J)[e]	mg/kg	NA	CFR, 2002b
165C002	Sludge	Lead	190	mg/kg	NA	CFR, 2002b
165C002	Sludge	Silver	3.1 (B)	mg/kg	NA	CFR, 2002b
165C003	Sludge	Diesel-Range Organics	**28,000 (J)[f]**	mg/kg	100	NDEP, 1997b
165C003	Sludge	Gasoline-Range Organics	**170 (H)**	mg/kg	100	NDEP, 1997b
165C003	Sludge	1,2,4-Trimethylbenzene	30 (J)[c]	µg/kg	NA	CFR, 2002b
165C003	Sludge	1,3,5-Trimethylbenzene	30 (J)[c]	µg/kg	NA	CFR, 2002b
165C003	Sludge	Methylene Chloride	38 (J)[c]	µg/kg	NA	CFR, 2002b
165C003	Sludge	N-Butylbenzene	15 (J)[c]	µg/kg	NA	CFR, 2002b

Table A.5-6
Sludge Sample Results Detected Above Minimum Reporting Limits at CAS 25-59-01
(Page 2 of 2)

Sample Number	Matrix	Analyte	Result[h]	Units	Regulatory Limits	Regulatory Reference
165C003	Sludge	P-Isopropyltoluene	18 (J)[c]	µg/kg	NA	CFR, 2002b
165C003	Sludge	Sec-Butylbenzene	17 (J)[c]	µg/kg	NA	CFR, 2002b
165C003	Sludge	1,4-Dichlorobenzene	250 (J)	µg/kg	NA	CFR, 2002b
165C003	Sludge	Benzo(A)Pyrene	910 (J)[g]	µg/kg	NA	CFR, 2002b
165C003	Sludge	Bis(2-Ethylhexyl)Phthalate	1,100 (J)[g]	µg/kg	NA	CFR, 2002b
165C003	Sludge	Chrysene	1,700 (J)[g]	µg/kg	NA	CFR, 2002b
165C003	Sludge	Fluoranthene	1,000	µg/kg	NA	CFR, 2002b
165C003	Sludge	Phenanthrene	3,900	µg/kg	NA	CFR, 2002b
165C003	Sludge	Pyrene	6,900 (J)[g]	µg/kg	NA	CFR, 2002b
165C003	Sludge	Uranium-234	4.65	pCi/g	100	NDEP, 1997c
165C003	Sludge	Uranium-235	0.33	pCi/g	100	NDEP, 1997c
165C003	Sludge	Plutonium-238	0.09	pCi/g	10	NDEP, 1997c
165C003	Sludge	Plutonium-239	4.75	pCi/g	10	NDEP, 1997c
165C003	Sludge	Mercury	0.29 (J)[a]	mg/kg	NA	CFR, 2002b
165C003	Sludge	Arsenic	20	mg/kg	NA	CFR, 2002b
165C003	Sludge	Barium	50	mg/kg	NA	CFR, 2002b
165C003	Sludge	Chromium	69 (J)[e]	mg/kg	NA	CFR, 2002b
165C003	Sludge	Lead	170	mg/kg	NA	CFR, 2002b
165C003	Sludge	TCLP Lead	0.03	mg/L	5	CFR, 2002b
165C003	Sludge	Selenium	12	mg/kg	NA	CFR, 2002b

[a]Qualifier added to laboratory data; record accepted. Spike recovery was outside control limits.
[b]Qualifier added to laboratory data; record accepted. Surrogate recovery exceeded the upper limits.
[c]Qualifier added to laboratory data; record accepted. Surrogate recovery exceeded the upper limits. Matrix effects may exist.
[d]Qualifier added to laboratory data; record accepted. Spike recovery was outside control limits. Matrix effects may exist.
[e]Qualifier added to laboratory data; record accepted. Duplicate precision analyses were outside control limits.
[f]Qualifier added to laboratory data; record accepted. Surrogates diluted out.
[g]Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits. Matrix effects may exist.
[h]Results exceeding the regulatory limits are in bold text.

B = Value greater than the instrument detection limit, but less than or equal to the contract-required detection limit.
H = Not calibrated in first analysis. Positive hit in reanalysis.
J = Estimated value
NA = Not applicable
mg/kg = Milligrams per kilogram
µg/kg = Micrograms per kilogram
pCi/g = Picocuries per gram
mg/L = Milligrams per liter

spectroscopy, isotopic U, isotopic Pu, and Sr-90. A sample of the septic tank sludge was also collected from the influent chamber and analyzed on site for fecal coliform bacteria. Sample 165C003 was collected from the effluent side of the septic tank and was analyzed for all of the above parameters.

Several COPCs were detected in the sludge samples. All COPCs were below regulatory disposal limits except for TPH (DRO and GRO), which were detected in samples 165C002 and 165C003. Diesel concentrations in these samples were 10,000 mg/kg and 28,000 mg/kg, respectively, and gasoline concentrations were 170 mg/kg in both samples. These levels exceed the NDEP action level of 100 mg/kg (NAC, 2000) for TPH. The sludge was negative for fecal coliform bacteria.

A.5.2.8 Contaminants of Concern

Based on the aforementioned analytical results, only the contents of the septic tank contain COCs. No COCs were identified in the soil surrounding the septic tank or under the cesspool.

A.5.3 Nature and Extent of COCs

The COCs are contained within the septic tank. Total petroleum hydrocarbons above the NDEP action level of 100 mg/kg for TPH (DRO and GRO) are located in both chambers of the septic tank. Approximately 220 gal of sludge remains in the chambers of the septic tank.

A.5.4 Revised Conceptual Site Model

No variations to the conceptual site model were identified.

A.6.0 Septic System (26-59-01)

Corrective Action Site 26-59-01, Septic System, is located approximately 142 ft south of Building 2205 (Compressor House) in Area 26 of the NTS. The site consists of a septic tank with a manhole cover, leachfield, and pipe that serviced Building 2205. The Compressor House is connected to the septic tank by approximately 172 ft of 6 in. VCP. There are six 30-ft long, 4-in. diameter, VCP, open joint, lateral leach lines on 8-ft centers in the leachfield. The barbwire fence surrounding the leachfield was removed during the investigation. The ground is slightly depressed, with normal vegetation and wood debris noted within the formerly fenced area (Figure A.6-1). More detail about this CAS is provided in the CAIP (NNSA/NV, 2002).

A.6.1 Corrective Action Investigation

Seven investigation samples were collected during investigation activities as listed in Table A.6-1. The planned sample locations are shown in Figure 4-4 of the CAIP. The actual sample locations are shown in Figure A.6-1. The specific CAI activities conducted to meet CAIP requirements at CAS 25-59-01 are described in the following sections.

A.6.1.1 Deviations

There were no deviations to the CAIP requirements; therefore, the CAIP requirements were met.

A.6.2 Investigation Results

The following sections provide CAS-specific details of the inspection and sampling of leachfield system features, FSRs, and sample selection and analysis.

A.6.2.1 Septic Tank Integrity Sampling

Two integrity soil samples were collected from two locations (D01 and D02), adjacent to the influent and effluent ends of the septic tank. The samples were collected from the soil horizons underlying the base of the septic tank, both at a depth of 8 to 9 ft bgs.

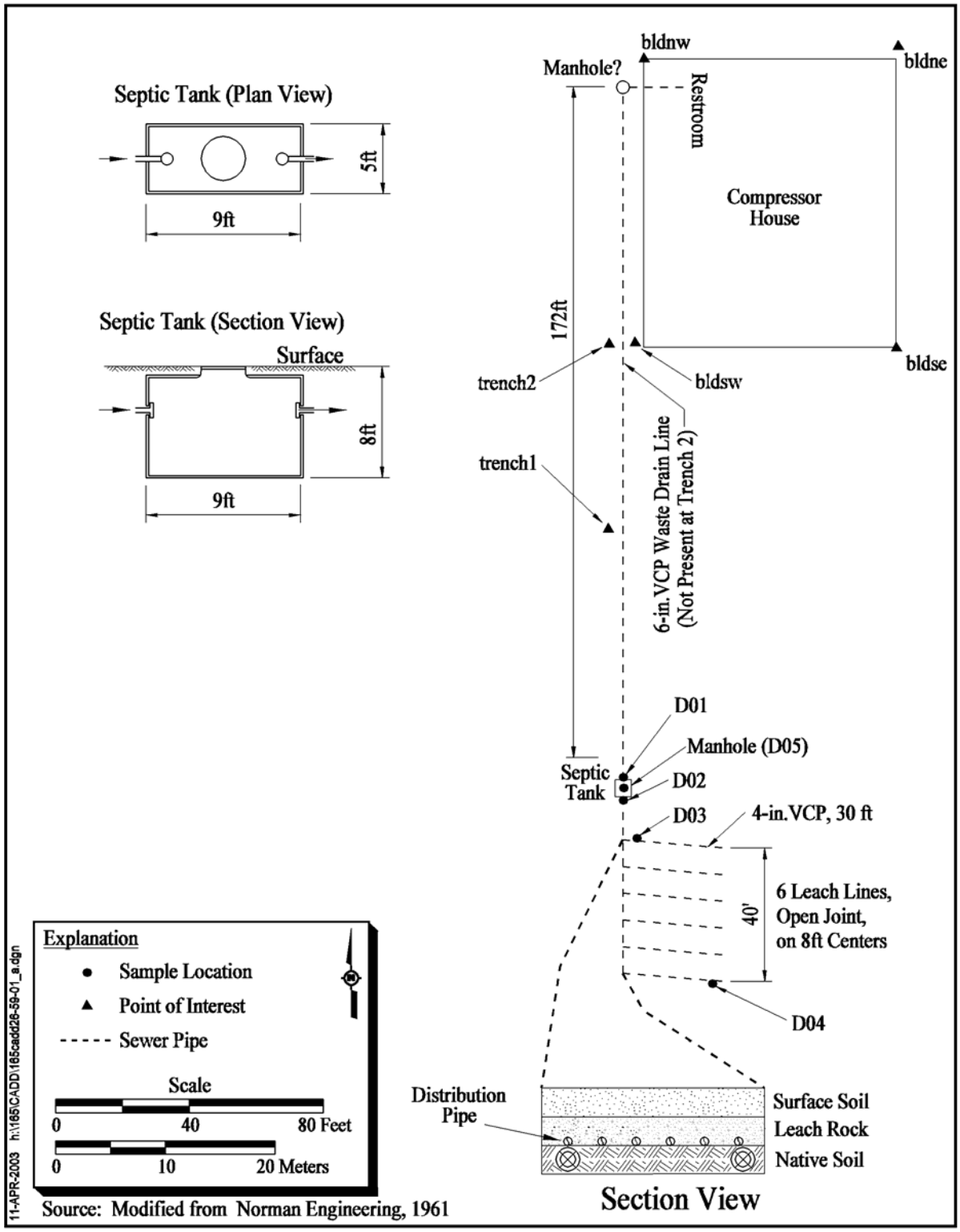

Figure A.6-1
Sampling Locations and Points of Interest at CAS 26-59-01, Septic System

Table A.6-1
Samples Collected for CAS 26-59-01, Septic System

Sample Number	Sample Location	Depth (ft bgs)	Sample Matrix	Purpose	Analyses
165D001	DO5	Septic Tank	Sludge	WM	Set 1, Set 2
165D002	D03	2.5 - 3.5	Soil	Environmental	Set 1
165D003	D03	5 - 6	Soil	Environmental	Set 1
165D004	D04	2 - 3	Soil	Environmental	Set 1
165D005	D04	4.5 - 5.5	Soil	Environmental	Set 1
165D006	D02	8 - 9	Soil	Environmental	Set 1
165D007	D01	8 - 9	Soil	Environmental	Set 1
165D301	D01	NA	Water	Trip Blank	Total VOC
165D302	D05	Septic Tank	Sludge	Field Duplicate of #165D001	Set 1, Set 2
165D303	D03	NA	Water	Trip Blank	Set 1
165D304	Sample Table	NA	Water	Field Blank	Set 1
165D305	Sample Table	NA	Water	Trip Blank	Total VOC
165D307	D01	NA	Water	Trip Blank	Total VOC

Set 1 = Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO and GRO), PCBs, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, and Strontium-90
Set 2 = TCLP VOCs, TCLP SVOCs, and TCLP RCRA Metals

WM = Waste management
NA = Not applicable
ft bgs = Feet below ground surface

A.6.2.2 Inspection of Collection System Components

The septic tank and collection system pipe were inspected. The concrete, rectangular-shaped septic tank has a 1,000-gal capacity and one chamber. The top of the tank is exposed at to the ground surface and is accessed by a manhole. The exterior dimensions of the septic tank are 9 ft (length) by 5 ft (width) by 8 ft (depth). The interior dimensions of the tank are 8.5 ft (length) by 4.5 ft (width) by 7.5 ft (depth). One sludge sample was collected from the septic tank in accordance with the CAIP. Visual inspection revealed that a maximum of 6 in. (approximately 143 gal) of dry sludge remained in the bottom of the tank. Photographs of the interior of the septic tank were taken to document the visual inspection and are in project files.

Portions of the collection system pipe were inspected for breaks and pipe contents. A video survey was conducted through the influent end of the septic tank towards Building 2205 for approximately 86 ft. The pipe was observed with no breaks or sample media present. A backhoe excavation was made at location Trench 1 to continue the video survey towards the building. Gravel caused refusal in the run at 52 ft, which is just south of the building. Otherwise, no residual media was present. Another backhoe excavation was made at location Trench 2. The excavation was 25-ft long and 10-ft wide. Due to the presence of pea gravel, the excavation depth was limited to 7 ft bgs. The abundance of pea gravel at location Trench 2 suggests the sewer pipe was breached during installation of the large aboveground tanks next to the building. No other access point for the camera was located and the utilities present next to the building precluded further excavations in the area. All excavated video access locations were grouted prior to backfilling.

A.6.2.3 Leachfield Sampling

Backhoe excavations were conducted to access sampling horizons and collect samples from the biased locations at the base of the leachfield as presented in the CAIP. Excavations provided a visual verification of the leachfield configuration (Figure A.6-1). Four soil samples were collected from two locations (proximal [D03] and distal [D04] ends) beneath the leachfield as specified in the CAIP. The leachfield native soil/leachrock interface varied from 2 to 2.5 ft bgs. The proximal samples were collected at 2.5 and 5 ft bgs and the distal samples were collected at 2 and 4.5 ft bgs. All four samples were submitted for laboratory analyses.

A.6.2.4 Field-Screening Results

Soil samples were field screened for VOCs and alpha and beta/gamma radiation. The FSRs were compared to FSLs to guide sampling decisions. The VOC headspace FSLs were not exceeded during excavations and sampling activities. No samples had elevated FSRs for alpha and beta/gamma radiation.

A.6.2.5 Sample Analyses

The soil and sludge samples were analyzed for CAIP-specified COPCs which included total VOCs, total SVOCs, total RCRA metals, TPH (DRO and GRO), PCBs, isotopic U, isotopic Pu, Sr-90, and gamma-emitting radionuclides. In addition, the sludge sample was analyzed according to the TCLP

for VOCs, SVOCs, and RCRA metals. A sample of the septic tank contents (dry sludge) was also collected and analyzed for fecal coliform bacteria. The analytical parameters and laboratory analytical methods used to analyze the investigation samples are listed in Table A.2-2. Table A.6-1 lists the sample-specific analytical parameters.

A.6.2.6 Analytes Detected Above Minimum Reporting Limits

The analytical results detected at concentrations exceeding the correlated MRLs (NNSA/NV, 2002) are summarized in the following sections. These results are compared to PALs, which are a subset of those that exceed MRLs. All of the analytical results obtained through sample analysis are usable.

A.6.2.6.1 Total Volatile Organic Compound Analytical Results for Soil Samples

Total VOCs analytical results for soil did not exceed the MRLs.

A.6.2.6.2 Total Semivolatile Organic Compound Analytical Results for Soil Samples

Total SVOCs analytical results for soil did not exceed the MRLs.

A.6.2.6.3 Total Petroleum Hydrocarbon Analytical Results for Soil Samples

The TPH (DRO and GRO) analytical results for soil did not exceed the MRLs.

A.6.2.6.4 Total RCRA Metals Analytical Results for Soil Samples

Total RCRA metals analytical results for soil samples did not exceed the PALs.

A.6.2.6.5 Polychlorinated Biphenyl Results for Soil Samples

The PCB analytical results for soil did not exceed the MRLs.

A.6.2.6.6 Gamma Spectroscopy Results for Soil Samples

Concentrations of gamma-emitting radionuclides exceeding the MRLs are shown in Table A.6-3. These results did not exceed the PALs.

Table A.6-2
Soil Sample Results for Total RCRA Metals Detected Above Minimum Reporting Limits at CAS 26-59-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)					
			Arsenic	Barium	Chromium	Lead	Mercury	Selenium
Preliminary Action Levels			**23[a]**	**100,000[b]**	**450[b]**	**750[b]**	**610[b]**	**10,000[b]**
165D002	D03	2.5 - 3.5	10	120	6	9.6	--	0.6
165D003		5 - 6	9.6	110	5.2	7.4	--	--
165D004	D04	2 - 3	8.4	140	6.3	8.3	--	--
165D005		4.5 - 5.5	9.6	150	4.5	8.8	--	--
165D006	D02	8 - 9	9.2	100	3.7	7.9	--	0.88
165D007	D01	8 - 9	12	130	2.4	6	0.12	--

[a]Mean plus two times the standard deviation of the mean for sediment samples collected by the NBMG throughout NTTR (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above MRLs

A.6.2.6.7 Isotopic Uranium Results for Soil Samples

Isotopic U analytical results for soil samples detected above MRLs are shown in Table A.6-4. These results do not exceed the PALs.

A.6.2.6.8 Isotopic Plutonium Results for Soil Samples

Isotopic Pu and analytical results for soil samples did not exceed MRLs.

A.6.2.6.9 Strontium-90 Results for Soil Samples

Strontium-90 analytical results for soil samples did not exceed MRLs.

A.6.2.7 Septic Tank Sludge Sample Results

Results of collected septic tank content sample were compared to regulatory limits based on disposal options. These results are not compared to PALs because septic tank contents are typically removed for disposal. If the waste has no hazardous component, the regulatory level is based on NTS disposal

Table A.6-3
Soil Sample Results of Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 26-59-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Actinium-228	Bismuth-212	Bismuth-214	Lead-212	Lead-214	Thallium-208
Preliminary Action Levels[a]			**15**	**15**	**15**	**15**	**15**	**15**
165D002	D03	2.5 - 3.5	1.37	--	1.22	1.62	1.25	0.55
165D003		5 - 6	0.97	2.2 (TI)	0.92	1.35	0.95	0.36
165D004	D04	2 - 3	0.92	--	1.1	1.34	1.1	0.36
165D005		4.5 - 5.5	1.11	--	1.28	1.11	1.2	0.384
165D006	D02	8 - 9	1.45	--	0.95	1.69	1.22	0.5
165D007	D01	8 - 9	0.83	--	0.95	1.09	1.2	--

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-212, bismuth-214, lead-212, lead-214, and thallium-208, as found in Chapter IV of DOE 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The PALs for these isotopes are specified as 15 pCi/g averaged over the first 15 centimeters of soil (DOE, 1993). For the purpose of this document, 15 centimeters is assumed to be equivalent to 0.5 ft (6 in.); therefore, 15 pCi/g represents the PALs for these radionuclides in the subsurface soil (0.5 ft depth).

ft bgs = Feet below ground surface
-- = Not detected above MRLs
TI = Nuclide identification is tentative

options at landfills and lagoons (BN, 1995; CFR, 2000c; NDEP, 1997a, b, and c). Any sludge or liquid waste must be solidified before disposal at the NTS landfills (NDEP, 1997b). If the waste is hazardous, the release criteria are based on interpretation of the guidelines presented in the POC (BN, 1995; Alderson, 1999). For waste destined for off-site disposal, the POC radiological levels must be met to certify that the waste has no added radioactivity.

Analytical results exceeding MRLs are listed in Table A.6-5. Two sludge samples (165D001 and its field duplicate, 165D302) were obtained from inside the septic tank. The samples were analyzed for total VOCs, total SVOCs, total RCRA metals, TPH (DRO and GRO), PCBs, gamma spectroscopy, isotopic U, isotopic Pu, Sr-90, TCLP VOCs, TCLP SVOCs, and TCLP RCRA metals. The sludge was analyzed on site for fecal coliform bacteria.

Table A.6-4
Soil Sample Results for Isotopic Uranium Detected Above Minimum Reporting Limits at CAS 26-59-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)		
			Uranium-234	Uranium-235	Uranium-238
Preliminary Action Levels[a]			**85.9**	**10.5**	**63.2**
165D002	D03	2.5 - 3.5	1.25	0.093	1.28
165D003		5 - 6	1.17	0.072	1.23
165D004	D04	2 - 3	1.38	0.143	1.14
165D005		4.5 - 5.5	1.89	0.107	1.57
165D006	D02	8 - 9	1.27	0.062	1.14
165D007	D01	8 - 9	1.19	0.069	1.08

[a]Taken from the construction, commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram

Several COPCs were detected in the sludge samples. All COPCs were below regulatory disposal limits except for TPH which was detected in samples 165D001 and 165D302. Diesel-range organics concentrations in these samples were 230 mg/kg and 240 mg/kg, respectively. These levels exceed the NDEP action level of 100 mg/kg (NAC, 2000) for TPH. The sample was positive for fecal coliform bacteria and the analytical laboratory was notified.

A.6.2.8 Contaminants of Concern

Based on the aforementioned analytical results, only the contents of the septic tank contain COCs. No COCs were identified in the soil surrounding the septic tank or under the leachfield.

A.6.3 Nature and Extent of COCs

The COCs are contained within the septic tank. Total petroleum hydrocarbons exceeding the NDEP regulatory action level of 100 mg/kg are located within the septic tank. Approximately 143 gallons of sludge remain in the single-chamber tank.

Table A.6-5
Sludge Sample Results Detected Above Minimum Reporting Limits at CAS 26-59-01
(Page 1 of 2)

Sample Number	Matrix	Analyte	Result[e]	Units	Regulatory Limits	Regulatory Reference
165D001	Sludge	Mercury	4.3*	mg/kg	NA	CFR, 2002b
165D001	Sludge	Arsenic	29	mg/kg	NA	CFR, 2002b
165D001	Sludge	Barium	110	mg/kg	NA	CFR, 2002b
165D001	Sludge	Cadmium	14	mg/kg	NA	CFR, 2002b
165D001	Sludge	Chromium	200 (J)[a*]	mg/kg	NA	CFR, 2002b
165D001	Sludge	Lead	470*	mg/kg	NA	CFR, 2002b
165D001	Sludge	Selenium	10	mg/kg	NA	CFR, 2002b
165D001	Sludge	Silver	7.8	mg/kg	NA	CFR, 2002b
165D001	Sludge	**Diesel-Range Organics**	**230 (M, Z)**	mg/kg	100	NDEP, 1997b
165D001	Sludge	2-Methylnaphthalene	1,100	µg/kg	NA	CFR, 2002b
165D001	Sludge	Anthracene	950	µg/kg	NA	CFR, 2002b
165D001	Sludge	Bis(2-Ethylhexyl)Phthalate	1,100 (J)[b]	µg/kg	NA	CFR, 2002b
165D001	Sludge	Fluorene	620	µg/kg	NA	CFR, 2002b
165D001	Sludge	Naphthalene	750	µg/kg	NA	CFR, 2002b
165D001	Sludge	Benzo(A)Anthracene	7,000 (J)[b]	µg/kg	NA	CFR, 2002b
165D001	Sludge	Benzo(A)Pyrene	7,300	µg/kg	NA	CFR, 2002b
165D001	Sludge	Benzo(B)Fluoranthene	4,500	µg/kg	NA	CFR, 2002b
165D001	Sludge	Benzo(G,H,I)Perylene	4,800	µg/kg	NA	CFR, 2002b
165D001	Sludge	Benzo(K)Fluoranthene	1,900	µg/kg	NA	CFR, 2002b
165D001	Sludge	Chrysene	8,600 (J)[b]	µg/kg	NA	CFR, 2002b
165D001	Sludge	Fluoranthene	3,000	µg/kg	NA	CFR, 2002b
165D001	Sludge	Indeno(1,2,3-CD)Pyrene	4,100	µg/kg	NA	CFR, 2002b
165D001	Sludge	Phenanthrene	5,900	µg/kg	NA	CFR, 2002b
165D001	Sludge	Pyrene	13,000 (J)[b]	µg/kg	NA	CFR, 2002b
165D001	Sludge	Lead-212	0.69	pCi/g	N	NDEP, 1997c
165D001	Sludge	Lead-214	0.55	pCi/g	N	NDEP, 1997c
165D001	Sludge	Uranium-234	1.39	pCi/g	100	NDEP, 1997c
165D001	Sludge	Uranium-235	0.143	pCi/g	100	NDEP, 1997c
165D001	Sludge	Uranium-238	0.77	pCi/g	100	NDEP, 1997c
165D001	Sludge	Aroclor-1254	7,400 (J)[c]	µg/kg	50,000	CFR, 2002c
165D302	Sludge	Uranium-234	2.61	pCi/g	100	NDEP, 1997c
165D302	Sludge	Uranium-238	1.44	pCi/g	100	NDEP, 1997c
165D302	Sludge	2-Methylnaphthalene	860	µg/kg	NA	CFR, 2002b
165D302	Sludge	Anthracene	970	µg/kg	NA	CFR, 2002b
165D302	Sludge	Benzo(K)Fluoranthene	2,200 (J)[d]	µg/kg	NA	CFR, 2002b
165D302	Sludge	Bis(2-Ethylhexyl)Phthalate	1,000 (J)[b]	µg/kg	NA	CFR, 2002b

Table A.6-5
Sludge Sample Results Detected Above Minimum Reporting Limits at CAS 26-59-01
(Page 2 of 2)

Sample Number	Matrix	Analyte	Result[e]	Units	Regulatory Limits	Regulatory Reference
165D302	Sludge	Di-N-Octyl Phthalate	360 (J)[b]	µg/kg	NA	CFR, 2002b
165D302	Sludge	Fluorene	550	µg/kg	NA	CFR, 2002b
165D302	Sludge	Naphthalene	620	µg/kg	NA	CFR, 2002b
165D302	Sludge	Benzo(A)Anthracene	7,100 (J)[b]	µg/kg	NA	CFR, 2002b
165D302	Sludge	Benzo(A)Pyrene	7,200 (J)[d]	µg/kg	NA	CFR, 2002b
165D302	Sludge	Benzo(B)Fluoranthene	4,400(J)[d]	µg/kg	NA	CFR, 2002b
165D302	Sludge	Benzo(G,H,I)Perylene	4,500 (J)[d]	µg/kg	NA	CFR, 2002b
165D302	Sludge	Chrysene	8,800 (J)[b]	µg/kg	NA	CFR, 2002b
165D302	Sludge	Dibenzo(A,H)Anthracene	1,600 (J)[d]	µg/kg	NA	CFR, 2002b
165D302	Sludge	Fluoranthene	3,200	µg/kg	NA	CFR, 2002b
165D302	Sludge	Indeno(1,2,3-CD)Pyrene	3,300 (J)[d]	µg/kg	NA	CFR, 2002b
165D302	Sludge	Phenanthrene	5,500	µg/kg	NA	CFR, 2002b
165D302	Sludge	Pyrene	13,000 (J)[b]	µg/kg	NA	CFR, 2002b
165D302	Sludge	**Diesel-Range Organics**	**240 (M, Z)**	mg/kg	100	NDEP, 1997b
165D302	Sludge	Aroclor-1254	5,400 (J)[c]	µg/kg	50,000	CFR, 2002c
165D302	Sludge	Lead-212	0.39	pCi/g	100	NDEP, 1997c
165D302	Sludge	Arsenic	42	mg/kg	NA	CFR, 2002b
165D302	Sludge	Barium	110	mg/kg	NA	CFR, 2002b
165D302	Sludge	Chromium	230 (J)[a*]	mg/kg	NA	CFR, 2002b
165D302	Sludge	Lead	350*	mg/kg	NA	CFR, 2002b
165D302	Sludge	Mercury	9.4*	mg/kg	NA	CFR, 2002b
165D302	Sludge	Selenium	20*	mg/kg	NA	CFR, 2002b
165D302	Sludge	Silver	2.9	mg/kg	NA	CFR, 2002b

[*] TCLP analysis was performed. The results were below detection limits.
[a]Qualifier added to laboratory data; record accepted. Duplicate precision analyses were outside control limits.
[b]Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits. Matrix effects may exist.
[c]Qualifier added to laboratory data; record accepted. Surrogates dilute out.
[d]Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits.
[e]Results exceeding regulatory limits are in bold text.

J = Estimated value
N = No limit established for the NTS Industrial Landfill
NA = Not applicable
M = Motor oil
Z = The reported results did not resemble the patterns of the following petroleum hydrocarbon products: gasoline, JP-4, JP-8, diesel, mineral spirits, motor oil, Stoddard solvent, and Bunker C.
mg/kg = Milligrams per kilogram
µg/kg = Micrograms per kilogram
pCi/g = Picocuries per gram

A.6.4 Revised Conceptual Site Model

No variations to the conceptual site model were identified.

A.7.0 Train Decontamination Area (CAS 25-07-06)

Corrective Action Site 25-07-06, Train Decontamination Area, is located approximately 50 yards north of the E-MAD facility in Area 25 at the NTS. The site consists of a concrete decontamination pad (approximately 68 x 35 ft) with a 1-ft concrete berm, a 6-in. diameter radioactive floor drain centered in the pad, 125 ft of 6-in. VCP (radioactive waste line) 2 ft bgs from the drain to an isolation valve, railroad tracks trending through the pad, and a handrail partially surrounding the decontamination pad (Figure A.7-1). More detail about this CAS is provided in the CAIP (NNSA/NV, 2002).

A.7.1 Corrective Action Investigation

Twenty-nine soil samples and samples of concrete, wood, and paint were collected during investigation activities as listed in Table A.7-1. The planned sample locations are shown in Figure 4-5 of the CAIP. The actual sample locations are shown in Figure A.7-1. The specific CAI activities conducted to meet CAIP requirements at CAS 25-07-06 are described in the following sections.

A.7.1.1 Deviations

There was one deviation to the CAIP requirements. The radioactive waste line, 125 ft of 6-in. VCP, from the drain to an isolation valve was not inspected for contents. A verbal approval to exclude this survey was obtained from the NNSA/NSO Task Manager and is documented in the FADL (June 18, 2002) for that day's activity. This deviation was selected because the decontamination pad drain was grouted shut and the decontamination pad surface exceeded the unrestricted release criteria. The assumption was made that if the concrete pad exceeded unrestricted release criteria, the VCP would also exceed unrestricted release criteria due to similar matrices. This assumption and deviation allowed site workers to keep exposure potential as-low-as- reasonably-achievable (ALARA). All other CAIP requirements were met.

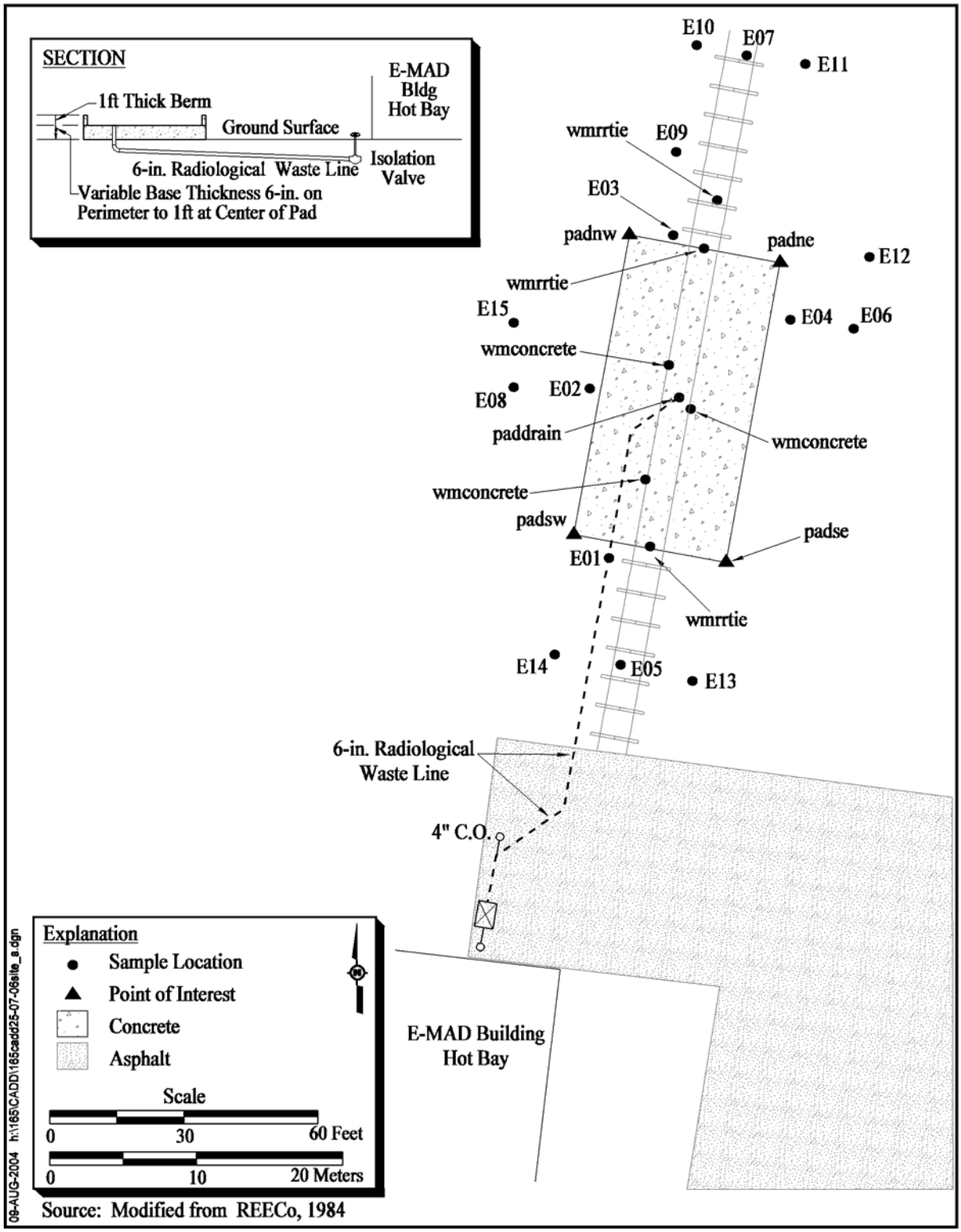

Figure A.7-1
Sampling Locations and Points of Interest at CAS 25-07-06,
Train Decontamination Area

Table A.7-1
Samples Collected for CAS 25-07-06, Train Decontamination Area
(Page 1 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Sample Matrix	Purpose	Analyses
165E001	E01	0 - 0.5	Soil	Environmental	Set 1
165E001A					Set 3
165E002	E02	0 - 0.5	Soil	Environmental	Set 1
165E002A					Set 3
165E003	E03	0 - 0.5	Soil	Environmental	Set 1
165E003A					Set 3
165E004	E04	0 - 0.5	Soil	Environmental	Set 1
165E004A					Set 3
165E005	E05	0 - 0.5	Soil	Environmental	Set 1
165E005A					Set 3
165E006	E06	0 - 0.5	Soil	Environmental	Set 1
165E006A					Set 3
165E007	E07	0 - 0.5	Soil	Environmental	Set 1
165E007A					Set 3
165E008	E08	0 - 0.5	Soil	Environmental	Set 1
165E008A					Set 3
165E009	E01	2.5 - 3.5	Soil	Environmental	Set 1
165E010	E02	2.5 - 3.5	Soil	Environmental	Set 1
165E011	E03	2.5 - 3.5	Soil	Environmental	Set 1
165E012	E12	0 - 0.5	Soil	Environmental	Isotopic Uranium
165E013	E12	2.5 - 3.5	Soil	Environmental	Isotopic Uranium
165E014	E06	2.5 - 3.5	Soil	Environmental	Isotopic Uranium
165E015	E15	0 - 0.5	Soil	Environmental	Set 3
165E016	E15	2.5 - 3.5	Soil	Environmental	Set 3
165E017	E08	2.5 - 3.5	Soil	Environmental	Set 3
165E018	E14	0 - 0.5	Soil	Environmental	Gamma Spectroscopy
165E019	E14	2.5 - 3.5	Soil	Environmental	Gamma Spectroscopy
165E020	E05	2.5 - 3.5	Soil	Environmental	Gamma Spectroscopy
165E021	E13	0 - 0.5	Soil	Environmental	Gamma Spectroscopy
165E022	E13	2.5 - 3.5	Soil	Environmental	Gamma Spectroscopy
165E023	E10	0 - 0.5	Soil	Environmental	Set 4
165E024	E10	2.5 - 3.5	Soil	Environmental	Set 4
165E025	E11	0 - 0.5	Soil	Environmental	Set 4
165E026	E11	2.5 - 3.5	Soil	Environmental	Set 4
165E027	E07	2.5 - 3.5	Soil	Environmental	Set 4
165E028	E09	0 - 0.5	Soil	Environmental	Set 4

Table A.7-1
Samples Collected for CAS 25-07-06, Train Decontamination Area
(Page 2 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Sample Matrix	Purpose	Analyses
165E029	E09	2.5 - 3.5	Soil	Environmental	Set 4
165E301	E01	NA	Water	Trip Blank	Total VOCs
165E302	E01	NA	Water	Field Blank	Set 1
165E303	E01	NA	Water	Trip Blank	Total VOCs
165E304	E01	NA	Water	Trip Blank	Total VOCs
165E304A	E01	NA	Water	Trip Blank	Total VOCs
165E305	E03	2.5 - 3.5	Soil	Field Duplicate of #165E011	Set 1
165E305A	Sample Table	NA	Water	Field Blank	Set 1
165306	Sample Table	NA	Water	Equipment Rinsate Blank	Set 1
165E307	Sample Table	NA	Water	Trip Blank	Total VOCs
165E308	Decontamination Pad	NA	Swipe	Field Blank	PCBs
165E309	Sample Table	NA	Water	Trip Blank	Total VOCs
165E501	Decontamination Pad	0 - 0.5”	Paint	WM	Set 5
165E502	Decontamination Pad	0 - 0.25”	Concrete	WM	Set 6
165E503	Decontamination Pad	0.25” - 0.5”	Concrete	WM	Gamma Spectroscopy
165E504	Decontamination Pad	0.25” - 0.5”	Concrete	WM	Set 6
165E505	Decontamination Pad	0.25” - 0.5”	Concrete	WM	Set 3
165E506	Decontamination Pad	1" - 2"	Concrete	WM	Set 6
165E507	Decontamination Pad	1" - 2"	Concrete	WM	Set 3
165E508	1st Tie North Side	0 - 4"	Wood	WM	Set 6
165E509	1st Tie South Side	0 - 4"	Wood	WM	Set 6
165E510	7th Tie North Side	0 - 4"	Wood	WM	Set 6
165E511	Decontamination Pad	NA	Swipe	WM	PCBs
165E512	Decontamination Pad	NA	Swipe	WM	PCBs
165E513	Decontamination Pad	NA	Swipe	WM	PCBs

Set 1 = Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO and GRO), PCBs, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, and Strontium-90
Set 3 = Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, and Strontium-90
Set 4 = Total RCRA Metals, TPH (DRO), Gamma Spectroscopy, and Strontium-90
Set 5 = PCBs, TCLP VOCs, TCLP SVOCs, TCLP RCRA Metals, and Gamma Spectroscopy
Set 6 = PCBs, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, Strontium-90, TCLP VOCs, TCLP SVOCs, and TCLP RCRA Metals

WM = Waste management
NA = Not applicable
ft bgs = Feet below ground surface

A.7.2 Investigation Results

The following sections provide CAS-specific details of the inspection and sampling of system features, FSRs, and sample selection and analysis.

A.7.2.1 Radiological Survey of Soil

A radiological walk-over survey was performed at CAS 25-07-06, Train Decontamination Area, to determine if radiological contamination is present in surficial soil at activities statistically greater than background. The results of this survey identified locations of radiological surface contamination and were used to focus the CAI efforts on biased sampling locations.

Measurements of the gamma radiation emission rate for surficial soil at CAS 25-07-06 were taken over an area that extended a minimum of 15 ft radially from the concrete pad. A total of 6,558 data points were recorded at this site with a mean gamma radiation emission rate of 257 counts per second versus the mean undisturbed background gamma radiation emission rate of 194 counts per second. The results were plotted on a color-coded contour map (Figure A.7-2) and indicate that the gamma radiation emission rate is moderately elevated and localized around the perimeter of the concrete pad with a few isolated, lower activity areas to the north and east. The elevated gamma radiation emission rate can be directly attributed to the historical decontamination activities conducted at the site.

A.7.2.2 Radiological Survey of Concrete Decontamination Pad

Radiological surveys were conducted on the decontamination pad to identify radiological areas of elevated activity (i.e., results in excess of the unrestricted release criteria 1,000 dpm/100 cm^2 over background). The radiological survey methods consisted of scanning, one-minute static measurements, and swiping. A complete survey of the surface of the concrete decontamination pad was conducted. This survey consisted of dividing the concrete pad into 1-square meter (m^2) grids and then performing an approximate 100 percent surface scanning survey of the pad for alpha and beta/gamma contamination. One-minute static measurements were taken at grid spaces that exhibited elevated count rates as identified during the scanning survey and 159 swipes were collected and counted. The swipe sample results indicate that removable contamination did not exceed the Table A.4-2 allowable residual surface contamination values in dpm/100 cm^2 of the *NV/YMP*

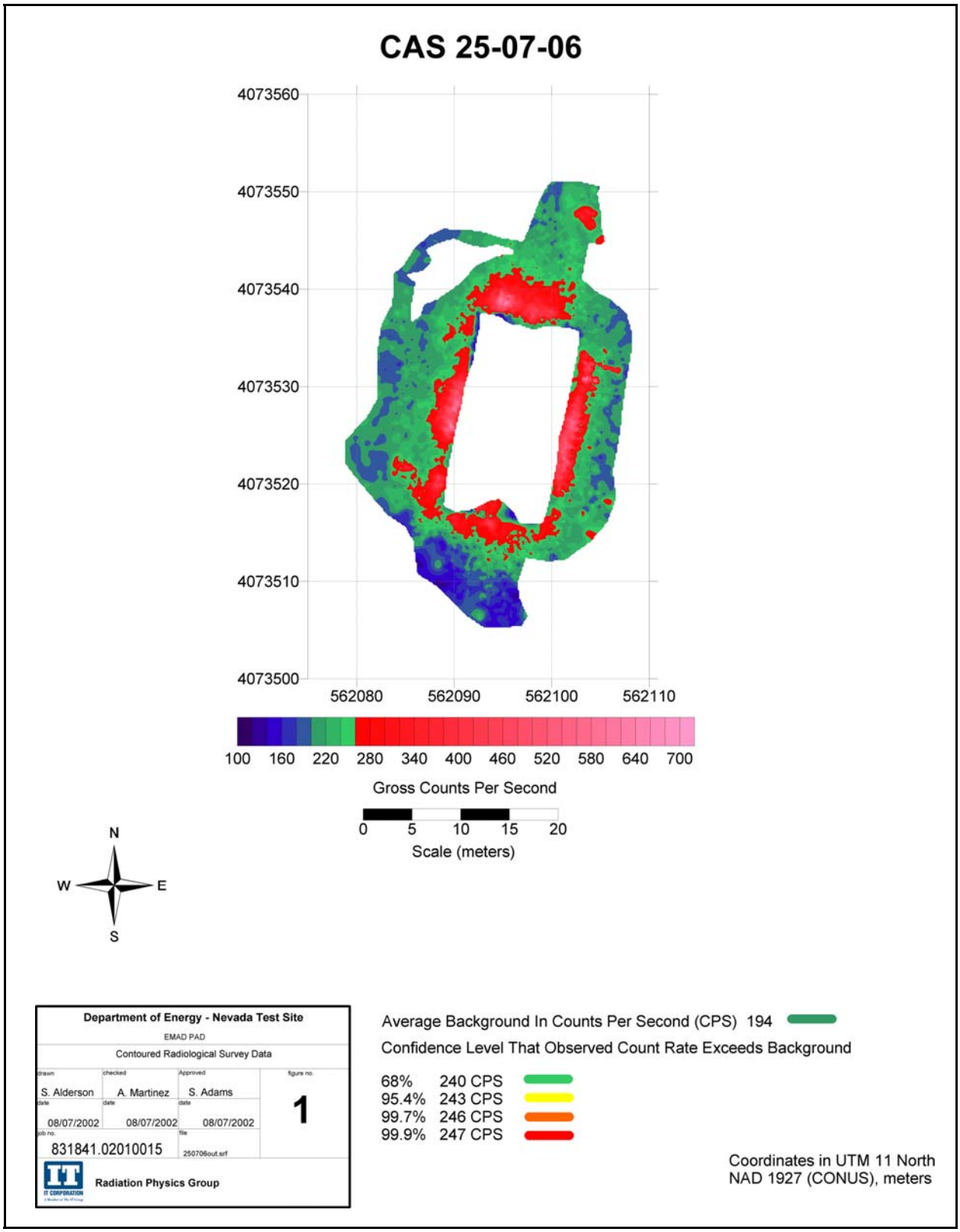

Figure A.7-2
Surface Radiological Survey at CAS 25-07-06

Radiological Control Manual (DOE/NV, 2000) for the radiological constituents of concern. However, the one-minute static measurements indicate that total contamination did exceed the Table 4-2 allowable residual surface contamination values, in dpm/100 cm^2 of the *NV/YMP Radiological Control Manual*, at 121 out of the 175 static measurement locations for the radiological contaminants of concern.

A.7.2.3 Waste Characterization of Concrete Decontamination Pad, Railroad Ties, and Paint

A total of 13 waste characterization samples were collected of concrete, paint, and railroad ties (wood) on and adjacent to the pad. The results were compared to regulatory levels and disposal criteria to determine a path forward for remedial actions. Concrete and wood samples were collected using drills and collecting the cuttings. Paint samples were collected using a paint scraper. Analytical results are discussed in Section A.7.2.8.

A.7.2.4 Soil Sampling

The surface radiological survey was used to select biased surface soil sample locations at "hot spots" on each side of the decontamination pad. During sample collection at these biased locations, the FSL for radiological constituents was exceeded on the north, south, and west side of the pad. Deeper samples (2.5 to 3.5 ft bgs) were collected at these locations. Step-out samples (approximately 15 ft outward) were also collected from around the pad in the surface soils (0 to 0.5 ft bgs). Upon review of the analytical results of these data, additional step-out surface soil samples were collected. A total of 29 soil samples were collected around the concrete decontamination pad. All samples were sent to the laboratory for analysis. In addition, one QC soil duplicate was collected and analyzed. See Table A.7-1 and Figure A.7-1 for sample depths and locations. Samples were collected using a scoop for surface samples and a hand auger for subsurface samples.

A.7.2.5 Field-Screening Results

Soil samples were field screened for VOCs and alpha and beta/gamma radiation. The FSRs were compared to FSLs to guide sampling decisions. The VOC headspace FSLs were not exceeded during sampling activities. Several samples had elevated FSRs for alpha and beta/gamma radiation. These samples included 165E001, 165E002, and 165E003, which were taken from 0 to 0.5 ft bgs adjacent to

the decontamination pad on the south, west, and north sides, respectively. These locations were chosen based on the radiological surface survey results indicating elevated readings around the pad. The deeper horizon from 2.5 to 3.5 ft bgs did not exceed FSLs for alpha and beta/gamma radiation.

A.7.2.6 Sample Analyses

Investigation soil samples were analyzed for CAIP-specified COPCs including total VOCs, total SVOCs, total RCRA metals, TPH (DRO and GRO), PCBs, isotopic U, isotopic Pu, Sr-90, and gamma-emitting radionuclides. The analytical parameters and laboratory analytical methods used to analyze the investigation samples are listed in Table A.2-2. Table A.7-1 lists the sample-specific analytical parameters.

A.7.2.7 Analytes Detected Above Minimum Reporting Limits

The analytical results detected at concentrations exceeding the correlated MRLs (NNSA/NV, 2002) are summarized in the following sections. These results are compared to PALs which are a subset of those that exceed MRLs. A portion of the analytical results were rejected; however, these rejected data did not impact closure decisions as discussed in Section B.1.1.3 of Appendix B.

A.7.2.7.1 Total Volatile Organic Compounds Analytical Results for Soil Samples

Total VOCs analytical results for soil samples exceeding the MRLs are shown in Table A.7-2. These results did not exceed the PALs.

A.7.2.7.2 Total Semivolatile Organic Compounds Analytical Results for Soil Samples

Total SVOC analytical results exceeding the MRLs are shown in Table A.7-3. These results did not exceed the PALs.

A.7.2.7.3 Total Petroleum Hydrocarbon Analytical Results for Soil Samples

Several locations had TPH (DRO) analytical results exceeding MRLs as shown in Table A.7-4. One surface sample (165E007) collected approximately 15 ft north of the pad (at location E07) between the railroad tracks had a TPH (DRO) analytical result for soil that exceeded the PAL.

Table A.7-2
Soil Sample Results for Total VOCs Detected Above Minimum Reporting Limits at CAS 25-07-06

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)					
			2-Butanone	2-Hexanone	4-Methyl-2-Pentanone	Acetone	Methylene Chloride	Naphthalene
Preliminary Action Levels[a]			**28,000,000**	**NI**	**2,900,000**	**6,200,000**	**21,000**	**190,000**
165E001	E01	0 - 0.5	340	150	47	610 (J)[b]	38	--
165E002	E02	0 - 0.5	--	--	--	47 (J)[b]	51	--
165E003	E03	0 - 0.5	--	--	--	26 (J)[b]	47	--
165E004	E04	0 - 0.5	--	--	--	59 (J)[b]	49	--
165E005	E05	0 - 0.5	--	--	--	22 (J)[b]	38	7.5 (J)[c]
165E006	E06	0 - 0.5	--	--	--	27 (J)[d]	55 (J)[e]	--
165E007	E07	0 - 0.5	23	--	--	57 (J)[b]	46	--
165E008	E08	0 - 0.5	--	--	--	37 (J)[b]	45	--
165E009	E01	2.5 - 3.5	--	--	--	--	32	--
165E010	E02	2.5 - 3.5	--	--	--	--	29	--
165E011	E03	2.5 - 3.5	--	--	--	--	23	--
165E305		2.5 - 3.5	--	--	--	--	22	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).
[b]Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05.
[c]Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits. Matrix effects may exist.
[d]Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits. Surrogate recovery exceeded the upper limits. Average relative response factor <0.05. Relative response factor <0.05.
[e]Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits. Matrix effects may exist. Surrogate recovery exceeded the upper limits.

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram
-- = Not detected above MRLs
NI = Not identified
J = Estimated value

Table A.7-3
Soil Sample Results for Total SVOCs Detected Above Minimum Reporting Limits at CAS 25-07-06

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)					
			Bis(2-Ethylhexyl)Phthalate	Di-N-Butyl Phthalate	Benzo(B)Fluoranthene	Chrysene	Fluoranthene	Pyrene
Preliminary Action Levels[a]			**180,000**	**88,000,000**	**2,900**	**290,000**	**30,000,000**	**54,000,000**
165E001	E01	0 - 0.5	1,700	1,200	--	--	--	--
165E003	E03	0 - 0.5	--	390	--	--	--	--
165E005	E05	0 - 0.5	--	400	410 (J)[b]	480	920	1,100
165E007	E07	0 - 0.5	9,900	--	--	--	--	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).
[b]Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits. Matrix effects may exist.

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
-- = Not detected above MRLs
J = Estimated value

A.7.2.7.4 Total RCRA Metals Analytical Results for Soil Samples

The total RCRA metals detected in soil samples at concentrations exceeding MRLs are listed in Table A.7-5 and discussed below. Lead was the only RCRA metal detected in soil samples at concentrations exceeding the PALs.

Lead was detected at 5,500 mg/kg in surficial soil collected at location E03 (sample 165E003). A TCLP for lead was performed on this soil sample and indicated 49 mg/L, which exceeded the disposal regulation of 5.0 mg/L (CFR, 2002a).

Table A.7-4
Soil Sample Results for TPH-DRO Detected Above Minimum Reporting Limits at CAS 25-07-06

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)
			Diesel-Range Organics
Preliminary Action Level[a, b]			100
165E001	E01	0 - 0.5	54 (M, Z)
165E005	E05	0 - 0.5	23 (M, Z)
165E007	E07	0 - 0.5	**310** (M, Z)
165E027		2.5 - 3.5	42 (M, Z)

[a]*Nevada Administrative Code* 445A.2272(b) (NAC, 2000)
[b]Result exceeding the PAL is in bold text.

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
M = Motor oil
Z = The reported results did not resemble the patterns of the following petroleum hydrocarbon products: gasoline, JP-4, JP-8, diesel, mineral spirits, motor oil, Stoddard solvent, and Bunker C.

A.7.2.7.5 Polychlorinated Biphenyl Results for Soil Samples

Polychlorinated biphenyl results exceeding the MRLs are shown in Table A.7-6. These results did not exceed the PALs.

A.7.2.7.6 Gamma Spectroscopy Results for Soil Samples

Gamma spectroscopy analytical results for detected radionuclide concentrations exceeding the MRLs are shown in Table A.7-7.

Cesium-137 was detected above the PAL in surface soil from 0 to 0.5 ft bgs at locations E01, E02, E03, and E05 and in the subsurface from 2.5 to 3.5 ft bgs at location E07.

A.7.2.7.7 Isotopic Uranium Results for Soil Samples

Concentrations of isotopic U exceeding the MRLs are shown in Table A.7-8. These results did not exceed the PALs.

Table A.7-5
Soil Sample Results for Total RCRA Metals Detected Above Minimum Reporting Limits at CAS 25-07-06

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)					
			Arsenic	Barium	Cadmium	Chromium	Lead	Selenium
Preliminary Action Levels[c]			23[a]	100,000[b]	810[b]	450[b]	750[b]	10,000[b]
165E001	E01	0 - 0.5	3.2	53	1.6	15	55	--
165E002	E02	0 - 0.5	1.8	60	--	4	8.6	--
165E003	E03	0 - 0.5	8.7	59	--	5.2	**5,500**	--
165E004	E04	0 - 0.5	2.1	52	--	3.7	4.6	--
165E005	E05	0 - 0.5	3.6	65	0.64	6.7	15	0.58
165E006	E06	0 - 0.5	2.3	64	--	3.7	5.5	--
165E007	E07	0 - 0.5	3.1	74	0.76	5.6	11	--
165E008	E08	0 - 0.5	2.1	58	--	4	5.3	--
165E009	E01	2.5 - 3.5	2.7	69	--	7.4	5.4	--
165E010	E02	2.5 - 3.5	2.7	79	--	5.7	6.7	--
165E011	E03	2.5 - 3.5	1.8	69	--	2.8	3.7	--
165E023	E10	0 - 0.5	1.8	57	--	2.9	6.2	--
165E024		2.5 - 3.5	2.2	58	--	2.5	4.7	--
165E025	E11	0 - 0.5	1.9	65	--	2.7	4.8	--
165E026		2.5 - 3.5	2.2	59	--	2.6	4.3	--
165E027	E07	2.5 - 3.5	7.4	110	--	12	7.6	1
165E028	E09	0 - 0.5	2.4	58	--	3.6	12	--
165E029		2.5 - 3.5	2.1	74	--	2.4	4.2	--
165E305	E03	2.5 - 3.5	2.7	110	0.59	6.7	23	0.73

[a]Mean plus two times the standard deviation of the mean for sediment samples collected by the NBMG throughout NTTR (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).
[c]Results exceeding the PALs are in bold text.

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above MRLs

A.7.2.7.8 Isotopic Plutonium Results for Soil Samples

Isotopic Pu-239 concentrations in soil samples above MRLs are presented in Table A.7-8. These results did not exceed the PALs.

Table A.7-6
Soil Samples for PCBs Detected
Above Minimum Reporting Limits at CAS 25-07-06

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)	
			Aroclor-1254	Aroclor-1260
Preliminary Action Levels[a]			1,000	1,000
165E001	E01	0 - 0.5	67	120
165E002	E02	0 - 0.5	--	270
165E003	E03	0 - 0.5	390	--
165E005	E05	0 - 0.5	630	--
165E007	E07	0 - 0.5	77	45
165E010	E02	2.5 - 3.5	72	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
-- = Not detected above MRLs

A.7.2.7.9 Strontium-90 Results for Soil Samples

Strontium-90 concentrations exceeding the MRLs are presented in Table A.7-8. These results did not exceed the PALs.

A.7.2.8 Concrete Decontamination Pad and Waste Management Sample Results

Concrete, paint, and wood samples were collected for analyses. The results above MRLs are presented in Table A.7-9 and were compared to regulatory limits based on disposal options. If the waste has no hazardous component, the regulatory limit is based on NTS disposal options at landfills (BN, 1995; CFR, 2002b and c; NDEP, 1997a, b, and c). If the waste is hazardous, the release criteria are based on interpretation of the guidelines presented in the POC (BN, 1995; Alderson, 1999). For waste destined for off-site disposal, the POC radiological levels must be met to certify that the waste has no added radioactivity. Radionuclides exceeding the sanitary NTS disposal criteria (NDEP, 1997b and c) will be managed as low-level waste.

A complete radiation survey was performed that identifies areas on the concrete pad and railroad ties adjacent to the pad that exceeded unrestricted release criteria (Figure A.7-2). Therefore, additional

Table A.7-7
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 25-07-06
(Page 1 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cobalt-60[b]	Cesium-137[b]	Lead-212[a]		Lead-214[a]		Niobium-94[b]	Thallium-208[a]		Uranium-235[b]
Preliminary Action Levels[a,b,c]			5	15	5	15	5	15	1.61	7.30	5	15	5	15	2.43	5	15	10.5
165E001	E01	0 - 0.5	1.05	NA	--	NA	--	NA	0.58	**44.5**	1	NA	--	NA	0.41 (J)	0.31	NA	0.46 (J)
165E001A		0 - 0.5	--	NA	--	NA	--	NA	0.85	**83**	0.83	NA	--	NA	0.52 (J)	--	NA	--
165E002	E02	0 - 0.5	--	NA	--	NA	--	NA	--	**39.2**	1.18	NA	--	NA	--	--	NA	--
165E002A		0 - 0.5	--	NA	--	NA	--	NA	--	**65**	--	NA	--	NA	--	--	NA	0.8 (J)
165E003	E03	0 - 0.5	--	NA	--	NA	--	NA	--	**65**	0.85	NA	--	NA	--	--	NA	--
165E003A		0 - 0.5	--	NA	--	NA	--	NA	--	**49,100**	--	NA	--	NA	--	--	NA	--
165E004	E04	0 - 0.5	1.11	NA	--	NA	--	NA	--	0.215	1.08	NA	0.55	NA	--	0.29	NA	--
165E004A		0 - 0.5	--	NA	--	NA	--	NA	--	3.47	1.06	NA	--	NA	--	0.44	NA	--
165E005	E05	0 - 0.5	1.2	NA	--	NA	0.72	NA	--	1.72	1.03	NA	0.94	NA	--	0.36	NA	--
165E005A		0 - 0.5	--	NA	--	NA	--	NA	--	**20.6**	1.07	NA	--	NA	--	--	NA	--
165E006	E06	0 - 0.5	--	NA	--	NA	--	NA	--	1.04	0.98	NA	0.57	NA	--	--	NA	--
165E006A		0 - 0.5	--	NA	--	NA	--	NA	--	--	1.21	NA	0.57	NA	--	0.45	NA	--
165E007	E07	0 - 0.5	1.27	NA	--	NA	1.1	NA	--	0.47	1.39	NA	0.82	NA	--	0.33	NA	--
165E007A		0 - 0.5	--	NA	--	NA	--	NA	--	1.51	1.14	NA	0.79	NA	--	--	NA	--
165E008	E08	0 - 0.5	--	NA	--	NA	--	NA	--	0.76	1.27	NA	0.51	NA	--	0.44	NA	--
165E008A		0 - 0.5	--	NA	--	NA	0.62	NA	--	--	1.34	NA	0.7	NA	--	0.4	NA	--
165E009	E01	2.5 - 3.5	NA	1.33	NA	--	NA	--	--	--	NA	1.27	NA	0.68	--	NA	0.36	--
165E010	E02	2.5 - 3.5	NA	--	NA	--	NA	0.88	--	0.33	NA	1.3	NA	0.75	--	NA	0.5	--
165E011	E03	2.5 - 3.5	NA	1.42	NA	--	NA	0.58	--	--	NA	1.51	NA	0.69	--	NA	0.32	--
165E015	E15	0 - 0.5	1.35	NA	--	NA	0.61	NA	--	0.97	1.06	NA	0.67	NA	--	0.4	NA	--
165E016		2.5 - 3.5	NA	1.13	NA	1.83	NA	0.64	--	--	NA	1.1	NA	0.62	--	NA	0.36	--
165E017	E08	2.5 - 3.5	NA	1.14	NA	--	NA	0.54	--	0.149	NA	1.09	NA	0.56	--	NA	0.415	--
165E018	E14	0 - 0.5	1.22	NA	--	NA	0.67	NA	--	0.61	1.28	NA	0.62	NA	--	0.38	NA	--
165E019		2.5 - 3.5	NA	--	NA	--	NA	--	--	--	NA	1.11	NA	0.67	--	NA	--	--

Table A.7-7
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 25-07-06
(Page 2 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)															
			Actinium-228[a]		Bismuth-212[a]		Bismuth-214[a]		Cobalt-60[b]	Cesium-137[b]	Lead-212[a]		Lead-214[a]		Niobium-94[b]	Thallium-208[a]		Uranium-235[b]
Preliminary Action Levels[a,b,c]			**5**	**15**	**5**	**15**	**5**	**15**	**1.61**	**7.30**	**5**	**15**	**5**	**15**	**2.43**	**5**	**15**	**10.5**
165E020	E05	2.5 - 3.5	NA	--	NA	--	NA	--	--	--	NA	1.14	NA	0.7	--	NA	--	--
165E021	E13	0 - 0.5	--	NA	--	NA	--	NA	--	1.32	1.04	NA	0.73	NA	--	0.37	NA	--
165E022		2.5 - 3.5	NA	1.04	NA	--	NA	0.48	--	--	NA	1.1	NA	0.58	--	NA	0.36	--
165E023	E10	0 - 0.5	0.99	NA	--	NA	0.61	NA	--	--	1.39	NA	0.57	NA	--	0.45	NA	--
165E024		2.5 - 3.5	NA	1.17	NA	--	NA	0.48	--	--	NA	1.06	NA	0.67	--	NA	0.39	--
165E025	E11	0 - 0.5	1.11	NA	--	NA	0.64	NA	--	0.223	1.2	NA	0.64	NA	--	0.45	NA	--
165E026		2.5 - 3.5	NA	1.04	NA	--	NA	0.58	--	--	NA	1.55	NA	0.84	--	NA	0.41	--
165E027	E07	2.5 - 3.5	NA	1.52	NA	--	NA	0.97	--	**9.6**	NA	1.99	NA	1.03	--	NA	0.54	--
165E028	E09	0 - 0.5	0.94	NA	--	NA	0.69	NA	--	4.71	1.33	NA	0.75	NA	--	0.37	NA	--
165E029		2.5 - 3.5	NA	1.07	NA	--	NA	0.54	--	--	NA	1.09	NA	0.63	--	NA	0.39	--
165E305	E03	2.5 - 3.5	NA	1.15	NA	--	NA	0.54	--	--	NA	1.15	NA	0.54	--	NA	0.39	--

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-212, bismuth-214, lead-212, lead-214, and thallium-208, as found in Chapter IV of DOE 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The PALs for these isotopes are specified as 5 pCi/g averaged over the first 15 centimeters of soil and 15 pCi/g for deeper soils (DOE, 1993). For the purpose of this document, 15 centimeters is assumed to be equivalent to 0.5 ft (6 in.); therefore, the 5/15 pCi/g represents PALs for these radionuclides in the surface soil (0 - 0.5 ft depth) and the subsurface soil (> 0.5 ft depth), respectively.

[b]Taken from the construction, commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem/yr dose.

[c]Results exceeding PALs are in bold text.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
NA = Not Applicable
-- = Not detected above MRLs
J = Estimated value. Qualifier added to laboratory data; record accepted. Duplicate **normalized difference** outside control limits.

Table A.7-8
Soil Sample Results for Isotopes Detected Above Minimum Reporting Limits at CAS 25-07-06

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)				
			Uranium-234	Uranium-235	Uranium-238	Plutonium-239	Strontium-90
Preliminary Action Levels[a]			**85.9**	**10.5**	**63.2**	**7.62**	**503**
165E001	E01	0 - 0.5	2.85 (J)[b]	0.51	0.83	1.48 (J)[b]	1.72 (J)[c]
165E001A		0 - 0.5	1.33 (J)[b]	0.205	0.78	0.57 (J)[b]	0.93 (J)[c]
165E002	E02	0 - 0.5	15.2 (J)[b]	1.86 (J)[c]	1.28	0.242 (J)[b]	460 (J)[c]
165E002A		0 - 0.5	2.81 (J)[b]	0.314	0.64	0.021 (J)[b]	13.4 (J)[c]
165E003	E03	0 - 0.5	1.3 (J)[b]	0.122 (J)[c]	0.71	--	2.17 (J)[c]
165E003A		0 - 0.5	1.67 (J)[b]	0.183 (J)[c]	0.67	--	1.98
165E004	E04	0 - 0.5	0.74 (J)[b]	0.282 (J)[c]	0.66	--	--
165E004A		0 - 0.5	0.59 (J)[b]	0.125 (J)[c]	0.58	--	--
165E005	E05	0 - 0.5	1.1 (J)[b]	0.212 (J)[c]	0.82	--	0.43 (J)[c]
165E005A		0 - 0.5	1.37 (J)[b]	0.21 (J)[c]	0.76	--	0.44 (J)[c]
165E006	E06	0 - 0.5	0.62 (J)[b]	--	0.63	--	--
165E006A		0 - 0.5	0.71 (J)[b]	--	0.51	--	--
165E007	E07	0 - 0.5	0.97 (J)[b]	0.206 (J)[c]	0.8	--	--
165E007A		0 - 0.5	0.78 (J)[b]	0.086 (J)[c]	0.74	--	--
165E008	E08	0 - 0.5	0.66 (J)[b]	0.095 (J)[c]	0.66	--	--
165E008A		0 - 0.5	0.63 (J)[b]	--	0.63	--	--
165E009	E01	2.5 - 3.5	0.83 (J)[b]	0.162 (J)[c]	0.74	--	--
165E010	E02	2.5 - 3.5	1.24 (J)[b]	0.185 (J)[c]	0.93	--	--
165E011	E03	2.5 - 3.5	0.71	--	0.67	--	--
165E012	E12	0 - 0.5	0.63	0.093	0.579	--	--
165E013		2.5 - 3.5	0.66	0.063	0.69	--	--
165E014	E06	2.5 - 3.5	0.89	--	0.86	--	--
165E015	E15	0 - 0.5	0.65	0.112	0.59	--	0.44
165E016		2.5 - 3.5	0.64	0.059	0.63	--	0.87
165E017	E08	2.5 - 3.5	0.65	0.099	0.7	--	--
165E028	E09	0 - 0.5	--	--	--	--	0.5
165E305	E03	2.5 - 3.5	0.77	--	0.64	--	--

[a]Taken from the construction, commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem/yr dose.
[b]Qualifier added to laboratory data; record accepted. Duplicate RPD over the control limits.
[c]Qualifier added to laboratory data; record accepted. Duplicate normalized difference outside control limits.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
-- = Not detected above MRLs
J = Estimated value

Table A.7-9
Paint, Concrete, and Wood Samples Detected Above Minimum Reporting Limits at CAS 25-07-06
(Page 1 of 2)

Sample Number	Matrix	Analyte	Result[a]	Units	Regulatory Limits	Regulatory Reference
165E501	Paint	Bismuth-214	2.02 (J)	pCi/g	100	NDEP, 1997c
165E501	Paint	Cobalt-60	1.97 (J)	pCi/g	500	NDEP, 1997c
165E501	Paint	**Cesium-137**	**210 (J)**	pCi/g	100	NDEP, 1997c
165E501	Paint	Niobium-94	1.02 (J)	pCi/g	N	NDEP, 1997c
165E501	Paint	TCLP Cadmium	0.094	mg/L	1	CFR, 2002b
165E501	Paint	Aroclor-1254	3500	µg/kg	50,000	CFR, 2000b
165E502	Concrete	Cesium-137	7.9	pCi/g	100	NDEP, 1997c
165E502	Concrete	Lead-212	0.58	pCi/g	100	NDEP, 1997c
165E502	Concrete	Lead-214	0.46	pCi/g	100	NDEP, 1997c
165E502	Concrete	Uranium-234	1.35	pCi/g	100	NDEP, 1997c
165E502	Concrete	Uranium-235	0.109	pCi/g	100	NDEP, 1997c
165E502	Concrete	Uranium-238	0.45	pCi/g	100	NDEP, 1997c
165E502	Concrete	Strontium-90	1.74	pCi/g	100	NDEP, 1997c
165E502	Concrete	Aroclor-1254	48	µg/kg	50,000	CFR, 2000b
165E503	Concrete	Lead-212	0.38	pCi/g	100	NDEP, 1997c
165E503	Concrete	Uranium-234	0.53	pCi/g	100	NDEP, 1997c
165E503	Concrete	Uranium-238	0.48	pCi/g	100	NDEP, 1997c
165E504	Concrete	Cobalt-60	0.76	pCi/g	N	NDEP, 1997c
165E504	Concrete	Cesium-137	10.6	pCi/g	100	NDEP, 1997c
165E504	Concrete	Uranium-234	2.26	pCi/g	100	NDEP, 1997c
165E504	Concrete	Uranium-235	0.162	pCi/g	100	NDEP, 1997c
165E504	Concrete	Uranium-238	0.422	pCi/g	100	NDEP, 1997c
165E504	Concrete	Strontium-90	2.47	pCi/g	100	NDEP, 1997c
165E504	Concrete	Plutonium-239	0.408	pCi/g	10	NDEP, 1997c
165E504	Concrete	Aroclor-1254	41	µg/kg	50,000	CFR, 2000b
165E505	Concrete	Uranium-234	0.73	pCi/g	100	NDEP, 1997c
165E505	Concrete	Uranium-238	0.48	pCi/g	100	NDEP, 1997c
165E506	Concrete	Cesium-137	49.2	pCi/g	100	NDEP, 1997c
165E506	Concrete	Uranium-234	7.14	pCi/g	100	NDEP, 1997c
165E506	Concrete	Uranium-235	0.52	pCi/g	100	NDEP, 1997c
165E506	Concrete	Uranium-238	0.53	pCi/g	100	NDEP, 1997c
165E506	Concrete	Strontium-90	13.6	pCi/g	100	NDEP, 1997c

Table A.7-9
Paint, Concrete, and Wood Samples Detected Above Minimum Reporting Limits at CAS 25-07-06
(Page 2 of 2)

Sample Number	Matrix	Analyte	Result[a]	Units	Regulatory Limits	Regulatory Reference
165E506	Concrete	Plutonium-239	0.066	pCi/g	10	NDEP, 1997c
165E506	Concrete	Aroclor-1254	38	µg/kg	50,000	CFR, 2000b
165E507	Concrete	Uranium-234	0.59	pCi/g	100	NDEP, 1997c
165E507	Concrete	Uranium-238	0.352	pCi/g	100	NDEP, 1997c
165E508	Wood	Cesium-137	31.3 (J)	pCi/g	100	NDEP, 1997c
165E508	Wood	Uranium-234	0.67	pCi/g	100	NDEP, 1997c
165E508	Wood	Strontium-90	1.39	pCi/g	100	NDEP, 1997c
165E508	Wood	TCLP 2-Methylphenol	0.25	mg/L	NA	CFR, 2002b
165E508	Wood	TCLP 3+4-Methylphenol	0.85	mg/L	NA	CFR, 2002b
165E509	Wood	TCLP 2-Methylphenol	1.2	mg/L	NA	CFR, 2002b
165E509	Wood	TCLP 3+4-Methylphenol	4.5	mg/L	NA	CFR, 2002b
165E509	Wood	Cesium-137	9.9 (J)	pCi/g	100	NDEP, 1997c
165E509	Wood	Uranium-234	0.114	pCi/g	100	NDEP, 1997c
165E509	Wood	Strontium-90	48.5	pCi/g	100	NDEP, 1997c
165E509	Wood	TCLP Pyridine	0.19	mg/L	NA	CFR, 2002b
165E510	Wood	TCLP 2-Methylphenol	0.58	mg/L	NA	CFR, 2002b
165E510	Wood	TCLP 3+4-Methylphenol	2.2	mg/L	NA	CFR, 2002b

[a]Results exceeding the regulatory limits are in bold text.

pCi/g = Picocuries per gram
mg/L = Milligrams per liter
µg/kg = Micrograms per kilogram
J = Estimated value. Qualifier added to laboratory data; record accepted. Sample does not meet counting geometry requirements.
N = Limit not established for NTS Industrial Landfill
NA = Not applicable

sampling was performed to characterize the pad for disposal. Samples were collected from the painted surface of the pad, the concrete, and the wooden railroad ties immediately adjacent to the pad. Painted surfaces were also swiped for PCB contamination.

Three swipe samples (165E511, 165E512, and 165E513) of the painted surfaces were obtained from near cracks and the drain. The swipes were analyzed for PCBs, but no PCBs were detected. One paint sample (165E501) was composited from three locations on the decontamination pad. Biased locations were selected based on the high radiological screening results, cracks in the paint/concrete,

and low sections of the concrete pad. The composite paint sample was analyzed for PCBs, TCLP VOCs, TCLP SVOCs, TCLP RCRA metals, and gamma spectroscopy. Cesium-137 was detected at concentrations above the sanitary NTS disposal criteria (NDEP, 1997b and c).

Six concrete samples (165E502, 165E503, 165E504, 165E505, 165E506, and 165E507) were obtained from the surface of the pad at varied depths (0 to 2 in.). Biased locations were selected based on radiological screening results, cracks in the paint/concrete, and low sections of the pad. The concrete was analyzed for PCBs, TCLP VOCs, TCLP SVOCs, TCLP RCRA metals, isotopic U, isotopic Pu, Sr-90, and gamma spectroscopy. The concentration of a number of analytes were above MRLs; however, none exceeded the sanitary NTS disposal criteria (NDEP, 1997b and c) except for Cs-137, which exceeds the landfill criteria. If the concrete pad is broken for disposal and managed as waste, it will be considered low-level waste.

Three surface wood samples were obtained from railroad ties at a depth of 0 to 6 in. One was obtained from the first tie south of the pad (165E508), one was obtained from the first tie north of the pad (165E509), and one from the seventh tie north of the pad (165E510). Samples were analyzed for PCBs, TCLP VOCs, TCLP SVOCs, TCLP RCRA metals, isotopic U, isotopic Pu, Sr-90, and gamma spectroscopy. The concentration of a number of analytes were above MRLs; however, all were below the sanitary NTS disposal criteria (NDEP, 1997b and c).

A.7.2.9 Contaminants of Concern

Based on the aforementioned analytical results, COCs were identified in the surface and subsurface soil surrounding the decontamination pad. Cesium-137 and lead were detected above the PALs in surface soil at location E03, and TCLP lead was detected above the regulatory disposal limit. (Note: Soil associated with this location will be considered mixed waste if it is removed.) Cesium-137 was the only COC identified at locations E01, E02, and E05. At sample location E07, TPH (DRO) was detected above the PAL and regulatory disposal limit in the surface, and Cs-137 was detected at concentrations greater than the PAL at 2.5 to 3.5 ft bgs.

The total surface radiological contamination on the decontamination pad, its surface attachments (e.g., rails), and adjacent railroad ties exceeded the associated unrestricted release criteria of 1,000 dpm/100 cm^2 at 121 of the 175 static measurement locations.

A.7.3 Nature and Extent of COCs

Total petroleum hydrocarbons are located approximately 50 ft north of the decontamination pad in the surface soil at location E07. Cesium-137 was detected in a concentration exceeding the PAL from 2.5 to 3.5 ft bgs at this location. Step-out locations E10 and E11, 10 ft east and west of E07, did not indicate COCs. Lead and Cs-137 were present at the northwest edge of the pad in the surface soil at location E03. The interval sampled at 2.5 to 3.5 ft bgs did not indicate COCs. Step-out location E09, 15-ft north of E03, did not indicate COCs.

The COC Cs-137 was found in surface soil at locations E01, E02, E03, and E05. The interval sampled at 2.5 to 3.5 ft bgs did not indicate Cs-137 at these locations. Step-out locations E06, E08, E09, E12, E13, E14, and E15 did not indicate CS-137 at 0 to 0.5 ft bgs.

The decontamination pad, its surface attachments (e.g., rails), and adjacent railroad ties are considered contaminated with COCs.

A.7.4 Revised Conceptual Site Model

No variations to the conceptual site model were identified.

A.8.0 Vehicle Washdown (CAS 25-07-07)

Corrective Action Site 25-07-07, Vehicle Washdown, is located in Area 25 of the NTS, adjacent to the Reactor Control Point (RCP) facility, and approximately 48 ft east of Road C at its junction with Road H. The site consists of a decontamination pad (16 x 32 ft); a gravity-fed, gravel-lined sump (37 x 32 x 3 ft); trailer pads; and three box hydrants with hose racks and utility pad. The utility pad is connected to the sump via 4-in. VCP (50 ft) and 30 ft of 4-in. Orangeburg piping (Figure A.8-1). More detail about this CAS is provided in the CAIP (NNSA/NV, 2002).

A.8.1 Corrective Action Investigation

Twenty-one soil samples were collected during investigation activities and are listed in Table A.8-1. The SCLs show surface samples were collected from 2 to 6 in. bgs; however, these samples are considered to represent the surface interval (0 to 0.5 ft bgs). The planned sample locations are shown in Figure 4-6 of the CAIP. The actual sample locations are shown in Figure A.8-1. The specific CAI activities conducted to meet CAIP requirements at CAS 25-07-07 are described in the following sections.

A.8.1.1 Deviations

There was a deviation to the CAIP requirement. The 4-in. VCP (50 ft) and 30 ft of 4-in. Orangeburg pipe were not video surveyed as originally intended. This deviation was due to the lack of access points at this CAS. The access at the utility pad would not allow the camera into the tight pipe bend at the surface. In addition, the clean-out riser was not located. The Orangeburg pipe was observed to be deteriorated and no sample media was present in the pipe at sample location F07. Despite this deviation, the pertinent CAIP requirements were met.

A.8.2 Investigation Results

The following sections provide CAS-specific details of the inspection and sampling of system features, FSRs, and sample selection and analysis.

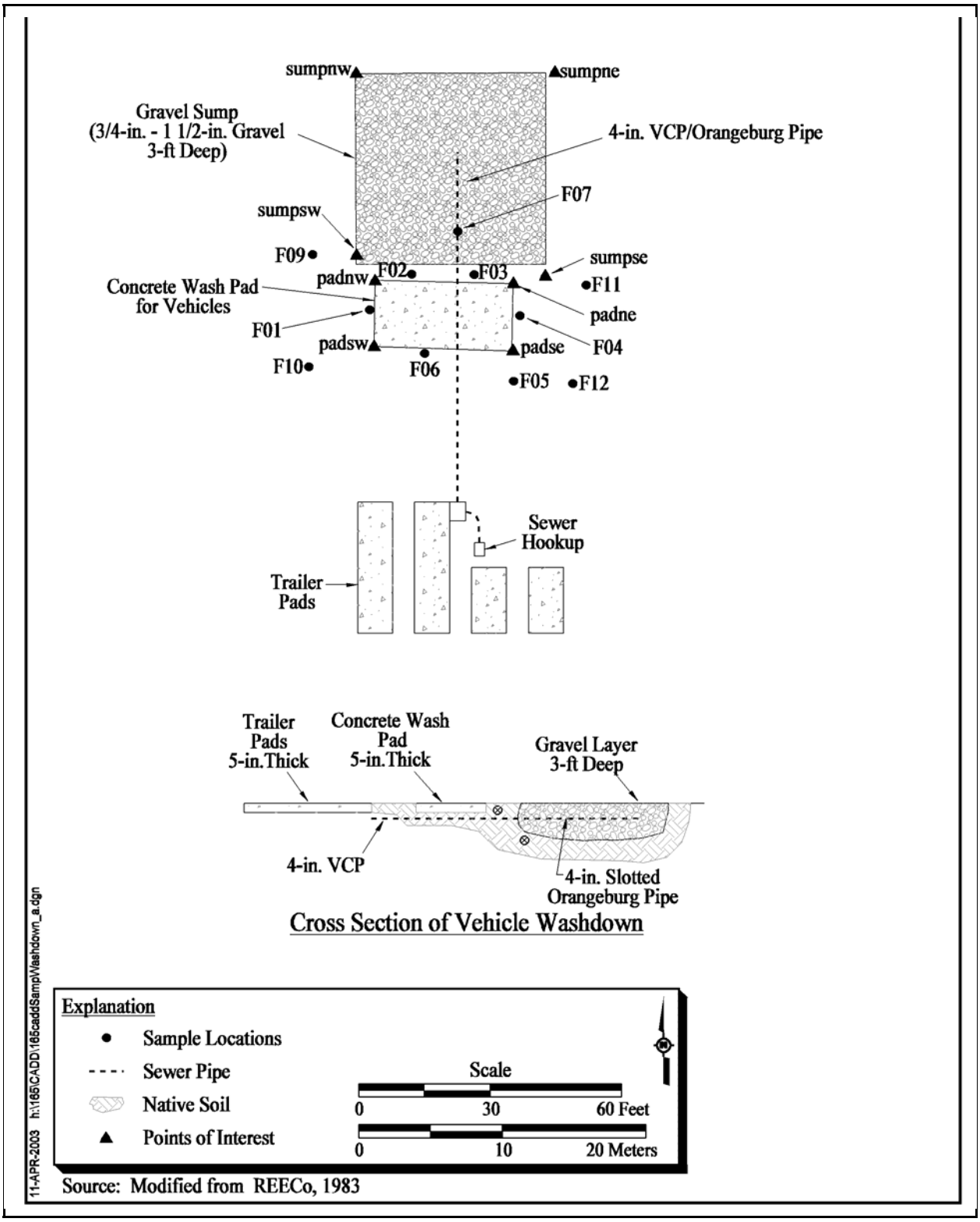

Figure A.8-1
Sampling Locations and Points of Interest at CAS 25-07-07, Vehicle Washdown

Table A.8-1
Samples Collected for CAS 25-07-07, Vehicle Washdown

Sample Number	Sample Location	Depth (ft bgs)	Sample Matrix	Purpose	Analyses
165F001	F01	0 - 0.5	Soil	Environmental	Set 1, Total Beryllium
165F002	F02	0 - 0.5	Soil	Environmental	Set 1, Total Beryllium
165F003	F03	0 - 0.5	Soil	Environmental	Set 1, Total Beryllium
165F004	F04	0 - 0.5	Soil	Environmental	Set 1, Total Beryllium
165F005	F05	0 - 0.5	Soil	Environmental	Set 1, Total Beryllium
165F006	F06	0 - 0.5	Soil	Environmental	Set 1, Total Beryllium
165F007	F07	3 - 4	Soil	Environmental MS/MSD	Set 1, Total Beryllium
165F008	F07	5.5 - 6.5	Soil	Environmental	Set 1, Total Beryllium
165F009	F09	0 - 0.5	Soil	Environmental	TPH-DRO, Isotopic Uranium
165F010	F10	0 - 0.5	Soil	Environmental	TPH-DRO, Isotopic Uranium
165F011	F09	2.5 - 3.5	Soil	Environmental	TPH-DRO, Isotopic Uranium
165F012	F01	2.5 - 3.5	Soil	Environmental	TPH-DRO, Isotopic Uranium
165F013	F10	2.5 - 3.5	Soil	Environmental	TPH-DRO, Isotopic Uranium
165F014	F02	2.5 - 3.5	Soil	Environmental	TPH-DRO, Isotopic Uranium
165F015	F03	2.5 - 3.5	Soil	Environmental	TPH-DRO
165F016	F11	0 - 0.5	Soil	Environmental	TPH-DRO
165F017	F12	0 - 0.5	Soil	Environmental	TPH-DRO
165F018	F06	2.5 - 3.5	Soil	Environmental	TPH-DRO
165F019	F04	2.5 - 3.5	Soil	Environmental	TPH-DRO
165F020	F11	2.5 - 3.5	Soil	Environmental	TPH-DRO
165F021	F12	2.5 - 3.5	Soil	Environmental	TPH-DRO
165F301	F01	NA	Water	Trip Blank	Total VOCs
165F302	F01	NA	Water	Field Blank	Set 1, Total Beryllium
165F303	F01	NA	Water	Trip Blank	Total VOCs
165F305	F07	NA	Water	Trip Blank	Total VOCs
165F306	Sample Table	NA	Water	Trip Blank	Total VOCs
165F307	F11	2.5 - 3.5	Soil	Field Duplicate of #165F020	TPH-DRO

Set 1 = Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO and GRO), PCBs, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, and Strontium-90

MS/MSD = Matrix spike/matrix spike duplicate
NA = Not applicable
ft bgs = Feet below ground surface

A.8.2.1 Radiological Survey of Soil

A radiological walk-over survey was performed at CAS 25-07-07, Vehicle Washdown, to determine if radiological contamination is present in surficial soil at activities statistically greater than background.

Measurements of the gamma radiation emission rate for surficial soil at CAS 25-07-07 were taken over an area that extended a minimum of 15 ft radially from the concrete pad. A total of 2,519 data points were recorded at this site with a mean gamma radiation emission rate of 165 counts per second versus the mean undisturbed background gamma radiation emission rate of 192 counts per second. The results were plotted on a color-coded contour map (Figure A.8-2) and indicate that the gamma radiation emission rate is slightly elevated and localized around the outer edge of the concrete pad.

The elevated gamma radiation emission rate can be attributed to many factors such as geometry of the plane of the detector face with the plane of the surficial soil, varying soil types and geology, and residual radiological contamination. It is difficult to ascertain what the source is of this elevated gamma radiation emission rate since it is only slightly greater than the mean undisturbed background gamma radiation emission rate. This site poses no risk to individuals from residual radiological contamination; therefore, biasing sample locations are not warranted.

A.8.2.2 Radiological Survey of Concrete Decontamination Pad

Radiological surveys were conducted on the vehicle washdown pad to identify radiological areas of elevated activity (i.e., results in excess of the unrestricted release criteria of 1,000 dpm/100 cm^2 over background). The radiological survey methods consisted of scanning and one-minute static measurements. A complete survey of the surface of the concrete decontamination pad was conducted. This survey consisted of dividing the concrete pad into 1-m^2 grids and then performing an approximate 100 percent surface scanning survey of the pad for alpha and beta/gamma contamination. One-minute static measurements were taken at grid spaces that exhibited elevated count rates as identified during the scanning survey. Swipe samples were not collected since there were no static measurement results in excess of the removable contamination values of the Table 4-2 (allowable residual surface contamination values in dpm/100 cm^2) of the *NV/YMP Radiological Control Manual* (DOE/NV, 2000) for the radiological constituents of concern.

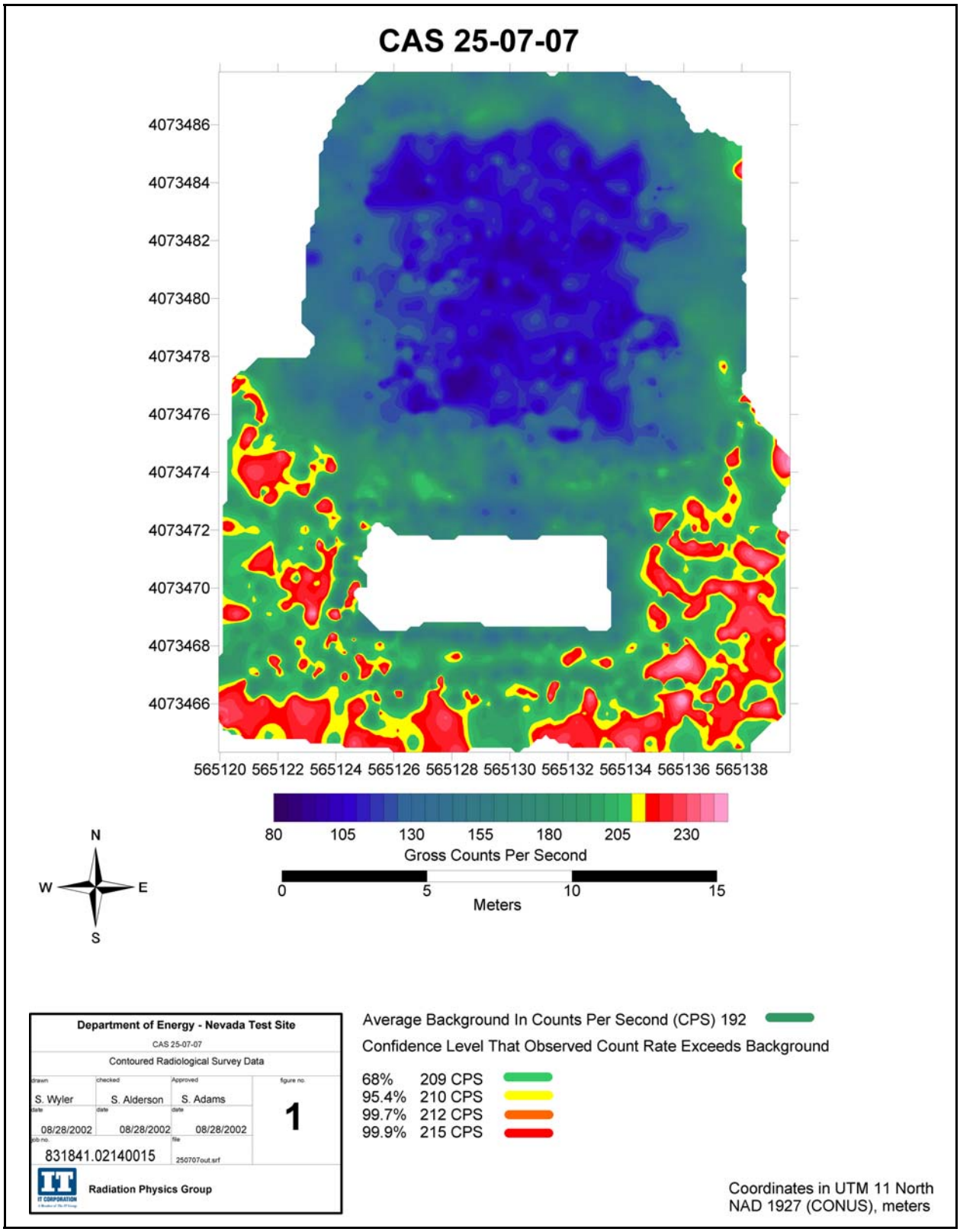

Figure A.8-2
Surface Radiological Survey at CAS 25-07-07

A.8.2.3 Soil Sampling

Surface soil samples (0 to 0.5 ft bgs) were collected on each side of the decontamination pad. During sample collection at locations F01, F02, F03, F04, and F06, a dark staining was observed from 0.2 to 0.5 ft bgs as well as degraded asphalt around the pad at several locations. Deeper samples (2.5 to 3.5 ft bgs) were collected at these locations and no staining was present at this depth. Step-out samples (approximately 15 ft outward) were also collected from around the pad in the soils from 0 to 0.5 ft and 2.5 to 3.5 ft bgs. A total of 21 soil samples were collected around the concrete decontamination pad. All samples were sent to the laboratory for analysis. In addition, one QC soil duplicate was collected and analyzed. See Table A.8-1 and Figure A.8-1 for sample locations and depths. Samples were collected using a scoop for surface samples and a backhoe for subsurface samples.

A soil sample (165F007) was collected (3 to 4 ft bgs) at the native-soil/gravel interface within the gravel sump beneath the Orangeburg pipe. The sump gravel is 3 ft deep at location F07. During sample collection at this location, the Orangeburg pipe was identified as dark-colored and decomposed. A deeper sample was collected at this location from 5.5 to 6.5 ft bgs. No staining was present in the soil at either depth. One MS/MSD was performed on one sample from this location.

A.8.2.4 Field-Screening Results

Soil samples were field screened for VOCs and alpha and beta/gamma radiation. The FSRs were compared to FSLs to guide sampling decisions. The VOC headspace FSLs were not exceeded during sampling activities. Soil samples did not exceed FSLs for alpha and beta/gamma radiation.

A.8.2.5 Sample Analyses

Investigation soil samples were analyzed for CAIP-specified COPCs including total VOCs, total SVOCs, total RCRA metals and beryllium, TPH (DRO and GRO), PCBs, isotopic U, isotopic Pu, Sr-90, and gamma-emitting radionuclides. The analytical parameters and laboratory analytical methods used to analyze the investigation samples are listed in Table A.2-2. Table A.8-1 lists the sample-specific analytical parameters.

A.8.2.6 Analytes Detected Above Minimum Reporting Limits

The analytical results detected at concentrations exceeding the correlated MRLs (NNSA/NV, 2002) are summarized in the following sections. These results are compared to PALs that are a subset of those that exceed MRLs. A portion of the analytical results were rejected; however, these rejected data did not impact closure decisions as discussed in Section B.1.1.3 of Appendix B.

A.8.2.6.1 Total Volatile Organic Compound Analytical Results for Soil Samples

Total VOCs analytical results for soil samples exceeding the MRLs are shown in Table A.8-2. These results did not exceed the PALs.

Table A.8-2
Soil Sample Results for Total VOCs Detected Above Minimum Reporting Limits at CAS 25-07-07

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)	
			Methylene Chloride	Naphthalene
Preliminary Action Levels[a]			21,000	190,000
165F001	F01	0 - 0.5	14	--
165F002	F02	0 - 0.5	21	5.5

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
-- = Not detected above MRLs

A.8.2.6.2 Total Semivolatile Organic Compounds Analytical Results for Soil Samples

No total SVOCs analytical results for soil exceeded the MRLs.

A.8.2.6.3 Total Petroleum Hydrocarbon Analytical Results for Soil Samples

Several locations had TPH analytical results exceeding MRLs and are shown in Table A.8-3. Surface soil samples collected at sample locations F01, F02, F03, F04, and F06 contained TPH (DRO) at concentrations exceeding the PALs. They were collected immediately within the stained layer surrounding the decontamination pad.

Table A.8-3
Soil Sample Results for TPH-DRO and -GRO Detected Above Minimum Reporting Limits at CAS 25-07-07

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
			Diesel-Range Organics	Gasoline-Range Organics
Preliminary Action Level[a, b]			100	100
165F001	F01	0 - 0.5	**320** (M)	--
165F002	F02	0 - 0.5	**400** (D, M)	--
165F003	F03	0 - 0.5	**230** (M)	--
165F004	F04	0 - 0.5	**740** (M)	--
165F005	F05	0 - 0.5	--	0.73 (Z)
165F006	F06	0 - 0.5	**1,200** (M)	--
165F009	F09	0 - 0.5	55 (M)	--
165F010	F10	0 - 0.5	37 (M)	--

[a]*Nevada Administrative Code* 445A.2272(b) (NAC, 2000)
[b]Results exceeding the PALs are in bold text.

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
D = Indicates that a pattern resembling diesel was detected in the sample
M = Motor oil
Z = The reported results did not resemble the patterns of the following petroleum hydrocarbon products: gasoline, JP-4, JP-8, diesel, mineral spirits, motor oil, Stoddard solvent, and Bunker C.
-- = Not detected above MRLs

A.8.2.6.4 Total RCRA Metals Analytical Results for Soil Samples

The total RCRA metals detected in soil samples at concentrations exceeding MRLs are listed in Table A.8-4. These results did not exceed the PALs.

A.8.2.6.5 Total Beryllium Results for Soil Samples

The total beryllium analytical results for soil samples did not exceed the MRLs.

A.8.2.6.6 Polychlorinated Biphenyl Results for Soil Samples

The PCB analytical results exceeding the MRLs are listed in Table A.8-5. The PALs were not exceeded at this CAS.

Table A.8-4
Soil Sample Results for Total RCRA Metals Detected Above Minimum Reporting Limits for CAS 25-07-07

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)					
			Arsenic	Barium	Cadmium	Chromium	Lead	Selenium
Preliminary Action Levels			**23[a]**	**100,000[b]**	**810[b]**	**450[b]**	**750[b]**	**10,000[b]**
165F001	F01	0 - 0.5	3.6	110	0.59	5.7	29	0.92
165F002	F02	0 - 0.5	3	91	--	4.5	20	0.62
165F003	F03	0 - 0.5	5.2	100	--	5.6	22	--
165F004	F04	0 - 0.5	3.1	130	--	9.3	23	--
165F005	F05	0 - 0.5	2.6	92	--	4.4	11	--
165F006	F06	0 - 0.5	3.6	120	0.82	6	35	--
165F007	F07	3 - 4	1.7	78	--	1.9	5.9	--
165F008		5.5 - 6.5	2.5	88	--	2.7	5.5	--

[a]Mean plus two times the standard deviation of the mean for sediment samples collected by the NBMG throughout NTTR (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above MRLs

Table A.8-5
Soil Sample Results for PCBs Detected Above Minimum Reporting Limits at CAS 25-07-07

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (μg/kg)
			Aroclor-1260
Preliminary Action Levels[a]			**1,000**
165F001	F01	0 - 0.5	35
165F003	F03	0 - 0.5	110
165F004	F04	0 - 0.5	470
165F006	F06	0 - 0.5	87

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
μg/kg = Micrograms per kilogram

A.8.2.6.7 Gamma Spectroscopy Results for Soil Samples

Cesium-137 and naturally occurring gamma-emitting radionuclides detected greater than MRLs are shown in Table A.8-6. These results did not exceed the PALs.

Table A.8-6
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 25-07-07

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)										
			Actinium-228[a]		Bismuth-214[a]		Cesium-137[b]	Lead-212[a]		Lead-214[a]		Thallium-208[a]	
Preliminary Action Levels			**5**	**15**	**5**	**15**	**7.30**	**5**	**15**	**5**	**15**	**5**	**15**
165F001	F01	0 - 0.5	1.46	NA	0.69	NA	--	1.22	NA	0.89	NA	0.58	NA
165F002	F02	0 - 0.5	1.07	NA	0.86	NA	--	1.66	NA	0.83	NA	0.52	NA
165F003	F03	0 - 0.5	1.58	NA	0.81	NA	1.58	1.69	NA	0.81	NA	0.5	NA
165F004	F04	0 - 0.5	1.65	NA	0.65	NA	--	1.55	NA	1.04	NA	0.54	NA
165F005	F05	0 - 0.5	1.41	NA	0.73	NA	--	1.43	NA	0.75	NA	0.57	NA
165F006	F06	0 - 0.5	1.53	NA	0.85	NA	4.23	1.75	NA	0.99	NA	0.53	NA
165F007	F07	3 - 4	NA	1.68	NA	0.76	--	NA	1.67	NA	0.8	NA	0.56
165F008		5.5 - 6.5	NA	1.62	NA	0.71	--	NA	2.15	NA	0.81	NA	0.6

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, and thallium-208, as found in Chapter IV of DOE 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The PALs for these isotopes are specified as 5 pCi/g averaged over the first 15 centimeters of soil and 15 pCi/g for deeper soils (DOE, 1993). For the purpose of this document, 15 centimeters is assumed to be equivalent to 0.5 ft (6 in.); therefore, the 5/15 pCi/g represents the PALs for these radionuclides in the surface soil (0 to 0.5 ft depth) and the subsurface soil (> 0.5 ft depth), respectively.
[b]Taken from the construction, commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem/yr dose.

ft bgs = Feet below ground surface
NA = Not applicable
pCi/g = Picocuries per gram
-- = Not detected above MRLs

A.8.2.6.8 Isotopic Uranium Results for Soil Samples

Isotopic U concentrations detected in soil samples above MRLs are shown in Table A.8-7. These concentrations did not exceed the PALs.

A.8.2.6.9 Isotopic Plutonium Results for Soil Samples

Isotopic Pu concentrations for soil samples with concentrations in excess of the MRLs are shown in Table A.8-7. These concentrations did not exceed the PALs.

Table A.8-7
Soil Sample Results for Isotopes Detected Above Minimum Reporting Limits at CAS 25-07-07

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)			
			Plutonium-239	Uranium-234	Uranium-235	Uranium-238
Preliminary Action Levels[a]			7.62	85.9	10.5	63.2
165F001	F01	0 - 0.5	0.118	0.88	R	0.92
165F002	F02	0 - 0.5	--	0.7	0.138 (J)[b]	0.72
165F003	F03	0 - 0.5	--	0.78	0.114 (Jb[b]	0.8
165F004	F04	0 - 0.5	--	0.82	0.131 (J)[b]	0.84
165F005	F05	0 - 0.5	--	0.81	0.124 (J)[b]	0.79
165F006	F06	0 - 0.5	0.109	1.05	R	0.85
165F007	F07	3 - 4	--	0.93	0.076	1.01
165F008		5.5 - 6.5	--	0.92	0.053	0.81
165F009	F09	0 - 0.5	--	0.76	0.06 (J)[c]	0.79
165F010	F10	0 - 0.5	--	0.72	0.062 (J)[c]	0.71
165F011	F09	2.5 - 3.5	--	0.8	0.052 (J)[c]	0.77
165F012	F01	2.5 - 3.5	--	0.76	0.087 (J)[c]	0.82
165F013	F10	2.5 - 3.5	--	0.7	--	0.72
165F014	F02	2.5 - 3.5	--	0.75	0.082 (J)[c]	0.79

[a]Taken from the construction, commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem/yr dose.
[b]Qualifier added to laboratory data; record accepted. Duplicate RPD over the control limits.
[c]Qualifier added to laboratory data; record accepted. Field blank or equipment rinsate blank or source blank contamination.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
-- = Not detected above MRLs
J = Estimated value
R = Result was rejected

A.8.2.6.10 Strontium-90 Results for Soil Samples

Strontium-90 was not detected above MRLs in soil samples collected at this CAS.

A.8.2.7 Contaminants of Concern

Based on the aforementioned analytical results, TPH (DRO) was identified in the surface soil surrounding the decontamination pad.

A.8.3 Nature and Extent of COCs

The COC TPH (DRO) was found in surface soils (0 to 0.5 ft bgs) on all sides of the pad at locations F01, F02, F03, F04, and F06. The TPH concentrations decreased with depth at these locations and were below PALs within 2.5 ft bgs. Sample results from the step-out locations (F09, F10, F11, and F12) indicate TPH concentrations do not exceed PALs beyond 15 ft laterally from the pad.

A.8.4 Revised Conceptual Site Model

No variations to the conceptual site model were identified.

A.9.0 Vehicle Washdown Station (CAS 26-07-01)

Corrective Action Site 26-07-01, Vehicle Washdown Station, is located in Area 26, 150 yards east of Building 2201 (Maintenance, Assembly, and Disassembly Building). The site includes a bermed concrete pad (50 x 22 ft) and a metal support structure with a transite awning containing 10 sprayer heads. The pad drain and associated piping is not part of this CAU; it is part of CAU 271 (CAS 26-05-01) (Figure A.9-1). More detail about this CAS is provided in the CAIP (NNSA/NV, 2002).

A.9.1 Corrective Action Investigation

Twenty-five investigation samples were collected during investigation activities and are listed in Table A.9-1. The planned sample locations are shown in Figure 4-7 of the CAIP. The actual sample locations are shown in Figure A.9-1. The specific CAI activities conducted to meet CAIP requirements at CAS 26-07-01 are described in the following sections.

A.9.1.1 Deviations

No deviations to the CAIP requirements were identified.

A.9.2 Investigation Results

The following sections provide CAS-specific details of the inspection and sampling of system features, FSRs, and sample selection and analysis.

A.9.2.1 Radiological Survey of Soil

A radiological walk-over survey was performed at CAS 26-07-01 to determine if radiological contamination is present in surficial soil at concentrations statistically greater than surficial soil from undisturbed background locations. The results of this survey indicate locations of radiological surface contamination and were used to focus CAI efforts on biased sampling locations.

Measurements of the gamma radiation emission rate for surficial soil at CAS 26-07-01 were taken over an area that extended a minimum of 15 ft radially from the concrete pad. Two discrete surveys of this CAS were performed. One survey was performed due to the presence of carbonized flecks that

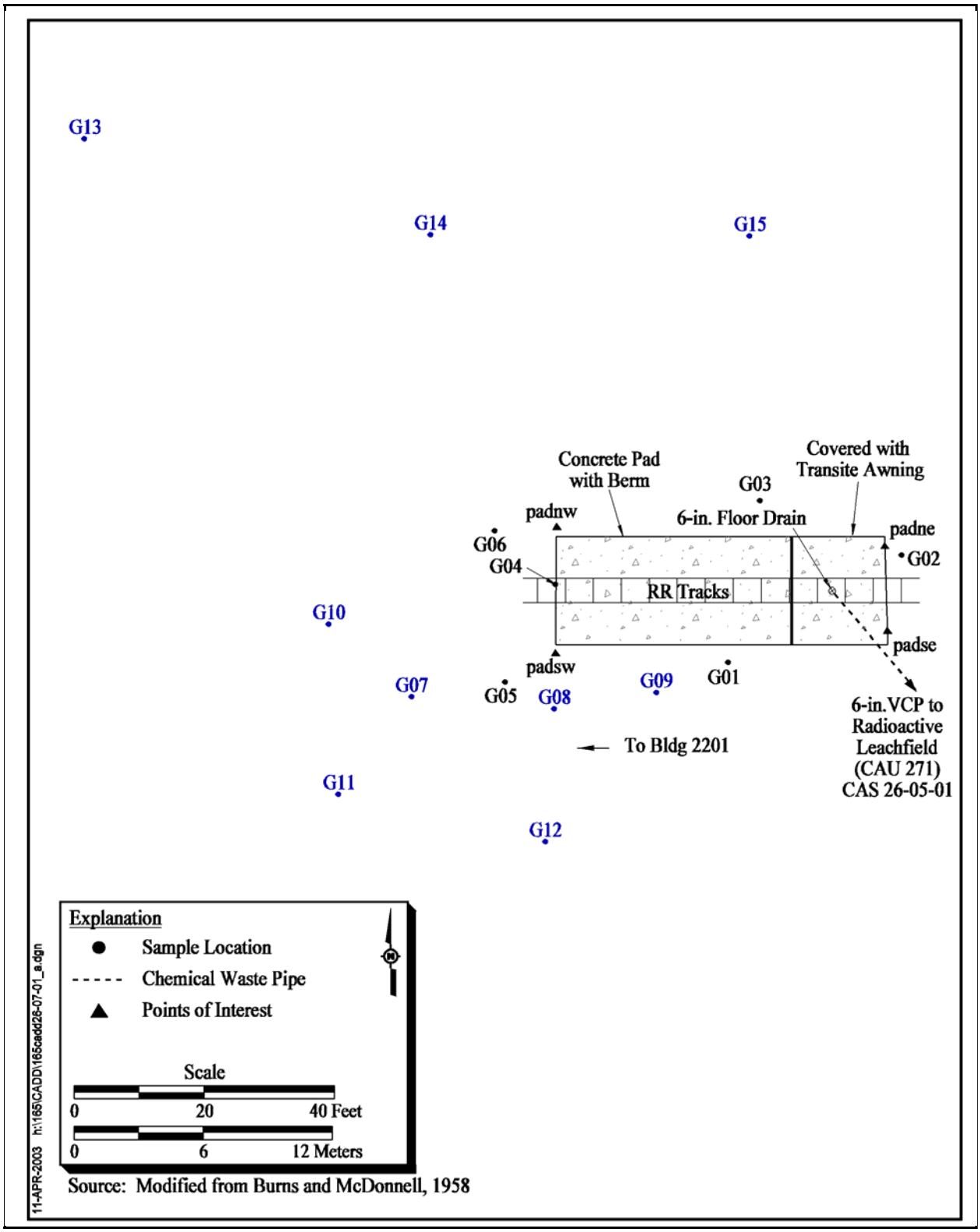

Figure A.9-1
Sampling Locations and Points of Interest at CAS 26-07-01,
Vehicle Washdown Station

Table A.9-1
Samples Collected for CAS 26-07-01, Vehicle Washdown Station
(Page 1 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Sample Matrix	Purpose	Analyses
165G001	G01	0 - 0.5	Soil	Environmental	Set 1, Total Beryllium
165G002	G02	0 - 0.5	Soil	Environmental	Set 1, Total Beryllium
165G003	G03	0 - 0.5	Soil	Environmental MS/MSD	Set 1, Total Beryllium
165G004	G04	0 - 0.5	Soil	Environmental	Set 1, Total Beryllium
165G005	G04	2.5 - 3.5	Soil	Environmental	Isotopic Uranium
165G006	G05	0 - 0.5	Soil	Environmental	Isotopic Uranium
165G007	G05	2.5 - 3.5	Soil	Environmental	Isotopic Uranium
165G008	G06	0 - 0.5	Soil	Environmental	Isotopic Uranium
165G009	G06	2.5 - 3.5	Soil	Environmental	Isotopic Uranium
165G010	G13	0 - 0.5	Soil	Background	Isotopic Uranium
165G011	G14	0 - 0.5	Soil	Background	Isotopic Uranium
165G012	G15	0 - 0.5	Soil	Background	Isotopic Uranium
165G013	G07	0 - 0.5	Soil	Environmental	Isotopic Uranium
154G014	G07	2.5 - 3	Soil	Environmental	Isotopic Uranium
165G015	G08	0 - 0.5	Soil	Environmental	Isotopic Uranium
165G016	G08	2.5 - 3	Soil	Environmental	Isotopic Uranium
165G017	G09	0 - 0.5	Soil	Environmental	Isotopic Uranium
165G018	G09	2.5 - 3	Soil	Environmental	Isotopic Uranium
165G019	G10	0 - 0.5	Soil	Environmental	Isotopic Uranium
165G020	G10	2.5 - 3	Soil	Environmental	Isotopic Uranium
165G021	G11	0 - 0.5	Soil	Environmental	Isotopic Uranium
165G022	G11	0 - 0.5	Soil	Field Duplicate of 165G021	Isotopic Uranium
165G023	G11	2.5 - 3	Soil	Environmental	Isotopic Uranium
165G024	G12	0 - 0.5	Soil	Environmental Lab QC	Isotopic Uranium
165G025	G12	2.5 - 3	Soil	Environmental	Isotopic Uranium
165G301	Sample Table	NA	Water	Field Blank	Set 1, Total Beryllium
165G302	G01	NA	Water	Trip Blank	Total VOCs
165G305	Sample Table	NA	Water	Trip Blank	Total VOCs
165G307	Sample Table	NA	Water	Trip Blank	Total VOCs

Table A.9-1
Samples Collected for CAS 26-07-01, Vehicle Washdown Station
(Page 2 of 2)

Sample Number	Sample Location	Depth (ft bgs)	Sample Matrix	Purpose	Analyses
165G308	NA	NA	Water	Source Blank	Isotopic Uranium
165G309	NA	NA	Water	Field Blank	Isotopic Uranium
165G510[a]	Decontamination Pad	NA	Carbonized Fleck	WM	Gamma Spectroscopy[a]

[a]Gamma Spectroscopy on this sample was performed on site.

Set 1 = Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO and GRO), PCBs, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, and Strontium-90

MS/MSD = Matrix spike/matrix spike duplicate
NA = Not applicable
WM = Waste Management
ft bgs = Feet below ground surface

had elevated radiological activity. Another survey was performed after removal of the flecks. A total of 2,811 data points were recorded at this site during the first survey, with a mean gamma radiation emission rate of 197 counts per second versus the mean undisturbed background gamma radiation emission rate of 214 counts per second. The results were plotted on a color-coded contour map shown in Figure A.9-2.

Figure A.9-2 indicates that the gamma radiation emission rate is moderately elevated in discrete soil locations confined to the southern, western, and northern edges of the concrete pad. The elevated gamma radiation emission rate can be directly attributed to the presence of discrete radioactive media (carbonized flecks). The discrete radioactive media was collected and removed, and the site was surveyed again. A total of 1,321 data points were recorded during the second survey, with a mean gamma radiation emission rate of 167 counts per second versus the mean undisturbed background gamma radiation emission rate of 202 counts per second. The results were plotted on a color-coded contour map and shown in Figure A.9-3.

Figure A.9-3 clearly shows that the discrete radioactive media located on the southern, western, and northern edges of the concrete pad have been removed. The elevated circular spot near the center of Figure A.9-3 is the sump region of the concrete pad. Although the sump region indicates an elevated gamma emission rate, this is due to the sensitivity of the instrument and the geometry of the

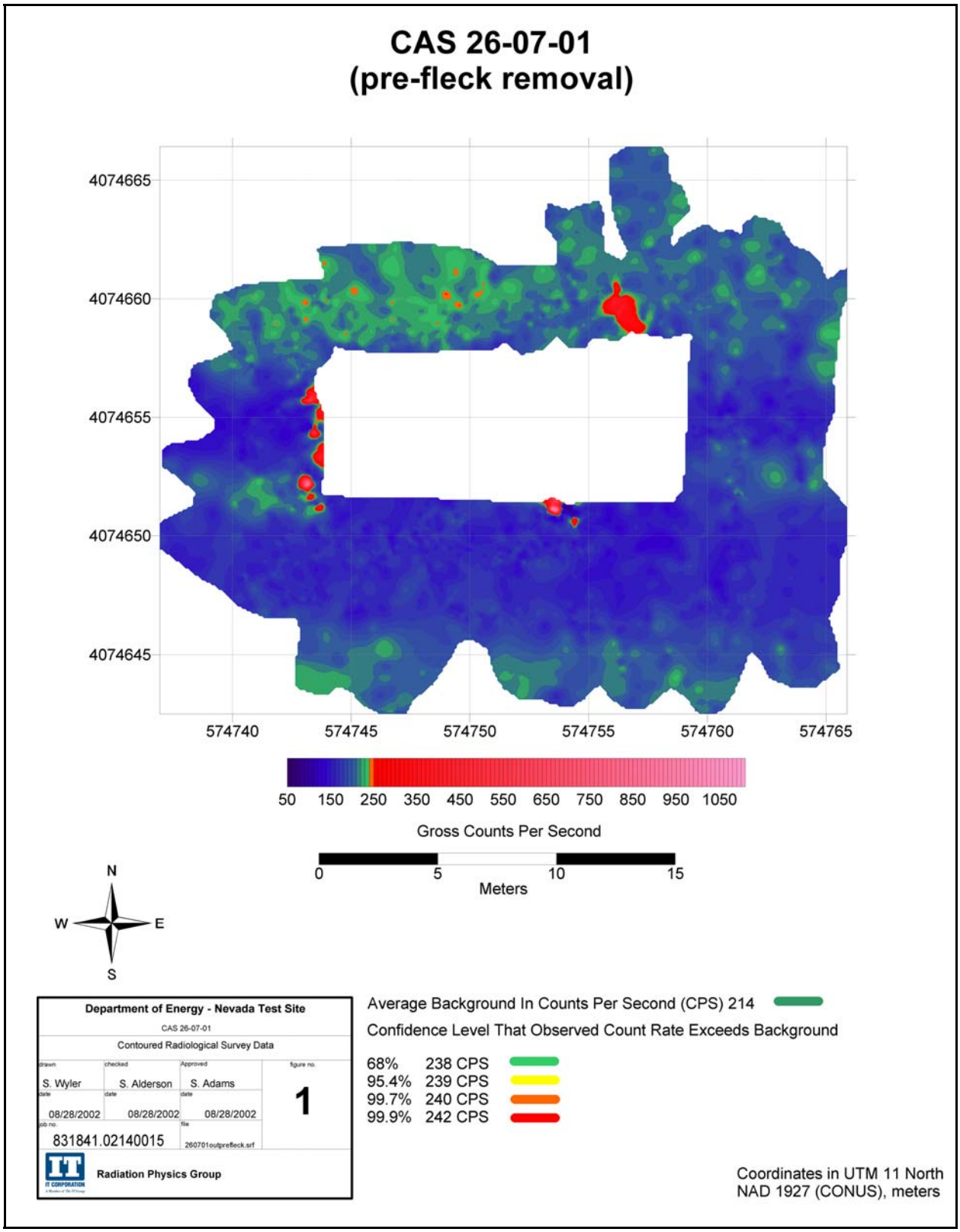

Figure A.9-2
Surface Radiological Survey at CAS 26-07-01 Showing Flecks

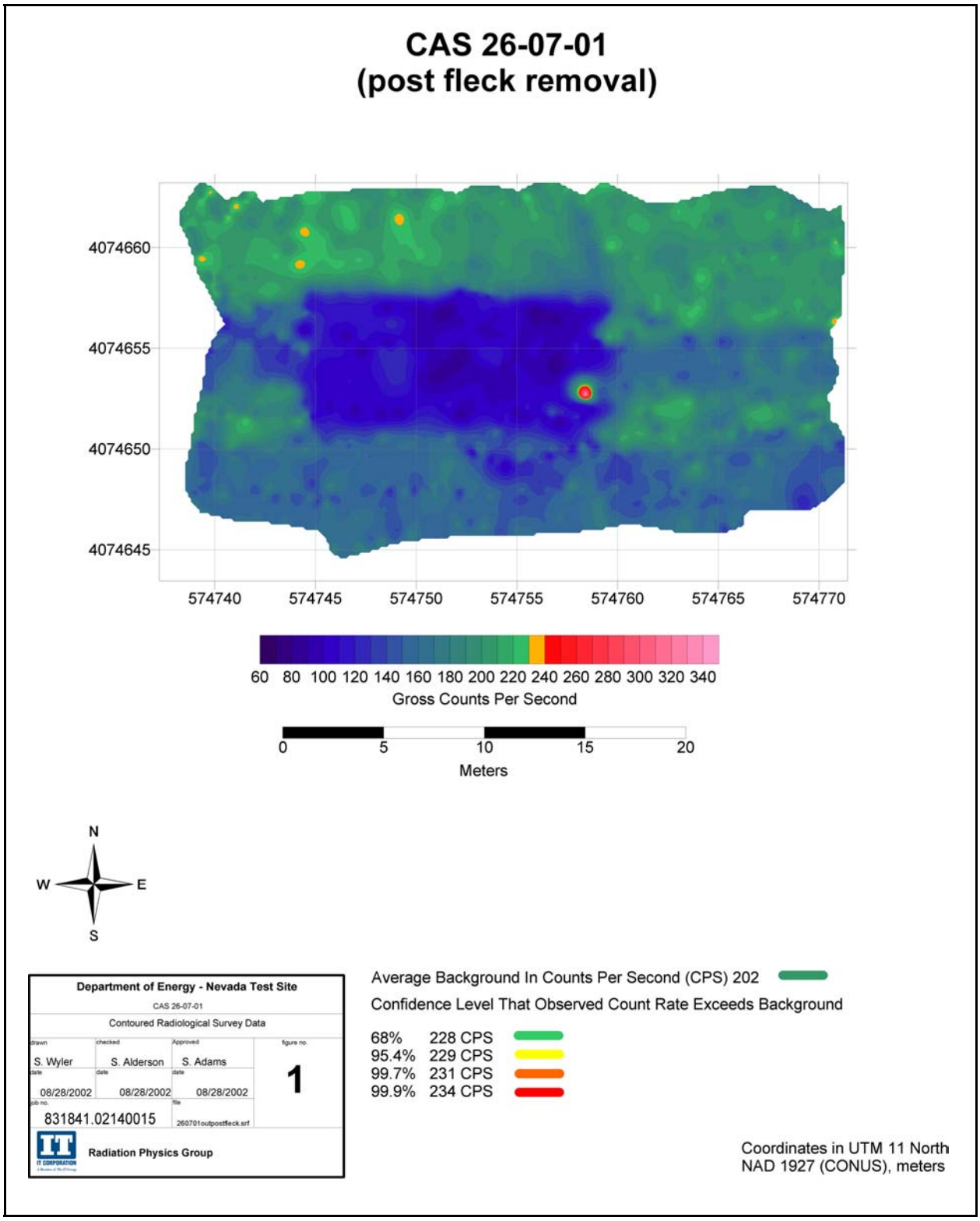

Figure A.9-3
Surface Radiological Survey at CAS 26-07-01 After Removal of Flecks

instrument in relation to the concrete pad surface and sidewalls of the sump. This sump area does not contain an elevated gamma emission rate and can be discounted.

A.9.2.2 Radiological Survey of Concrete Decontamination Pad

Radiological surveys were conducted on the decontamination pad and transite awning to identify radiological areas of elevated activity (i.e., results in excess of the unrestricted release criteria of 1,000 dpm/100 cm^2 over background). The radiological survey methods consisted of scanning, one-minute static measurements, and swiping. A complete survey of the surface of the concrete decontamination pad and the transite awning, up to 3 meters (m) above ground surface, was conducted. This survey consisted of dividing the concrete pad into 1-m^2 grids and then performing an approximate 100 percent surface scanning survey of the pad for alpha and beta/gamma contamination. One-minute static measurements were taken at grid spaces that exhibited elevated count rates as identified during the scanning survey, and three swipes were collected and counted. Carbonized flecks discovered on the concrete pad during the survey process were removed and then the surface was resurveyed to verify that no fuel particles or residual contamination were present (Figure A.9-3). The direct integrated survey indicated that the three locations where the fuel particles were present initially were above the *NV/YMP Radiological Control Manual* Table 2-2 for total contamination. Swipe samples and the verification survey results indicated that no contamination readings exceeding the *NV/YMP Radiological Control Manual* Table 2-2 limits were present; therefore, no concrete or transite was sampled for laboratory analysis.

A.9.2.3 Soil Sampling

The surface radiological survey was used to bias surface soil sample locations on each side of the decontamination pad as specified in the CAIP. During sample collection at these biased locations, the FSL for VOCs and radiological constituents was not exceeded.

A total of 25 soil samples were collected around the pad. All samples were sent to the laboratory for analysis. In addition, one duplicate and two MS/MSD samples were collected and analyzed. See Table A.9-1 and Figure A.9-1 for sample depths and locations. Samples were collected using a scoop for surface samples and a hand auger for subsurface samples.

A.9.2.4 Field-Screening Results

Soil samples were field screened for VOCs and alpha and beta/gamma radiation. The FSRs were compared to FSLs to guide sampling decisions. The VOC headspace FSLs were not exceeded during sampling activities. No samples had elevated FSRs for alpha and beta/gamma radiation.

A.9.2.5 Sample Analyses

Investigation soil samples were analyzed for CAIP-specified COPCs including total VOCs, total SVOCs, total RCRA metals and beryllium, TPH (DRO and GRO), PCBs, isotopic U, isotopic Pu, Sr-90, and gamma-emitting radionuclides. The analytical parameters and laboratory analytical methods used to analyze the investigation samples are listed in Table A.2-2. Table A.9-1 lists the sample-specific analytical parameters.

A.9.2.6 Analytes Detected Above Minimum Reporting Limits

The analytical results detected at concentrations exceeding the correlated MRLs (NNSA/NV, 2002) are summarized in the following sections. These results are compared to PALs which are a subset of those that exceed MRLs. A portion of the analytical results were rejected; however, these rejected data did not impact closure decisions as discussed in Section B.1.1.3 of Appendix B.

A.9.2.6.1 Total Volatile Organic Compound Analytical Results for Soil Samples

Total VOC analytical results above the MRLs are shown in Table A.9-2. These results for soil samples did not exceed the PALs.

A.9.2.6.2 Total Semivolatile Organic Compound Analytical Results for Soil Samples

Total SVOCs analytical results for soil exceeding the MRLs are shown in Table A.9-3. Results did not exceed the PALs.

A.9.2.6.3 Total Petroleum Hydrocarbons Analytical Results for Soil Samples

Analytical results for total TPH in soil samples exceeding the MRLs are shown in Table A.9-4. No results exceeded the PAL.

Table A.9-2
Soil Sample Results for Total VOCs Detected Above Minimum Reporting Limits for CAS 26-07-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)			
			Acetone	M+P-Xylene	Naphthalene	P-Isopropyltoluene
Preliminary Action Levels[a]			**6,200,000**	**210[b]**	**190,000**	**NI**
165G001	G01	0 - 0.5	--	10	--	--
165G002	G02	0 - 0.5	72 (J)[c]	--	--	--
165G003	G03	0 - 0.5	88 (J)[c]	10	--	6.3
165G004	G04	0 - 0.5	65 (J)[d]	--	76 (B)	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).
[b]M+P and O-xylene comprise total xylene. O-xylene was not detected.
[c]Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05.
[d]Qualifier added to laboratory data; record accepted. Average relative response factor <0.05. Relative response factor <0.05. Continuing calibration verification percent >25 percent.

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
-- = Not detected above MRLs
B = Analyte was found in sample and associated blank.
NI = Not identified
J = Estimated value

Table A.9-3
Soil Sample Results for Total SVOCs Detected Above Minimum Reporting Limits at CAS 26-07-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)	
			Fluoranthene	Pyrene
Preliminary Action Levels[a]			**30,000,000**	**54,000,000**
165G004	G04	0 - 0.5	440	580 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
J = Estimated value. Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits. Matrix effects may exist.

A.9.2.6.4 Total RCRA Metals Analytical Results for Soil Samples

The total RCRA metals detected in soil samples at concentrations exceeding MRLs are listed in Table A.9-5. No metals were detected in soil at concentrations exceeding the PALs.

Table A.9-4
Soil Sample Results for TPH-DRO Detected Above Minimum Reporting Limits at CAS 26-07-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)
			Diesel-Range Organics
Preliminary Action Level[a]			100
165G004	G04	0 - 0.5	45 (M, Z)

[a]*Nevada Administrative Code* 445A.2272(b) (NAC, 2000)

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
M = Motor oil
Z = The reported results did not resemble the patterns of the following petroleum hydrocarbon products: gasoline, JP-4, JP-8, diesel, mineral spirits, motor oil, Stoddard solvent, and Bunker C.

Table A.9-5
Soil Sample Results for Total Metals Detected Above Minimum Reporting Limits at CAS 26-07-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)						
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Selenium
Preliminary Action Levels			23[a]	100,000[b]	2,200[b]	810[b]	450[b]	750[b]	10,000[b]
165G001	G01	0 - 0.5	6.2	150	--	--	7.6	9	0.62
165G002	G02	0 - 0.5	6.7	110	--	0.56	7	20	1
165G003	G03	0 - 0.5	12	170	0.66	--	11	14	1.5
165G004	G04	0 - 0.5	11	170	0.74	1.2	21 (J)	89 (J)	--

[a]Mean plus two times the standard deviation of the mean for sediment samples collected by the NBMG throughout NTTR (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above MRLs
J = Estimated value. Qualifier added to laboratory data; record accepted. Spike recovery was outside control limits. Duplicate precision analyses were outside control limits.

A.9.2.6.5 Total Beryllium Results for Soil Samples

Total beryllium analytical results for soil samples exceeding MRLs are listed in Table A.9-5. No results exceeded the PALs.

A.9.2.6.6 Polychlorinated Biphenyl Results for Soil Samples

Analytical results for PCBs in soil that exceeded the MRLs are shown in Table A.9-6. No results exceeded the PALs.

Table A.9-6
Soil Sample Results for PCBs Detected Above Minimum Reporting Limits at CAS 26-07-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)
			Aroclor-1260
Preliminary Action Level			1,000
165G004	G04	0 - 0.5	130

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram

A.9.2.6.7 Gamma Spectroscopy Results for Soil Samples

Gamma spectroscopy analytical results for detected radionuclide concentrations exceeding the MRLs are shown in Table A.9-7. These concentrations do not exceed the PALs.

A.9.2.6.8 Isotopic Uranium Results for Soil Samples

Isotopic U detected in soil samples at concentrations above the MRLs are shown in Table A.9-8. Isotopic U results did not exceed the PALs.

A.9.2.6.9 Isotopic Plutonium Results for Soil Samples

These results were not detected above PALs. Isotopic Pu results exceeding MRLs are shown in Table A.9-8.

A.9.2.6.10 Strontium-90 Results for Soil Samples

Strontium-90 was not detected in soil samples above MRLs.

Table A.9-7
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 26-07-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Actinium-228[a]	Bismuth-214[a]	Cesium-137[b]	Lead-212[a]	Lead-214[a]	Thallium-20[a]
Preliminary Action Levels			**5**	**5**	**7.3**	**5**	**5**	**5**
165G001	G01	0 - 0.5	0.88	0.55	0.198	1.13	0.7	0.349
165G002	G02	0 - 0.5	1.41	0.96	1	1.67	1.05	0.52
165G003	G03	0 - 0.5	1.52	0.91	--	1.59	1.02	0.44
165G004	G04	0 - 0.5	--	0.77	7.7 (J)	1.77	0.84	0.4

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, and thallium-208, as found in Chapter IV of DOE 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The PALs for these isotopes are specified as 5 pCi/g averaged over the first 15 centimeters of soil (DOE, 1993). For the purpose of this document, 15 centimeters is assumed to be equivalent to 0.5 ft (6 in.); therefore, the 5 pCi/g represents the PAL for these radionuclides in the surface soil (0 to 0.5 ft depth).
[b]Taken from the construction, commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
-- = Not detected above MRLs
J = Estimated value. Qualifier added to laboratory data; record accepted. Duplicate normalized difference outside control limits.

A.9.2.7 Carbonized Fleck Removal

Several carbonized flecks with elevated radiological activity were removed from the decontamination pad and surrounding soil. This sample (165G510) has activities that exceed the sanitary NTS sanitary landfill disposal criteria (NDEP, 1997b and c). It was managed, profiled, and shipped in accordance with the NTSWAC for disposal of low-level waste.

A.9.2.8 Contaminants of Concern

No COCs were identified at this CAS.

Table A.9-8
Soil Sample Results for Isotopes Detected Above Minimum Reporting Limits at CAS 26-07-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)			
			Plutonium-239	Uranium-234	Uranium-235	Uranium-238
Preliminary Action Levels[a]			**7.62**	**85.9**	**10.5**	**63.2**
165G001	G01	0 - 0.5	--	0.97	0.11	0.87
165G002	G02	0 - 0.5	--	1.49	0.155	1.1
165G003	G03	0 - 0.5	--	1.03	0.114	0.87
165G004	G04	0 - 0.5	0.057	14.7	R	0.93
165G005		2.5 - 3.5	--	1.03	0.109	0.88
165G006	G05	0 - 0.5	--	1.57	0.225	0.79
165G007		2.5 - 3.5	--	0.96	0.065	0.84
165G008	G06	0 - 0.5	--	0.98	0.089	0.93
165G009		2.5 - 3.5	--	0.9	0.076	0.92
165G010	G13	0 - 0.5	NA	0.84	0.033	0.86
165G011	G14	0 - 0.5	NA	0.89	0.037	0.79
165G012	G15	0 - 0.5	NA	0.9	0.038	0.81
165G013	G07	0 - 0.5	NA	0.81	0.034	0.69
165G014	G07	2.5 - 3	NA	0.98	0.049	0.87
165G015	G08	0 - 0.5	NA	0.67	0.033	0.74
165G016	G08	2.5 - 3	NA	0.87	0.073	0.86
165G017	G09	0 - 0.5	NA	0.75	0.045	0.6
165G018	G09	2.5 - 3	NA	0.83	0.053	0.68
165G019	G10	0 - 0.5	NA	0.96	0.047	0.87
165G020	G10	2.5 - 3	NA	0.83	0.053	0.87
165G021	G11	0 - 0.5	NA	0.87	0.056	0.88
165G022	G11	0 - 0.5	NA	0.83	0.049	0.77
165G023	G11	2.5 - 3	NA	0.92	0.038	0.98
165G024	G12	0 - 0.5	NA	0.84	0.052	0.71
165G025	G12	2.5 - 3	NA	0.84	0.047	0.75

[a]Taken from the construction, commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
NA = Not analyzed
-- = Not detected above MRLs
R = Result was rejected

A.9.3 Nature and Extent of COCs

No COCs have been identified in the soil at this CAS.

A.9.4 Revised Conceptual Site Model

No variations to the conceptual site model were identified.

A.10.0 Reservoir and French Drain (CAS 25-47-01)

Corrective Action Site 25-47-01, Reservoir and French Drain, is located south of the RCP facility in Area 25. Components include a backfilled reservoir (40 x 160 ft) and a backfilled L-shaped earthen drain (70 x 5 ft) from the CAU 271 (CAS 25-04-11) distribution box to the north end of the reservoir (dimensions are estimated from aerial photos) (Figure A.10-1). The CAS 25-04-11 leachfield was constructed directly over the earthen drain. The location of the reservoir is now marked by a slight depression and unconsolidated soil. Previous sampling results from CAS 25-04-11 are documented in the CAU 271 CADD. More details about CAS 25-47-01 are provided in the CAIP (NNSA/NV, 2002).

A.10.1 Corrective Action Investigation

Seven investigation samples were collected during the investigation activities and are listed in Table A.10-1. The planned sample locations are shown in Figure 4-8 of the CAIP (NNSA/NV, 2002). The actual investigation sample locations are shown in Figure A.10-1. The specific CAI activities conducted to meet CAIP requirements at CAS 25-47-01 are described in the following sections.

A.10.1.1 Deviations

There were no deviations to the CAIP requirements; therefore, the CAIP requirements were met.

A.10.2 Investigation Results

The following sections provide CAS-specific details of the inspection and sampling of system features, FSRs, and sample collection and analysis.

A.10.2.1 Soil Sampling

An aerial photo (EG&G/EM, 1964) and geodetic survey were used to locate the reservoir and earthen drain. The photo was scanned into an electronic file and existing points on the photo were assigned known coordinates, thereby establishing a coordinate system for the photo. The soil sample locations were chosen and the corresponding coordinate assigned. These soil sample locations were entered

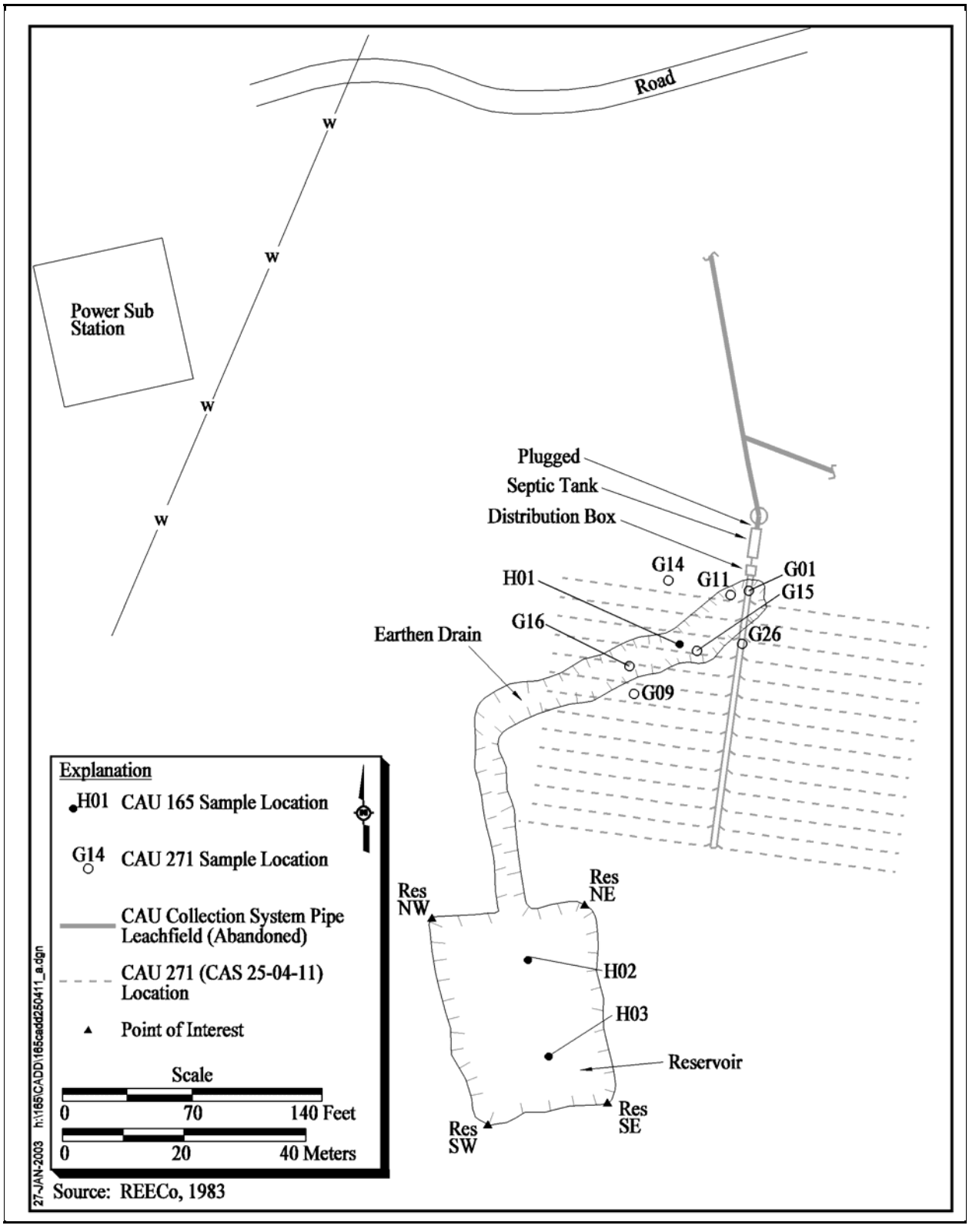

Figure A.10-1
Sampling Locations and Points of Interest at CAS 25-47-01, Reservoir and French Drain

Table A.10-1
Samples Collected for CAS 25-47-01, Reservoir and French Drain

Sample Number	Sample Location	Depth (ft bgs)	Sample Matrix	Purpose	Analyses
165H001	H01	3 - 4	Soil	Environmental	Set 1
165H002	H01	5.5 - 6.5	Soil	Environmental	Set 1
165H003	H02	5 - 6	Soil	Environmental	Set 1
165H004	H02	6 - 7	Soil	Environmental	Set 1
165H005	H02	8.5 - 9.5	Soil	Environmental	Set 1
165H006	H03	5.5 - 6.5	Soil	Environmental	Set 1
165H007	H03	8 - 9	Soil	Environmental	Set 1
165H301	H01	NA	Water	Trip Blank	Total VOCs
165H302	H01	NA	Water	Field Blank	Set 1
165H303	H02	6 - 7	Soil	Field Duplicate of #165H004	Set 1
165H304	H01	NA	Water	Trip Blank	Total VOCs

Set 1 = Total VOCs, Total SVOCs, Total RCRA Metals, TPH (DRO and GRO), PCBs, Gamma Spectroscopy, Isotopic Uranium, Isotopic Plutonium, and Strontium-90

MS/MSD = Matrix spike/matrix spike duplicate
NA = Not applicable
ft bgs = Feet below ground surface

into a GPS and located. During sample collection activities, the base of the reservoir was observed in a thin, dark, clayey layer at 5.5 ft bgs at both sample locations (H02 and H03) and photographs documented the material. This material was included in the samples submitted for laboratory analysis from these locations and horizon. Sample location H01, at the proximal end of the earthen drain, did not show any indication of the dark clay layer.

A total of seven soil samples were collected from the reservoir and french drain. Sample depths were variable at the three locations. See Table A.10-1 and Figure A.10-1 for sample locations and depths. In addition, one QC soil duplicate was collected and analyzed. All samples were sent to the laboratory for analysis. Samples were collected using a backhoe.

A.10.2.2 Field-Screening Results

Soil samples were field screened for VOCs and alpha and beta/gamma radiation. The FSRs were compared to FSLs to guide sampling decisions. None of the samples exceeded FSLs.

A.10.2.3 Sample Analyses

Investigation soil samples were analyzed for CAIP-specified COPCs including total VOCs, total SVOCs, total RCRA metals, TPH (DRO and GRO), PCBs, isotopic U, isotopic Pu, Sr-90, and gamma-emitting radionuclides. The analytical parameters and laboratory analytical methods used to analyze the investigation samples are listed in Table A.2-2. Table A.10-1 lists the sample-specific analytical parameters.

A.10.2.4 Analytes Detected Above Minimum Reporting Limits

The analytical results detected at concentrations exceeding the correlated MRLs (NNSA/NV, 2002) are summarized in the following sections. These results are compared to PALs that are a subset of those that exceed MRLs. A portion of the analytical results were rejected; however, these rejected data did not impact closure decisions as discussed in Section B.1.1.3 of Appendix B.

A.10.2.4.1 Total Volatile Organic Compound Analytical Results for Soil Samples

Total VOCs analytical results for soil samples exceeding the MRLs are shown on Table A.10-2. These results did not exceed the PALs.

Table A.10-2
Soil Sample Results for Total VOCs Detected Above Minimum Reporting Limits at CAS 25-47-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)
			Methylene Chloride
Preliminary Action Level[a]			21,000
165H007	H03	8 - 9	23 (J)
165H303	H02	6 - 7	26 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
J = Estimated value. Qualifier added to laboratory data; record accepted. Continuing calibration verification percent >25 percent.

A.10.2.4.2 Total Semivolatile Organic Compound Analytical Results for Soil Samples

Table A.10-3 presents the SVOCs results in sample 165H001 that exceeded the MRLs.

Table A.10-3
Soil Sample Results for Total SVOCs Detected Above Minimum Reporting Limits at CAS 25-47-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (µg/kg)						
			Benzo(A)Anthracene	Benzo(A)Pyrene	Benzo(B)Fluoranthene	Benzo(K)Fluoranthene	Chrysene	Fluoranthene	Pyrene
Preliminary Action Levels[a]			**2,900**	**290**	**2,900**	**29,000**	**290,000**	**30,000,000**	**54,000,000**
165H001	H01	3 - 4	770	**610** (J)	960 (J)	350 (J)	760	840	800

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).
[b]Results exceeding the PALs are in bold text.

ft bgs = Feet below ground surface
µg/kg = Micrograms per kilogram
J = Estimated value. Qualifier added to laboratory data; record accepted. Internal standard area count exceeded the quality control limits. Matrix effects may exist.

Benzo(a)pyrene was detected above the PAL at location H01 in sample 165H001 collected from 3 to 4 ft bgs. The deeper horizon from 5.5 to 6.5 ft bgs did not detect this SVOC. Step-out sampling was not conducted; however, samples collected during the CAI of CAU 271 at CAS 25-04-11 in this immediate area suffice as step-outs. Specifically, benzo(a)pyrene was not detected at locations G01, G09, G11, G14, G15, G16, and G26 (Figure A.10-1).

Furthermore, sampling at CAU 271 CAS 25-04-11 confirmed that detections of benzo(a)pyrene at several locations were isolated and related to the Orangeburg pipe used in the leachfield. Therefore, benzo(a)pyrene will not be considered a COC for this site. One of the samples from CAU 271 was field spiked with pieces of Orangeburg distribution pipe. This action was completed to confirm whether SVOC results in soil at CASs containing this specific type of pipe were being skewed to produce false positive readings in soil for SVOCs. Based on the results of this sample, it appears that soil samples containing pieces of Orangeburg pipe showed detections of SVOC compounds

(specifically, benzo(a)pyrene) related to the pipe material. Orangeburg pipe is made of a black, compressed, tar paper-like material.

A.10.2.4.3 Total Petroleum Hydrocarbon Analytical Results for Soil Samples

No TPH (DRO and GRO) analytical results for soil exceeded the MRLs.

A.10.2.4.4 Total RCRA Metals Results for Soil Samples

Total RCRA metals results exceeding the MRLs are shown in Table A.10-4. These results did not exceed the PALs.

Table A.10-4
Soil Sample Results for Total RCRA Metals Detected Above Minimum Reporting Limits at CAS 25-47-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)					
			Arsenic	Barium	Chromium	Lead	Selenium	Silver
Preliminary Action Levels			**23[a]**	**100,000[b]**	**450[b]**	**750[b]**	**10,000[b]**	**10,000[b]**
165H001	H01	3 - 4	2.5	88	2.7	6.5	--	--
165H002		5.5 - 6.5	2.5	120	2.8	6.9	--	--
165H003	H02	5 - 6	2.2	87	2.7	5	--	--
165H004		6 - 7	2.7	100	2.8	5.5	0.7	3.3
165H005		8.5 - 9.5	2.7	89	1.7	4.2	--	--
165H006	H03	5.5 - 6.5	2.1	81	2.5	5.4	0.53	--
165H007		8 - 9	1.9	95	1.7	4.2	0.57	--
165H303	H02	6 - 7	2.6	110	2.9	6.9	--	5.2

[a]Mean plus two times the standard deviation of the mean for sediment samples collected by the NBMG throughout NTTR (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2000).

ft bgs = Feet below ground surface
mg/kg = Milligrams per kilogram
-- = Not detected above MRLs

A.10.2.4.5 Polychlorinated Biphenyl Results for Soil Samples

No PCB analytical results for soil exceeded the MRLs.

A.10.2.4.6 Gamma Spectroscopy Results for Soil Samples

Gamma spectroscopy results were not detected above MRLs; however, detected naturally occurring gamma-emitting radionuclides are shown in Table A.10-5. These results did not exceed the PALs.

Table A.10-5
Soil Sample Results for Gamma-Emitting Radionuclides Detected Above Minimum Reporting Limits at CAS 25-47-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)					
			Actinium-228	Bismuth-212	Bismuth-214	Lead-212	Lead-214	Thallium-208
Preliminary Action Levels[a]			**15**	**15**	**15**	**15**	**15**	**15**
165H001	H01	3 - 4	1.77	--	0.61	1.56	0.77	0.62
165H002		5.5 - 6.5	1.6	--	0.77	1.74	0.98	0.55
165H003	H02	5 - 6	1.63	--	0.78	1.97	1	0.62
165H004		6 - 7	1.82	2.19	0.74	1.76	0.98	0.55
165H005		8.5 - 9.5	2.11	--	1.09	2.35	0.92	0.67
165H006	H03	5.5 - 6.5	1.48	--	0.66	1.72	0.88	0.56
165H007		8 - 9	1.5	--	0.66	1.56	0.82	0.444
165H303	H02	6 - 7	1.85	--	0.91	1.84	0.91	0.58

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-212, bismuth-214, lead-212, lead-214, and thallium-208, as found in Chapter IV of DOE 5400.5, Change 2, "Radiation Protection of the Public and Environment" (DOE, 1993). The PALs for these isotopes are specified as 5 pCi/g averaged over the first 15 centimeters of soil and 15 pCi/g for deeper soils (DOE, 1993). For the purpose of this document, 15 centimeters is assumed to be equivalent to 0.5 ft (6 in.); therefore, 15 pCi/g represents the PALs for these radionuclides in the subsurface soil (> 0.5 ft depth).

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
-- = Not detected above MRLs

A.10.2.4.7 Isotopic Uranium Results in Soil Samples

Isotopic U results detected in soil samples at concentrations exceeding the MRLs are shown in Table A.10-6. The results did not exceed PALs.

A.10.2.4.8 Isotopic Plutonium Results in Soil Samples

Isotopic Pu was not detected above MRLs in soil samples.

Table A.10-6
Soil Sample Results for Isotopic Uranium Detected Above Minimum Reporting Limits at CAS 25-47-01

Sample Number	Sample Location	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)		
			Uranium-234	Uranium-235	Uranium-238
Preliminary Action Levels[a]			85.9	10.5	63.2
165H001	H01	3 - 4	0.83	--	0.8
165H002		5.5 - 6.5	0.96	0.107	0.98
165H003	H02	5 - 6	0.89	0.066	0.86
165H004		6 - 7	1	0.067	0.93
165H005		8.5 - 9.5	1.05	--	0.98
165H006	H03	5.5 - 6.5	0.95	0.084	0.75
165H007		8 - 9	0.91	0.105	0.82
165H303	H02	6 - 7	0.88	0.097	0.93

[a]Taken from the construction, commercial, and industrial land-use scenario in Table 2.1 of the NCRP Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review Factors Relevant to Site-Specific Studies* (NCRP, 1999). The values provided in this source document were scaled to a 15-mrem/yr dose.

ft bgs = Feet below ground surface
pCi/g = Picocuries per gram
-- = Not detected above MRLs

A.10.2.4.9 Strontium-90 Results for Soil Samples

Strontium-90 was not detected above MRLs in soil samples.

A.10.2.5 Contaminants of Concern

No COCs were identified in this CAS.

A.10.3 Nature and Extent of COCs

No COCs were identified in this CAS.

A.10.4 Revised Conceptual Site Model

No variations to the conceptual site model were identified.

A.11.0 Waste Management

A.11.1 Waste Minimization

Corrective Action Unit 165 integrated waste minimization in the field activities. Investigation-derived waste was segregated to the greatest extent possible. Controls were in place to minimize the use of hazardous materials and unnecessary generation of hazardous and/or mixed waste. Decontamination activities were planned and executed to minimize the volume of rinsate generated.

Potentially hazardous waste generated during the investigation was placed in 55-gal steel drums and labeled as "Hazardous Waste-Pending Analysis." Three hazardous waste accumulation areas (HWAAs) and eight satellite accumulation areas (SAAs) were established to manage the waste at the investigation areas. The amount, type, and source of waste placed into each drum were recorded in waste management logbooks at each location.

A.11.1.1 Characterization

Analytical results of associated samples and process knowledge for each drum was reviewed to ensure compliance with federal regulations, state regulations, DOE directives/policies, guidance, waste disposal criteria, and Stoller-Navarro Joint Venture (SNJV) Standard Quality Practices. Analytical data was reviewed through Tier I, II, and III validation.

A.11.1.2 Waste Streams

Newly generated IDW was segregated into the following waste streams:

- Personal protective equipment (PPE) and disposable sampling equipment
- Debris including, but not limited to, plastic sheeting, glass/plastic sample jars, PPE, soil, wood, sampling scoops, aluminum foil, bowls, etc.
- Decontamination rinsate
- Carbonized flecks

A.11.2 Investigation-Derived Waste Generated

Fifteen containers of waste were generated during the investigation:

- Four drums of IDW were characterized as hydrocarbon waste exceeding the regulatory threshold established by State of Nevada regulations (NDEP, 1997b). These drums were disposed of at the permitted NTS Hydrocarbon Landfill. Hydrocarbon waste was generated at CASs 25-20-01, 25-51-02, 25-59-01, and from field-screening activities.

- Nine drums were characterized as sanitary waste and disposed of at the permitted sanitary facilities at the NTS. These drums were generated at all CASs.

- Two drums contain waste associated with sampling activities that have radioisotopes exceeding the NTS sanitary landfill disposal criteria. They were managed and disposed of as low-level waste in accordance with NTSWAC. Low-level waste was generated at CASs 25-07-06 and 26-07-01.

- Plastic decontamination pad liners were disposed of as sanitary waste at the NTS Industrial Landfill at Area 9.

A.11.2.1 Waste Management Samples

Waste management samples were not collected from drummed waste.

A.12.0 Quality Assurance

This section contains a summary of the QA/QC process implemented during the sampling and analysis activities conducted in support of the CAU 165 CAI. Laboratory analyses were conducted for samples used in the decision-making process to provide a quantitative measurement of any COPCs present. Rigorous QA/QC was implemented for all laboratory samples including documentation, verification, and validation of analytical results, and affirmation of DQI requirements related to laboratory analyses. Detailed information regarding the QA program is contained in the Industrial Sites QAPP (DOE/NV, 1996). A discussion of the DQIs, including the datasets, is provided in Appendix B.

A.12.1 Data Validation

Data validation was performed in accordance with the Industrial Sites QAPP (DOE/NV, 1996) and approved protocols and procedures. All laboratory data from samples collected and analyzed for CAU 165 were evaluated for data quality according to the *EPA Functional Guidelines* (EPA, 1994b and 1999). These guidelines are implemented in a tiered process and are presented in Sections A.12.1.1 through A.12.1.3. Data were reviewed to ensure that samples were appropriately processed and analyzed, and the results passed data validation criteria. Documentation of the data qualifications resulting from these reviews is retained in project files as a hard copy and electronic media.

One hundred percent of the data generated as part of this investigation were subjected to Tier I and Tier II evaluations as defined below. A Tier III evaluation was performed on ten percent of the data generated.

A.12.1.1 Tier I Evaluation

Tier I evaluation for chemical and radiological analyses examines, but was not limited to:

- Sample count/type consistent with chain of custody
- Analysis count/type consistent with chain of custody
- Correct sample matrix
- Significant problems stated in cover letter or case narrative

- Completeness of certificates of analysis
- Completeness of Contract Laboratory Program (CLP) or CLP-like packages
- Completeness of signatures, dates, and times on chain of custody
- Condition-upon-receipt variance form included
- Requested analyses performed on all samples
- Date received/analyzed given for each sample
- Correct concentration units indicated
- Electronic data transfer supplied
- Results reported for field and laboratory QC samples
- Whether or not the deliverable met the overall objectives of the project
- Proper field documentation accompanies project packages

A.12.1.2 Tier II Evaluation

Tier II evaluation for chemical and radiological analyses examined, but was not limited to, the following.

Chemical:

- Correct detection limits achieved
- Sample date, preparation date, and analysis date for each sample
- Holding time criteria met
- QC batch association for each sample
- Cooler temperature upon receipt
- Sample pH for aqueous samples, as required
- Detection limits properly adjusted for dilution, as required
- Blank contamination evaluated and applied to sample results/qualifiers
- MS/MSD duplicate, percent recovery (%R), and RPDs evaluated and applied to laboratory results/qualifiers
- FD RPDs evaluated using professional judgement and applied to laboratory results/qualifiers
- LD RPDs evaluated and applied to laboratory results/qualifiers
- Surrogate %Rs evaluated and applied to laboratory results/qualifiers

- Laboratory control sample (LCS) %R evaluated and applied to laboratory results/qualifiers
- Initial and continuing calibration evaluated and applied to laboratory results/qualifiers
- Internal standard evaluated and applied to laboratory results/qualifiers
- Mass spectrometer tuning criteria
- Organic compound quantitation
- Inductively coupled plasma (ICP) interference check sample evaluation
- Graphite furnace atomic absorption quality control
- ICP serial dilution effects
- Recalculation of 10 percent of laboratory results from raw data

Radioanalytical:

- Correct detection limits achieved
- Blank contamination evaluated and, if significant, qualifiers are applied to sample results
- Certificate of Analysis consistent with data package documentation
- Quality control sample results (duplicates, LCSs, laboratory blanks) evaluated and used to determine laboratory result qualifiers
- Sample results, uncertainty, and minimum detectable concentration evaluated
- Detector system calibrated to National Institute for Standards and Technology (NIST)-traceable sources
- Calibration sources preparation was documented, demonstrating proper preparation and appropriateness for sample matrix, emission energies, and concentrations
- Detector system response to daily, weekly, and monthly background and calibration checks for peak energy, peak centroid, peak full-width half-maximum, and peak efficiency, depending on the detection system
- Tracers NIST-traceable, appropriate for the analysis performed, and recoveries that met QC requirements
- Documentation of all QC sample preparation complete and properly performed

- Spectra lines, photon emissions, particle energies, peak areas, and background peak areas support the identified radionuclide and its concentration
- Recalculation of 10 percent of laboratory results from raw data

A.12.1.3 Tier III Review

The Tier III review is an independent examination of the Tier II evaluation. The Tier III review independently duplicates the Tier II review for a limited number of samples (typically 5 percent) and includes the following additional evaluations.

Chemical:

- Recalculation of laboratory results from raw data

Radioanalytical:

- QC sample results (e.g., calibration source concentration, %R, and RDP) verified
- Radionuclides and their concentration validated as appropriate considering their decay schemes, half-lives, and process knowledge of the site
- Each identified line in spectra verified against emission libraries and calibration results
- Independent identification of spectra lines, area under the peaks, and quantification of radionuclide concentration in a random number of sample results
- Recalculation of 10 percent of the laboratory results from raw data

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

A.12.2 Quality Control Samples

There were 33 trip blanks, 12 field blanks, 4 equipment rinsate blanks, 5 MS/MSD, and 5 field duplicates collected and submitted for analysis by laboratory analytical methods as shown in Table A.2-1. During the March 11, 2003, sampling event, QC samples included one field duplicate, one laboratory QC, one source blank for disposable sampling equipment, and one field blank. Each of these were analyzed for isotopic U. The quality control samples were assigned individual sample

numbers and sent to the laboratory "blind." Additional samples were selected by the laboratory to be analyzed as laboratory duplicates.

A.12.2.1 Field Quality Control Samples

Review of the field-blank analytical data for the CAU 165 soil sampling indicates that cross-contamination from field methods did not occur during sample collection. Field, equipment rinsate, and source blanks were analyzed for the applicable parameters listed in Table A.2-2 and trip blanks were analyzed for VOCs only. Several different contaminants were detected in some of the samples above the contract-required detection limits including methylene chloride, diethyl phthalate, and chloroform.

During the sampling events, five field duplicate soil samples were sent as blind samples to the laboratory to be analyzed for the investigation parameters listed in Table A.2-2. For these samples, the duplicate results precision (i.e., RPDs between the environmental sample results and their corresponding field duplicate sample results) were evaluated to the guidelines set forth in the EPA Functional Guidelines (EPA, 1994b). Six samples had analytes that were greater than the allowable RPD.

A.12.2.2 Laboratory Quality Control Samples

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

The laboratory included a PB, LCS, and a laboratory duplicate sample with each batch of field samples analyzed for radionuclides.

A.12.3 Field Nonconformances

There were no field nonconformances identified for the CAI.

A.12.4 Laboratory Nonconformances

Laboratory nonconformances are due to inconsistencies in analytical instrumentation operation, sample preparations, extractions, missed holding times, and fluctuations in internal standard and calibration results. Nineteen nonconformances were issued by the laboratory that resulted in qualifying data and have been accounted for during the data qualification process.

A.13.0 Summary

Analytes detected in soil samples during the CAI were evaluated against PALs to determine the nature and extent of COCs for CAU 165. Assessment of the data generated from CAI activities indicates the PALs were exceeded in soil samples at CAU 165. Additionally, analytes detected in sludge in septic tanks and sediment in pipes were evaluated against regulatory levels based on disposal options. The following summarizes the results for each CAS where COCs were detected.

CAS 25-20-01 - The COCs TPH (DRO) and the VOC tetrachloroethene were found in soils beneath the dry well at the leachrock/native soil interface at 9 ft bgs. The concentrations decreased with depth, and were below PALs within 2.5 ft vertically of the dry-well base. The overlying soil surrounding the dry well was field screened during excavation and no elevated FSLs were observed. The extent of COC-impacted soil has been determined at this CAS.

CAS 25-51-02 - Total petroleum hydrocarbons (DRO) were found in soils beneath the pipe outfall at one horizon (2.5 to 3.5 ft bgs) at location B04. The concentrations decreased with depth, and were below PALs at the next sample horizon (7.5 to 8.5 ft bgs). The overlying soil at B04 was field screened during excavation and no elevated FSLs were observed. The extent of COC-impacted soil has been determined.

Polychlorinated biphenyls were identified above the PAL in the pipe at B01 and B02 only. The PCB concentrations in the pipe did not exceed the action level of 50 ppm for disposal purposes.

CAS 25-59-01 - Only the contents of the septic tank contain COCs. Total petroleum hydrocarbons above the NDEP action level of 100 mg/kg for TPH (DRO and GRO) are located in both chambers of the septic tank. Approximately 220 gal of sludge remains in the chambers of the septic tank.

CAS 26-59-01 - Only the contents of the septic tank contain COCs. Total petroleum hydrocarbons (DRO) exceeding the NDEP regulatory action level of 100 mg/kg are located within the septic tank. Approximately 143 gal of sludge remain in the single-chamber tank.

CAS 25-07-06 - COCs were identified in the surface soil surrounding the decontamination pad. Total petroleum hydrocarbons (DRO) are located approximately 50 ft north of the decontamination

pad in the surface soil at location E07. The interval sampled at 2.5 to 3.5 ft bgs at this location contained Cs-137 at concentrations exceeding the PAL. Step-out locations E10 and E11 did not indicate COCs.

Lead and Cs-137 are present in the surface soil at location E03 at the northwest edge of the pad in the surface soil at location E03. The interval sampled at 2.5 to 3.5 ft bgs did not indicate COCs. Step-out location E09 did not indicate COCs.

Cesium-137 was detected at concentrations exceeding the PALs in surface soil at locations E01, E02, E03, and E05 and in the subsurface interval sampled from 2.5 to 3.5 ft bgs at location E07. Step-out locations E06, E08, E09, E12, E13, E14, and E15 did not indicate the presence of CS-137.

The decontamination pad and adjacent railroad ties are considered contaminated with these COCs.

CAS 25-07-07 - The COC TPH (DRO) was found in surface soils (0 to 0.5 ft bgs) on all sides of the pad at locations F01, F02, F03, F04, and F06. The TPH concentrations decreased with depth at these locations and were below PALs within 2.5 ft bgs. Sample results from the step-out locations (F09, F10, F11, and F12) indicate TPH concentrations do not exceed PALs beyond 15 ft laterally from the pad.

CAS 26-07-01 - There were no COCs identified at this CAS.

CAS 25-47-01 - There were no COCs identified at this CAS.

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Appendix B

Data Assessment for CAU 165

B.1.0 Data Assessment

This appendix provides an assessment of CAU 165 CAI results to determine whether the data collected met the DQOs and can support their intended use in the decision-making process. This assessment includes a reconciliation of the data with the general CSM(s) established for this project.

B.1.1 Statement of Usability

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

B.1.1.1 Precision

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

$$RPD = \left|\{(a_1 - a_2)/[(a_1 + a_2)/2]\} \times 100\right|$$

where

a_1 = Sample value
a_2 = Duplicate sample value

Determinations of precision can be made for field samples, laboratory duplicates (LDs), or both. For field samples, duplicates are collected simultaneously with a sample from the same source under similar conditions in separate containers. The duplicate sample is treated independently of the original sample in order to assess field impacts and laboratory performance on precision through a comparison of results. Laboratory precision is evaluated as part of the required laboratory internal QC program to assess performance of analytical procedures. The laboratory sample duplicates are more an aliquot or subset of a field sample generated by the laboratory. They are not separate samples, they are portions of an existing sample. Typically, other LD QC samples include MSD and laboratory control sample duplicate (LCSD) samples.

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

B.1.1.1.1 Precision for Chemical Analyses

The RPD criteria used for assessment of laboratory sample duplicate precision for analytical results of samples collected at CAU 165 were established as follows:

- Inorganic analysis RPD criteria is obtained from the EPA's *Contract Laboratory Functional Guidelines for Inorganic Data Review* (EPA, 1994).
- Organic analysis RPD criteria is established by the laboratory to evaluate precision for MSD and LCSD analyses.

The control limits are evaluated at the laboratory on a quarterly basis by monitoring the historical data and performance for each method. No review criteria for organic field duplicate RPD comparability have been established; therefore, the laboratory MSD RPD criteria is applied for precision evaluation of field duplicates.

Precision values for organic and inorganic analysis that are within the established control criteria indicate that analytical results for associated samples are valid. Laboratory duplicate RPD values that are outside the criteria for organic analysis do not necessarily result in the qualification of analytical data. It is only one factor considered in making overall judgements about the quality of the reported analytical results. Inorganic LD RPD values outside the established control criteria do result in the qualification of associated analytical results as estimated. Field Duplicate RPD values that are outside the criteria for organic and inorganic analyses do not result in the qualification of analytical data. Out of control RPD values do not necessarily indicate that the data is not useful for the purpose

intended; however, it is an indication that data precision should be considered for the overall assessment of the data quality and potential impact on data application in meeting project DQIs.

Method-specific precision as RPD is determined by taking the number of measurements within criteria, dividing that by the number of measurements analyzed, and multiplying by 100. For the purpose of determining data precision of sample analyses for CAU 165, all water and soil samples including field QC samples (i.e., trip blanks, equipment rinsate samples, field blanks) were evaluated and incorporated into the precision calculation.

Precision for the measurement of target compounds or analytes collected at CAU 165 was determined for RCRA metals and beryllium, TCLP metals, SVOCs, TCLP SVOCs, VOCs, TCLP VOCs, PCBs, and TPH (DRO and GRO).

Table B.1-1 and Table B.1-2 provide the field and LD precision analysis results. The low FD percent precision for mercury is attributed to the following: FD 165B308 and its sample 165B006 were qualified as nondetect due to blank contamination. The blank contamination caused a high RPD; FD sample 165D302 and its sample 165D001 were analyzed at different dilutions. Accurate RPD measurements cannot be evaluated from different dilutions. The low FD percent precision for metals is attributed to FD 165E305 and its sample 165E011 failing to meet the RPD criteria.

Inorganic LD RPD values outside the established control criteria result in estimation for that measurement of all associated samples in the SDG. For example, if a LD had an RPD value for lead outside the established control criteria, lead results for all of the samples in that SDG would be qualified as estimated.

Out of control RPD values do not necessarily indicate that the data is not useful for the purpose intended. It does indicate that precision should be considered for the overall assessment of the data quality and impact to the application of associated data to meet the project's objectives.

B.1.1.1.2 Precision for Radiological Analysis

The precision of radiochemical measurements is evaluated by measuring two aliquots of a sample and comparing the results. A LD is measured with every batch of samples analyzed by the laboratory. Field duplicate data is available when two aliquots of a sample are submitted to the laboratory for

Table B.1-1
Chemical Precision Measurements for CAU 165

	Organics					Inorganics		
	VOCs	SVOCs	TPH-DRO	TPH-GRO	PCBs	*Metals	Beryllium	Mercury
Matrix Spike Duplicate (MSD) Precision								
Total Number of MSD Measurements > IDL	65	77	17	11	16	77	4	9
Total Number of RPDs within Criteria	65	76	17	11	16	75	4	8
MSD % Precision	100	98.70	100	100	100	97.40	100	88.89
Laboratory Control Sample Duplicate (LCSD) Precision								
Total Number of LCSD Measurements > IDL	155	231	23	22	42	126	6	18
Total Number of RPDs within Criteria	155	229	23	22	42	126	6	18
LCSD % Precision	100	99.13	100	100	100	100	100	100
Field Duplicate (FD) Precision								
Total Number of FD Measurements >IDL	345	284	5	4	28	28	0	4
Total Number of RPDs within Criteria	344	283	5	4	28	18	0	2
FD % Precision	99.71	99.65	100	100	100	64.29	NA	50.00
Laboratory Sample Duplicate (Lab-Dup) Precision								
Total Number of Lab-Dup Measurements >IDL	NA	NA	NA	NA	NA	77	4	9
Total Number of RPDs within Criteria	NA	NA	NA	NA	NA	73	4	9
Lab-Dup % Precision	NA	NA	NA	NA	NA	94.81	100	100

*Arsenic (As), barium (Ba), cadmium (Cd), chromium (Cr), lead (Pb), selenium (Se), silver (Ag)

IDL = Instrument Detection Limit

analysis. Matrix spike duplicates, also used to evaluate precision, are performed by the laboratory upon request.

The duplicate precision is evaluated using the RPD or ND. The RPD is applicable when both the sample and its duplicate have concentrations of the target radionuclide exceeding five times their minimum detectable concentration. This excludes many measurements because the samples contain

Table B.1-2
TCLP Chemical Precision Measurements for CAU 165

	Organics		Inorganics	
	TCLP VOCs	**TCLP SVOCs**	**TCLP *Metals**	**TCLP Mercury**
TCLP Matrix Spike Duplicate (MSD) Precision				
Total Number of MSD Measurements > IDL	40	0	22	3
Total Number of RPDs within Criteria	39	0	22	3
MSD % Precision	97.50	NA	100	100
TCLP Laboratory Control Sample Duplicate (LCSD) Precision				
Total Number of LCSD Measurements > IDL	60	36	29	3
Total Number of RPDs within Criteria	59	36	29	3
LCSD % Precision	98.33	100	100	100
TCLP Field Duplicate (FD) Precision				
Total Number of FD Measurements > IDL	10	12	7	1
Total Number of RPDs within Criteria	10	12	6	1
FD % Precision	100	100	85.71	100
TCLP Laboratory Sample Duplicate (Lab-Dup) Precision				
Total Number of Lab-Dup Measurements > IDL	NA	NA	22	3
Total Number of RPDs within Criteria	NA	NA	22	3
Lab-Dup % Precision	NA	NA	100	100

*Arsenic, barium, cadmium, chromium, lead, selenium, silver

IDL = Instrument Detection Limit

nondetectable or low levels of the target radionuclide. In situations where the RPD does not apply, duplicate results are evaluated using the ND which is expressed by:

$$ND = (S - D) / \sqrt{(TPU_S)^2 + (TPU_D)^2}$$

where

S = Sample result
D = Duplicate Result
TPU_S = 2σ TPU of the sample
TPU_D = 2σ TPU of the duplicate
σ = Standard deviation

The control limit for the ND is -1.96 to 1.96, which represents a confidence level of 95 percent. Depending on the sample concentration, typically only one duplicate evaluation needs to be performed.

If the sample duplicate RPD or ND is outside the control limit, the field samples measured in the same analytical batch will be qualified. Samples are not qualified based on field duplicates or MSDs.

A duplicate comparison that is outside control limits does not necessarily indicate that the data is not useful for the purpose intended; however, it is an indication that data precision should be considered for the overall assessment of the data quality and potential impact on data application in meeting project DQIs.

For the purpose of determining data precision of sample analyses for CAU 165, all water and soil duplicates were evaluated and incorporated into Tables B.1-3 through B.1-5.

The isotopic gamma analysis provides results for 39 radionuclides. Only two or three of these radionuclides are usually present in sufficient concentration to allow the determination of their RPDs. The duplicate data for the remaining radionuclides is compared using the ND. Matrix spike duplicate samples will not be analyzed by the laboratory because of the difficulty in preparing homogeneous spiked duplicates and the radioactive waste produced.

The results of the precision tests for laboratory isotopic gamma measurements are included in Table B.1-3. Thirty duplicate pairs were measured with each containing 39 radionuclides.

Table B.1-3
Laboratory Duplicate Precision

	Gamma Spectroscopy	Isotopic Uranium	Isotopic Plutonium	Strontium-90	Gross Alpha	Gross Beta	Tritium
Relative Percent Difference							
No. Performed	29	48	3	9	0	0	0
No. within Limits	28	46	2	8	0	0	0
Percent within Limits	97	96	67	89	NA	NA	NA
Normalized Differences							
No. Performed	1141	46	49	20	1	1	1
No. within Limits	1138	45	49	19	1	1	1
Percent within Limits	100	98	100	95	100	100	100

Table B.1-4
Laboratory MS/MSD Precision

	Isotopic Uranium	Isotopic Plutonium	Strontium-90
Relative Percent Difference			
No. Performed	18	5	5
No. within Limits	17	5	5
Percent within Limits	94	100	100

Table B.1-5
Field Duplicate Precision

	Gamma Spectroscopy	Isotopic Uranium	Isotopic Plutonium	Strontium-90
Relative Percent Difference				
No. Performed	5	10	0	0
No. within Limits	5	9	0	0
Percent within Limits	100	90	NA	NA
Normalized Difference				
No. Performed	151	5	8	4
No. within Limits	150	5	8	4
Percent within Limits	99	100	100	100

Ninety-seven percent of the RPD comparisons were within limits and 100 percent of the ND tests were acceptable.

The isotopic U analysis includes the measurement of three radionuclides, two of which often occur in concentrations sufficient for RPD evaluation. As shown by the laboratory U-precision results in Table B.1-3, 96 percent of the RPD tests and 98 percent of the ND tests were within limits.

The isotopic Pu analysis measures two radionuclides but usually their concentrations in samples are too low to permit the evaluation of the RPD. Table B.1-3 contains the precision results for the LDs measured with the Pu laboratory batches.

The Sr-90 LD analyses are listed in Table B.1-3. Eighty-nine percent of the RPD tests and 95 percent of the ND comparisons were within the control limit.

The gross alpha, gross beta, and tritium analyses provide one result. Only one duplicate was analyzed by these measurements. All of the precision tests, which are included in Table B.1-3, performed with these measurements were within the established control limits.

Five sets of MS and MSD samples were analyzed for isotopic Pu and Sr-90 and six sets for isotopic U. Since all the samples contained concentrations of the target radionuclide greater than five times the MDC, the RPD comparison was used for each set. As can be seen in Table B.1-4, 100 percent of the isotopic Pu and Sr-90 and 94 percent of the isotopic U RPD tests were within established criteria.

Overall, 99 percent of the laboratory precision tests for CAU 165 radioanalytical measurements were within the control limits. The results of the duplicate comparison of the field duplicates are provided in Table B.1-5. Four field duplicates were analyzed for gamma, isotopic Pu, and Sr-90 and five for isotopic U. One U RPD and one gamma ND were outside the control limits. Of the 183 precision tests performed for field duplicate samples, 181 or 99 percent were acceptable.

B.1.1.1.3 Precision Summary

Overall, the precision for CAU 165 measurements was within DQI specifications. The results of the duplicate comparison of the field and LDs for chemical analyses are provided in Table B.1-1. The results for TCLP analyses are given in Table B.1-2. Of the 728 precision tests performed on FDs,

713 or 98 percent were within control limits. Of the 1,207 precision tests for LDs, LCSD, and MSDs, 1,195 or 99 percent were within control limits. The results of the duplicate comparison of the FDs for radiochemical analyses are provided in Table B.1-5. Of the 180 precision tests performed on the FDs, 178 or 99 percent were within the control limits. The results of LDs for radiochemical analyses, including laboratory spike and MS RPDs, are provided in Table B.1-3 and Table B.1-4. Of the 1,376 precision tests performed for LDs, 1,365 or 99 percent were within control limits. Therefore, the measurements for CAU 165 are considered valid in regard to precision.

B.1.1.2 Accuracy

Accuracy is a measure of the closeness of an individual measurement or the average of a number of measurements to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that result from sampling and analytical operations.

B.1.1.2.1 Accuracy for Chemical Analysis

Accuracy is determined by analyzing a reference material of known pollutant concentration or by reanalyzing a sample to which a material of known concentration or amount of pollutant has been added (spiked). Accuracy is expressed as % R for the purposes of evaluating the quality of data reported for CAU 165.

Matrix spike samples are prepared by adding a known concentration of a target analyte to a specified amount of matrix sample for which an independent estimate of the target analyte concentration is available. Spiked samples are used to determine the laboratory's overall efficiency by comparing the percent recovered to the known true value. For example, a sample that is spiked with 10 ppm of a known analyte should produce a reported result of 10 ppm greater than the value of the sample itself. Consequently, the accuracy for this analysis would be reported as 100 percent. Matrix spike recoveries within the specified criteria for organic and inorganic analyses indicate the laboratory is operating within established controls and producing valid, quality results. Matrix spike results outside the control limits for organic analyses may not result in qualification of the data. An assessment of the entire analytical process is performed to determine the quality of the data and whether qualification is necessary.

Laboratory control samples are generated to provide accuracy of analytical methods and laboratory performance. They are prepared, extracted (as required by method), analyzed, and reported once per SDG per matrix. For organic analyses, laboratory control limits are used to evaluate the accuracy of all analyses. The control limits are evaluated at the laboratory quarterly by monitoring the historical data and performance for each method. The acceptable limits for inorganic analyses are established in the EPA *Contract Laboratory Functional Guidelines for Inorganic Data Review* (EPA, 1994). Sample results within established control ranges for organic and inorganic analyses show that the analytical method is accurate and the data provided are valid.

Surrogates (System Monitoring Compounds) are used to assess the method performance for each sample analyzed for organic analyses. Control limits established by the laboratory are used to evaluate the accuracy of the surrogate recoveries. 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 must be evaluated when determining the quality of the analytical data provided.

Table B.1-6 and Table B.1-7 identify the number of matrix spike, laboratory control, and surrogate measurements performed for CAU 165. The tables present the total number of measurements analyzed, the number of measurements within the specified criteria, and the percent accuracy of each method. Method-specific accuracy is determined by taking the number of measurements within criteria, dividing that by the total number of measurements analyzed, and multiplying by 100. For organic analyses, each sample had surrogates analyzed; therefore, the number of surrogates is significantly greater than the number of MS and LCSs.

Matrix spike accuracy results for organic analyses in Table B.1-6 and Table B.1-7 include the total number of MS measurements per analysis and the number of MS measurements within criteria. All samples for organic analyses within the associated SDG are not qualified, only the native sample in which the spike was added. Inorganic MS results outside of the established control criteria do result in data qualified as estimated for all the samples in that batch. However, only the analyte(s) outside of control requires qualification.

Table B.1-6 and Table B.1-7 include the total number of LCS measurements per analysis and the number of LCS measurements within criteria. Laboratory control samples within the specified

Table B.1-6
Laboratory Accuracy Measurements for CAU 165

	Organics					Inorganics		
	VOCs	SVOCs	TPH-DRO	TPH-GRO	PCBs	*Metals	Beryllium	Mercury
Matrix Spike (MS) Accuracy								
Total Number of MS Measurements	130	154	34	22	34	154	8	18
Total Number of MS Measurements within Criteria	125	149	32	16	31	151	8	15
MS % Accuracy	96.15	96.75	94.12	72.73	91.18	98.05	100	83.33
Laboratory Control Sample (LCS) Accuracy								
Total Number of LCS Measurements	310	462	46	45	84	252	12	36
Total Number of LCS Measurements within Criteria	310	456	46	45	84	252	12	36
LCS % Accuracy	100	98.70	100	100	100	100	100	100
Surrogate Accuracy								
Total Number of Measurements Analyzed	8625	5818	102	72	684	NA	NA	NA
Total Number of Measurements not Affected by Out-of-Control Surrogates	8598	5746	100	68	593	NA	NA	NA
Surrogate % Accuracy	99.69	98.76	98.04	94.44	86.70	NA	NA	NA

*Arsenic, barium, cadmium, chromium, lead, selenium, silver

criteria for organic and inorganic analyses indicate the laboratory is producing valid data. Laboratory control samples outside of the established criteria result in the qualification of inorganic data and may result in the qualification of organic data. For organic analyses, an evaluation of the overall analytical process is performed to determine if data qualification is necessary. Inorganic LCS recoveries outside of established controls require data to be qualified for the individual analyte out of control. If the LCS criteria are not met, the laboratory performance and method accuracy are in question.

Surrogates reported within established control criteria indicate good laboratory method performance and the absence of matrix influences on the samples and result in quality, valid data. Table B.1-6 and

Table B.1-7
TCLP Laboratory Accuracy Measurements for CAU 165

	Organics		Inorganics	
	TCLP VOCs	**TCLP SVOCs**	**TCLP *Metals**	**TCLP Mercury**
TCLP Matrix Spike (MS) Accuracy				
Total Number of MS Measurements	80	36	44	6
Total Number of MS Measurements within Criteria	77	36	44	6
MS % Accuracy	96.25	100	100	100
TCLP Laboratory Control Sample (LCS) Accuracy				
Total Number of LCS Measurements	120	72	58	7
Total Number of LCS Measurements within Criteria	120	72	58	7
LCS % Accuracy	100	100	100	100
TCLP Surrogate Accuracy				
Total Number of Measurements Analyzed	160	168	NA	NA
Total Number of Measurements not Affected by Out-of-Control Surrogates	150	168	NA	NA
Surrogate % Accuracy	93.75	100	NA	NA

*Arsenic, barium, cadmium, chromium, lead, selenium, silver

Table B.1-7 include the total number of sample measurements performed for each method and the total number of sample measurements qualified for surrogate recoveries exceeding criteria. The estimated organic data in this CAU do not necessarily indicate the data is not useful. Data qualification is one factor to be considered in the overall assessment of the data quality and the impact to the project's objectives.

Accuracy for the measurement of target analytes collected at CAU 165 was determined for RCRA metals and beryllium, TCLP metals, SVOCs, TCLP SVOCs, VOCs, TCLP VOCs, PCBs, and TPH (DRO and GRO).

For the purpose of determining data accuracy of sample analysis for CAU 165, all water and soil samples including field QC samples (i.e., trip blanks, equipment rinsate samples, field blanks) were evaluated and incorporated into the accuracy calculation.

B.1.1.2.2 Accuracy for Radiological Analysis

Laboratory control samples and MS samples are used to determine the accuracy of radioanalytical measurements. The LCS is prepared by adding a known concentration of the radionuclide being measured to a sample that does not contain radioactivity (i.e., distilled water). This sample is analyzed with the field samples using the same sample preparation, reagents, and analytical methods employed for the samples. One LCS is prepared with each batch of samples for analysis by a specific measurement.

Matrix spike samples are prepared by adding a known concentration of a target radionuclide to a specified field sample with a measured concentration. The MS samples are analyzed to determine if the measurement accuracy is affected by the sample matrix. The MS samples are analyzed with sample batches, when requested. For CAU 165, MS samples were performed for the isotopic U, isotopic Pu, and Sr-90 analyses. Normally, a MS analysis is not performed for gamma measurements since this is a nondestructive analysis using large sample aliquots. This results in radioactive waste and it is difficult to prepare homogeneous solid spike samples.

The accuracy of the LCS determination is expressed as a %R by the following:

$$\%\ \text{Recovery (\%R)} = \frac{\text{Amount of analyte measured}}{\text{Amount of analyte added}} \times 100$$

The accuracy of the MS determination is expressed as a %R by the following:

$$\%R = \frac{\text{MS Result} - \text{Sample Result}}{\text{Amount of analyte added}} \times 100$$

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

Table B.1-8 and Table B.1-9 identify the number of laboratory control and MS samples, including soil and water matrices, measured for each radiochemical measurement for CAU 165. The percent accuracy for the procedure is determined as the number of MS or LCS samples analyzed within the control limits divided by the total number analyzed, and multiplied by 100.

Table B.1-8
Radioanalytical Laboratory Control Sample (LCS) Accuracy

	Gamma Spectroscopy	Isotopic Uranium	Isotopic Plutonium	Strontium-90	Gross Alpha	Gross Beta	Tritium
Total Number	119	63	26	29	1	1	1
Total Number within Criteria	119	63	26	28	1	1	1
LCS % Accuracy	100	100	100	97	100	100	100

Table B.1-9
Radioanalytical Matrix Spike (MS) Accuracy

	Gamma Spectroscopy	Isotopic Uranium	Isotopic Plutonium	Strontium -90
Total Number	NA	34	10	10
Total Number within Criteria	NA	34	10	10
MS % Accuracy	NA	100	100	100

Each isotopic gamma LCS sample contains four or five radionuclides, each of which has a %R determined. Matrix spike measurements are usually not performed with gamma measurements because of the difficulty in preparing homogeneous samples and the radioactive waste created.

Three U radionuclides are added to the isotopic U LCS and MS samples. The isotopic Pu and Sr-90 LCS and MS samples contain one added radionuclide.

Laboratory control samples within the specified criteria for radiological analyses indicate the laboratory is producing valid data. If the LCS criteria are not met, the laboratory performance and method accuracy are in question. Radiological LCS recoveries outside of established controls require data to be qualified for the individual radionuclide out of control. Since LCS recoveries were

100 percent for all analyses except one Sr-90 LCS, the Sr-90 result for only one water sample was qualified based on LCS performance.

B.1.1.2.3 Accuracy Summary

Overall, the accuracy for CAU 165 was within acceptable limits. Surrogate recoveries, which gauge the accuracy of individual sample results for specified chemical analyses, were within acceptable accuracy ranges (86.7 percent or better). Acceptable MS recovery results were 72.73 percent or better for chemical and radiochemical analyses. The LCS percent accuracy for the radioanalytical measurements was 100 percent. Chemical LCSs were 98.7 percent or better. Therefore, the measurements for CAU 165 are considered valid in regard to accuracy.

B.1.1.3 Completeness

Completeness is defined as the acquisition of sufficient data of the appropriate quality to satisfy DQO decision data requirements. A measure of completeness is the amount of data that are judged to be valid. Percent completeness for sample analyses was determined by dividing the total number of samples analyzed (per method) by the total number of samples sent to the lab and multiplying the result by 100. Percent completeness for measurement usability (not rejected) was determined by dividing the total number of nonrejected measurements by the total number of measurements (per method) and multiplying the result by 100. All measurements for completeness include reanalyses. Tables B.1-10 through B.1-12 contain results of completeness per analytical method.

The specified sampling locations were used as planned and all samples were collected as specified in the CAIP except for CAS 25-20-01. Tetrachloroethene and TPH (DRO) were detected above the PALs in a sample collected from the dry well's leachrock/native soil interface. The CAIP dictated that this scenario required step-out samples to be collected and analyzed for these analytes. Step-out samples were collected and analyzed for total VOCs (including tetrachloroethene); however, analytical results were not obtained for TPH (DRO).

Table B.1-10
Chemical Completeness for CAU 165

Completeness Parameters	Organics					Inorganics		
	VOCs	SVOCs	TPH-DRO	TPH-GRO	PCBs	Metals*	Beryllium	Mercury
Sample Analysis Completeness								
Total Samples Sent to Laboratory	115	72	102	72	92	79	14	79
Total Samples Analyzed	115	72	102	72	92	79	14	79
Total Samples Not Analyzed by Laboratory	0	0	0	0	0	0	0	0
Percent Completeness	100	100	100	100	100	100	100	100
Measurement Usability Completeness								
Total Measurements**	8625	5818	102	72	684	553	14	79
Total Measurements Rejected - Field	0	0	0	0	0	0	0	0
Total Measurements Rejected - Laboratory/Matrix	78	46	0	0	0	0	0	0
Percent Completeness	99.10	99.21	100	100	100	100	100	100

*Arsenic, barium, cadmium, chromium, lead, selenium, silver
**Measurements include reanalyses

The tetrachloroethene and TPH (DRO) concentrations were below the PALs within 2.5 ft vertically. Tetrachloroethene has shorter carbon chains than TPH(DRO) and its specific gravity is 1.63, while that of TPH (DRO) is less than 1.0 (HHS, 1994); therefore, tetrachloroethene is more mobile than TPH. The extent of TPH (DRO) is limited to within that of the tetrachloroethene (i.e., less than 15 ft laterally).

No analyses were compromised as a result of sample containers not reaching the laboratory intact.

In accordance with the CAU 165 CAIP, 100 percent completeness of critical analytes (TPH [DRO], PCBs, beryllium, Cs-137, Co-60, Sr-90, and isotopic U) has been met and 80 percent completeness of noncritical analytes has been met.

Rejected data affecting completeness are presented and discussed in the following sections.

Table B.1-11
TCLP Completeness for CAU 165

Completeness Parameters	Organics		Inorganics	
	TCLP VOCs	TCLP SVOCs	TCLP *Metals	TCLP Mercury
Sample Analysis Completeness				
Total Samples Sent to Laboratory	15	12	13	12
Total Samples Analyzed	15	12	13	12
Total Samples Not Analyzed by the Laboratory	0	0	0	0
Percent Completeness	100	100	100	100
Measurement Usability Completeness				
Total Measurements**	160	168	85	12
Total Measurements Rejected - Field	0	0	0	0
Total Measurements Rejected - Laboratory/Matrix	0	0	0	0
Percent Completeness	100	100	100	100

*Arsenic, barium, cadmium, chromium, lead, selenium, silver
**Measurements include reanalyses

B.1.1.3.1 Acetone Rejected Data

Acetone was rejected in 78 soil and sludge samples (including 6 reanalysis) based on the results having low relative response factors (RRFs) (i.e., less than 0.05). These sample results were reevaluated to determine data usability.

The data were validated according to *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA, 1999). Although contract laboratory program guidelines require that the Acetone RRF be greater than 0.01 (Note: All calibrations associated with the samples in question had RRFs greater than 0.01), functional guidelines require that all nondetected data be rejected when the initial or continuing calibration curves have RRFs less than 0.05. The samples were rejected for acetone because initial and continuing calibration RRFs were less than 0.05.

Since the samples were analyzed using SW846 Method 8260 B (EPA, 1996), linear regression is a viable approach for instrument calibration. The calibrations were reexamined using linear regression

Table B.1-12
Radiological Completeness for CAU 165

Completeness Parameters	Gamma Spectroscopy	Isotopic Uranium	Isotopic Plutonium	Strontium-90	Gross Alpha and Beta	Tritium
Sample Analysis Completeness						
Total Samples Sent to Laboratory	105	124	92	99	2	2
Total Samples Analyzed	105	124	92	99	2	2
Total Samples Not Analyzed by the Laboratory	0	0	0	0	0	0
Percent Completeness	100	100	100	100	100	100
Measurement Usability Completeness						
Total Measurements*	4095	372	184	99	4	2
Total Measurements Rejected - Field	0	0	0	0	0	0
Total Measurements Rejected - Laboratory/Matrix	6	3	0	0	0	0
Percent Completeness	99.85	99.19	100	100	100	100

*Measurements include reanalyses

calibrations, and all technical criteria were met. Using linear regression, the acetone results would not have been rejected since the sample results would not have been calculated using an average RRF.

Therefore, there is no indication that acetone is present in the samples that were rejected for acetone, and all rejected acetone results are considered usable as nondetects.

Lab Drain Dry Well (CAS 25-20-01) Rejected Data

All analytical results for CAS 25-20-01 are considered usable.

Drywell (CAS 25-51-02) Rejected Data

All analytical results for CAS-25-51-02 are considered usable.

Septic System (CAS 25-59-01) Rejected Data

Table B.1-13 lists the rejected results per analytical method for CAS 25-59-01. All other results are considered usable.

Table B.1-13
CAU 165 Rejected Data for CAS 25-59-01

Sample Number	Parameter	CAS Number	Analyte	Sample Matrix
165C002	SVOCs	87-86-5	Pentachlorophenol	Sludge
165C002RR1	SVOCs	87-86-5	Pentachlorophenol	Sludge
165C006	Gamma spectroscopy	14109-32-1	Cadmium-109	Soil

Pentachlorophenol (SVOC) results were rejected in one sludge sample because the spike recovery was outside control limits and matrix effects may exist. This analysis was rerun and these results were rejected for the same reason. These rejected results are considered acceptable data gaps for this sludge sample because usable results at any concentration would not affect closure decisions for CAS 25-59-01.

Cadmium (Cd)-109 was rejected in one soil sample because its spectral identification did not meet requirements. This radionuclide was not considered a COPC for this CAS because the half-life for Cd-109 is too short. This rejected soil result is considered an acceptable data gap because it does not affect closure decisions.

Septic System (CAS 26-59-01) Rejected Data

All analytical results for CAS 26-59-01 are considered usable.

Train Decontamination Area (CAS 25-07-06) Rejected Data

Table B.1-14 lists the rejected results per analytical method for CAS 25-07-06. All other results are considered usable.

The rejected SVOC results are for the reanalysis of a soil sample. The initial run produced usable results below the MRLs. These are considered acceptable data gaps and do not affect closure decisions for this CAS.

Cadmium-109 results were rejected in two soil samples and beryllium-7 was rejected in one soil sample due to spectral problems preventing accurate identification or quantification. These

Table B.1-14
CAU 165 Rejected Data for CAS 25-07-06

Sample Number	Parameter	CAS Number	Analyte	Sample Matrix
165E007RR1	SVOCs	50-32-8	Benzo(A)Pyrene	Soil
165E007RR1	SVOCs	205-99-2	Benzo(B)Fluoranthene	Soil
165E007RR1	SVOCs	191-24-2	Benzo(G,H,I)Perylene	Soil
165E007RR1	SVOCs	207-08-9	Benzo(K)Fluoranthene	Soil
165E007RR1	SVOCs	53-70-3	Dibenzo(A,H)Anthracene	Soil
165E007RR1	SVOCs	193-39-5	Indeno(1,2,3-CD)Pyrene	Soil
165E003A	Gamma spectroscopy	13966-02-4	Beryllium-7	Soil
165E007	Gamma spectroscopy	14109-32-1	Cadmium-109	Soil
165E028	Gamma spectroscopy	14109-32-1	Cadmium-109	Soil

radionuclides were not considered COPCs for this CAS. This rejected soil result is considered an acceptable data gap because it does not affect closure decisions.

Vehicle Washdown (CAS 25-07-07) Rejected Data

Table B.1-15 lists the rejected results per analytical method for CAS 25-07-07. All other results are considered usable.

Table B.1-15
CAU 165 Rejected Data for CAS 25-07-07 (Page 1 of 2)

Sample Number	Parameter	CAS Number	Analyte	Sample Matrix
165F001	Isotopic Uranium	15117-96-1	Uranium-235	Soil
165F003	SVOCs	91-94-1	3,3'-Dichlorobenzidine	Soil
165F003	SVOCs	56-55-3	Benzo(A)Anthracene	Soil
165F003	SVOCs	117-81-7	Bis(2-Ethylhexyl)Phthalate	Soil
165F003	SVOCs	85-68-7	Butyl Benzyl Phthalate	Soil
165F003	SVOCs	218-01-9	Chrysene	Soil
165F003	SVOCs	117-84-0	Di-N-Octyl Phthalate	Soil
165F003	SVOCs	129-00-0	Pyrene	Soil
165F006	Isotopic Uranium	15117-96-1	Uranium-235	Soil

Table B.1-15
CAU 165 Rejected Data for CAS 25-07-07 (Page 2 of 2)

Sample Number	Parameter	CAS Number	Analyte	Sample Matrix
165F006	SVOCs	58-90-2	2,3,4,6-Tetrachlorophenol	Soil
165F006	SVOCs	91-94-1	3,3'-Dichlorobenzidine	Soil
165F006	SVOCs	534-52-1	4,6-Dinitro-2-Methylphenol	Soil
165F006	SVOCs	101-55-3	4-Bromophenyl Phenyl Ether	Soil
165F006	SVOCs	120-12-7	Anthracene	Soil
165F006	SVOCs	56-55-3	Benzo(A)Anthracene	Soil
165F006	SVOCs	117-81-7	Bis(2-Ethylhexyl)Phthalate	Soil
165F006	SVOCs	85-68-7	Butyl Benzyl Phthalate	Soil
165F006	SVOCs	86-74-8	Carbazole	Soil
165F006	SVOCs	84-74-2	Di-N-Butyl Phthalate	Soil
165F006	SVOCs	117-84-0	Di-N-Octyl Phthalate	Soil
165F006	SVOCs	206-44-0	Fluoranthene	Soil
165F006	SVOCs	118-74-1	Hexachlorobenzene	Soil
165F006	SVOCs	86-30-6	N-Nitrosodiphenylamine	Soil
165F006	SVOCs	87-86-5	Pentachlorophenol	Soil
165F006	SVOCs	85-01-8	Phenanthrene	Soil
165F006	SVOCs	129-00-0	Pyrene	Soil
165F007	SVOCs	51-28-5	2,4-Dinitrophenol	Soil
165F007	SVOCs	87-86-5	Pentachlorophenol	Soil

The rejected SVOC results in two soil samples were due to the internal area response showing an extremely low count and matrix effects may exist, and in one soil sample due to a low relative response factor. No SVOCs were detected above MRLs in any of the usable SVOC results; therefore, these analytes are not likely to be present. The TPH (DRO) results associated with these samples indicate the presence of TPH above the PAL. Any corrective action associated with the TPH will include the locations with rejected SVOC results. Therefore, these rejected data are considered acceptable data gaps because they do not affect closure decisions.

Uranium-235 results were rejected in two soil samples due to significant tailing of U-234 counts into the U-235 region of interest. The MDCs for U-235 gamma spectroscopy results on the same samples

ranged from 0.66 to 0.74 pCi/g and the results were nondetect. No U-235 concentrations exceeded the PALs. The TPH PAL was exceeded at these locations and corrective action will be considered accordingly. Therefore, these rejected data are considered acceptable data gaps because they do not affect closure decisions.

Vehicle Washdown Station (CAS 26-07-01) Rejected Data

Table B.1-16 lists the only rejected result for CAS 26-07-01. All other results are considered usable.

Table B.1-16
CAU 165 Rejected Data for CAS 26-07-01

Sample Number	Parameter	CAS Number	Analyte	Sample Matrix
165G004	Isotopic Uranium	15117-96-1	U-235	Soil

A U-235 result was rejected in one soil sample due to significant tailing of U-234 counts into the U-235 region of interest. The MDC for the U-235 gamma spectroscopy result on the same sample was 0.81 pCi/g, and the result was nondetect. Therefore, this rejected data is considered an acceptable data gap because it does not affect closure decisions.

Reservoir and French Drain (CAS 25-47-01) Rejected Data

Table B.1-17 lists the rejected results per analytical method for CAS 25-47-01. All other results are considered usable.

The results for SVOCs 2,4-dinitrophenol and pentachlorophenol were rejected in six soil samples due to a low relative response factor. No SVOCs of interest were detected in usable sample results. The SVOC results for the leachfield (CAU 271, CAS 25-04-11) samples were all nondetect for these analytes. Therefore, this rejected data is considered an acceptable data gap because it does not affect closure decisions.

Cadmium-109 results were rejected in two soil samples due to spectral problems preventing accurate identification or quantification. This radionuclide was not considered a COPC for this CAS because

Table B.1-17
CAU 165 Rejected Data for CAS 25-47-01

Sample Number	Parameter	CAS Number	Analyte	Sample Matrix
165H001	Gamma Spectroscopy	14109-32-1	Cadmium-109	Soil
165H002	SVOCs	51-28-5	2,4-Dinitrophenol	Soil
165H002	SVOCs	87-86-5	Pentachlorophenol	Soil
165H003	SVOCs	51-28-5	2,4-Dinitrophenol	Soil
165H003	SVOCs	87-86-5	Pentachlorophenol	Soil
165H004	Gamma Spectroscopy	14109-32-1	Cadmium-109	Soil
165H004	SVOCs	51-28-5	2,4-Dinitrophenol	Soil
165H004	SVOCs	87-86-5	Pentachlorophenol	Soil
165H005	SVOCs	51-28-5	2,4-Dinitrophenol	Soil
165H005	SVOCs	87-86-5	Pentachlorophenol	Soil
165H006	SVOCs	51-28-5	2,4-Dinitrophenol	Soil
165H006	SVOCs	87-86-5	Pentachlorophenol	Soil
165H303	SVOCs	51-28-5	2,4-Dinitrophenol	Soil
165H303	SVOCs	87-86-5	Pentachlorophenol	Soil

the half-life for Cd-109 is too short. This rejected soil result is considered an acceptable data gap because it does not affect closure decisions.

B.1.1.4 Representativeness

The DQO process, as identified in Appendix A of the CAIP, was used to address sampling and analytical requirements for CAU 165. During this process, appropriate biased locations were selected that enabled the collected samples to be representative of the area being evaluated. Biased sampling was performed to ensure sampling of suspected or known contamination. In addition, analytical requirements were specified in order to ensure appropriate methods were selected for COPCs. This was performed to address the concerns of all stakeholders and project personnel. The DQO approach was based upon process knowledge gained during the preliminary assessment. Samples were collected and analyzed as planned with the completeness issues discussed above. In addition, QC blanks were used as a way of measuring outside factors that could impact sample results. No significant impacts to data were identified due to QC blanks. Therefore, the analytical data acquired during the CAU 165 CAI are considered representative of site characteristics and contamination.

B.1.1.5 Comparability

Field sampling, as described in the CAU 165 CAIP, was performed and documented in accordance with approved procedures that are comparable to standard industry practices. Approved analytical methods and procedures per DOE were used to analyzed, report, and validate the data. These are comparable to other methods used in industry and government practices, but most importantly are comparable to other investigations conducted for the NTS. Therefore, datasets within this project are considered comparable to other datasets generated using these same standardized DOE procedures, thereby meeting DQO requirements. The employed methods and procedures also ensured that data were appropriate for comparison to action levels specified in the CAIP and this CADD.

B.1.2 Reconciliation of Conceptual Site Models to the Data

This section provides a reconciliation of the data collected and analyzed during this investigation with the CSMs established in the DQO process.

B.1.2.1 Conceptual Site Models

Three CSMs were developed for the CAU 165 CASs as presented in the CAIP (NNSA/NV, 2002). The CSMs were based on historical information and process knowledge. Each CSM is discussed in the following sections.

B.1.2.1.1 Dry Well/Septic System CSM

This section describes CSM elements for CAU 165 CASs designated as dry wells and septic systems. The following CASs are included in this category:

- CAS 25-20-01, Lab Drain Dry Well
- CAS 25-51-02, Drywell
- CAS 25-59-01, Septic System
- CAS 26-59-01, Septic System

The primary source of potential contamination for all four CASs is associated with the potential releases of COPCs into system components (i.e., pipes, dry well, septic tanks, cesspool, leachfield) and disposal end-points, which include surface and subsurface soil adjacent to system components. Therefore, the general CSM included soil potentially impacted by surface and subsurface

disposal/release of effluent. The mechanisms for this type of release include both designed (i.e., disposal end-points) and accidental (e.g., septic tank breach) releases. Surface migration may have occurred at CAS 25-51-02 due to surface flow during rain events. The CSM was determined to be valid for CASs 25-59-01 and 26-59-01.

The CSMs and system configurations were consistent with those provided in the CAIP with the exception of CASs 25-51-02 and 25-20-01. An additional pipe was found to be connected to CAS 25-20-01, a dry well. This pipe was traced to a stick-up located east of the dry well. The additional pipe did not invalidate the CSM for the dry well.

Exploratory excavations and video mole surveys were used in an attempt to locate the dry well originally assumed to be associated with CAS 25-51-02. There was no evidence that a dry well was ever connected to the collection system pipe associated with CAS 25-51-02. This pipe was traced to a surface outfall located south of the originally assumed dry well location. This change in system configuration resulted in changes to the CSM and planned sample locations as detailed in ROTC Number 3 to the CAIP (NNSA/NV, 2002). The revised CSM and sample locations addressed the potential for surface and near-surface soil contamination.

B.1.2.1.2 Decontamination Pad CSM

This section describes CSM elements for CASs designated as decontamination pads. The following CASs are included in this category:

- CAS 25-07-06, Train Decontamination Area
- CAS 25-07-07, Vehicle Washdown
- CAS 26-07-01, Vehicle Washdown Station

The primary source of potential contamination for all three CASs is associated with the assumed release of COPCs into or onto system components (i.e., concrete decontamination pads, pipes, awning, gravel sump) and surface/near-surface soil immediately surrounding the decontamination pads. Therefore, the general CSM included these solid surfaces and soil potentially impacted by release of effluent at the surface. The primary mechanisms for this type of release include discharge of effluent through the systems and possible overspray. Infiltration from precipitation and run-off may be minor transport mechanisms by either moving contaminants through open floor drains into

associated collection or dispersion points or by moving surface contamination to low-lying areas adjacent to the site. The CSM was determined to be valid for CASs 25-07-06, 25-07-07, and 26-07-01.

B.1.2.1.3 Reservoir CSM

This section describes CSM elements for CAS 25-47-01, which is designated as a reservoir and french drain.

The primary source of potential contamination for this CAS is associated with the assumed release of COPCs into surface and subsurface soil within, and immediately surrounding, the historical boundaries of the reservoir and earthern drain. Therefore, the general CSM included soil potentially impacted by the release of effluent to the surface considering that the reservoir and drain have been backfilled. Infiltration from precipitation is not considered to be a current transport mechanism for moving contaminants deeper into surrounding soil. The CSM was determined to be valid for CAS 25-47-01.

B.1.2.2 Investigation Design and Contaminant Identification

The CSMs were used as the basis for identifying appropriate sampling strategies and data collection methods. Results of DQIs were successful in identifying the accuracy of the CSM as a predication of the nature and extent of potential contamination. Precision and accuracy results from the field samples identified sample homogeneity and minimal matrix interference, thereby providing confidence in collected data.

To address the CAS-specific CSMs, surface and subsurface samples collected for analyses were designed to define the nature and extent of the COPCs identified in the CAIP. Biased strategies were developed to focus the investigation on areas of potential contamination.

The investigation design has shown that contamination did not extend beyond the immediate vicinity of the dry well, surface outfall, components of septic systems, decontamination pads, or reservoir. Therefore, the CSMs accurately predict the extent of COPCs at each CAS. The models were designed to determine the extent of impact on contaminated effluent released to the soil. The CSMs

were successful in predicting contaminant location, and the DQIs provided a measure of the success of this design.

B.1.2.3 Contaminant Nature and Extent

The presence of contamination was identified by sample results showing COPC soil concentrations exceeding PALs established in the CAIP, thereby defining COCs at each CAS. In general, soil sample results demonstrated that the vertical and lateral extent of COCs was limited to the physical boundaries of the CSMs defined in the CAIP. Field screening was conducted and samples were collected at locations to bound contaminated areas with results below action levels. This confirmed that the extent of contamination was limited to anticipated regions defined by the CAS-specific CSMs. The CAS-specific investigation findings, analytical results, and descriptions of site conditions are presented in Appendix A of this CADD.

B.1.3 Conclusions

Samples were collected and analyzed as planned and within acceptable performance limits, except where noted.

The DQIs (i.e., precision, accuracy, completeness, representativeness, and comparability) were evaluated for quality impact to the data. All of the data, except data qualified as rejected, can be used in project decisions. The rejected data have been discussed and determined to have little impact on closure decisions.

Thus, the DQIs for the investigation have been met, and the data can be used to develop corrective action alternatives and to support selection of a preferred closure alternative for each CAS.

B.2.0 References

EPA, see U.S. Environmental Protection Agency.

HHS, see U.S. Department of Health and Human Services.

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

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002. *Corrective Action Investigation Plan for Corrective Action Unit 165: Areas 25 and 26 Dry Well and Washdown Areas, Nevada Test Site, Nevada*, DOE/NV--788. Las Vegas, NV.

U.S. Department of Health and Human Services. 1994. *NIOSH Pocket Guide to Chemical Hazards*. Washington, DC: Public Health Services, Center for Disease Control and Prevention.

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. 1996. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846 CD ROM PB97-501928GEI, which contains updates for 1986, 1992, 1994, and 1996. Washington, DC.

U.S. Environmental Protection Agency. 1999. *Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA 540/R-99/008. Washington, DC.

Appendix C

Cost Estimates for CAU 165

(16 Pages)

BECHTEL NEVADA

EST ID: CAU 165
CAS 25-07-06

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

SUBJECT: CADD Alternative Cost Estimates for CAU 165: Area 25 and 26 Dry Well and Washdown Areas, NTS

ESTIMATOR: Charles Denson **REF #:**

TYPE OF ESTIMATE:				TYPE OF WORK:	
X	ORDER OF MAGNITUDE		TITLE II		NON-MANUAL ONLY
	PRELIMINARY / PLANNING / STUDY		WORK ORDER		MANUAL ONLY
	CONCEPTUAL / BUDGET		COMPARATIVE	X	MANUAL & NON-MANUAL
	TITLE I		OTHER		OTHER

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 25-07-06, which is included within Corrective Action Unit (CAU) 165. CAU 165 CAS 25-07-06 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 25-07-06 is specifically described within the FFACO as a Train Decontamination Area, located approximately 50 yds. north of the E-MAD facility in Area 25. Three alternatives have been evaluated for closure of the CAS: I. No Further Action; II. Clean Closure; and III. Closure in Place with Administrative Controls. This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only. Cost for project management, plan preparation, project support, and/or other activities are not included herein.

SCOPE:

Provide site closure using one of the following alternatives:

I) NO FURTHER ACTION
II) CLEAN CLOSURE
III) CLOSURE IN PLACE WITH ADMINISTRATIVE CONTROLS

BASIS:

The characterization contractor recently completed field measurements of the Train Decontamination Area which indicates that the types and amounts of materials requiring remedial action are as follows: 104 cu. yds. of a concrete decon pad, 73 yds. of hollow steel safety railings, 24 wooden RR ties, 42 yds. of VCP, 91 yds. of steel railroad tracks, 53 cu. yds. of TPH and rad-impacted soil, 31 cu. yds. of rad and hazardous impacted soil, and 72 cu. yds. of rad-impacted soil. Radioactive, TPH, and hazardous constituents were identified at various sample locations along the train decontamination pad and railroad tracks that exceeded the preliminary action level (PAL). Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database. There is no estimate required for evaluation of the No Further Action alternative since no cost is incurred.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative I: No Further Action

Alternative II: Clean Closure

- Perform removal of train decontamination pad (104 cu. yds.).
- Perform removal of steel safety railings (73 yds.), VCP (42 yds,) and a floor drain.
- Perform removal of 24 wood railroad ties (2.5 cu. yds.) and steel railroad tracks (91 yds.).
- Perform removal of TPH and rad-impacted soil area (53 cu. yds.).
- Perform verification sampling. (TPH & Cs-137)
- Perform removal of Rad and hazardous impacted soil areas (31 cu. yds.).
- Perform verification sampling. (Lead & Cs-137)
- Perform removal of Low Level impacted soil (72 cu. yds. which includes E01, E02, & E05).
- Perform verification sampling. (Cs-137)
- Excavate open depression area (298 cu. yds.) with clean fill material.

Alternative III: Closure in Place with Administrative Controls

- Install wire fencing (420 lf.).
- Install identification / warning signs.

BECHTEL NEVADA

EST ID: CAU 165
CAS 25-07-06

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

ASSUMPTIONS:

- No corrective actions are required for the surrounding areas outside the CAS boundary.
- All COCs at the site have been identified during the site investigation and analytical data accurately represents site conditions and waste characteristics.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- No standing water exists in the pipe units. If standing water exists, the initial remedial action will be reevaluated and a new estimate will be generated.
- Waste volumes are based on field measurements collected during the corrective action investigation.
- Work to be performed by BN during a "normal" workday (no provision for overtime has been provided). Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies which may be realized if work for similar activities at similar sites can be completed concurrently.
- This estimate does not include costs for preparation of required project plans, permits, reports, mobilization and demobilization, site preparations, or project management.
- A soil borrow area is located within one mile of the site.
- There will be no surface impediments.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 Rev. 4 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY04 final rates (Rev. 4) effective 07/28/04 and were applied using the BN FY04 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure**	**$208,633**
	a. Perform Removal of Train Decontamination Pad	
	b. Perform Removal of Steel Safety Railings, VCP, and Floor Drain	
	c. Perform Removal of Wood RR Ties and Steel RR Tracks	
	d. Perform Removal of TPH and Rad-Impacted Soil	
	e. Perform Verification Sampling	
	f. Perform Removal of Rad and Hazardous Impacted Soil	
	g. Perform Verification Sampling	
	h. Perform Removal of Rad Impacted Soil	
	I. Perform Verification Sampling	
	j. Backfill Open Excavated Area with Clean Fill Material	
	k. Waste Management (TPH, Hazardous, Radioactive, and Sanitary)	
Alternative III:	**Closure in Place with Administrative Controls**	**$10,375**
	a. Install Wire Fencing	
	b. Install Identification / Warning Signs	
	e. Waste Management (Sanitary)	

REVIEW / CONCURRENCE:

/s/ Signature on file

Project Manager — 8/11/04 Date

/s/ Signature on file

Estimating — 08-11-04 Date

/s/ Signature on file

Project Controls for A.M. Hirschy — 8/11/04 Date

BECHTEL NEVADA

EST ID: CAU 165
CAS 25-07-07

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

SUBJECT: CADD Alternative Cost Estimates for CAU 165: Area 25 and 26 Dry Well and Washdown Areas, NTS

ESTIMATOR: Charles Denson **REF #:**

TYPE OF ESTIMATE:			TYPE OF WORK:	
X	ORDER OF MAGNITUDE	TITLE II		NON-MANUAL ONLY
	PRELIMINARY / PLANNING / STUDY	WORK ORDER		MANUAL ONLY
	CONCEPTUAL / BUDGET	COMPARATIVE	X	MANUAL & NON-MANUAL
	TITLE I	OTHER		OTHER

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 25-07-07, which is included within Corrective Action Unit (CAU) 165. CAU 165 CAS 25-07-07 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 25-07-07 is specifically described within the FFACO as a Vehicle Washdown area, located approximately 48 ft. east of Road C, adjacent to the Reactor Control Point facility in Area 25. Three alternatives have been evaluated for closure of the CAS: I. No Further Action; II. Clean Closure; and III. Closure in Place with Administrative Controls. This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only. Cost for project management, plan preparation, project support, and/or other activities are not included herein.

SCOPE:

Provide site closure using one of the following alternatives:

I) NO FURTHER ACTION
II) CLEAN CLOSURE
III) CLOSURE IN PLACE WITH ADMINISTRATIVE CONTROLS

BASIS:

The characterization contractor recently completed field measurements of the Vehicle Washdown area which indicates that the types and amounts of materials requiring remedial action are as follows: 7.9 cu. yds. of concrete, 130.7 cu. yds. of TPH impacted soil (which includes 20.6 cu. yds. of rock), and miscellaneous sanitary debris. TPH was identified at six sample locations around the concrete decon wash pad that exceeded the preliminary action level (PAL). Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database. There is no estimate required for evaluation of the No Further Action alternative since no cost is incurred.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative I: No Further Action
Alternative II: Clean Closure

- Perform removal of concrete wash pad (7.9 cu. yds.).
- Perform removal of TPH impacted soil area (130.7 cu. yds., which includes 20.6 cu. yds. of rock).
- Perform verification sampling.
- Backfill open excavated areas (138.6 cu. yds.) with clean fill material.

Alternative III: Closure in Place with Administrative Controls

- Install wire fencing (65 yds.).
- Install identification or warning signs.

BECHTEL NEVADA

EST ID: CAU 165
CAS 25-07-07

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

ASSUMPTIONS:

- No corrective actions are required for the surrounding areas outside the CAS boundary.
- All COCs at the site have been identified during the site investigation and analytical data accurately represents site conditions and waste characteristics.
- The dimensions of the concrete decon pad are 16 ft. X 32 ft. with a 5 in. thickness.
- Radioactive or chemical constituents are not present on the concrete decon pad.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are based on field measurements collected during the corrective action investigation.
- Work to be performed by BN during a "normal" workday (no provision for overtime has been provided). Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies which may be realized if work for similar activities at similar sites can be completed concurrently.
- This estimate does not include costs for preparation of required project plans, permits, reports, mobilization and demobilization, site preparations, or project management.
- A soil borrow area is located within one mile of the site.
- There will be no surface impediments.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 Rev. 4 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY04 final rates (Rev. 4) effective 07/28/04 and were applied using the BN FY04 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure**	**$93,658**
	a. Perform Removal of Concrete Wash Pad	
	b. Perform Removal of TPH Impacted Soil Area	
	c. Perform Verification Sampling	
	d. Backfill Open Excavated Area with Clean Fill Material	
	e. Waste Management (TPH and Sanitary)	
Alternative III:	**Closure in Place with Administrative Controls**	**$10,314**
	a. Install Wire Fencing	
	c. Install Identification / Warning Signs	
	d. Waste Management (Sanitary)	

REVIEW / CONCURRENCE:

/s/ Signature on file

Project Manager — Date: 8/11/04

/s/ Signature on file

Estimating — Date: 08-11-04

/s/ Signature on file

Project Controls — Date: 8/11/04

for A.M. Hirschy

BECHTEL NEVADA

EST ID: CAU 165
CAS 25-20-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson **FROM:** Charles Denson

SUBJECT: CADD Alternative Cost Estimates for CAU 165: Area 25 and 26 Dry Well and Washdown Areas, NTS

ESTIMATOR: Charles Denson **REF #:**

TYPE OF ESTIMATE:			TYPE OF WORK:	
X	ORDER OF MAGNITUDE	TITLE II		NON-MANUAL ONLY
	PRELIMINARY / PLANNING / STUDY	WORK ORDER		MANUAL ONLY
	CONCEPTUAL / BUDGET	COMPARATIVE	X	MANUAL & NON-MANUAL
	TITLE I	OTHER		OTHER

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 25-20-01, which is included within Corrective Action Unit (CAU) 165. CAU 165 CAS 25-20-01 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 25-20-01 is specifically described within the FFACO as a Lab Drain Dry Well, located approximately 60 ft. north of Building 4215 in the Central Support Area of Area 25. Three alternatives have been evaluated for closure of the CAS: I. No Further Action; II. Clean Closure; and III. Closure in Place with Administrative Controls. This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only. Cost for project management, plan preparation, project support, and/or other activities are not included herein.

SCOPE:

Provide site closure using one of the following alternatives:

I) NO FURTHER ACTION
II) CLEAN CLOSURE
III) CLOSURE IN PLACE WITH ADMINISTRATIVE CONTROLS

BASIS:

The characterization contractor recently completed field measurements of the Lab Drain Dry Well which indicates that the types and amounts of materials requiring remedial action are as follows: 4.9 cu. yds. of a concrete dry well, 2.3 cu. yds. of leachrock, 670 sq. ft. of asphalt surface, 30 ft. of 6-in. VCP line, 65.5 cu. yds. of hazardous impacted soil, pipe inlet and outlet ports, and miscellaneous sanitary debris. TPH and hazardous constituents were identified at two sample locations at the dry well that exceeded the preliminary action level (PAL). Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database. There is no estimate required for evaluation of the No Further Action alternative since no cost is incurred.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative I: No Further Action

Alternative II: Clean Closure

- Perform removal of concrete dry well (4.9 cu. yds.)
- Excavate and stage clean soil overburden (231 cu. yds.)
- Perform removal of asphalt surface (670 sq. ft.)
- Perform removal of 6-in. VCP Pipe (30 ft.), Leachrock (2.3 cu. yds.), and hazardous impacted soil area (65.5 cu. yds.)
- Grout ends of pipe.
- Perform verification sampling. (VOC's and TPH)
- Backfill open excavated area with clean fill material (303.7 cu. yds.)

Alternative III: Closure in Place with Administrative Controls

- Grout inlet and outlet access ports
- Backfill interior void space
- Install four ground surface monuments
- Install administrative controls (identification / warning signs)

BECHTEL NEVADA

EST ID: CAU 165
CAS 25-20-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

ASSUMPTIONS:

- No corrective actions are required for the surrounding areas outside the CAS boundary.
- All COCs at the site have been identified during the site investigation and analytical data accurately represents site conditions and waste characteristics.
- Soil benching is not included in the estimate.
- Radioactive constituents are not present in the concrete dry well.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are based on field measurements collected during the corrective action investigation.
- Work to be performed by BN during a "normal" workday (no provision for overtime has been provided). Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies which may be realized if work for similar activities at similar sites can be completed concurrently.
- This estimate does not include costs for preparation of required project plans, permits, reports, mobilization and demobilization, site preparations, or project management.
- A soil borrow area is located within one mile of the site.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 Rev. 4 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY04 final rates (Rev. 4) effective 07/28/04 and were applied using the BN FY04 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure**	**$202,718**
	a. Perform Removal of Concrete Dry Well	
	b. Excavate and Stage Clean Soil Overburden	
	c. Perform Removal of Asphalt Surface	
	d. Perform Removal of VCP, Leachrock, and Hazardous Impacted Soil	
	e. Grout Pipe Ends	
	f. Perform Verification Sampling	
	g. Backfill Open Excavated Area with Clean Fill Material	
	h. Waste Management (TPH, Hazardous, and Sanitary)	
Alternative III:	**Closure in Place with Administrative Controls**	**$12,829**
	a. Grout Inlet and Outlet Access Ports	
	b. Backfill Interior Void Space	
	c. Install Four Ground Surface Monuments	
	d. Install Administrative Controls	
	e. Waste Management (Sanitary)	

REVIEW / CONCURRENCE:

/s/ Signature on file

Project Manager — Date 8/11/04

/s/ Signature on file

Estimating — Date 08-11-04

/s/ Signature on file

Project Controls for A.M. Hirschy — Date 8/11/04

BECHTEL NEVADA

EST ID: CAU 165
CAS 25-47-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

SUBJECT: **CADD Alternative Cost Estimates for CAU 165: Area 25 and 26 Dry Well and Washdown Areas, NTS**

ESTIMATOR: Charles Denson

REF #:

TYPE OF ESTIMATE:				TYPE OF WORK:	
X	ORDER OF MAGNITUDE		TITLE II		NON-MANUAL ONLY
	PRELIMINARY / PLANNING / STUDY		WORK ORDER		MANUAL ONLY
	CONCEPTUAL / BUDGET		COMPARATIVE	X	MANUAL & NON-MANUAL
	TITLE I		OTHER		OTHER

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 25-47-01, which is included within Corrective Action Unit (CAU) 165. CAU 165 CAS 25-47-01 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 25-47-01 is specifically described within the FFACO as a Reservoir and French Drain located south of the Reactor Control Point facilities in Area 25.

SCOPE:

I) NO FURTHER ACTION

BASIS:

The characterization contractor recently completed field measurements of the Reservoir and French Drain area which indicated that no remedial action was required. No constituents of concern were identified that exceeded the preliminary action level (PAL).

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative I: No Further Action

- No further action was the preferred alternative

ASSUMPTIONS:

- No actions and no associated costs. No administrative controls are implied.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 Rev. 4 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY04 final rates (Rev. 4) effective 07/28/04 and were applied using the BN FY04 cost model.

BECHTEL NEVADA

EST ID: CAU 165
CAS 25-47-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure**	**N/A**
Alternative III:	**Closure in Place with Administrative Controls**	**N/A**

REVIEW / CONCURRENCE:

/s/ Signature on file

Project Manager — Date: 8/11/04

/s/ Signature on file

Estimating — Date: 08-11-04

/s/ Signature on file

Project Controls for A.M. Hirsch — Date: 8/11/04

BECHTEL NEVADA

EST ID: CAU 165
CAS 25-51-02

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

SUBJECT: CADD Alternative Cost Estimates for CAU 165: Area 25 and 26 Dry Well and Washdown Areas, NTS

ESTIMATOR: Charles Denson

REF #:

TYPE OF ESTIMATE:				TYPE OF WORK:	
X	ORDER OF MAGNITUDE		TITLE II		NON-MANUAL ONLY
	PRELIMINARY / PLANNING / STUDY		WORK ORDER		MANUAL ONLY
	CONCEPTUAL / BUDGET		COMPARATIVE	X	MANUAL & NON-MANUAL
	TITLE I		OTHER		OTHER

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 25-51-02, which is included within Corrective Action Unit (CAU) 165. CAU 165 CAS 25-51-02 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 25-51-02 is specifically described within the FFACO as a Dry Well, located east of Building 3320 (Utility Equipment Building) at the Engineering Test Stand in Area 25. Three alternatives have been evaluated for closure of the CAS: I. No Further Action; II. Clean Closure; and III. Closure in Place with Administrative Controls. This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only. Cost for project management, plan preparation, project support, and/or other activities are not included herein.

SCOPE:

Provide site closure using one of the following alternatives:

I) NO FURTHER ACTION

II) CLEAN CLOSURE

III) CLOSURE IN PLACE WITH ADMINISTRATIVE CONTROLS

BASIS:

The characterization contractor recently completed field measurements of the CAS, which is actually a surface outfall, that indicates the types and amounts of materials requiring remedial action are as follows: 30 yds. of duriron pipe, 77 yds. of VCP, 196.5 cu. yds. of TPH impacted soil, and miscellaneous sanitary debris. TPH constituents were identified at the pipe outfall drainage ditch and PCBs were detected internally that exceeded the preliminary action level (PAL). Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database. There is no estimate required for evaluation of the No Further Action alternative since no cost is incurred.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative I: No Further Action

Alternative II: Clean Closure

- Excavate Soil Overburden (107 yds.).
- Grout pipe at the building.
- Perform removal of duriron pipe (30 yds.).
- Perform removal of VCP (77 yds.).
- Perform removal of TPH impacted soil area (196.5 cu. yds.).
- Perform verification sampling.
- Backfill open excavated area with soil overburden and clean fill material.

Alternative III: Closure in Place with Administrative Controls

- Install wire fencing (40 yds.).
- Grout pipe ends.
- Redirect surface flow.
- Install identification / warning signs.

BECHTEL NEVADA

EST ID: CAU 165
CAS 25-51-02

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson **FROM:** Charles Denson

ASSUMPTIONS:

- No corrective actions are required for the surrounding areas outside the CAS boundary.
- All COCs at the site have been identified during the site investigation and analytical data accurately represents site conditions and waste characteristics.
- BN-Engineering will evaluate the effort required to control localized flooding from impacting the outfall area.
- The duriron and VCP pipes potentially contain PCB impacted sediment. The PCB concentrations are above the PAL, but less than Land Disposal Restrictions (LDR) and can be disposed of as a sanitary waste.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are based on field measurements collected during the corrective action investigation.
- Work to be performed by BN during a "normal" workday (no provision for overtime has been provided). Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies which may be realized if work for similar activities at similar sites can be completed concurrently.
- This estimate does not include costs for preparation of required project plans, permits, reports, mobilization and demobilization, site preparations, or project management.
- A soil borrow area is located within one mile of the site.
- Utilities are near the outfall and ETS Fence.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 Rev. 4 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY04 final rates (Rev. 4) effective 07/28/04 and were applied using the BN FY04 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure**	**$125,719**
	a. Excavate Soil Overburden	
	b. Perform Removal of Duriron Pipe	
	c. Perform Removal of VCP	
	d. Grout Pipe Ends at the Building	
	e. Perform Removal of TPH Impacted Soil	
	f. Perform Verification Sampling	
	g. Backfill Open Excavated Area with Clean Fill Material	
	h. Waste Management (TPH and Sanitary)	
Alternative III:	**Closure in Place with Administrative Controls**	**$22,967**
	a. Install Wire Fencing	
	b. Grout pipe ends	
	c. Redirect Surface Flow	
	d. Install identification / warning signs	

REVIEW / CONCURRENCE:

/s/ Signature on file

Project Manager — Date 8/11/04

/s/ Signature on file

Estimating — Date 08-11-04

/s/ Signature on file

Project Controls — Date 8/11/04

for A.M. Hirschy

BECHTEL NEVADA

EST ID: CAU 165
CAS 25-59-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

SUBJECT: **CADD Alternative Cost Estimates for CAU 165: Area 25 and 26 Dry Well and Washdown Areas, NTS**

ESTIMATOR: Charles Denson

REF #:

TYPE OF ESTIMATE:				TYPE OF WORK:	
X	ORDER OF MAGNITUDE		TITLE II		NON-MANUAL ONLY
	PRELIMINARY / PLANNING / STUDY		WORK ORDER		MANUAL ONLY
	CONCEPTUAL / BUDGET		COMPARATIVE	X	MANUAL & NON-MANUAL
	TITLE I		OTHER		OTHER

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 25-59-01, which is included within Corrective Action Unit (CAU) 165. CAU 165 CAS 25-59-01 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 25-59-01 is specifically described within the FFACO as a Septic System, located near the Engine Transport System Maintenance (ETSM) Building (Building 3901) in Area 25. Two alternatives have been evaluated for closure of the CAS: I. No Further Action and II. Clean Closure. This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only. Cost for project management, plan preparation, project support, and/or other activities are not included herein.

SCOPE:

Provide site closure using one of the following alternatives:

I) NO FURTHER ACTION

II) CLEAN CLOSURE

BASIS:

The characterization contractor recently completed field measurements of the Septic System which indicates that the types and amounts of materials requiring remedial action are as follows: 175 gallons of tank sludge in the septic tank influent chamber, 45 gallons of tank sludge in the septic tank effluent chamber, septic tank inlet and outlet ports, and miscellaneous sanitary debris. TPH was identified at two sample locations at the primary septic tank manhole and a secondary manhole that exceeded the preliminary action level (PAL). Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database. There is no estimate required for evaluation of the No Further Action alternative since no cost is incurred.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative I: No Further Action

Alternative II: Clean Closure

- Perform removal of sludge from septic tank influent and effluent chamber (220 gal.).
- Grout inlet and outlet access ports.
- Final rinse of septic tank influent and effluent chamber.
- Verification Sampling (analyze rinsate for TPH)
- Stabilize septic tank chamber floors with adhesive coating or a fixative (inert material).
- Stabilize the crushed rock surface (in the concrete cesspool) with a grout mixture (inert material).

BECHTEL NEVADA

EST ID: CAU 165
CAS 25-59-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

ASSUMPTIONS:

- No corrective actions are required for the surrounding areas outside the CAS boundary.
- All COCs at the site have been identified during the site investigation and analytical data accurately represents site conditions and waste characteristics.
- The interior dimensions of the septic tank influent chamber are 7 ft. X 4 ft. X 8 ft. to the bottom.
- The interior dimensions of the septic tank effluent chamber are 3 ft. X 4 ft. X 8 ft. to the bottom.
- The interior dimensions of the concrete cesspool are 7 ft. diameter X 16.5 ft. to the bottom of crushed rock.
- The crushed rock thickness is approximately 5 ft.
- The septic tank is accessible through the manhole/access port for each chamber. If the manhole is not accessible, entry into the septic tank will be reevaluated to generate a new estimate (entry would likely involve removal of the top of the septic tank by remote operations and properly disposed).
- The concrete cesspool is accessible through the manhole.
- Radioactive or hazardous constituents are not present in the septic system.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are based on field measurements collected during the corrective action investigation.
- Work to be performed by BN during a "normal" workday (no provision for overtime has been provided). Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies which may be realized if work for similar activities at similar sites can be completed concurrently.
- This estimate does not include costs for preparation of required project plans, permits, reports, mobilization and demobilization, site preparations, or project management.
- No media exists in the cesspool between the surface and crushed rock.
- All sludge in the septic tank and cesspool can successfully be removed to the extent possible through remote operations.
- A soil borrow area is located within one mile of the site.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 Rev. 4 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY04 final rates (Rev. 4) effective 07/28/04 and were applied using the BN FY04 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure**	**$70,923**

a. Perform Removal of Sludge From Septic Tank Influent/Effluent Chamber
b. Grout Inlet and Outlet Access Ports
c. Final Rinse of Septic Tank Influent/Effluent Chamber
d. Perform Verification Sampling
e. Stabilize Septic Tank Floor Chambers with Adhesive Coating or Fixative
f. Stabilize Crushed Rock Surface with a Grout Mixture
g. Waste Management (TPH and Sanitary)

REVIEW / CONCURRENCE:

/s/ Signature on file

Project Manager _____ Date 8/11/04

/s/ Signature on file

Estimating _____ Date 08-11-04

/s/ Signature on file

Project Controls for A.N. Hirschy Date 8/11/04

BECHTEL NEVADA

EST ID: CAU 165
CAS 26-07-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

SUBJECT: **CADD Alternative Cost Estimates for CAU 165: Area 25 and 26 Dry Well and Washdown Areas, NTS**

ESTIMATOR: Charles Denson

REF #:

TYPE OF ESTIMATE:				TYPE OF WORK:	
X	ORDER OF MAGNITUDE		TITLE II		NON-MANUAL ONLY
	PRELIMINARY / PLANNING / STUDY		WORK ORDER		MANUAL ONLY
	CONCEPTUAL / BUDGET		COMPARATIVE	X	MANUAL & NON-MANUAL
	TITLE I		OTHER		OTHER

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 26-07-01, which is included within Corrective Action Unit (CAU) 165. CAU 165 CAS 26-07-01 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 26-07-01 is specifically described within the FFACO as a Vehicle Washdown Station, located 150 yards east of Building 2201 (Maintenance, Assembly, and Disassembly Building) in Area 26.

SCOPE:

NO FURTHER ACTION

BASIS:

The characterization contractor recently completed field measurements of the Vehicle Washdown Station area which indicated that a remedial action was not required. No constituents of concern were identified that exceeded the preliminary action level (PAL).

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative I: No Further Action

- No further action was the preferred alternative.

ASSUMPTIONS:

- No actions and no associated costs. No administrative controls are implied.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 Rev. 4 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY04 final rates (Rev. 4) effective 07/28/04 and were applied using the BN FY04 cost model.

BECHTEL NEVADA

EST ID: CAU 165
CAS 26-07-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure**	**N/A**
Alternative III:	**Closure in Place with Administrative Controls**	**N/A**

REVIEW / CONCURRENCE:

/s/ Signature on file

Project Manager — Date 8/11/04

/s/ Signature on file

Estimating — Date 08-11-04

/s/ Signature on file

Project Controls — Date 8/11/04

for A.M. Hirschy

BECHTEL NEVADA

EST ID: CAU 165
CAS 26-59-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

SUBJECT: **CADD Alternative Cost Estimates for CAU 165: Area 25 and 26 Dry Well and Washdown Areas, NTS**

ESTIMATOR: Charles Denson

REF #:

TYPE OF ESTIMATE:				TYPE OF WORK:	
X	ORDER OF MAGNITUDE		TITLE II		NON-MANUAL ONLY
	PRELIMINARY / PLANNING / STUDY		WORK ORDER		MANUAL ONLY
	CONCEPTUAL / BUDGET		COMPARATIVE	X	MANUAL & NON-MANUAL
	TITLE I		OTHER		OTHER

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

DOE PRIME (LUMP SUM)		SUBCONTRACT	
BN CONSTRUCTION	X	GPP	
BN MAINTENANCE		OTHER	

STATEMENT OF WORK

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS) 26-59-01, which is included within Corrective Action Unit (CAU) 165. CAU 165 CAS 26-59-01 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 26-59-01 is specifically described within the FFACO as a Septic System, located 143 feet from the southwest corner of Building 2205 (Compressor House) in Area 26. Two alternatives have been evaluated for closure of the CAS: I. No Further Action and II. Clean Closure. This estimate will be used to identify the most cost effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only. Cost for project management, plan preparation, project support, and/or other activities are not included herein.

SCOPE:

Provide site closure using one of the following alternatives:

I) NO FURTHER ACTION

II) CLEAN CLOSURE

BASIS:

The characterization contractor recently completed field measurements of the Septic System which indicates that the types and amounts of materials requiring remedial action are as follows: 143 gallons of dry tank sludge, a 4-6 inch VCP drain line, and surface sanitary debris. TPH was identified at a sample location in the septic tank that exceeded the preliminary action level (PAL). Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the BN estimating database. There is no estimate required for evaluation of the No Further Action alternative since no cost is incurred.

ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS

Alternative I: No Further Action

Alternative II: Clean Closure

- Perform removal of sludge from septic tank (143 gal.).
- Grout inlet and outlet access ports.
- Final rinse of septic tank.
- Analyze rinsate for TPH.
- Stabilize septic tank floor with adhesive coating (inert material).

BECHTEL NEVADA

EST ID: CAU 165
CAS 26-59-01

COST ESTIMATE PROPOSAL DATA SHEET

Date: 10-Aug-04

TO: Glenn Richardson

FROM: Charles Denson

ASSUMPTIONS:

- No corrective actions are required for the surrounding areas outside the CAS boundary.
- All COCs at the site have been identified during the site investigation and analytical data accurately represents site conditions and waste characteristics.
- The interior dimensions of the septic tank are 8.5 ft. X 4.5 ft. X 7.5ft. to the bottom.
- The septic tank is accessible through the manhole. If the manhole is not accessible, entry into the septic tank will be reevaluated for a new estimate (entry would likely involve removal of the top of the septic tank by remote operations and properly disposed).
- Radioactive or hazardous constituents are not present in the septic system.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are based on field measurements collected during the corrective action investigation.
- Work to be performed by BN during a "normal" workday (no provision for overtime has been provided). Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies which may be realized if work for similar activities at similar sites can be completed concurrently.
- This estimate does not include costs for preparation of required project plans, permits, reports, mobilization and demobilization, site preparations, or project management.
- All sludge in the septic tank can successfully be removed to the extent possible through remote operations.
- A soil borrow area is located within one mile of the site.
- There will be no surface impediments.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

ESCALATION:

No escalation factors have been applied. All costs are in FY04 Rev.4 dollars.

CONTINGENCY:

Contingency costs are not included in this estimate.

RATES:

Rates are based on FY04 final rates (Rev. 4) effective 07/28/04 and were applied using the BN FY04 cost model.

COST ALTERNATIVES SUMMARY:

Alternative I:	**No Further Action**	**$0**
Alternative II:	**Clean Closure**	**$55,167**

a. Perform Removal of Sludge From Septic Tank
b. Grout Inlet and Outlet Access Ports
c. Final Rinse of Septic Tank
d. Perform Verification Sampling
e. Stabilize Septic Tank Floor with Adhesive Coating
f. Waste Management (TPH and Sanitary)

REVIEW / CONCURRENCE:

/s/ Signature on file — 8/11/04
Project Manager — Date

/s/ Signature on file — 08-11-04
Estimating — Date

/s/ Signature on file — 8/11/04
Project Controls — Date
for A.M. Hirschy

Appendix D

Sample Location Coordinates for CAU 165

D.1.0 Sample Location Coordinates

Sample location coordinates were collected during the CAI using a Trimble GPS, Model TSCI. These coordinates identify the field sampling locations (e.g., latitude, longitude, elevation) and points of interest at each CAS in CAU 165.

D.1.1 Lab Drain Dry Well (CAS 25-20-01)

Sample locations and pertinent points of interest at CAS 25-20-01 are shown on Figure A.3-1. The corresponding coordinates for CAS 25-20-01 sample locations are listed in Table D.1-1.

Table D.1-1
Sample Location Coordinates for CAS 25-20-01,
Sample Locations and Points of Interest

Latitude	Longitude	Northing[a]	Easting[a]	HAE (meters)	Location	Horizontal Precision (meters)	Vertical Precision (meters)
36.78099	-116.28757	4070611.3	563572.7	1035.58	Bldg. NW	0.477	0.586
36.78099	-116.28736	4070611.6	563591.4	1035.99	Bldg. NE	0.606	0.603
36.78101	-116.28748	4070614.2	563580.2	1034.83	Pipe	0.396	0.536
36.78099	-116.28748	4070611.8	563580.4	1034.62	Pipe	0.581	0.593
36.78114	-116.28748	4070627.9	563580.6	1035.13	Drywell	0.397	0.533
36.78114	-116.28748	4070628.4	563580.5	1034.81	A01	0.313	0.407
36.78114	-116.28749	4070627.6	563579.7	1034.84	A02	0.304	0.405
36.78113	-116.28727	4070627.5	563599.2	1034.88	Sewer Stickup	0.3	0.404
36.7811	-116.28751	4070623.2	563578.1	1036.11	A03	0.304	0.408
36.78116	-116.28753	4070630.6	563575.9	1035.85	A04	0.297	0.401
36.78116	-116.28744	4070630.6	563584.3	1035.86	A05	0.298	0.402

[a]UTM Zone 11, NAD 27

HAE = Height above ellipsoid

D.1.2 Drywell (CAS 25-51-02)

Sample locations and pertinent points (locations) of interest at CAS 25-51-02 are shown on Figure A.4-1. The corresponding coordinates for CAS 25-51-02 sample locations are listed in Table D.1-2.

Table D.1-2
Sample Location Coordinates for CAS 25-51-02,
Sample Locations and Points of Interest

Latitude	Longitude	Northing[a]	Easting[a]	HAE (meters)	Location	Horizontal Precision (meters)	Vertical Precision (meters)
36.82972	-116.30938	561586.92	4076003	1140.91	NE Bldg.	0.594	0.863
36.82945	-116.30939	561586.86	4075972	1140.82	SE	0.52	0.519
36.82965	-116.30936	561588.9	4075995	1140.67	Pipe Stickup	0.777	1.093
36.82966	-116.30938	561586.95	4075996	1140.54	Pipe Bldg.	0.766	1.052
36.82966	-116.30916	561606.73	4075997	1139.8	B01	0.393	0.489
36.8297	-116.30899	561622.4	4076001	1140.68	Fence N	0.405	0.505
36.82945	-116.30899	561622.33	4075973	1140.33	Fence South	0.394	0.488
36.82966	-116.30908	561614.56	4075996	1140.07	Clay Iron Pipe	0.503	0.70
36.82966	-116.30906	561616.29	4075997	1139.98	Pipe Bend	0.585	1.122
36.82957	-116.30897	561623.86	4075987	1139.75	AP1	0.584	1.221
36.82947	-116.30881	561638.64	4075976	1139.74	B02	0.584	1.221
36.82944	-116.30875	561643.79	4075972	1139.62	Bend	0.584	1.255
36.82914	-116.30872	561646.42	4075938	1137.72	B03	0.584	1.255
36.8291	-116.30871	561647.37	4075935	1137.47	B04	0.584	1.255

[a]UTM Zone 11, NAD 27

HAE = Height above ellipsoid

D.1.3 Septic System (CAS 25-59-01)

Sample locations and pertinent points (locations) of interest at CAS 25-59-01 are shown on Figure A.5-1. The corresponding coordinates for CAS 25-59-01 sample locations are listed in Table D.1-3.

D.1.4 Septic System (CAS 26-59-01)

Sample locations and pertinent points (locations) of interest at CAS 26-59-01 are shown on Figure A.6-1. The corresponding coordinates for CAS 26-59-01 sample locations are listed in Table D.1-4.

Table D.1-3
Sample Location Coordinates for CAS 25-59-01
Sample Locations and Points of Interest

Latitude	Longitude	Northing[a]	Easting[a]	HAE (meters)	Location	Horizontal Precision (meters)	Vertical Precision (meters)
36.80713	-116.30376	4073499.9	562106.6	1068.42	HWAA	0.502	0.656
36.80719	-116.30375	4073506.6	562107.9	1068.19	HWAA	0.502	0.656
36.80718	-116.30368	4073505.7	562114.3	1068.17	HWAA	0.502	0.656
36.80712	-116.30369	4073499.1	562113.3	1068.31	HWAA	0.496	0.652
36.80748	-116.30306	4073539.3	562169	1071.56	Bldg. SE	0.62	0.794
36.8075	-116.30322	4073541.9	562154.9	1071.67	Bldg. SW	0.842	0.655
36.8077	-116.30329	4073564	562148.5	1079.15	Cesspool	0.927	1.281
36.80768	-116.30329	4073562.1	562148.6	1073.96	C06	0.933	1.307
36.80772	-116.30328	4073566.2	562148.9	1077.15	C05	0.934	1.312
36.80772	-116.30329	4073566.6	562148.5	1075.96	ST	0.94	1.339
36.80772	-116.30327	4073566.3	562150.2	1074.8	ST	0.942	1.345
36.80775	-116.30325	4073569.5	562151.6	1073.18	ST	0.638	0.706
36.80775	-116.30326	4073569.5	562150.5	1073.59	ST	0.638	0.706
36.80774	-116.30326	4073568.9	562151.1	1074.64	Manhole	0.64	0.706
36.80776	-116.30325	4073570.6	562151.5	1073.53	C04	0.641	0.706
36.80777	-116.30325	4073572.1	562151.8	1074.11	Cleanout	0.642	0.705
36.80781	-116.30318	4073576.2	562157.7	1073.64	Bldg. NW	0.962	1.438
36.80773	-116.30327	4073567.9	562149.7	1075.02	Small Manhole	0.967	1.461

[a]UTM Zone 11, NAD 27

HAE = Height above ellipsoid

D.1.5 Train Decontamination Area (CAS 25-07-06)

Sample locations and pertinent points (locations) of interest at CAS 25-07-06 are shown on Figure A.7-1. The corresponding coordinates for CAS 25-07-06 sample locations are listed in Table D.1-5.

Table D.1-4
Sample Location Coordinates for CAS 26-59-01,
Sample Locations and Points of Interest

Latitude	Longitude	Northing[a]	Easting[a]	HAE (meters)	Location	Horizontal Precision (meters)	Vertical Precision (meters)
36.82213	-116.14123	4075281.8	576590.6	1305.13	D01	0.387	0.752
36.82212	-116.14123	4075280.8	576590.6	1305.24	Manhole	0.387	0.752
36.82211	-116.14123	4075279.7	576590.6	1305.11	D02	0.387	0.752
36.82208	-116.14121	4075276.3	576591.8	1305.12	D03	0.387	0.752
36.82196	-116.14114	4075263	576598.7	1304.5	D04	0.387	0.752
36.82233	-116.14124	4075304.4	576589.2	1305.99	Trench 1	0.385	0.757
36.82248	-116.14124	4075321.3	576589.3	1306.69	Trench 2	0.385	0.757
36.82248	-116.14121	4075321.4	576591.6	1306.64	Bldg. SW	0.463	0.782
36.82248	-116.14094	4075321	576615.5	1305.87	Bldg. SE	0.482	1.478
36.82272	-116.1412	4075347.4	576592.5	1306.15	Bldg. NW	0.59	1.103
36.82272	-116.14094	4075348.5	576615.7	1306.24	Bldg. NE	0.814	0.885

[a]UTM Zone 11, NAD 27

HAE = Height above ellipsoid

D.1.6 Vehicle Washdown (CAS 25-07-07)

Sample locations and pertinent points (locations) of interest at CAS 25-07-07 are shown on Figure A.8-1. The corresponding coordinates for CAS 25-07-07 sample locations are listed in Table D.1-6.

D.1.7 Vehicle Washdown Station (CAS 26-07-01)

Sample locations and pertinent points (locations) of interest at CAS 26-07-01 are shown on Figure A.9-1. The corresponding coordinates for CAS 26-07-01 sample locations are listed in Table D.1-7.

Table D.1-5
Sample Location Coordinates for CAS 25-07-06, Sample Locations and Points of Interest

Latitude	Longitude	Northing[a]	Easting[a]	HAE (meters)	Location	Horizontal Precision (meters)	Vertical Precision (meters)
36.80728	-116.30385	4073517.4	562098.5	1068.43	Pad SE	0.547	0.754
36.80747	-116.30381	4073537.9	562102.2	1068.63	Pad NE	0.547	0.754
36.80749	-116.30392	4073539.8	562091.9	1068.54	Pad NW	0.547	0.754
36.8073	-116.30397	4073519.3	562088.1	1068.25	Pad SW	0.547	0.754
36.80729	-116.30391	4073518.5	562093.3	1067.86	WM RR Tie	0.547	0.754
36.80739	-116.30389	4073528.7	562095.3	1067.67	Pad Drain	0.547	0.754
36.80738	-116.30388	4073527.9	562096.1	1067.87	WM Concrete	0.547	0.754
36.80741	-116.30389	4073530.9	562094.6	1067.9	WM Concrete	0.547	0.754
36.80734	-116.30391	4073523.1	562093	1067.86	WM Concrete	0.547	0.754
36.80748	-116.30387	4073538.9	562097	1068.14	WM RR Tie	0.547	0.754
36.80751	-116.30386	4073542.2	562097.9	1068.13	WM RR Tie	0.547	0.754
36.8076	-116.30383	4073552.1	562099.9	1068.24	E07	0.547	0.754
36.8076	-116.30387	4073552.8	562096.5	1067.58	E10	0.547	0.754
36.80759	-116.30379	4073551.5	562103.9	1067.55	E11	0.547	0.754
36.80749	-116.30389	4073539.8	562094.9	1067.78	E03	0.547	0.754
36.80743	-116.30401	4073533.8	562084	1069.73	E15	0.547	0.754
36.80739	-116.30401	4073529.4	562084	1069.1	E08	0.547	0.754
36.80739	-116.30396	4073529.3	562089.2	1068.17	E02	0.547	0.754
36.80729	-116.30394	4073517.7	562090.5	1068.3	E01	0.556	0.728
36.80723	-116.30398	4073511.1	562086.8	1068.12	E14	0.556	0.728
36.80722	-116.30393	4073510.4	562091.3	1068.14	E05	0.556	0.728
36.80721	-116.30388	4073509.3	562096.2	1068.67	E13	0.553	0.721
36.80743	-116.3038	4073534	562102.9	1068.7	E04	0.553	0.721
36.80743	-116.30375	4073533.4	562107.2	1069.97	E06	0.553	0.721
36.80747	-116.30374	4073538.3	562108.3	1069.86	E12	0.553	0.721
36.80754	-116.30389	4073545.5	562095.1	1068.2	E09	0.545	0.707

[a]UTM Zone 11, NAD 27

HAE = Height above ellipsoid

Table D.1-6
Sample Location Coordinates for CAS 25-07-07,
Sample Locations and Points of Interest

Latitude	Longitude	Northing[a]	Easting[a]	HAE (meters)	Location	Horizontal Precision (meters)	Vertical Precision (meters)
36.80664	-116.26993	4073468.9	565125.3	1098.76	Pad SW	0.355	0.563
36.80668	-116.26992	4073473.5	565125.4	1098.78	Pad NW	0.355	0.563
36.80668	-116.26982	4073473.3	565135	1098.76	Pad NE	0.355	0.563
36.80664	-116.26982	4073468.6	565134.9	1098.66	Pad SE	0.355	0.563
36.80666	-116.26981	4073471.1	565135.5	1098.47	F04	0.355	0.563
36.80668	-116.26976	4073473.2	565140.1	1098.54	F11	0.355	0.563
36.80662	-116.26977	4073466.4	565139.1	1098.45	F12	0.355	0.563
36.80662	-116.26982	4073466.5	565135	1098.38	F05	0.355	0.563
36.80664	-116.26989	4073468.5	565128.8	1098.35	F06	0.355	0.563
36.80669	-116.26985	4073474	565132.3	1098.28	F03	0.355	0.563
36.80669	-116.2699	4073474	565127.9	1098.24	F02	0.355	0.563
36.80667	-116.26993	4073471.5	565125	1098.18	F01	0.355	0.563
36.8067	-116.26997	4073475.3	565121	1098.37	F09	0.355	0.563
36.80663	-116.26998	4073467.5	565120.8	1098.3	F10	0.355	0.563
36.80672	-116.26986	4073477	565131.1	1097.86	F07 and F08	0.355	0.563
36.80669	-116.26979	4073473.8	565137.3	1098.49	Sump SE	0.355	0.563
36.80681	-116.26978	4073488	565137.9	1098.83	Sump NE	0.356	0.559
36.80682	-116.26994	4073488.1	565124	1098.76	Sump NW	0.359	0.524
36.8067	-116.26994	4073475.3	565124.1	1098.53	Sump SW	0.359	0.524

[a]UTM Zone 11, NAD 27

HAE = Height above ellipsoid

D.1.8 Reservoir and French Drain (CAS 25-47-01)

Sample locations and pertinent points (locations) of interest at CAS 25-47-01 are shown on Figure A.10-1. The corresponding coordinates for CAS 25-47-01 sample locations are listed in Table D.1-8.

Table D.1-7
Sample Location Coordinates for CAS 26-07-01, Sample Locations and Points of Interest

Latitude	Longitude	Northing[a]	Easting[a]	HAE (meters)	Location	Horizontal Precision (meters)	Vertical Precision (meters)
36.81665	-116.162	4074658.1	574743.4	1334.71	Pad NW	0.393	0.687
36.8166	-116.162	4074652.3	574743.4	1334.92	Pad SW	0.393	0.687
36.81661	-116.16183	4074653.3	574758.8	1333.72	Pad SE	0.452	0.717
36.81664	-116.16183	4074657.3	574758.6	1335.71	Pad NE	0.428	0.74
36.81664	-116.16184	4074656.5	574757.4	1334.68	Drain	0.458	0.726
36.81659	-116.16191	4074651.9	574751.4	1333.66	G01	0.392	0.707
36.81664	-116.16182	4074656.9	574759.4	1333.6	G02	0.407	0.726
36.81666	-116.16189	4074659.4	574752.8	1334.84	G03	0.453	0.833
36.81663	-116.162	4074655.5	574743.3	1334.44	G04	0.393	0.687
36.81658	-116.162	4074651.5	574741.0	1340.4	G05	--	--
36.81664	-116.162	4074657.8	574740.5	1340.0	G06	--	--
36.81658	-116.162	4074650	574736.6	1336.62	G07	1.373	2.119
36.81658	-116.162	4074650	574743.3	1336.36	G08	1.373	2.119
36.81658	-116.162	4074651	574748	1336.45	G09	1.437	2.24
36.81661	-116.162	4074654	574732.8	1336.51	G10	1.418	2.217
36.81654	-116.162	4074646	574733.2	1336.01	G11	1.443	2.267
36.81652	-116.162	4074644	574742.9	1336.33	G12	1.443	2.267
36.81682	-116.162	4074676	574721.4	1338.35	G13	1.449	2.279
36.81678	-116.162	4074672	574737.5	1337.9	G14	1.492	2.362
36.81677	-116.162	4074672	574752.4	1337.98	G15	1.521	2.418

[a]UTM Zone 11, NAD 27

HAE = Height above ellipsoid
-- = None recorded

Table D.1-8
Sample Location Coordinates for CAS 25-47-01, Sample Locations and Points of Interest

Northing[a]	Easting[a]	Location
4073064.4	564884.5	H01
4073012.9	564859.2	H02
4072997.1	564862.6	H03
4073022.1	564868.4	Res NE
4073019.7	564843.1	Res NW
4072986.3	564851.8	Res SW
4072990.8	564873.3	Res SE
4073050.1	564839.3	ED Bend
4073049.7	564854.5	ED
4073057.3	564872.8	ED Mid

[a]UTM Zone 11, NAD 27

Appendix E

Evaluation of Risk

E.1.0 Evaluation of Risk

A detailed assessment of risk for no action and evaluated alternatives was not performed because COCs exceeding PALs are not present or will not be left in place without appropriate controls.

Appendix F

Project Organization for CAU 165

F.1.0 Project Organization

The NNSA/NSO Project Manager is Janet Appenzeller-Wing and her telephone number is (702) 295-0461.

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

Appendix G

NDEP Comments on the Final Revision 0 and the Draft Revision 1

Note: NDEP's comment number 2 on the Final Revision 0 version of this report (see page G-1) involved the radiological preliminary action levels. Based on this comment and other negotiations that have occurred between NDEP and NNSA/NSO subsequent to Revision 0 being finalized, the radiological PALs have been re-established and are presented in this revised document. In order to effectively address NDEP's comment number 2 on the Draft Revision 1 report, a new comment response form has been prepared (see page G-2) for this revision and the PAL comment has been addressed to reflect current NDEP and NNSA/NSO agreements.

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

1. Document Title/Number Final Corrective Action Decision Document for Corrective Action Unit 165: Area 25 and 26 Dry Well and Washdown Areas, Nevada Test Site, Nevada
2. Document Date April 2003
3. Revision Number 0
4. Originator/Organization Shaw Environmental, Inc.
5. Responsible DOE/NV ERP Project Mgr. Janet Appenzeller-Wing
6. Date Comments Due
7. Review Criteria Full
9. Reviewer's Signature
8. Reviewer/Organization/Phone No. Greg Raab, NDEP, 486-2867

10. Comment Number/ Location	11. Type[a]	12. Comment	13. Comment Response	14. Accept
1) Page A-5 Last Paragraph Last 2 Sentences		Surface materials removed include...lead bricks... These items were placed southwest of the site for disposition by BN. Described how and where BN will dispose of the lead bricks.	The following paragraph was added using ROTC #1, "The lead bricks are scheduled to be removed by BN in late FY2004 or early FY2005 during closure activities. If the lead bricks meet the performance objective for certification of nonradioactive waste, they will be sent for recycling or disposed of in accordance with 40 CFR (Hazardous Waste Regulations). If the lead bricks have elevated radiation, they will be treated and disposed of in accordance with applicable requirements (Federal, State, and DOE Orders/Agreements), through BN Waste Control Department."	
2) Page A-23 Reference A in Table A.3-8 and all others with same citation		Environmental Monitoring Report for the Proposed Ward Valley, California, Low-Level Radioactive Waste (LLRW) Facility (US Ecology and Atlan-Tech, 1992). NDEP has rejected this reference in CAU 529 CAIP for establishing the PALs, as it has no relevance to the Nevada Test Site. If the CADD recommendations for closure remain the same, NNSA/NSO may submit a Record of Technical Change to address this issue. If the CADD recommendations are not the same based on the new PALs, NNSA/NSO may need to submit a revised document.	Per discussions with NDEP and NNSA personnel, the Ward Valley reference is acceptable. An expanded explanation of the use of the Ward Valley data and its relevance to the NTS will be included in future documents. This comment does not require a change to this document.	

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

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

1. Document Title/Number Final Corrective Action Decision Document for Corrective Action Unit 165: Area 25 and 26 Dry Well and Washdown Areas, Nevada Test Site, Nevada
2. Document Date August 2004
3. Revision Number Draft 1
4. Originator/Organization Stoller-Navarro Joint Venture
5. Responsible DOE/NV ERP Project Mgr. Janet Appenzeller-Wing
6. Date Comments Due
7. Review Criteria Full
9. Reviewer's Signature
8. Reviewer/Organization/Phone No. Greg Raab, NDEP, 486-2867

10. Comment Number/ Location	11. Type[a]	12. Comment	13. Comment Response	14. Accept
1) Appendix G		The NNSA response to NDEP's second comment has not been revised to reflect the actual changes to the radiological PALs in the revision 1.	A second Document Review Sheet has been added to Appendix G to address NDEP's comments on the draft Revision 1 of this document.	
2) Comment No. 2 taken from NDEP's comments on the Final Revision 0 of this Document.		Environmental Monitoring Report for the Proposed Ward Valley, California, Low-Level Radioactive Waste (LLRW) Facility (US Ecology and Atlan-Tech, 1992). NDEP has rejected this reference in CAU 529 CAIP for establishing the PALs, as it has no relevance to the Nevada Test Site. If the CADD recommendations for closure remain the same, NNSA/NSO may submit a Record of Technical Change to address this issue. If the CADD recommendations are not the same based on the new PALs, NNSA/NSO may need to submit a revised document.	Changes to the radiological PALs were agreed to by NDEP and NNSA/NSO and are reflected in Revision 1 to this document. The new radiological PALs are taken from the 1999 National Council on Radiation Protection and Measurements Report No. 129, *Recommended Screening Limits for Contaminated Surface Soil and Review of Factors Relevant to Site-Specific Studies,* and from DOE Order 5400.5, Change 2, "Radiation Protection of the Public and the Environment."	

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