Nevada
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Project

DOE/NV--1263

National Nuclear Security Administration

Corrective Action Decision Document/ Closure Report for Corrective Action Unit 190: Contaminated Waste Sites Nevada Test Site, Nevada

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Environmental Restoration
Project

U.S. Department of Energy
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CORRECTIVE ACTION DECISION DOCUMENT/ CLOSURE REPORT FOR CORRECTIVE ACTION UNIT 190: CONTAMINATED WASTE SITES 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/CLOSURE REPORT FOR CORRECTIVE ACTION UNIT 190: CONTAMINATED WASTE SITES NEVADA TEST SITE, NEVADA

Approved by: /s/ Kevin J. Cabble Date: 03/03/2008

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Acting Federal Project Director
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List of Acronyms and Abbreviations

AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
bgs	Below ground surface
BMP	Best management practice
BOL	Bill of Lading
CADD	Corrective Action Decision Document
CAI	Corrective action investigation
CAIP	Corrective Action Investigation Plan
CAS	Corrective Action Site
CAU	Corrective Action Unit
CD	Certificate of Disposal
CLP	Contract Laboratory Program
cm	Centimeter
COC	Contaminant of concern
COPC	Contaminant of potential concern
CR	Closure Report
CSM	Conceptual site model
DOE	U.S. Department of Energy
DQA	Data quality assessment
DQI	Data quality indicator
DQO	Data quality objective
DRO	Diesel-range organics
DU	Depleted uranium
EML	Environmental Measurements Laboratory
EPA	U.S. Environmental Protection Agency
FADL	Field Activity Daily Log
FAL	Final action level

List of Acronyms and Abbreviations *(Continued)*

FD	Field duplicate
FFACO	*Federal Facility Agreement and Consent Order*
FID	Flame-ionization detector
FSL	Field-screening level
FSR	Field-screening result
ft	Foot
ft^3	Cubic foot
GPS	Global positioning system
GRO	Gasoline-range organics
HEST	High-Explosive Simulation Test
ID	Identification
IDW	Investigation-derived waste
lb	Pound
LCS	Laboratory control sample
LLW	Low-level waste
LVF	Load Verification Form
MDC	Minimum detectable concentration
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MS	Matrix spike
MSD	Matrix spike duplicate
N/A	Not applicable
NAC	*Nevada Administrative Code*
NAD	North American Datum
NDEP	Nevada Division of Environmental Protection
NIST	National Institute of Standards and Technology
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office

List of Acronyms and Abbreviations *(Continued)*

NTS	Nevada Test Site
PACM	Presumed asbestos-containing material
PAL	Preliminary action level
PB	Preparation blank
PCB	Polychlorinated biphenyl
pCi/g	Picocuries per gram
pCi/L	Picocuries per liter
POC	Performance objective criteria
PPE	Personal protective equipment
ppm	Parts per million
PRG	Preliminary Remediation Goal
PSM	Potential source material
Pu	Plutonium
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RadCon	Radiological Control
RBCA	Risk-based corrective action
RBSL	Risk-based screening level
RCRA	*Resource Conservation and Recovery Act*
RESRAD	Residual radioactive
RPD	Relative percent difference
RWMC	Radioactive Waste Management Complex
SCL	Sample collection log
SDG	Sample delivery group
Sr	Strontium
SSTL	Site-specific target level
SVOC	Semivolatile organic compound

List of Acronyms and Abbreviations *(Continued)*

TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total petroleum hydrocarbons
U	Uranium
UTM	Universal Transverse Mercator
VOC	Volatile organic compound
WM	Waste management
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
%R	Percent recovery

Executive Summary

This Corrective Action Decision Document/Closure Report has been prepared for Corrective Action Unit (CAU) 190, Contaminated Waste Sites, Nevada Test Site, Nevada, in accordance with the *Federal Facility Agreement and Consent Order* that was agreed to by the State of Nevada; U.S. Department of Energy, Environmental Management; U.S. Department of Defense; and DOE, Legacy Management (1996, as amended January 2007). Corrective Action Unit 190 is comprised of the following four corrective action sites (CASs):

- 11-02-01, Underground Centrifuge
- 11-02-02, Drain Lines and Outfall
- 11-59-01, Tweezer Facility Septic System
- 14-23-01, LTU-6 Test Area

The purpose of this Corrective Action Decision Document/Closure Report is to provide justification and documentation supporting the recommendation for closure of CAU 190 with no further corrective action. To achieve this, corrective action investigation (CAI) activities were performed from March 21 through June 26, 2007. All CAI activities were conducted as set forth in the *Corrective Action Investigation Plan for Corrective Action Unit* 190: *Contaminated Waste Sites, Nevada Test Site, Nevada* (NNSA/NSO, 2006). The purpose of the CAI was to fulfill the following data needs as defined during the data quality objective process:

- Determine whether contaminants of concern (COCs) are present.
- If COCs are present, determine their nature and extent.
- Provide sufficient information and data to complete appropriate corrective actions.

The CAU 190 dataset from the investigation results was evaluated based on the data quality indicator parameters. This evaluation demonstrated the quality and acceptability of the dataset for use in fulfilling the data quality objective data needs.

Dibenzo(a,h)anthracene and benzo(a)pyrene were identified as COCs at CAS 11-02-02. Benzo(a)pyrene and chromium were identified as COCs at CAS 11-59-01. A corrective action of clean closure at CASs 11-02-02 and 11-59-01 ensured removal of all COC-impacted soil and potential source material during closure activities. Closure activities were performed from October to December 2007 in accordance with decisions made at the Corrective Action Alternative meeting held

on July 9, 2007, with DOE, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) and Nevada Division of Environmental Protection.

As a best management practice at 11-02-01, removal of the two hydraulic hoses and lead bricks inside the centrifuge was performed. The ladder was disconnected and placed on the centrifuge floor. At CAS 11-02-02, the cooling tower and associated steel pipe leading to the outfall, and two aboveground water tanks and piping were removed. At CAS 11-59-01, the septic tank, distribution box, and surface debris were removed. At CAS 14-23-01, metallic fragments, some contaminated with depleted uranium, were removed during closure activities. See Appendix D for additional closure activities performed at these CASs.

Therefore, the NNSA/NSO provides the following recommendations:

- No Further Action for CAU 190.
- No Corrective Action Plan.
- A Notice of Completion to the NNSA/NSO is requested from the Nevada Division of Environmental Protection for closure of CAU 190.
- Corrective Action Unit 190 should be moved from Appendix III to Appendix IV of the *Federal Facility Agreement and Consent Order.*

1.0 Introduction

This Corrective Action Decision Document (CADD)/Closure Report (CR) presents information supporting closure of Corrective Action Unit (CAU) 190, Contaminated Waste Sites, Nevada Test Site (NTS), Nevada. The corrective actions described in this document are in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) that was agreed to by the State of Nevada; U.S. Department of Energy (DOE), Environmental Management; U.S. Department of Defense; and DOE, Legacy Management (1996, as amended January 2007). The NTS is approximately 65 miles northwest of Las Vegas, Nevada.

Corrective Action Unit 190 is comprised of the four corrective action sites (CASs) that are shown on (Figure 1-1) and listed below:

- 11-02-01, Underground Centrifuge
- 11-02-02, Drain Lines and Outfall
- 11-59-01, Tweezer Facility Septic System
- 14-23-01, LTU-6 Test Area

A detailed discussion of the history of this CAU is presented in the *Corrective Action Investigation Plan* (CAIP) *for Corrective Action Unit 190: Contaminated Waste Sites, Nevada Test Site, Nevada* (NNSA/NSO, 2006a). This document provides or references the specific information necessary to support closure of this CAU.

1.1 Purpose

This CADD/CR provides justification for no further corrective action, and the technical rationale for closure activities implemented. This justification is based on the corrective actions implemented and the results of investigative activities conducted in accordance with the CAIP (NNSA/NSO, 2006a).

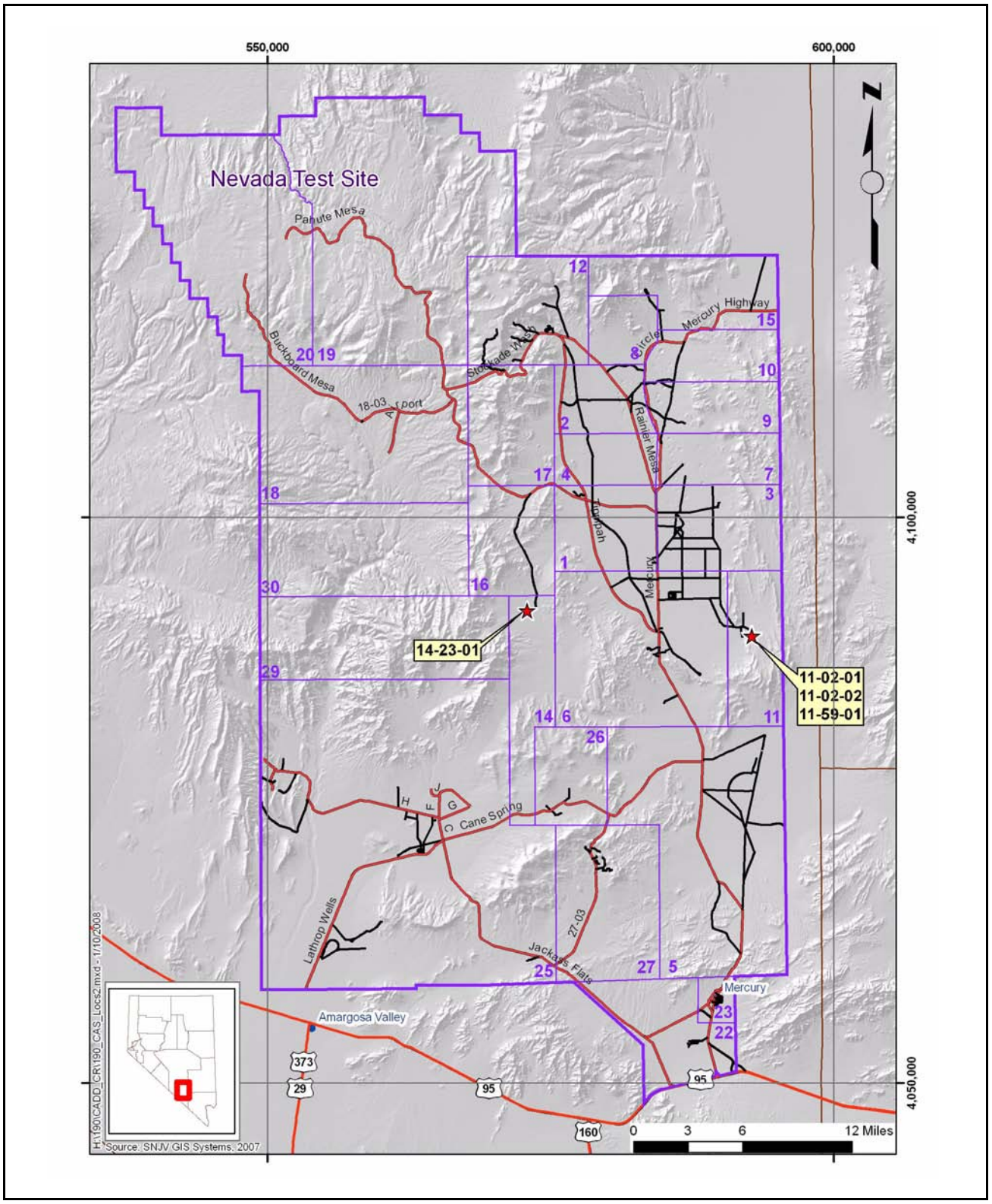

Figure 1-1
Nevada Test Site Map with CAU 190 CAS Locations

Corrective Action Unit 190, *Contaminated Waste Sites,* consists of four inactive sites. Three sites are located within the Tweezer Facility in Area 11 of the NTS and consist of an underground centrifuge, drain lines and outfall, and a septic system and leachfield. The fourth site is located at LTU-6 Test Area, in the northern part of Area 14, near the Mine Mountain Road and Mid Valley Road (Saddle Mountain Road) junction. This site consists of potentially contaminated soil from the debris ejected from MX missile testing.

1.2 Scope

The scope of this CADD/CR is to justify that no further corrective action is required at CAU 190, *Contaminated Waste Sites*. The following activities were conducted to accomplish this scope:

- Removal of surface debris and/or materials to facilitate sampling
- Radiological surveys
- Field screening
- Collection of environmental samples for laboratory analysis
- Collection of step-out samples to define the lateral and vertical extent of the contamination
- Collection of waste samples to determine the potential to generate COCs if released to the environment
- Collection of waste samples to determine the proper disposal of wastes
- Collection of quality control (QC) samples

1.3 Corrective Action Decision Document/Closure Report Contents

This CADD/CR is divided into the following sections and appendices:

Section 1.0 – Introduction: Summarizes the purpose, scope, and contents of this CADD/CR.

Section 2.0 – Corrective Action Investigation (CAI) Summary: Summarizes the investigation field activities, the results of the investigation, the need for corrective action, and a summary of the results of the data quality objective (DQO) assessment.

Section 3.0 – Recommendation: States why no further corrective action is required.

Section 4.0 – References: Provides a list of all referenced documents used in the preparation of this CADD/CR.

Appendix A – *Corrective Action Investigation Results:* Provides a description of the project objectives, field investigation and sampling activities, investigation results, waste management (WM), and quality assurance (QA). Section A.3.0 provides specific information regarding field activities, sampling methods, and laboratory analytical results from the investigation.

Appendix B – *Data Assessment:* Provides a data quality assessment (DQA) that reconciles DQO assumptions and requirements to the investigation results.

Appendix C – *Risk Assessment:* Presents an evaluation of risk associated with the establishment of final action levels (FALs).

Appendix D – *Closure Activity Summary:* Provides details on the completed closure activities and includes the required verification activities and supporting documentation.

Appendix E – *GPS Coordinates:* Provides global positioning system (GPS) coordinates for CAU 190 sample locations.

Appendix F – *NTS Load Verification Forms:* Provides load verification and shipping documentation for CAU 190.

Appendix G – *Nevada Division of Environmental Protection (NDEP) Comments:* Contains NDEP comments on the draft version of this document.

1.3.1 Applicable Programmatic Plans and Documents

All investigation activities were performed in accordance with the following documents:

- CAIP for CAU 190, *Contaminated Waste Sites* (NNSA/NSO, 2006a)
- *Industrial Sites Quality Assurance Project Plan* (QAPP) (NNSA/NV, 2002)

- FFACO (1996, as amended January 2007)
- Approved procedures

1.3.2 Data Quality Assessment Summary

The DQA is presented in Appendix B and includes an evaluation of the data quality indicators (DQIs) used to determine the degree of acceptability and usability of the reported data in the decision-making process. The DQO process ensures that the correct type, quality, and quantity of data will be available to support the resolution of those decisions at an appropriate level of confidence. Using both the DQO and DQA processes helps to ensure that DQO decisions are sound and defensible.

The DQA process as presented in Appendix B is comprised of the following steps:

- Step 1: Review DQOs and Sampling Design
- Step 2: Conduct a Preliminary Data Review
- Step 3: Select the Test
- Step 4: Verify the Assumptions
- Step 5: Draw Conclusions from the Data

Sample locations that support the presence and/or extent of contamination at each CAS are shown in Appendix B. Based on the results of the DQA presented in Appendix B, the nature and extent of COCs at CAU 190 have been identified adequately to implement corrective actions. The DQA also determined that information generated during the investigation support the conceptual site model (CSM) assumptions and the data collected met the DQOs and support their intended use in the decision-making process.

2.0 Corrective Action Investigation Summary

The following sections summarize the investigation activities and results, and justification for no further corrective action at CAU 190. Detailed investigation activities and results for individual CAU 190 CASs are presented in Appendix A.

2.1 Investigation Activities

Corrective action investigation activities were performed as set forth in the CAU 190 CAIP (NNSA/NSO, 2006a) from March 21 through April 11, 2007. Additional investigation activities were conducted from May 2 through June 26, 2007. Closure activities were conducted from October through December 2007 and are presented in Appendix D. The purpose of the CAU 190 CAI was to address the decision statements in the project-specific DQOs by:

- Determining whether contaminants of concern (COCs) are present in the soils associated with CAU 190.
- Determining the lateral and vertical extent of identified COCs.
- Ensuring adequate data have been collected to close the sites under NDEP, *Resource Conservation and Recovery Act* (RCRA) (CFR, 2006a), *Toxic Substances Control Act* (CFR, 2006b), and DOE requirements.

The scope of the CAI included the following activities:

- Performing radiological surveys (i.e., static, scanning, and swipe collection).
- Field screening soil samples for volatile organic compounds (VOCs) and total alpha and beta/gamma radiation.
- Collecting environmental samples for laboratory analyses to determine the presence of COCs and to define the vertical and lateral extent of COCs, if present.
- Collecting QC samples for laboratory analyses to ensure that the data generated from the analysis of investigation samples meet the requirements of the DQIs.
- Collecting liquid and solid waste samples from septic system components to identify whether the waste contained in these structures are sources of environmental contamination and support future waste disposal activities. Total fecal coliform bacteria analysis was conducted onsite for select liquid and sludge, for worker protection, and the results were negative.

A judgmental sampling scheme was implemented to select sample locations and evaluate analytical results, as outlined in the CAIP (NNSA/NSO, 2006a). Judgmental sampling allows the methodical selection of sample locations that target the populations of interest (defined in the DQOs) rather than nonselective random locations.

For the judgmental sampling scheme, individual sample results (rather than average concentrations) are used to compare to FALs. Therefore, statistical methods to generate site characteristics (averages) are not necessary (EPA, 2006). If good prior information is available on the target site of interest, then the sampling may be designed to collect samples only from areas known to have the highest concentration levels on the target site. If the observed concentrations from these samples are below the action level, then a decision can be made that the site does not contain unsafe levels of the contaminant without the samples being truly representative of the entire area.

The judgmental sampling design was used to confirm the existence of contamination at specific locations and provide information (such as extent of contamination) about specific areas of the site.

Confidence in judgmental sampling scheme decisions was established qualitatively by validation of the CSM and justification that sampling locations are the most likely locations to contain a COC, if a COC exists.

Waste characterization activities were conducted to gather sufficient information and data to support waste disposal decisions. Information regarding waste characterization is presented in Appendix A.

The following sections describe specific investigation activities conducted at each CAS. Additional information regarding the investigation is presented in Appendix A.

2.1.1 Underground Centrifuge (CAS 11-02-01)

The following subsections summarize the activities conducted at CAS 11-02-01.

2.1.1.1 Radiological Survey

Radiological swipe and direct static and scanning surveys were conducted on the lead bricks removed from the centrifuge. Results from these surveys showed that the removable and total (fixed and

removable) contamination values did not exceed levels defined in the *NV/YMP Radiological Control Manual* Table 4-2 (NNSA/NSO, 2004). Therefore, the bricks could be released to uncontrolled areas.

2.1.1.2 Visual Inspection

Several features associated with the centrifuge were inspected upon centrifuge lid removal. These features included the floor, walls, hydraulic hoses, ladder, lead bricks, spindle, motor, and sump. All the features were inspected for contents and/or breeches. The inspection indicated that the integrity of the centrifuge was intact. No additional biased sample locations were identified other than the planned locations at the hydraulic hose ends. Therefore, no additional biased samples were identified other than those proposed in the CAIP (NNSA/NSO, 2006a).

2.1.1.3 Field Screening

Investigation samples were field screened for alpha and beta/gamma radiation. The field-screening levels (FSLs) were not exceeded in samples collected at this CAS.

2.1.1.4 Sample Collection

A total of three characterization samples (including one field duplicate [FD]) were collected during investigation activities at CAS 11-02-01. The sample identifications (IDs), locations, types, and analyses are listed in Table A.3-1. The sample locations are shown on Figure A.3-1. Samples were collected using grab sampling using disposable scoops. Sample locations were collected at the hydraulic hose ends to determine whether there has been a release from this system. Samples 190A001 and 190A003 at locations A01 and A02 were collected from the surface interval (0 to 0.5 feet [ft] below ground surface [bgs]).

2.1.1.5 Conceptual Site Model Validation

The CSM and associated discussion for this CAS are provided in the CAIP (NNSA/NSO, 2006a).

The migration pathway and release mechanism information gathered during the CAI were consistent with the CSM. All information gathered during the CAI supports and validates the CSM as presented in the CAIP.

2.1.2 Drain Lines and Outfall (CAS 11-02-02)

The following subsections summarize the activities conducted at CAS 11-02-02.

2.1.2.1 Visual Inspection

Visual inspections were performed to identify biasing factors (i.e., staining, elevated radiation levels, odor) inside tanks, associated piping, and on the surface soil that may have been impacted by an outflow of these components. The surface soil at the pipe outfall showed visible signs of staining; however, no additional bias sampling locations were proposed because this location was originally planned for sampling.

A visual inspection was performed on the inside of the cooling tower to determine whether media were present to sample. Results indicate that no material was present inside the cooling tower to sample.

2.1.2.2 Video Surveys

No video surveys were conducted on the steel pipe from the cooling tower to the outfall due to the small diameter of the steel pipe.

2.1.2.3 Field Screening

Investigation samples were field screened for alpha and beta/gamma radiation. A handheld survey instrument was used to screen for alpha and beta/gamma radioactivity before soil samples were placed in sample jars. The radiological field-screening results (FSRs) were compared to FSLs to guide subsequent sampling decisions. The radiological FSRs were all below FSLs.

A flame-ionization detector (FID) was used to screen the cooling tower when the small hatch was opened. No elevated FSLs were observed.

2.1.2.4 Sample Collection

A total of 17 environmental soil characterization samples (including one FD and one matrix spike [MS]/matrix spike duplicate [MSD]) were collected from 11 locations during investigation activities

at CAS 11-02-02. Samples were collected using disposable scoops, or a hand auger for sampling depths greater than 0.5 ft bgs.

Decision I sampling activities at CAS 11-02-02 included the collection of environmental soil samples from the pipe outfall (location B01, Figure A.4-1). This location represented an area of potential release as detailed in the CAIP (NNSA/NSO, 2006a).

Decision II sampling activities included the collection of samples at various depths from locations B02 through B05 at approximately 5-ft distances from location B01.

2.1.2.5 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at CAU 190 CASs. The CSM and associated discussion for this CAS are provided in the CAIP (NNSA/NSO, 2006a).

The migration pathway and release mechanism information gathered during the CAI were consistent with the CSM. All information gathered during the CAI supports and validates the CSM as presented in the CAIP.

2.1.3 Tweezer Facility Septic System (CAS 11-59-01)

The following subsections summarize the activities conducted at CAS 11-59-01.

2.1.3.1 Visual Inspection

Visual inspections were made of the septic tank and the associated system components (i.e., piping and distribution box). Visual inspection was also made of the surrounding soils that may have been impacted by possible tank overflow.

Visual inspections were performed to identify biasing factors (i.e., staining, elevated radiation levels, odor) inside the distribution box, septic tank, and associated piping, and on the surface soil that may have been impacted by an overflow of these components. Initial inspection indicated that the integrity of the components was intact, except for a crack observed in the effluent pipe coming from

the septic tank. A sample was collected at this location. No other visible signs of structural failure or other biasing factors were noted; therefore, no additional bias sampling locations were proposed.

2.1.3.2 Video Surveys

Video surveys were conducted on the septic system piping to the extent possible to verify the presence and extent of piping identified on engineering drawings, and to identify any breaches, breaks, or residual material in the piping that might require additional biased sampling. Approximately 95 ft of piping leading to the source building from the septic tank was surveyed. No breaches or residual material were identified in the existing piping. Therefore, no additional biased sample locations were identified based on video survey results.

2.1.3.3 Field Screening

Soil samples were screened in the field for alpha and beta/gamma radioactivity. An FID was used for screening the inside of the septic tank upon opening the lid. A handheld survey instrument was used to screen for alpha and beta/gamma radioactivity before soil samples were placed in sample jars. The radiological FSRs were compared to FSLs to guide subsequent sampling decisions. The radiological FSRs were all below FSLs.

2.1.3.4 Sample Collection

A total of 30 environmental soil characterization samples (including two FD and one MS/MSD) were collected from 19 locations during investigation activities at CAS 11-59-01. Samples were collected using a decontaminated backhoe bucket and disposable scoops.

Decision I samples were collected from beneath the inlet and outlet piping of the septic tank and distribution box, and beneath the septic tanks and distribution box. Samples were collected at locations C06 through C19 from the leachfield as shown in Figure A.5-1 to determine whether there has been a release from the Orangeburg leachpipe. Soil samples were collected from 0 to 1.0 ft below the leachpipe at all locations and 3 to 4 ft below the pipe at locations C13, C15, and C19. The other locations were not accessible due to a caliche layer. The Orangeburg leachpipe ranged from 1 to 3 ft bgs.

Samples of liquid and sludge from the septic tank were collected at this CAS for waste characterization and disposal determination. Samples were collected using a composite liquid waste sampler or a sample dipper.

Verification sampling activities included the collection of three samples at locations at a radius approximately 3 to 4 ft from the C15 location.

2.1.3.5 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at CAU 190 CASs. The CSM and associated discussion for this CAS are provided in the CAIP (NNSA/NSO, 2006a).

The migration pathway and release mechanism information gathered during the CAI were consistent with the CSM. All information gathered during the CAI supports and validates the CSM as presented in the CAIP.

2.1.4 LTU-6 Test Area (CAS 14-23-01)

The following subsections summarize the activities conducted at CAS 14-23-01.

2.1.4.1 Radiological Survey

Radiological swipe and direct static and scanning surveys were conducted on the metallic fragments that were removed before sampling beneath them. Results from these surveys showed elevated fixed contamination and removable alpha and beta/gamma radiation.

2.1.4.2 Visual Inspection

Several features associated with the LTU-6 Test Area were identified and inspected within the CAS. These features consisted of radiologically elevated spots identified during the walkover survey, former debris locations, and current debris locations. Several additional biased sample locations were identified other than the planned locations because additional debris fragments were found.

2.1.4.3 Field Screening

Investigation samples were field screened for alpha and beta/gamma radiation. The FSLs were not exceeded in samples collected at this CAS.

2.1.4.4 Sample Collection

A total of 15 characterization samples (including one FD) were collected during investigation activities at CAS 14-23-01. Decision I environmental sampling activities included the collection of biased surface soil samples at the radiologically elevated locations, former debris locations, and current debris locations to determine whether there has been a release from the debris fragments on the ground. All samples were collected from the surface interval (0 to 0.5 ft bgs) using disposable scoops.

No COCs were identified at this CAS; therefore, no Decision II samples were collected.

2.1.4.5 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at CAU 190 CASs. The CSM and associated discussion for this CAS are provided in the CAIP (NNSA/NSO, 2006a).

The migration pathway and release mechanism information gathered during the CAI were consistent with the CSM. All information gathered during the CAI supports and validates the CSM as presented in the CAIP.

2.2 Results

The data summary provided in Section 2.2.1 defines the contaminants of potential concern (COPCs) that exceeded the FALs (i.e., COCs) within the CAU 190 CASs and the extent of any identified COCs. Section 2.2.2 summarizes the assessment made in Appendix B, which demonstrates that the investigation results satisfy the DQO data requirements.

2.2.1 Summary of Analytical Data

Chemical and radiological results for environmental and tank content samples collected at each of the CASs are summarized in Sections 2.2.1.1 through 2.2.1.4. Environmental samples are evaluated against FALs to determine the presence of COCs and the extent of COC contamination, if present. Tank content samples are evaluated against FALs (or RCRA toxicity characteristic concentrations for liquid samples) to determine whether a release of the tank contents to the surrounding environmental media could cause the presence of a COC in the environmental media.

The preliminary action levels (PALs) for the CAU 190 investigation were determined during the DQO process and are discussed in Section 3.3 of the CAIP (NNSA/NSO, 2006a). The FALs used to determine the presence of COCs and evaluate the need for additional corrective action are defined in Section 2.3. Details about the methods used during this investigation and a comparison of environmental sample results to the FALs are presented in Appendix A.

2.2.1.1 Underground Centrifuge (CAS 11-02-01)

Based on the observations, the radiological surveys conducted, and the analytical results of the environmental samples collected at this CAS, no COCs are present in the soil at this CAS. Therefore, no further action is required at this CAS.

The maximum concentration of each detected contaminant at this CAS is listed in Table 2-1.

2.2.1.2 Drain Lines and Outfall (CAS 11-02-02)

Based on field observations, radiological surveys conducted, and the analytical results for soil samples collected within CAS 11-02-02, the only COCs identified at this CAS are benzo(a)pyrene and dibenzo(a,h)anthracene. These COCs were identified at and near the pipe outfall.

A total of four surface samples (including one FD) exceeded the PAL of 100 milligrams per kilogram (mg/kg) for total petroleum hydrocarbons (TPH)-diesel-range organics (DRO). Samples 190B001 through 190B003 and sample 190B008 were collected immediately beneath the outlet pipe (location B01) from various depths down to 1.5 ft bgs. Results for TPH-DRO ranged from 164 mg/kg to

Table 2-1
Maximum Concentration of Detected
Contaminants for CAS 11-02-01, Underground Centrifuge

Constituent	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
Anthracene	0.0101 (J)	190A002	0.0 - 0.5	A01	100,000	mg/kg
Benzo(a)anthracene	0.0179 (J)	190A002	0.0 - 0.5	A01	2.1	mg/kg
Benzo(a)pyrene	0.0451 (J)	190A001	0.0 - 0.5	A01	0.21	mg/kg
Benzo(b)fluoranthene	0.0355 (J)	190A001	0.0 - 0.5	A01	2.1	mg/kg
Benzo(g,h,i)perylene	0.065 (J)	190A001	0.0 - 0.5	A01	29,000	mg/kg
Benzo(k)fluoranthene	0.0371 (J)	190A001	0.0 - 0.5	A01	21	mg/kg
Benzoic acid	0.445 (J)	190A002	0.0 - 0.5	A01	100,000	mg/kg
Chrysene	0.0256 (J)	190A001	0.0 - 0.5	A01	210	mg/kg
Dibenzo(a,h)anthracene	0.164 (J)	190A001	0.0 - 0.5	A01	0.21	mg/kg
Diesel-Range Organics	11.4	190A003	0.0 - 0.5	A02	N/A[a]	mg/kg
Indeno(1,2,3-cd)pyrene	0.143 (J)	190A001	0.0 - 0.5	A01	2.1	mg/kg

[a]The FAL for TPH-DRO was established as the FALs of the individual hazardous constituents of TPH-DRO (see Appendix C).

bgs = Below ground surface
FAL = Final action level
ft = Foot

mg/kg = Milligrams per kilogram
N/A = Not applicable

J = Estimated value

1,850 mg/kg. The TPH-DRO was moved to a Tier 2 evaluation and no hazardous constituents of TPH-DRO exceeded their corresponding FALs, except for benzo(a)pyrene.

Concentrations of semivolatile organic compounds (SVOCs) that exceeded the FALs were detected at two locations (B01 and B02) in the surface soil (0.0 to 0.5 ft bgs). Benzo(a)pyrene was detected at 0.282 mg/kg, which exceeds the FAL of 0.21 mg/kg. Dibenzo(a,h)anthracene was detected at 0.305 mg/kg, which exceeds the FAL of 0.21 mg/kg.

These COCs were limited to the near-surface interval (0.0 to 1.5 ft bgs), where concentrations decreased laterally to below the FALs within 5 ft of the outfall, and decrease to values below the FALs within the top 1.5 ft of soil. The distribution of the data suggests that the contamination resulted from pipe outfall discharge.

During closure activities, the two water tanks and cooling tower were verified empty of contents and disassembled for removal and disposal at the U-10C Landfill. The steel drainage pipe (100 ft) and impacted soil at the pipe outfall (approximately 75 cubic feet [ft^3]) were also disposed of at the U10C Landfill. Verification samples (see Section A.4.0, samples 190B012 through 190B017) around the removed soil area indicated that no COCs remain.

The maximum concentration of each detected contaminant at this CAS is listed in Table 2-2. Values exceeding the action level are indicated in bold.

Table 2-2
Maximum Concentration of Detected
Contaminants for CAS 11-02-02, Drain Lines and Outfall
(Page 1 of 2)

Constituent	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
2-Butanone	0.0146 (J)	190B001	0.0 - 0.5	B01	110,000	mg/kg
2-Hexanone	0.393	190B001	0.0 - 0.5	B01	110,000	mg/kg
2-Methylnaphthalene	0.00777 (J)	190B004	0.0 - 0.5	B02	190	mg/kg
Acenaphthene	0.0745 (J)	190B004	0.0 - 0.5	B02	29,000	mg/kg
Acetone	0.0283	190B001	0.0 - 0.5	B01	54,000	mg/kg
Actinium-228	1.9	190B002	0.0 - 0.5	B01	5	pCi/g
Anthracene	0.125 (J)	190B004	0.0 - 0.5	B02	100,000	mg/kg
Arsenic	12.6	190B002	0.0 - 0.5	B01	23	mg/kg
Barium	238 (J-)	190B002	0.0 - 0.5	B01	67,000	mg/kg
Benzo(a)anthracene	0.306 (J)	190B004	0.0 - 0.5	B02	2.1	mg/kg
Benzo(a)pyrene	**0.282**	190B004	0.0 - 0.5	B02	0.21	mg/kg
Benzo(b)fluoranthene	0.345	190B004	0.0 - 0.5	B02	2.1	mg/kg
Benzo(g,h,i)perylene	0.242 (J)	190B004	0.0 - 0.5	B02	29,000	mg/kg
Benzo(k)fluoranthene	0.129 (J)	190B004	0.0 - 0.5	B02	21	mg/kg
Bis(2-ethylhexyl)phthalate	0.0737 (J)	190B008	1 - 1.5	B01	120	mg/kg
Cadmium	0.56	190B002	0.0 - 0.5	B01	450	mg/kg
Carbazole	0.0625 (J)	190B004	0.0 - 0.5	B02	86	mg/kg
Chromium	19.8	190B003	0.5 - 1.0	B01	450	mg/kg
Chrysene	0.347	190B004	0.0 - 0.5	B02	210	mg/kg

Table 2-2
Maximum Concentration of Detected
Contaminants for CAS 11-02-02, Drain Lines and Outfall
(Page 2 of 2)

Constituent	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
Dibenzo(a,h)anthracene	**0.305 (J)**	190B003	0.5 - 1.0	B01	0.21	mg/kg
Diesel-Range Organics	**1,850**	190B001	0.0 - 0.5	B01	N/A[a]	mg/kg
Fluoranthene	0.657	190B004	0.0 - 0.5	B02	22,000	mg/kg
Fluorene	0.0399 (J)	190B004	0.0 - 0.5	B02	26,000	mg/kg
Gasoline-Range Organics	0.793 (J)	190B001	0.0 - 0.5	B01	100	mg/kg
Indeno(1,2,3-cd)pyrene	0.271 (J)	190B003	0.5 - 1.0	B01	2.1	mg/kg
Lead	104 (J-)	190B003	0.5 - 1.0	B01	800	mg/kg
Lead-212	1.91	190B003	0.5 - 1.0	B01	5	pCi/g
Lead-214	1.28	190B001	0.0 - 0.5	B01	5	pCi/g
Mercury	0.019 (J)	190B003	0.5 - 1.0	B01	310	mg/kg
Phenanthrene	0.509	190B004	0.0 - 0.5	B02	100,000	mg/kg
Pyrene	0.567	190B004	0.0 - 0.5	B02	29,000	mg/kg
Silver	1.7 (J)	190B003	0.5 - 1.0	B01	5,100	mg/kg
Thallium-208	0.605	190B001	0.0 - 0.5	B01	5	pCi/g

[a]The FAL for TPH-DRO was established as the FALs of the individual hazardous constituents of TPH-DRO (see Appendix C).

bgs = Below ground surface
FAL = Final action level
ft = Foot
mg/kg = Milligrams per kilogram
N/A = Not applicable
pCi/g = Picocuries per gram

J = Estimated value
J- = The result is an estimated quantity, but the result may be biased low.
Values exceeding the action level are indicated in bold.

2.2.1.3 Tweezer Facility Septic System (CAS 11-59-01)

Based on field observations and the analytical results for soil, Orangeburg pipe, and septage samples collected within CAS 11-59-01, the only COCs that were identified are chromium and benzo(a)pyrene. Benzo(a)pyrene was detected at 0.347 mg/kg, which exceeds the FAL of 0.21 mg/kg. Chromium was detected below a crack in the effluent pipe coming from the septic tank at 463 mg/kg, which exceeds the FAL of 450 mg/kg.

The chromium is limited to the interval just below the effluent pipe coming from the septic tank that was observed to be cracked. Concentrations decrease vertically to concentrations below the FALs at the sample collected at the base of the tank. The extent of this contamination was limited to the area just below the pipe.

Benzo(a)pyrene was detected just below the leachpipe at location C15. A deeper sample was collected at this location and did not contain benzo(a)pyrene. A sample was collected of the Orangeburg pipe and results showed high concentrations of benzo(a)pyrene. Decision II (verification samples) sampling activities included the collection of three samples at this location at a radius approximately 3 ft from the initial location. Results in Appendix A indicate that COCs have not migrated to these three locations.

A corrective action of clean closure ensured removal of the COC-impacted soil, the potential source material (PSM) inside the septic tank, and the Orangeburg pipe. No COCs remain at this CAS.

As a best management practice (BMP), the septic tank, distribution box, and surface debris, were removed. See Appendix D for closure activities performed at this CAS.

The maximum concentration of each detected contaminant at this CAS is listed in Table 2-3. Values exceeding the action level are indicated in bold.

Table 2-3
Maximum Concentration of Detected
Contaminants for CAS 11-59-01, Tweezer Facility Septic System
(Page 1 of 3)

Constituent	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
1,4-Dichlorobenzene	0.000384 (J)	190C004	0.0 - 0.5	C03	7.9	mg/kg
2,3,4,6-Tetrachlorophenol	0.162 (J)	190C010	0.0 - 1.0	C06	18,000	mg/kg
Acenaphthene	0.018 (J)	190C020	0.0 - 1.0	C15	29,000	mg/kg
Acetone	0.00678 (J)	190C021	3.0 - 4.0	C15	54,000	mg/kg
Actinium-228	2.45	190C004	0.0 - 0.5	C03	5	pCi/g
Anthracene	0.0908 (J)	190C020	0.0 - 1.0	C15	100,000	mg/kg
Aroclor 1242	0.0039 (J)	190C023	0.0 - 1.0	C16	0.74	mg/kg
Aroclor 1254	0.064 (J)	190C004	0.0 - 0.5	C03	0.74	mg/kg

Table 2-3
Maximum Concentration of Detected
Contaminants for CAS 11-59-01, Tweezer Facility Septic System
(Page 2 of 3)

Constituent	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
Aroclor 1260	0.0175 (J)	190C004	0.0 - 0.5	C03	0.74	mg/kg
Arsenic	6.7	190C001	0.0 - 0.5	C02	23	mg/kg
Barium	344 (J)	190C021	3.0 - 4.0	C15	67,000	mg/kg
Benzo(a)anthracene	0.443	190C020	0.0 - 1.0	C15	2.1	mg/kg
Benzo(a)pyrene	**0.347**	190C020	0.0 - 1.0	C15	0.21	mg/kg
Benzo(b)fluoranthene	0.623 (J)	190C020	0.0 - 1.0	C15	2.1	mg/kg
Benzo(g,h,i)perylene	0.179 (J)	190C020	0.0 - 1.0	C15	29,000	mg/kg
Benzo(k)fluoranthene	0.0132 (J)	190C010	0.0 - 1.0	C06	21	mg/kg
Benzoic Acid	0.5 (J)	190C010	0.0 - 1.0	C06	100,000	mg/kg
Beryllium	1.1	190C017	0.0 - 1.0	C13	1,900	mg/kg
Bis(2-ethylhexyl)phthalate	1.99	190C030	2.0 - 3.0	C15C	120	mg/kg
Cadmium	0.59	190C002	0.0 - 0.5	C02	450	mg/kg
Carbazole	0.0845 (J)	190C020	0.0 - 1.0	C15	86	mg/kg
Chromium	**463**	190C004	0.0 - 0.5	C03	450	mg/kg
Chrysene	0.395	190C020	0.0 - 1.0	C15	210	mg/kg
Dibenzo(a,h)anthracene	0.154 (J)	190C020	0.0 - 1.0	C15	0.21	mg/kg
Diesel-Range Organics	74.9 (J)	190C020	0.0 - 1.0	C15	100	mg/kg
Fluoranthene	0.832	190C020	0.0 - 1.0	C15	22,000	mg/kg
Fluorene	0.0199 (J)	190C020	0.0 - 1.0	C15	26,000	mg/kg
Gasoline-Range Organics	0.0393 (J)	190C005	0.0 - 0.5	C03	100	mg/kg
Indeno(1,2,3-cd)pyrene	0.231 (J)	190C020	0.0 - 1.0	C15	2.1	mg/kg
Lead	30.7	190C001.	0.0 - 0.5	C02	800	mg/kg
Lead-212	1.97	190C024	0.0 - 1.0	C17	5	pCi/g
Lead-214	1.39	190C010	0.0 - 1.0	C06	5	pCi/g
Mercury	0.046 (J)	190C026	0.0 - 1.0	C19	310	mg/kg
Methylene Chloride	0.00248 (J)	190C015	0.0 - 1.0	C11	21	mg/kg
Pentachlorophenol	0.183 (J)	190C010	0.0 - 1.0	C06	9	mg/kg
Phenanthrene	0.351	190C020	0.0 - 1.0	C15	100,000	mg/kg

Table 2-3
Maximum Concentration of Detected
Contaminants for CAS 11-59-01, Tweezer Facility Septic System
(Page 3 of 3)

Constituent	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
Pyrene	0.559	190C020	0.0 - 1.0	C15	29,000	mg/kg
Selenium	2.2	190C008	0.0 - 0.5	C05	5,100	mg/kg
Silver	874	190C023	0.0 - 1.0	C16	5,100	mg/kg
Styrene	0.00067 (J)	190C010	0.0 - 1.0	C06	1,700	mg/kg
Thallium-208	0.76	190C015	0.0 - 1.0	C11	5	pCi/g
Toluene	0.000468 (J)	190C004	0.0 - 0.5	C03	520	mg/kg

bgs = Below ground surface
FAL = Final action level
ft = Foot
mg/kg = Milligrams per kilogram
pCi/g = Picocuries per gram

J = Estimated value
Values exceeding the action level are indicated in bold.

2.2.1.4 LTU-6 Test Area (CAS 14-23-01)

Based on the observations, the radiological surveys conducted, and the analytical results of the environmental samples collected, no COCs are present in the soil at this CAS. However, some pieces of debris were found to be contaminated with depleted uranium (DU). Therefore, a corrective action of clean closure ensured removal of the DU-contaminated debris.

The maximum concentration of each detected contaminant at this CAS is listed in Table 2-4

2.2.2 Data Assessment Summary

The DQA is presented in Appendix B and includes an evaluation of the DQIs to determine the degree of acceptability and usability of the reported data in the decision-making process. The DQO process ensures that the right type, quality, and quantity of data will be available to support the resolution of those decisions at an appropriate level of confidence. Using both the DQO and DQA processes helps to ensure that DQO decisions are sound and defensible.

Table 2-4
Maximum Concentration of Detected Contaminants for CAS 14-23-01, LTU-6 Test Area

Constituent	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
Actinium-228	2.13	190D001	0.0 - 0.5	D01	5	pCi/g
Arsenic	4.9 (J)	190D015	0.5 - 1.0	D14	23	mg/kg
Barium	249 (J)	190D002	0.0 - 0.5	D01	67,000	mg/kg
Benzoic Acid	0.421 (J)	190D501	0.0 - 0.5	D01	100,000	mg/kg
Beryllium	1.4	190D005	0.0 - 0.5	D04	1,900	mg/kg
Beryllium	1.4	190D007	0.0 - 0.5	D06	1,900	mg/kg
Cadmium	0.25 (J)	190D015	0.5 - 1.0	D14	450	mg/kg
Cesium-137	0.225	190D003	0.0 - 0.5	D02	12.2	pCi/g
Chromium	12.8	190D002	0.0 - 0.5	D01	450	mg/kg
Dibenzo(a,h)anthracene	0.103 (J)	190D501	0.0 - 0.5	D01	0.21	mg/kg
Diesel-Range Organics	1.85 (J)	190D501	0.0 - 0.5	D01	100	mg/kg
Indeno(1,2,3-c,d)pyrene	0.0856 (J)	190D501	0.0 - 0.5	D01	2.1	mg/kg
Lead	25	190D002	0.0 - 0.5	D01	800	mg/kg
Lead-212	2.11 (J)	190D015	0.5 - 1.0	D14	5	pCi/g
Lead-214	1.34	190D004	0.0 - 0.5	D03	5	pCi/g
Mercury	0.035 (J)	190D007	0.0 - 0.5	D06	310	mg/kg
Selenium	1.8	190D007	0.0 - 0.5	D06	5,100	mg/kg
Silver	0.84 (J)	190D015	0.5 - 1.0	D14	5,100	mg/kg
Styrene	0.000701 (J)	190D501	0.0 - 0.5	D01	1,700	mg/kg
Thallium-208	0.751	190D001	0.0 - 0.5	D01	5	pCi/g
Thorium-234	4.41	190D015	0.5 - 1.0	D14	105	pCi/g
Toluene	0.000572 (J)	190D501	0.0 - 0.5	D01	520	mg/kg
Uranium-234	1.48	190D015	0.5 - 1.0	D14	143	pCi/g
Uranium-238	3.61	190D015	0.5 - 1.0	D14	105	pCi/g

bgs = Below ground surface
FAL = Final action level
ft = Foot

mg/kg = Milligrams per kilogram
pCi/g = Picocuries per gram

J = Estimated value

The DQA process (see Appendix B) is comprised of the following:

- Step 1: Review DQOs and Sampling Design.
- Step 2: Conduct a Preliminary Data Review.
- Step 3: Select the Test.
- Step 4: Verify the Assumptions.
- Step 5: Draw Conclusions from the Data.

Sample locations that support the presence and/or extent of contamination at each CAS are shown in Appendix A. Based on the results of the DQA presented in Appendix B, the DQO requirements have been met. The DQA also determined that information generated during the investigation supports the CSM assumptions, and the data collected support their intended use in the decision-making process.

2.3 Justification for No Further Action

No further corrective action is justified at CAU 190 based on an evaluation of risk to ensure protection of the public and the environment in accordance with *Nevada Administrative Code* (NAC) 445A (NAC, 2006a), feasibility, and cost effectiveness. The decision that no further action is needed was determined from DQO decision statements based on a comparison of the analyte concentrations in soil remaining at CAU 190 CASs to the FALs defined in Section 2.3.1.

All PSM and COC-impacted soils at CASs 11-02-02, 11-59-01, and 14-23-01 were removed during closure activities discussed in Appendix D. At CAS 14-23-01, removal of the metallic fragments (i.e., PSM) was performed during closure activities.

As a BMP at CAS 11-02-02, the cooling tower and associated steel pipe leading to the outfall, and two aboveground water tanks and piping were removed. At CAS 11-59-01, the septic tank, distribution box, and surface debris were removed. See Appendix D for additional closure activities performed at these CASs.

2.3.1 Final Action Levels

The CAU 190 FALs are risk-based cleanup goals that, if met, will ensure that each release site will not pose an unacceptable risk to human health and the environment and that conditions at each site are in compliance with applicable laws and regulations. The risk-based corrective action (RBCA) process used to establish FALs is described in the *Industrial Sites Project Establishment of Final*

Action Levels (NNSA/NSO, 2006b). This process conforms with NAC Section 445A.227, which lists the requirements for sites with soil contamination (NAC, 2006b). For the evaluation of corrective actions, NAC Section 445A.22705 (NAC, 2006c) requires the use of American Society for Testing and Materials (ASTM) Method E 1739-95 (ASTM, 1995) to "conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards (i.e., FALs) or to establish that corrective action is not necessary."

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

- Tier 1 evaluation – Sample results from source areas (highest concentrations) are compared to action levels based on generic (nonsite-specific) conditions (i.e., the PALs established in the CAIP [NNSA/NSO, 2006a]). The FALs may then be established as the Tier 1 action levels or the FALs may be calculated using a Tier 2 evaluation.

- Tier 2 evaluation – Conducted by calculating Tier 2 site-specific target levels (SSTLs) using site-specific information as inputs to the same or similar methodology used to calculate Tier 1 action levels. The Tier 2 SSTLs are then compared to individual sample results from reasonable points of exposure (as opposed to the source areas as is done in Tier 1) on a point-by-point basis. Total TPH concentrations will not be used for risk-based decisions under Tier 2 or Tier 3. Rather, the individual chemicals of concern will be compared to the SSTLs.

- Tier 3 evaluation – Conducted by calculating Tier 3 SSTLs on the basis of more sophisticated risk analyses using methodologies described in Method E 1739-95 that consider site-, pathway-, and receptor-specific parameters (ASTM, 1995).

A Tier 1 evaluation was conducted for all COPCs to determine whether contaminant levels satisfy the criteria for a quick regulatory closure or warrant a more site-specific assessment. This was accomplished by comparing individual source area contaminant concentration results to the Tier 1 action levels (the PALs established in the CAIP [NNSA/NSO, 2006a]).

The constituents detected that exceeded Tier 1 action levels at the CAU 190 CASs were:

- TPH at CAS 11-02-02.
- SVOCs at CASs 11-02-02 and 11-59-01.
- Metals at CAS 11-59-01.

The FALs were established as the Tier 1 action levels for all contaminants at each CAU 190 CAS.

3.0 Recommendation

No further corrective action is required at CAU 190. Selection of this corrective action is consistent with past practices for CASs that do not contain COCs or where COCs and PSM have been removed under a corrective action.

The NNSA/NSO requests that NDEP issue a Notice of Completion for this CAU and approval to move the CAU from Appendix III to Appendix IV of the FFACO.

4.0 References

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Appendix A

Corrective Action Investigation Results

A.1.0 Introduction

This appendix presents the CAI activities and analytical results for CAU 190. Corrective Action Unit 190 is located in Areas 11 and 14 of the NTS (Figure 1-1), and is comprised of the four CASs listed below:

- 11-02-01, Underground Centrifuge
- 11-02-02, Drain Lines and Outfall
- 11-59-01, Tweezer Facility Septic System
- 14-23-01, LTU-6 Test Area

Three CASs are located within the Tweezer Facility in Area 11 of the NTS and consist of an underground centrifuge, drain lines and outfall, and a septic system and leachfield (Figure A.1-1). The fourth site is at the LTU-6 Test Area in the northern part of Area 14, near the Mine Mountain Road and Mid Valley Road (Saddle Mountain Road) junction. This site consists of potentially contaminated soil from the ejected debris from MX missile testing.

Additional information regarding the history of each site, planning, and the scope of the investigation is presented in the CAU 190 CAIP (NNSA/NSO, 2006a).

A.1.1 Project Objectives

The investigation provided sufficient information to document completion of appropriate corrective actions for each CAU 190 CAS and supports a recommendation for closure of the CAU 190 CASs. This objective was achieved by identifying the absence of COCs.

The selection of soil and/or waste characterization sample locations was based on site conditions, and the strategy developed during the DQO process as outlined in the CAIP (NNSA/NSO, 2006a). The sampling strategy implemented a judgmental sampling approach at all of the CAU 190 CASs.

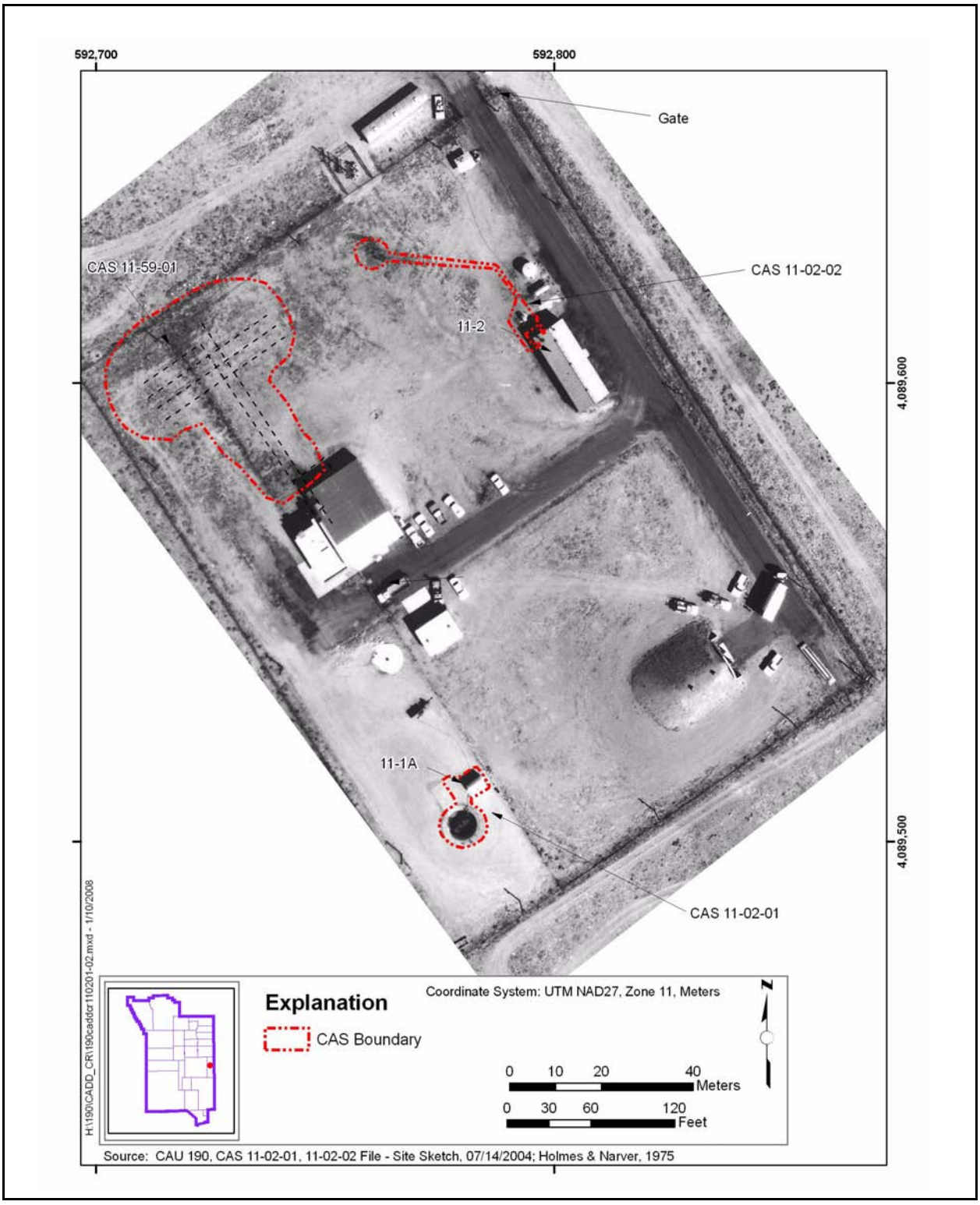

Figure A.1-1
Tweezer Facility CAS Locations

A.1.2 Content

This appendix describes the investigation and presents the results, and the contents are as follows:

- Section A.1.0 describes the investigation background, objectives, and content.
- Section A.2.0 provides an investigation overview.
- Sections A.3.0 through A.6.0 provide CAS-specific information regarding the field activities, sampling methods, and laboratory analytical results from investigation sampling.
- Section A.7.0 summarizes waste management activities.
- Section A.8.0 discusses the QA and QC processes followed and the results of QA/QC activities.
- Section A.9.0 provides a summary of the investigation results.
- Section A.10.0 lists the 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 in hard copy and electronic media.

A.2.0 Investigation Overview

Field investigation and sampling activities for the CAU 190 CAI were conducted from March 21 through April 11, 2007. Additional activities were conducted from May 2 through June 26, 2007. Table A.2-1 lists the CAI activities that were conducted at each CAS.

The investigation and sampling program was managed in accordance with the requirements set forth in the CAIP (NNSA/NSO, 2006a). Samples were collected and documented following the CAIP. Quality control samples (e.g., field blanks, equipment rinsate blanks, trip blanks, and duplicate samples) were collected as required by the Industrial Sites QAPP (NNSA/NV, 2002) and the CAIP. During field activities, waste minimization practices were followed according to approved procedures, including segregation of waste by waste type.

Weather conditions at the site varied to include sun (moderate temperatures), normal rainfall, intermittent cloudiness, and light to strong winds. Rain and lightning delayed site operations at the Tweezer Facility. Strong wind gusts delayed site operations due to the potential for airborne debris while collecting samples.

The CASs were investigated by conducting radiological surface screening and surveys, and sampling potential contaminant sources, surface and subsurface soils. Surface soil samples were collected by hand excavation. Subsurface soil samples were collected using hand augering or a backhoe. The soil samples were field screened at specific locations for VOCs, alpha and beta/gamma radiation. The results were compared to screening levels to guide in the CAS-specific investigations. Samples of various media (e.g., septage, Orangeburg pipe, sediments) were collected to support both environmental and waste characterization using teflon bailers and scoops, scrabbling, and a peristaltic pump with mylar tubing.

Except as noted in the following CAS-specific sections, CAU 190 Decision I sampling locations were accessible and sampling activities at planned locations were not restricted. Decision II step-out sample locations were accessible and remained within anticipated spatial boundaries.

Sections A.2.1 through A.2.4 provide the investigation methodology, site geology and hydrology, and laboratory analytical information.

Table A.2-1
Corrective Action Investigation Activities Conducted at Each Corrective Action Site To Meet Corrective Action Investigation Plan Requirements for CAU 190

Corrective Action Investigation Activities	Corrective Action Site			
	11-02-01	11-02-02	11-59-01	14-23-01
Inspected and verified the CAS components identified in the Corrective Action Investigation Plan.	X	X	X	X
Performed site walkovers to identify biased sampling locations.	X	X	X	X
Conducted scanning radiological walkover surveys (i.e., soil, concrete surfaces, debris) using a handheld detector and a global positioning system (GPS) receiver with a TSCITM data logger.	--	--	--	X
Performed swipe sampling for removable radioactivity using a handheld survey instrument and/or a gamma scintillator (Building 23-153, Mercury, NV).	X	--	--	X
Collected biased soil samples.	X	X	X	X
Collected soil samples from step-out sample locations (Decision II) based on the outer boundary sample locations where contaminants of concern were detected in Decision I soil samples.	--	X	X	--
Field screened samples for alpha and beta/gamma radiation using a handheld survey instrument.	X	X	X	X
Analyzed samples for gamma radiation using a high-purity germanium gamma spectrometer (Building 23-153, Mercury, NV).	--	--	--	X
Field screened samples for volatile organic compounds using the headspace method and a flame-ionization detector or photoionization detector.	--	--	X	--
Collected liquid and sludge samples from the contents of septic system components for waste characterization to support disposal recommendations and determine whether the waste could be a potential source of contamination for the environment (i.e., soil).	--	--	X	--
Conducted video surveys using a video-mole survey instrument to verify the features of a component and identify pipe contents or breaches in the associated piping.	--	--	X	--
Conducted analysis for total fecal coliform bacteria for the protection of workers and offsite laboratory personnel.	--	--	X	--
Submitted select samples for offsite laboratory analysis.	X	X	X	X
Collected GPS coordinates for sample locations and points of interest.	X	X	X	X

-- = Not applicable

A.2.1 Sample Locations

Investigation locations selected for sampling were based on interpretation of existing engineering drawings, aerial and land photographs, interviews with former and current site employees, information obtained during site visits, and site conditions as provided in the CAIP (NNSA/NSO, 2006a). Sampling points for each site were selected based on the approach provided in the CAIP. The planned biased sample locations are discussed in text and represented on figures in the CAIP. Actual environmental sample locations are shown on the figures included in Sections A.3.0 through A.6.0. Some locations were modified slightly from planned positions due to field conditions and observations. In some cases, FSRs and/or laboratory analytical results determined the need for step-out sampling locations. Sample locations were staked where appropriate and labeled. The sample locations were surveyed with a GPS instrument. A Trimble Pathfinder ProXRSTM GPS instrument was used to determine the sample location coordinates and CAS points of interest. Appendix F presents these data in a tabular format.

A.2.2 Investigation Activities

The investigation activities as listed in Table A.2-1 performed at CAU 190 were consistent with the field investigation activities stipulated in the CAIP (NNSA/NSO, 2006a). The investigation strategy allowed the nature and extent of contamination associated with each CAS to be established. The following sections describe the specific investigation activities that took place at CAU 190.

A.2.2.1 Radiological Surveys

Radiological surveys (i.e., direct scanning and static, and swipe collection) were performed at CASs 11-02-01 and 14-23-01 during the CAI. Radiological surveys were performed to identify the presence, the nature, and the extent of radiological contaminants at activities statistically distinguishable from background activities.

A.2.2.2 Field Screening

Field-screening activities for VOCs and alpha and beta/gamma radiation were performed as specified in the CAIP (NNSA/NSO, 2006a). The FSL for VOC headspace was established at 20 parts per million (ppm) or 2.5 times background, whichever was greater. 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 material collected at 10 background locations selected near each CAS. The radiation FSLs are instrument-specific and were established for each instrument and CAS before use. The FSLs for gamma-emitting radionuclides were compared to the PALs established in the CAIP.

The CAS-specific sections of this document identify the CASs where field screening was conducted and how the FSLs were used to aid in the selection of sample locations. The FSRs are recorded on SCLs that are retained in project files.

A.2.2.3 Piping and Septic Tank Inspections

At CAS 11-59-01 the pipe, tank, and system component inspection of surface (riser pipes, access hatches, and tie-ins) and subsurface (riser pipe connections, septic tank inlet and outlet pipes, possible breach areas in piping) features was conducted using a video surveyor, or by exposing the component and performing a visual inspection. Notes in the FADL and field maps provide documentation of the integrity of the individual components. The following subsection provides details of investigation techniques that were used to verify the integrity of the pipe, tank, and system components.

The following three steps were used to inspect and sample the septic tank:

- A visual inspection of the interior of the tank above the fluid level was performed to note items such as chambers present, provide access for measurement of the phases, estimation of the amount of contents, condition of the interior of the tank, and condition of the contents.
- Samples were collected of the individual phases of contents. Liquid and sludge samples were the only phases present. All septic tank samples were field screened for fecal coliform. Results of the fecal coliform screenings were negative and are maintained in the project files.
- Integrity of the tanks was evaluated by excavating to the base of each tank and verifying that there had not been a release from the tanks. A crack was observed on the effluent pipe. Samples were collected from below the inlet and outlet of each tank. Visual observations were recorded in the FADL and on the SCLs.

A video-mole survey was conducted using a video camera on septic system surface or subsurface piping to identify residual material, breaches, or unknown tie-ins. No breaches in the piping were identified during the video-mole survey; therefore, soil sample collection was not required beneath

piping. Residual material (e.g., pebbles, twigs) identified in the piping by the video-mole surveys were not sampled due to inadequate material and volume. Sections of piping that were breached to gain access for the video mole and/or to collect samples were grouted.

A.2.2.4 Surface and Subsurface Soil Sampling

Soil samples were collected using "scoop and trowel" (surface hand-grab sampling) and hand auger. All sample locations were initially field screened for alpha and beta/gamma radiation before the start of sampling. Additional screening was conducted during sample collection to both guide the investigation and serve as a health and safety control to protect the sampling team. Labeled sample containers were filled according to the following sequence: VOCs and TPH-gasoline-range organics (GRO) sample containers were filled with soil directly from the sample location, followed by the collection of soil for VOC field screening using headspace analysis. Additional soil was transferred into a stainless-steel bowl, homogenized, and field screened for alpha and beta/gamma radiation. Samples for the analysis of gamma radiation and TPH-DRO were then collected from the homogenized soil, and then all remaining sample containers were filled. To reduce the number of sample jars used or if matrix volumes were limited, samples collected for VOC field screening were used for TPH field screening after the headspace analysis was completed. Excess soil was returned to its original location and the sample containers appropriately disposed (based on FSRs and/or analytical results).

Surface soil samples were collected from 0.0 to 0.5 ft bgs at biased locations focusing on stained soil, aboveground features (i.e., pipe opening), or areas with elevated radiological measurements. Subsurface soil samples were collected as a continuation at surface soil sample locations where staining was noted, and/or FSRs and analytical results indicated contamination. Subsurface soil samples were also collected from the soil horizon at the base of septic system components (i.e., tanks, boxes, piping) to evaluate the structural integrity of the components.

A.2.2.5 Waste Characterization Sampling

Characterization of CAS-specific components, objects, materials, and waste was performed to support disposal of these potential remediation wastes and to determine whether the waste in question

at these CASs could be PSM. Investigation methods included visual inspection, radiological surveys, and direct sampling of the contents of septic system components.

Samples were analyzed in accordance with the CAIP (NNSA/NSO, 2006a). The specific analyses for each CAS are listed in CAS-specific sections, and the analytical results are compared to the federal limits for hazardous waste, NDEP hydrocarbon action limit, landfill acceptance criteria, and the limits in the NTS performance objective criteria (POC) (BN, 1995). The POC limits have been established for NTS hazardous waste generators to ensure that all hazardous waste being shipped offsite contains no "added radioactivity."

Specific waste characterization sampling and analysis was conducted on the following potential waste streams:

- Swipe samples collected from lead bricks at CAS 11-02-01.
- The presumed asbestos-containing material (PACM) samples collected from insulation covering the water tanks and cooling tower piping at CAS 11-02-02 and from the Orangeburg pipe at CAS 11-59-01.
- Liquid samples of the hydraulic fluid in the hoses at CAS 11-02-01.
- Septage from CAS 11-59-01.
- The Orangeburg pipe at CAS 11-59-01.

Asbestos sampling was conducted at CAS 11-02-02 following the U.S. Environmental Protection Agency (EPA) guidance document, *Asbestos in Buildings: Simplified Sampling Scheme for Friable Surfacing Materials* (EPA, 1985). Three independently numbered samples were collected from insulation to determine whether PACM is present. Sample locations were selected to be representative of the sampling area and material sampled. For very small areas (less than 1,000 square feet), collecting three samples per homogeneous area is the recommended procedure (EPA, 1985).

A.2.3 Laboratory Analytical Information

Radiological and chemical analyses were performed by General Engineering Laboratories, LLC, of Charleston, South Carolina. Asbestos samples were analyzed by Data Chem Laboratories of Salt

Lake City, Utah. The analytical suites and laboratory analytical methods used to analyze investigation samples are listed in Table A.2-2. Analytical results are reported in this appendix if they were detected above the minimum detectable concentrations (MDCs). The complete laboratory data packages are retained in the project files.

Table A.2-2
Laboratory Analytical Parameters and Methods, CAU 190 Investigation Samples[a]
(Page 1 of 2)

Analytical Parameter	Analytical Method[b]
Volatile Organic Compounds	EPA SW-846 8260B[c]
Semivolatile Organic Compounds	EPA SW-846 8270C[c]
RCRA Metals[d] Plus Beryllium	EPA SW-846 6010B/7470A/7471A[c]
TPH-DRO	EPA SW-846 8015[c] Modified
TPH-GRO	EPA SW-846 8015[c] Modified
Polychlorinated Biphenyls	EPA SW-846 8082[c]
Pesticides	EPA SW-846 8081A[c]
Explosives	EPA SW-846 8330[c]
Herbicides	EPA SW-846 8151A[c]
TCLP Volatile Organic Compounds	EPA SW-846 1311/8260B[c]
TCLP Semivolatile Organic Compounds	EPA SW-846 1311/8270C[c]
TCLP Herbicides	EPA SW-846 1311/8151A[c]
TCLP Pesticides	EPA SW-845 1311/8081A[c]
TCLP Metals[d]	EPA SW-846 1311/6010B/7470A[c]
Asbestos	NIOSH 9002[e]
Gamma Spectroscopy	DOE EML HASL 300[f] Approved Laboratory SOPs[g]
Isotopic Uranium	DOE EML HASL-300[f] U-02-RC Modified, Approved Laboratory SOPs[g]
Isotopic Plutonium	DOE EML HASL-300[f] PU-02-RC/PU-10-RC Modified, Approved Laboratory SOPs[g]
Strontium-90	EPA 905.0[h] Modified, Approved Laboratory SOPs[g]
Gross Alpha/Beta	EPA 900.0[h] Modified, Approved Laboratory SOPs[g]
Tritium	EPA 906.0[h] Modified, Approved Laboratory SOPs[g]

Table A.2-2
Laboratory Analytical Parameters and Methods, CAU 190 Investigation Samples[a]
(Page 2 of 2)

Analytical Parameter	Analytical Method[b]

[a]Investigation samples include both environmental and waste characterization samples and associated quality control samples.
[b]The most current EPA, DOE, ASTM, or NIOSH or equivalent accepted analytical method may be used.
[c]*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, 3rd edition, Parts 1-4, SW-846 CD-ROM (EPA, 1996).
[d]Arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver.
[e]*NIOSH Manual of Analytical Methods* (NMAM), Fourth Edition (NIOSH, 1994).
[f]*The Procedures Manual of the Environmental Measurements Laboratory*, HASL-300 (DOE, 1997).
[g]Laboratory Standard Operating Procedures approved by SNJV in accordance with industry standards and the SNJV Model Statement of Work requirements (SNJV, 2006).
[h]*Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EMSL/ORD, 1980).

Note: The term "modified" indicates modifications of approved methods. All modifications have been approved by the SNJV Analytical Services Department.

ASTM = American Society of Testing and Materials
DOE = U.S. Department of Energy
DRO = Diesel-range organics
EML = Environmental Measurements Laboratory
EPA = U.S. Environmental Protection Agency
GRO = Gasoline-range organics
HASL = Health and Safety Laboratory
NIOSH = National Institute for Occupational Safety and Health
RCRA = *Resource Conservation and Recovery Act*
SOP = Standard Operating Procedure
SNJV = Stoller-Navarro Joint Venture
TCLP = Toxicity Characteristic Leaching Procedure
TPH = Total petroleum hydrocarbons

Validated analytical data for CAU 190 investigation samples have been compiled and evaluated to confirm the presence of contamination and define the extent of contamination, if present. The analytical results for each CAS are presented in Sections A.3.0 through A.6.0.

The analytical parameters are CAS-specific and were selected through the application of site process knowledge as described in the CAIP DQOs (NNSA/NSO, 2006a). Samples collected during step-out sampling were only analyzed for the COPCs that exceeded FALs in the original samples. Soil samples for the analysis of geotechnical and hydrological properties were collected at locations representative of these properties for each CAS.

A.2.4 Comparison to Action Levels

A COC is defined as any contaminant present in environmental media exceeding a FAL. A COC may also be defined as a contaminant that, in combination with other like contaminants, is determined to jointly pose an unacceptable risk based on a multiple constituent analysis (NNSA/NSO, 2006b).

If COCs are present, corrective action must be considered for the CAS. The FALs for the CAU 190 investigation are defined for each CAS in Section 2.3.1. Results that are equal to or greater than FALs are identified by bold text in the CAS-specific results tables (Sections A.3.0 through A.6.0).

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

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

Sludge containing a contaminant exceeding an equivalent FAL concentration were considered to be PSM requiring a corrective action. Septic tank liquids with contaminant concentrations exceeding an equivalent toxicity characteristic action level were considered to be PSM requiring a corrective action.

A.3.0 Corrective Action Site 11-02-01, Underground Centrifuge

Corrective Action Site 11-02-01 is located at the Tweezer Facility east of Yucca Lake in Area 11 of the NTS (Figure A.3-1). The centrifuge was built to provide an acceleration environment for test components. Hydraulic fluid for the centrifuge was circulated through a pair of high-pressure hoses from a nearby pump house.The centrifuge measures 21.5 ft in diameter and 7.5 ft deep. A circular concrete pad surrounds the metal centrifuge, and the top is covered with a metal lid with an access hatch. The inside of the centrifuge contains a spindle and drainpipe connecting to a 5-by-5-by-3-ft gravel-filled drain sump in the floor of the centrifuge. The centrifuge is surrounded by a chain fence supported by several posts imbedded in the concrete.

The only component identified in the CAIP for investigation was the collection of soil samples from beneath the hydraulic hose end. Additional detail is provided in the CAIP (NNSA/NSO, 2006a).

A.3.1 Corrective Action Investigation

A total of three characterization samples (including one FD and one MS/MSD) were collected during investigation activities at CAS 11-02-01. The sample locations, IDs, types, and analyses are listed in Table A.3-1. The specific CAI activities conducted to satisfy the CAIP requirements at this CAS (NNSA/NSO, 2006a) are described in the following sections.

A.3.1.1 Field Screening

Investigation samples were field screened for alpha and beta/gamma radiation. The FSLs were not exceeded in samples collected at this CAS.

A.3.1.2 Radiological Surveys

Radiological swipe and direct static and scanning surveys were conducted on the lead bricks that were removed from the centrifuge for waste disposal purposes. Results from these surveys showed that the removable and total (fixed and removable) contamination values were below levels in the NV/YMP RadCon Manual Table 4-2 (NNSA/NSO, 2004). Therefore, the bricks could be released to uncontrolled areas.

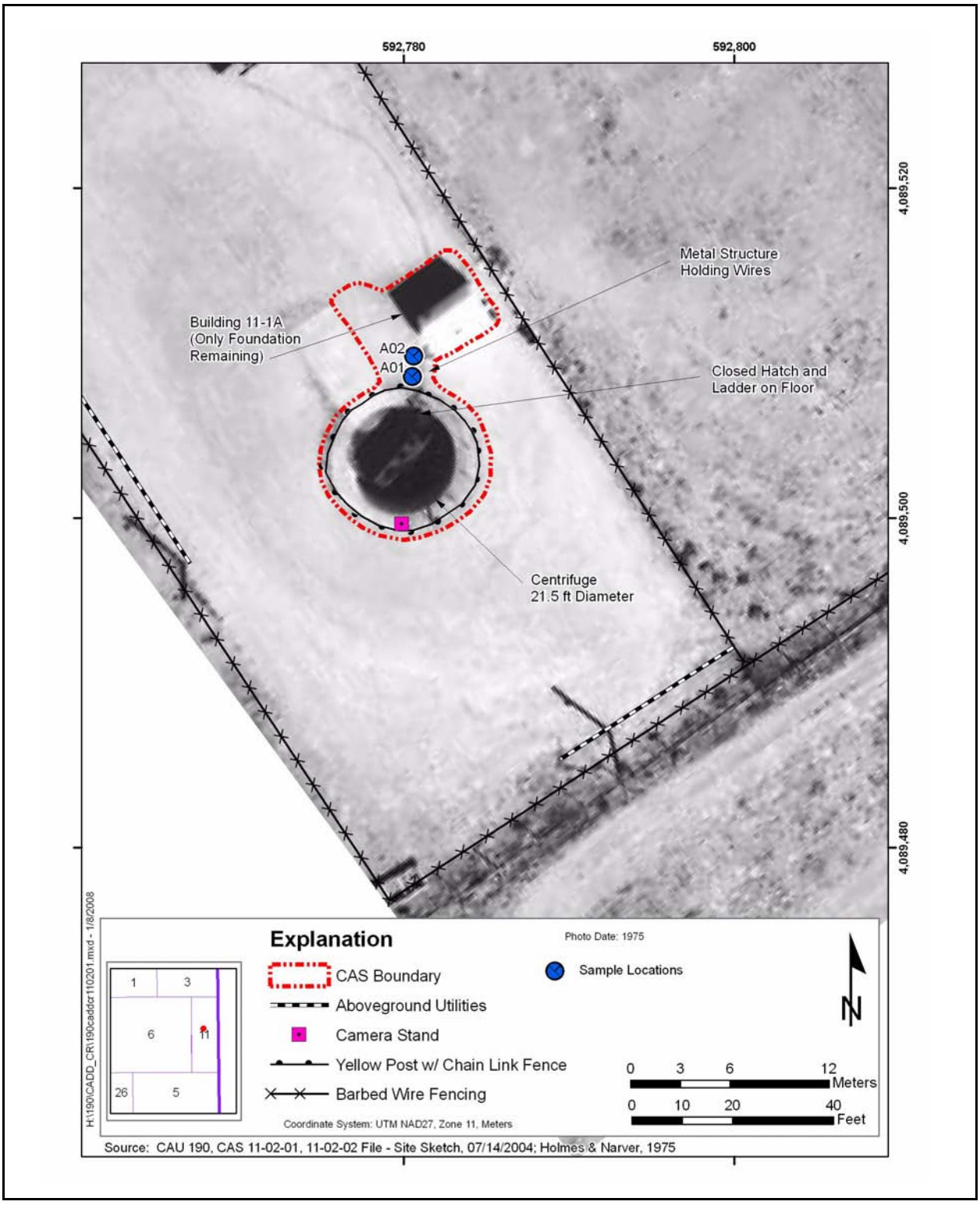

Figure A.3-1
Sample Locations at CAS 11-02-01, Underground Centrifuge

Table A.3-1
Samples Collected at CAS 11-02-01, Underground Centrifuge

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
A01	190A001	0.0 - 0.5	Soil	Environmental	Set 1
	190A002	0.0 - 0.5	Soil	Field Duplicate of #190A001	Set 1
A02	190A003	0.0 - 0.5	Soil	Environmental, MS/MSD	Set 1
N/A	190A301	N/A	Water	Trip Blank	VOCs

Set 1 = VOCs, SVOCs, TPH-DRO, PCBs

bgs = Below ground surface
DRO = Diesel-range organics
ft = Foot
MS = Matrix spike
MSD = Matrix spike duplicate
N/A = Not applicable
PCB = Polychlorinated biphenyl
SVOC = Semivolatile organic compound
TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

A.3.1.3 Visual Inspections

Several features associated with the centrifuge were inspected upon removing the centrifuge lid. These features included the floor, walls, hydraulic hoses, ladder, lead bricks, spindle, motor, and sump. All the features were inspected for contents and/or breeches. The inspection indicated that the integrity of the centrifuge was intact. No additional biased sample locations were identified other than the planned locations at the hydraulic hose ends.

A.3.1.4 Sample Collection

Decision I environmental sampling activities included the collection of biased surface soil samples at the hydraulic hose ends (Figure A.3-1) to determine whether there has been a release from this system. Samples 190A001 and 190A003 at locations A01 and A02 were collected from the surface interval (0 to 0.5 ft bgs).

A.3.1.5 Deviations

Investigation samples were collected as outlined in the CAIP (NNSA/NSO, 2006a) and submitted for laboratory analysis. The were no deviations to the planned sampling locations.

A.3.2 Investigation Results

The following sections provide analytical results from the samples collected to complete investigation activities as outlined in the CAIP (NNSA/NSO, 2006a). Investigation samples were analyzed for the CAIP-specified COPCs, which included VOCs, SVOCs, TPH-DRO and polychlorinated biphenyls (PCBs). The analytical parameters and laboratory methods used to analyze the investigation samples are listed in Table A.2-2. Table A.3-1 lists the sample-specific analytical suite for CAS 11-02-01.

Analytical results from the soil samples with concentrations exceeding MDCs are summarized in the following sections. An evaluation was conducted on all contaminants detected above MDCs by comparing individual concentration or activity results to the FALs. Establishment of the FALs are presented in Appendix C.

A.3.2.1 Volatile Organic Compounds

The VOCs analytical results for environmental samples collected at this CAS that were not detected above MDCs. Therefore, the FALs were established at the corresponding PAL concentrations.

A.3.2.2 Semivolatile Organic Compounds

The SVOCs analytical results for environmental samples collected at this CAS that were detected above MDCs are presented in Table A.3-2. No SVOCs were detected at concentrations exceeding the respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

Table A.3-2
Sample Results for SVOCs Detected above Minimum Detectable Concentrations at CAS 11-02-01, Underground Centrifuge

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)									
			Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Chrysene	Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene
Final Action Levels[a]			**100,000**	**2.1**	**0.21**	**2.1**	**29,000**	**21**	**100,000**	**210**	**0.21**	**2.1**
A01	190A001	0.0 - 0.5	--	0.0124 (J)	0.0451 (J)	0.0355 (J)	0.065 (J)	0.0371 (J)	--	0.0256 (J)	0.164 (J)	0.143 (J)
	190A002	0.0 - 0.5	0.0101 (J)	0.0179 (J)	0.0196 (J)	0.0119 (J)	0.0362 (J)	0.0214 (J)	0.445 (J)	--	0.141 (J)	0.114 (J)
A02	190A003	0.0 - 0.5	--	--	0.0123 (J)	0.0119 (J)	0.0225 (J)	--	--	--	0.119 (J)	0.0992 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram

J = Estimated value
-- = Not detected above minimum detectable concentrations.

A.3.2.3 Total Petroleum Hydrocarbons

The TPH-DRO analytical results for soil samples collected at this CAS that were detected above MDCs are presented in Table A.3-3. No TPH-DRO were detected at concentrations exceeding the respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

Table A.3-3
Sample Results for TPH-DRO Detected above
Minimum Detectable Concentrations at CAS 11-02-01

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)
			Diesel-Range Organics
Final Action Levels[a]			100
A01	190A002	0.0 - 0.5	6.27 (J)
A02	190A003	0.0 - 0.5	11.4

[a]Based on *Nevada Administrative Code,* "Contamination of Soil: Establishment of Action Levels" (NAC, 2006).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram

J = Estimated value

A.3.2.4 Polychlorinated Biphenyls

Polychlorinated biphenyls were not detected above MDCs. Therefore, the FALs were established at the corresponding PAL concentrations.

A.3.3 Nature and Extent of Contamination

Based on the analytical results for soil samples collected within CAS 11-02-01, no COCs were identified.

A.3.4 Revised Conceptual Site Model

The CAIP requirements (NNSA/NSO, 2006a) were met at this CAS, and no revisions were necessary to the CSM.

A.4.0 Corrective Action Site 11-02-02, Drain Lines and Outfall

Corrective Action Site 11-02-02 is located at the Tweezer Facility east of Yucca Lake in Area 11 of the NTS. The site consists of a cooling tower, subsurface piping, an outfall and drain line, and the soil surrounding these components. The cooling tower was connected to the service water piping at Building 11-2 and consisted of a battery room, gas compressor room, and mechanical equipment room. Two aboveground water tanks located northeast of the cooling tower were not part of the investigation but were removed as a BMP along with the cooling tower and pipe.

A.4.1 Corrective Action Investigation

A total of 17 environmental soil characterization samples (including one FD and one MS/MSD) were collected during investigation activities at CAS 11-02-02. The sample locations are shown on Figure A.4-1. The sample identification numbers, locations, depth, matrices, purpose, and analyses are listed in Table A.4-1.

A.4.1.1 Field Screening

Investigation samples were field screened for alpha and beta/gamma radiation. The FSLs were not exceeded in samples collected at this CAS.

A.4.1.2 Visual Inspections

Visual inspections were performed to identify biasing factors (i.e., staining, elevated radiation levels, odor) inside tanks, associated piping, and on the surface soil that may have been impacted by an outflow of these components. The surface soil at the pipe outfall showed visible signs of staining; however, no additional bias sampling locations were proposed because this location was originally planned for sampling.

A visual inspection was performed on the inside of the cooling tower to determine whether media were present to sample. Results indicate that no material was present inside the cooling tower to sample.

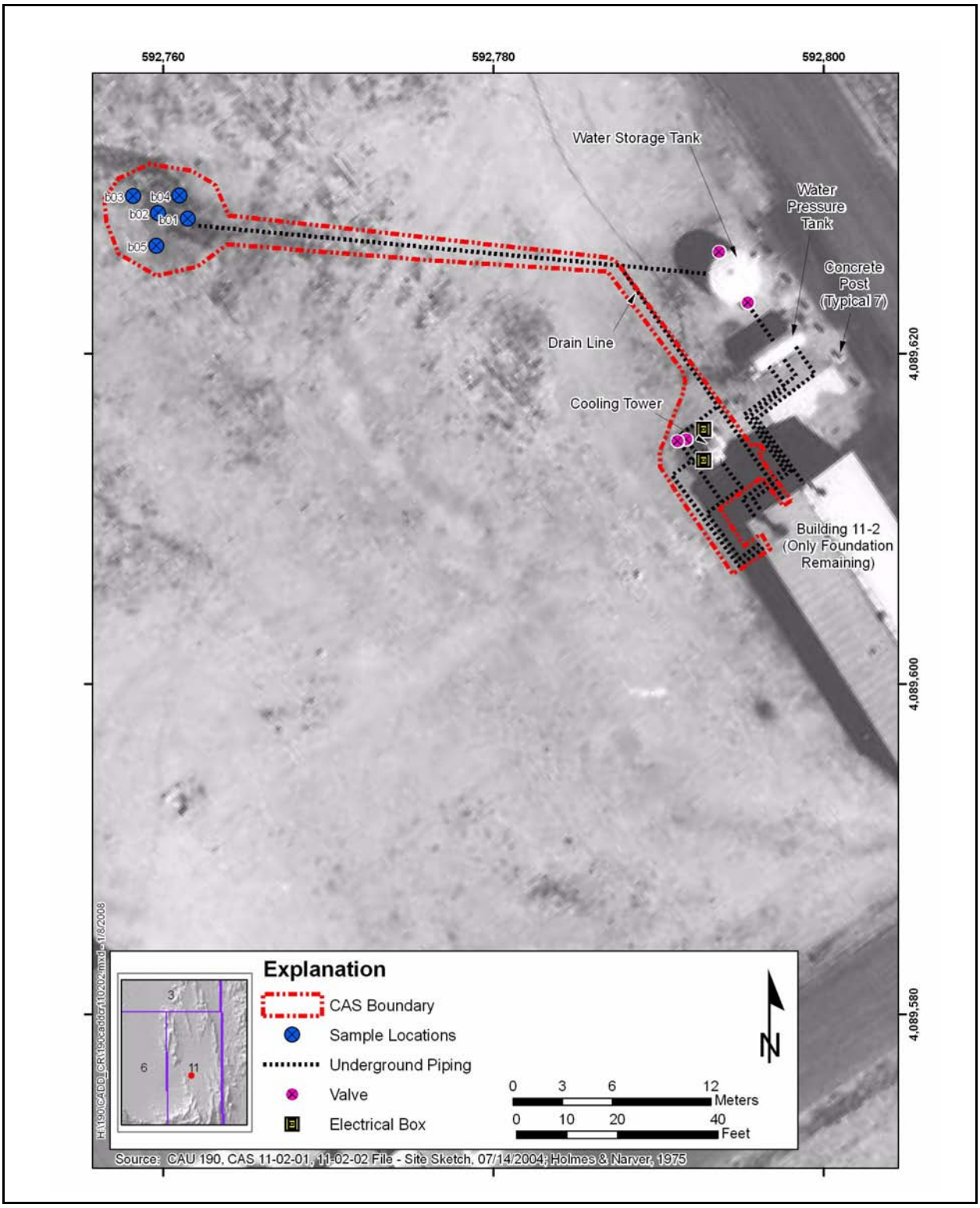

Figure A.4-1
Sample Locations at CAS 11-02-02, Drain Lines and Outfall

Table A.4-1
Samples Collected at CAS 11-02-02, Drain Lines and Outfall

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
B01	190B001	0.0 - 0.5	Soil	Environmental	Set 1
	190B002	0.0 - 0.5	Soil	Field Duplicate of #190B001	Set 1
	190B003	0.5 - 1.0	Soil	Environmental, MS/MSD	Set 1
	190B008	1.0 - 1.5	Soil	Environmental	Set 2
	190B501	0.5 - 1.0	Soil	Waste Management	TCLP Metals
B02	190B004	0.0 - 0.5	Soil	Environmental	Set 2
	190B009	0.9 - 1.0	Soil	Environmental	Set 2
B03	190B005	0.0 - 0.5	Soil	Environmental	Set 2
B04	190B006	0.0 - 0.5	Soil	Environmental	Set 2
	190B010	0.9 - 1.0	Soil	Environmental	Set 2
B05	190B007	0.0 - 0.5	Soil	Environmental	Set 2
	190B011	0.9 - 1.0	Soil	Environmental	Set 2
B06	190B012	1.0 - 2.0	Soil	Environmental	Set 2
B07	190B013	1.0 - 2.0	Soil	Environmental	Set 2
B08	190B014	1.0 - 2.0	Soil	Environmental	Set 2
B09	190B015	1.0 - 2.0	Soil	Environmental	Set 2
B10	190B016	1.0 - 2.0	Soil	Environmental	Set 2
B11	190B017	1.0 - 2.0	Soil	Environmental	Set 2

Set 1 = VOCs, SVOCs, RCRA Metals, TPH-DRO and -GRO, PCBs, Gamma Spectroscopy
Set 2 = SVOCs and TPH-DRO

bgs = Below ground surface
DRO = Diesel-range organics
ft = Foot
GRO = Gasoline-range organics
MS = Matrix spike
MSD = Matrix spike duplicate
PCB = Polychlorinated biphenyl
RCRA = *Resource Conservation and Recovery Act*
SVOC = Semivolatile organic compound
TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

A.4.1.3 Sample Collection

Surface and shallow subsurface soil sampling was conducted to support investigation activities. Soil samples were collected using disposable scoops for surface samples and a hand auger was used for shallow subsurface soil sampling.

Decision I sampling activities at CAS 11-02-02 included the collection of environmental soil samples from one location (B01) that represented an area of potential release as detailed in the CAIP (NNSA/NSO, 2006a). This location was the soil directly at the pipe outfall.

Decision II sampling activities included the collection of samples at various depths from locations B02 through B05 at approximately 5 ft distances from location B01 (Figure A.4-1).

A.4.1.4 Deviations

There were no deviations to the CAIP requirements (NNSA/NSO, 2006a) at this CAS.

A.4.2 Investigation Results

The following sections provide analytical results from the samples collected to complete investigation activities as outlined in the CAIP (NNSA/NSO, 2006a). Environmental investigation samples were analyzed for the CAIP-specified COPCs, which included VOCs, SVOCs, TPH-GRO and -DRO, RCRA metals, PCBs, and gamma-emitting radionuclides. Decision II samples were analyzed for SVOCs and TPH-DRO only. An unedited set of all analytical data is retained in the project files as electronic media.

Analytical results from the soil samples with concentrations exceeding MDCs are summarized in the following sections. An evaluation was conducted on all contaminants detected above MDCs by comparing individual concentration or activity results to the FALs. Establishment of the FALs is presented in Appendix C. The FALs were established as the corresponding PAL concentrations or activities if the contaminant concentrations were below their respective PALs.

A.4.2.1 Volatile Organic Compounds

The analytical results for VOCs in environmental samples collected at this CAS that were detected above MDCs are presented in Table A.4-2. No VOCs were detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

Table A.4-2
Sample Results for VOCs Detected above Minimum Detectable Concentrations at CAS 11-02-02, Drain Lines and Outfall

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)		
			2-Butanone	2-Hexanone	Acetone
Final Action Levels[a]			110,000	110,000	54,000
B01	190B001	0.0 - 0.5	0.0146 (J)	0.393	0.0283

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram

J = Estimated value

A.4.2.2 Semivolatile Organic Compounds

The SVOCs analytical results for environmental samples collected at this CAS that were detected above MDCs are presented in Table A.4-3. Concentrations of SVOCs that exceeded the FALs were detected at two locations in the surface soil (0.0 to 0.5 ft bgs). Benzo(a)pyrene was detected at 0.282 mg/kg, which is just above the PAL of 0.21 mg/kg. Dibenzo(a,h)anthracene was detected at 0.305 mg/kg, which is just above the PAL of 0.21 mg/kg. No other SVOCs were detected at concentrations exceeding their respective PALs. The FALs for all SVOCs were established at the corresponding PAL concentrations.

A.4.2.3 Total Petroleum Hydrocarbons

The TPH-DRO and -GRO analytical results for soil samples collected at this CAS that were detected above MDCs are presented in Table A.4-4. A total of four surface samples (including one FD) exceeded the PAL of 100 mg/kg for TPH-DRO. Samples 190B001 through 190B003 and sample 190B008 were collected immediately beneath the outlet pipe (location B01) from various

Table A.4-3
Sample Results for SVOCs Detected above Minimum Detectable Concentrations at CAS 11-02-02, Drain Lines and Outfall

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)																
			2-Methylnaphthalene	Acenaphthene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-ethylhexyl)phthalate	Carbazole	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene
Final Action Levels[a]			**190**	**29,000**	**100,000**	**2.1**	**0.21**	**2.1**	**29,000**	**21**	**120**	**86**	**210**	**0.21**	**22,000**	**26,000**	**2.1**	**100,000**	**29,000**
B01	190B001	0.0 - 0.5	--	--	0.087 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.118 (J)
	190B003	0.5 - 1.0	--	--	0.0103 (J)	0.0511 (J)	0.114 (J)	0.163 (J)	0.197 (J)	--	--	--	0.0677 (J)	**0.305** (J)	0.0909 (J)	--	0.271 (J)	0.0479 (J)	0.0861 (J)
	190B008	1.0 - 1.5	--	0.0139 (J)	0.0218 (J)	--	0.0701 (J)	0.0893 (J)	--	--	0.0737 (J)	--	0.0847 (J)	--	--	--	0.111 (J)	0.0884 (J)	0.15 (J)
B02	190B004	0.0 - 0.5	0.00777 (J)	0.0745 (J)	0.125 (J)	0.306 (J)	**0.282**	0.345	0.242 (J)	0.129 (J)	--	0.0625 (J)	0.347	--	0.657	0.0399 (J)	0.222 (J)	0.509	0.567
	190B009	0.9 - 1.0	--	--	0.00914 (J)	--	0.0291 (J)	0.0345 (J)	--	0.0209 (J)	--	--	0.0375 (J)	--	0.0618 (J)	--	--	0.0429 (J)	0.0595 (J)
B03	190B005	0.0 - 0.5	--	--	--	--	0.0235 (J)	0.0355 (J)	--	0.0153 (J)	--	--	0.0328 (J)	--	0.0562 (J)	--	--	0.0327 (J)	0.0499 (J)
B05	190B011	0.9 - 1.0	--	--	--	--	--	--	--	--	--	--	--	--	0.0138 (J)	--	--	0.011 (J)	0.0149 (J)
B06	190B012	1.0 - 2.0	--	--	--	--	--	--	--	--	--	--	--	--	0.178 (J)	--	--	--	--

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram
J = Estimated value
-- = Not detected above minimum detectable concentrations.
Values exceeding the action level are indicated in bold.

Table A.4-4
Sample Results for TPH-DRO and -GRO Detected above Minimum Detectable Concentrations at CAS 11-02-02, Drain Lines and Outfall

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
			Diesel-Range Organics	Gasoline-Range Organics
Final Action Levels[a]			100	100
B01	190B001	0.0 - 0.5	1,850	0.793 (J)
	190B002	0.0 - 0.5	**1,490** (J)	0.239 (J)
	190B003	0.5 - 1.0	586	0.0456 (J)
	190B008	1.0 - 1.5	164	--
B02	190B004	0.0 - 0.5	16.7	--
	190B009	0.9 - 1.0	4.36 (J)	--
B03	190B005	0.0 - 0.5	4.74 (J)	--
B04	190B006	0.0 - 0.5	4.49 (J)	--
	190B010	0.9 - 1.0	4.73 (J)	--
B05	190B007	0.0 - 0.5	4.51 (J)	--
	190B011	0.9 - 1.0	3.12 (J)	--
B06	190B012	1.0 - 2.0	7.72 (J)	--

[a]Based on *Nevada Administrative Code,* "Contamination of Soil: Establishment of Action Levels" (NAC, 2006).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram

J = Estimated value
-- = Not detected above minimum detectable concentrations.
Values exceeding the action level are indicated in bold.

depths down to 1.5 ft bgs. Results ranged from 164 mg/kg to 1,850 mg/kg. The TPH-DRO was moved on to a Tier 2 evaluation and none of the hazardous constituents of TPH-DRO were above PALs except for benzo(a)pyrene discussed in Section A.4.2.2.

A.4.2.4 Polychlorinated Biphenyls

Analytical results for PCBs in environmental samples collected at this CAS were not detected above MDCs. Therefore, the FALs were established at the corresponding PAL concentrations.

A.4.2.5 RCRA Metals and Beryllium

Analytical results for RCRA metals and beryllium detected in soil samples above MDCs are presented in Table A.4-5. No metals were detected at concentrations exceeding the respective PALs at this CAS. Therefore, the FALs were established at the corresponding PAL concentrations.

Table A.4-5
Sample Results for RCRA Metals Detected above Minimum Detectable Concentrations at CAS 11-02-02, Drain Lines and Outfall

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)						
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Silver
Final Action Levels			**23[a]**	**6,700[b]**	**450[b]**	**450[b]**	**800[b]**	**310[b]**	**5,100[b]**
B01	190B001	0.0 - 0.5	4	157 (J-)	0.48 (J)	12.3	36 (J-)	0.018 (J)	--
	190B002	0.0 - 0.5	12.6	238 (J-)	0.56	11.9	88.7 (J-)	0.017 (J)	--
	190B003	0.5 - 1.0	9.4	143 (J-)	--	19.8	104 (J-)	0.019 (J)	1.7 (J)

[a]Based on the background concentrations for metals. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram

J = Estimated value
J- = The result is an estimated quantity, but the result may be biased low.
-- = Not detected above minimum detectable concentrations.

A.4.2.6 Gamma-Emitting Radionuclides

Gamma-emitting radionuclide analytical results for soil samples detected above MDCs are presented in Table A.4-6. No radionuclides were detected at concentrations exceeding the respective PALs at this CAS. Therefore, the FALs were established at the corresponding PAL concentrations.

Table A.4-6
Sample Results for Gamma Spectroscopy Detected above Minimum Detectable Concentrations at CAS 11-02-02, Drain Lines and Outfall

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)			
			Actinium-228	Lead-212	Lead-214	Thallium-208
Final Action Levels[a]			5	5	5	5
B01	190B001	0.0 - 0.5	1.62	1.86	1.28	0.605
	190B002	0.0 - 0.5	1.9	1.71	1.23	0.495
	190B003	0.5 - 1.0	1.83	1.91	1.13	0.594

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, thallium-208, and thorium-232, 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 cm of soil and 15 pCi/g for deeper soils (DOE, 1993). For purposes of this document, 15 cm is assumed to be equivalent to 0.5 ft (6 inches); therefore, 5 pCi/g represents the PALs for these radionuclides in the surface soil (0 to 0.5 ft depth).

bgs = Below ground surface
cm = Centimeter
ft = Foot
PAL = Preliminary action level
pCi/g = Picocuries per gram

A.4.3 Nature and Extent of Contamination

Based on the analytical results for soil samples collected within CAS 11-02-02, the only COCs identified are benzo(a)pyrene and dibenzo(a,h)anthracene in the environmental soil samples at this CAS. These COCs were identified at the pipe outfall and near the pipe outfall. As shown by samples collected at locations B01 and B02 (see Figure A.4-1 and Tables A.4-3 and A.4-4), the COCs are limited to the surface interval (0.0 to 1.5 ft bgs), where concentrations decrease laterally to concentrations below the FALs within 5 ft of the outfall, and decrease to values below the FALs within the top 1.5 ft of soil. This suggests that at all locations where COCs were identified at concentrations exceeding the FALs, the extent of this contamination is limited to the surface and a short distance (5 ft) from the outfall. The distribution of the data suggests that the contamination resulted from discharge from the pipe outfall.

A.4.4 Revised Conceptual Site Model

The results of the CAI at CAS 11-02-02 did not contradict the CSM. No revision of the CSM was necessary.

A.5.0 Corrective Action Site 11-59-01, Tweezer Facility Septic System

Corrective Action Site 11-59-01 is located at the Tweezer Facility east of Yucca Lake in Area 11 of the NTS (Figure A.5-1). The site consists of the septic system associated with former Building 11-1. Former Building 11-1 was used to disassemble weapons components. It contained a dark room, disassembly room, x-ray room, control room, and test area. This building was demolished, and only a concrete foundation remains. According to engineering drawings, the CAS 11-59-01 septic system was connected to and serviced Building 11-1 in three locations; one on the southwest side, and two on the northwest side.

The components identified in the CAIP for investigation included the collection of soil samples from septic system components (NNSA/NSO, 2006a). Additional detail is provided in the CAIP.

A.5.1 Corrective Action Investigation

A total of 30 characterization samples (including two FDs and one MS/MSD) were collected during investigation activities at CAS 11-59-01. The sample locations, IDs, types, and analyses are listed in Table A.5-1. The specific CAI activities conducted to satisfy the CAIP requirements at this CAS (NNSA/NSO, 2006a) are described in the following sections.

A.5.1.1 Field Screening

Investigation samples were field screened for alpha and beta/gamma radiation. The FSLs were not exceeded in samples collected at this CAS.

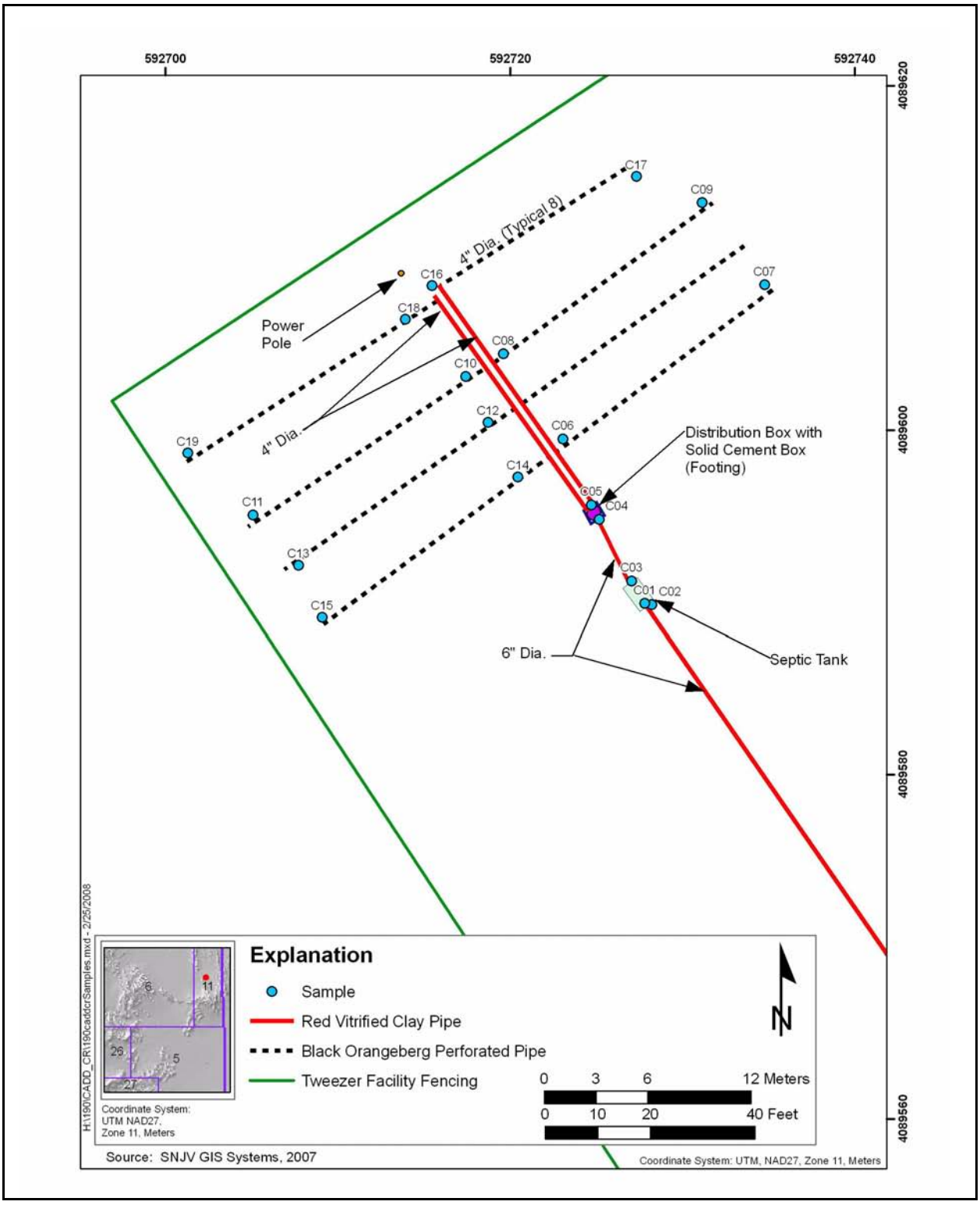

Figure A.5-1
Sample Locations at CAS 11-59-01, Tweezer Facility Septic System

Table A.5-1
Samples Collected at CAS 11-59-01, Tweezer Facility Septic System
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
C01	190C501	N/A	Liquid	Waste Management	Set 4
	190C502	N/A	Liquid	Waste Management	Set 4
	190C503	N/A	Sludge	Waste Management	Set 5
C02	190C001	3.0 - 3.5	Soil	Environmental	Set 2
	190C002	3.0 - 3.5	Soil	Field Duplicate of #190C001	Set 2
	190C003	7.5 - 8.0	Soil	Environmental, MS/MSD	Set 2
C03	190C004	3.0 - 3.5	Soil	Environmental	Set 2
	190C005	7.5 - 8.0	Soil	Environmental	Set 2
C04	190C006	2.5 - 3.0	Soil	Environmental	Set 2
	190C007	2.5 - 3.0	Soil	Environmental	Set 2
C05	190C008	2.5 - 3.0	Soil	Environmental	Set 2
	190C009	2.5 - 3.0	Soil	Environmental	Set 2
C06	190C010	0.0 - 1.0	Soil	Environmental	Set 2
C07	190C011	0.0 - 1.0	Soil	Environmental	Set 2
C08	190C012	0.0 - 1.0	Soil	Environmental	Set 2
C09	190C013	0.0 - 1.0	Soil	Environmental	Set 2
C10	190C014	0.0 - 1.0	Soil	Environmental	Set 2
C11	190C015	0.0 - 1.0	Soil	Environmental	Set 2
C12	190C016	0.0 - 1.0	Soil	Environmental	Set 2
C13	190C017	0.0 - 1.0	Soil	Environmental	Set 2
	190C018	3.0 - 4.0	Soil	Environmental	Set 2
C14	190C019	0.0 - 1.0	Soil	Environmental	Set 2
C15	190C020	0.0 - 1.0	Soil	Environmental	Set 2
	190C021	3.0 - 4.0	Soil	Environmental	Set 2
	190C022	3.0 - 4.0	Soil	Field Duplicate of #190C021	Set 2
	190C506	N/A	Solid	Waste Management	Asbestos
	190C507	N/A	Solid	Waste Management	Asbestos
	190C508	N/A	Solid	Waste Management	Asbestos

Table A.5-1
Samples Collected at CAS 11-59-01, Tweezer Facility Septic System
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
C15A	190C028	1.0 - 2.0	Soil	Environmental	Set 3
C15B	190C029	2.0 - 3.0	Soil	Environmental	Set 3
C15C	190C030	2.0 - 3.0	Soil	Environmental	Set 3
C16	190C023	0.0 - 1.0	Soil	Environmental	Set 2
C17	190C024	0.0 - 1.0	Soil	Environmental	Set 2
C18	190C025	0.0 - 1.0	Soil	Environmental	Set 2
C19	190C026	0.0 - 1.0	Soil	Environmental	Set 2
	190C027	3.0 - 4.0	Soil	Environmental	Set 2
N/A	190C301	N/A	Water	Trip Blank	VOCs
N/A	190C302	N/A	Water	Trip Blank	VOCs
N/A	190C303	N/A	Water	Trip Blank	VOCs
N/A	190C304	N/A	Water	Equipment Rinsate	Set 2
N/A	190C305	N/A	Water	Field Blank	Set 2
N/A	190C306	N/A	Water	Trip Blank	VOCs
N/A	190C307	N/A	Water	Trip Blank	VOCs
N/A	190C504	N/A	Solid	Waste Management	Set 3

Set 2 = VOCs, SVOCs, RCRA Metals, TPH-DRO and -GRO, PCBs, Gamma Spectroscopy
Set 3 = SVOCs, TPH-DRO
Set 4 = VOCs, SVOCs, TPH-DRO and -GRO, PCBs, Gamma Spectroscopy, Uranium, Plutonium, Strontium-90, Gross Alpha/Beta, Tritium, Pesticides, Herbicides
Set 5 = VOCs, SVOCs, TPH-DRO and -GRO, PCBs, Gamma Spectroscopy, Uranium, Plutonium, Strontium-90, Gross Alpha/Beta, Tritium, Pesticides, Herbicides, RCRA Metals plus beryllium, TCLP Metals

bgs = Below ground surface
DRO = Diesel-range organics
ft = Foot
GRO = Gasoline-range organics
MS = Matrix spike
MSD = Matrix spike duplicate
N/A = Not applicable
PCB = Polychlorinated biphenyl
RCRA = *Resource Conservation and Recovery Act*
SVOC = Semivolatile organic compound
TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

A.5.1.2 Visual Inspections

Several features associated with the septic system were identified and inspected within the CAS. These features consisted of an influent pipe, septic tank, distribution box, and Orangeburg leachpipe. All the features were accessed and inspected for contents and, if present, sediment or liquid samples

were collected. Initial inspection indicated that the integrity of the components was intact, except for a crack observed in the effluent pipe coming from the septic tank. A sample was collected at this location.

A.5.1.3 Video Surveys

Video surveys were conducted on the septic system associated piping to the extent possible to identify any breaches or residual material in the piping, and to verify the presence and extent of piping. The video survey was run from the septic tank to the source building (approximately 95 ft). No breaches or residual material were identified in the existing piping during the video survey.

A.5.1.4 Sample Collection

Decision I environmental sampling activities included the collection of biased subsurface soil samples surrounding the septic system components (Figure A.5-1) at this CAS.

Environmental samples were collected from the soil surrounding the septic tank to determine whether there has been a release from this system. Samples were collected directly below the inlet pipe (location C02), outlet pipe (location C03), and from the soil at the base of the septic tank at these same locations. The sample depth ranged from 5 to 10 ft bgs and the locations are shown on Figure A.5-1.

Environmental samples were collected from the soil surrounding the distribution box to determine whether there has been a release from this system. Samples were collected directly below the inlet pipe (location C04), outlet pipe (location C05), and from the soil at the base of the distribution box at these same locations. The sample depth ranged from 3 to 8 ft bgs and the locations are shown on Figure A.5-1.

Seventeen environmental samples (including one FD) were collected from fourteen locations (Locations C06 through C19) from the leachfield as shown in Figure A.5-1 to determine whether there has been a release from the Orangeburg leachpipe. One soil sample was collected from 0 to 1.0 ft below the leachpipe at all locations and at 3 to 4 ft at locations C13, C15, and C19. The other locations were not accessible due to a caliche layer. The Orangeburg leachpipe ranged from 1 to 3 ft bgs.

Decision II (verification samples) sampling activities included the collection of three samples around location C15 at a radius approximately 3 to 4 ft from the C15 location.

Samples of liquid and sludge from the septic tank were collected at this CAS for disposal determination. The analytical results for waste characterization samples are discussed in Section A.5.4.1.

A.5.1.5 Deviations

Investigation samples were collected as outlined in the CAIP (NNSA/NSO, 2006a) and submitted for laboratory analysis. The only minor deviations to the planned sampling were that some samples could not be collected at the planned (deeper) depths because of refusal due to a caliche layer. There were eleven sample locations where refusal was met at the deeper sampling horizon due to a hard stratigraphic layer. Because no contamination was found in the upper horizon (just below the leachpipe) at these locations, this deviation is not significant.

A.5.2 Investigation Results

The following sections provide analytical results from the samples collected to complete investigation activities as outlined in the CAIP (NNSA/NSO, 2006a). Investigation samples were analyzed for the CAIP-specified COPCs, which included VOCs, SVOCs, TPH-DRO and -GRO, RCRA metals, gamma-emitting radionuclides and PCBs. The analytical parameters and laboratory methods used to analyze the investigation samples are listed in Table A.2-2. Table A.5-1 lists the sample-specific analytical suite for CAS 11-59-01. Results of the septic tank content samples are discussed in Section A.5.4.1.

Analytical results from the soil samples with concentrations exceeding MDCs are summarized in the following sections. An evaluation was conducted on all contaminants detected above MDCs by comparing individual concentration or activity results to the FALs. Establishment of the FALs are presented in Appendix C.

A.5.2.1 Volatile Organic Compounds

The VOCs analytical results for environmental samples collected at this CAS that were detected above MDCs are presented in Table A.5-2. No VOCs were detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

Table A.5-2
Sample Results for VOCs Detected above Minimum Detectable Concentrations at CAS 11-59-01, Tweezer Facility Septic System
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)				
			1,4-Dichlorobenzene	Acetone	Methylene Chloride	Styrene	Toluene
Final Action Levels[a]			**7.9**	**54,000**	**21**	**1,700**	**520**
C02	190C001	3.0 - 3.5	--	0.00286 (J)	--	--	--
	190C002	3.0 - 3.5	--	0.00422 (J)	--	--	--
	190C003	7.5 - 8.0	--	0.00419 (J)	--	--	--
C03	190C004	3.0 - 3.5	0.000384 (J)	--	--	--	0.000468 (J)
	190C005	7.5 - 8.0	--	0.00367 (J)	--	--	--
C04	190C006	2.5 - 3.0	--	0.00311 (J)	0.0022 (J)	--	--
C05	190C009	0.0 - 0.5	--	0.00433 (J)	--	--	--
C06	190C010	0.0 - 1.0	--	--	--	0.00067 (J)	--
C07	190C011	0.0 - 1.0	--	0.00409 (J)	--	--	--
C08	190C012	0.0 - 1.0	--	--	--	0.000288 (J)	--
C11	190C015	0.0 - 1.0	--	0.00289 (J)	0.00248 (J)	--	--
C12	190C016	0.0 - 1.0	0.000313 (J)	--	--	--	--
C13	190C017	0.0 - 1.0	0.000247 (J)	--	--	--	--
C15	190C021	3.0 - 4.0	--	0.00678 (J)	--	--	--

Table A.5-2
Sample Results for VOCs Detected above Minimum Detectable Concentrations at CAS 11-59-01, Tweezer Facility Septic System
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)				
			1,4-Dichlorobenzene	Acetone	Methylene Chloride	Styrene	Toluene
Final Action Levels[a]			**7.9**	**54,000**	**21**	**1,700**	**520**

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram

J = Estimated value
-- = Not detected above minimum detectable concentrations.

A.5.2.2 Semivolatile Organic Compounds

The SVOCs analytical results for environmental samples collected at this CAS that were detected above MDCs are presented in Table A.5-3. Benzo(a)pyrene was detected at 0.347 mg/kg, which is just above the PAL of 0.21 mg/kg. The FAL for all SVOCs was established at the corresponding PAL concentrations.

A.5.2.3 Total Petroleum Hydrocarbons

The TPH-DRO and -GRO analytical results for soil samples collected at this CAS that were detected above MDCs are presented in Table A.5-4. No TPH sample results were detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

Table A.5-3
Sample Results for SVOCs Detected above Minimum Detectable Concentrations at CAS 11-59-01, Tweezer Facility Septic System
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)																		
			2,3,4,6-Tetrachlorophenol	Acenaphthene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate	Carbazole	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Pentachlorophenol	Phenanthrene	Pyrene
Final Action Levels[a]			**18,000**	**29,000**	**100,000**	**2.1**	**0.21**	**2.1**	**29,000**	**21**	**100,000**	**120**	**86**	**210**	**0.21**	**22,000**	**26,000**	**2.1**	**9**	**100,000**	**29,000**
C03	190C004	3.0 - 3.5	--	--	--	--	--	--	--	--	0.492 (J)	0.0897 (J)	--	--	--	0.013 (J)	--	--	--	--	--
C05	190C008	2.5 - 3.0	--	--	--	--	--	--	--	--	--	0.0976 (J)	--	--	--	--	--	--	--	--	--
C06	190C010	0.0 - 1.0	0.162 (J)	--	--	0.0328 (J)	0.0273 (J)	0.0373 (J)	--	0.0132 (J)	0.5 (J)	--	--	0.0258 (J)	--	0.041 (J)	--	--	0.183 (J)	0.0158 (J)	0.0347 (J)
C08	190C012	0.0 - 1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0118 (J)	--	--	--	--	--
C09	190C013	0.0 - 1.0	--	--	0.0301 (J)	0.223 (J)	0.169 (J)	0.285 (J)	0.104 (J)	--	--	--	0.0258 (J)	0.176 (J)	--	0.35 (J)	--	0.176 (J)	--	0.114 (J)	0.22 (J)
C10	190C014	0.0 - 1.0	--	--	--	0.0373 (J)	0.0302 (J)	0.049 (J)	--	--	--	--	--	0.0317 (J)	--	0.0519 (J)	--	--	--	0.019 (J)	0.0406 (J)
C11	190C015	0.0 - 1.0	--	--	--	0.0227 (J)	0.0145 (J)	0.0227 (J)	--	--	--	--	--	0.0186 (J)	--	0.0263 (J)	--	0.0887 (J)	--	--	0.0192 (J)
C12	190C016	0.0 - 1.0	--	--	--	0.0217 (J)	0.0143 (J)	0.0265 (J)	--	--	--	--	--	0.0162 (J)	--	0.025 (J)	--	--	--	--	0.0216 (J)
C15	190C020	0.0 - 1.0	--	0.018 (J)	0.0908 (J)	0.443	0.347	0.623 (J)	0.179 (J)	--	--	--	0.0845 (J)	0.395	0.154 (J)	0.832	0.0199 (J)	0.231 (J)	--	0.351	0.559
	190C022	3.0 - 4.0	--	--	--	0.0114 (J)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C15A	190C028	1.0 - 2.0	--	--	--	--	--	--	--	--	--	1.33	--	--	--	--	--	--	--	--	--

Table A.5-3
Sample Results for SVOCs Detected above Minimum Detectable Concentrations at CAS 11-59-01, Tweezer Facility Septic System
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)																	
			2,3,4,6-Tetrachlorophenol	Acenaphthene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate	Carbazole	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Pentachlorophenol	Phenanthrene	Pyrene
Final Action Levels[a]			**18,000**	**29,000**	**100,000**	**2.1**	**0.21**	**2.1**	**29,000**	**21**	**100,000**	**120**	**86**	**210**	**0.21**	**22,000**	**26,000**	**2.1**	**9**	**100,000**	**29,000**
C15B	190C029	2.0 - 3.0	--	--	--	--	--	0.0143	--	--	--	0.299 (J)	--	0.018 (J)	--	0.0276 (J)	--	--	--	0.0106 (J)	0.0305 (J)
C15C	190C030	2.0 - 3.0	--	--	--	--	--	--	--	--	--	1.99	--	--	--	--	--	--	--	--	--
C16	190C023	0.0 - 1.0	--	--	--	0.0189 (J)	0.0117 (J)	0.0202 (J)	--	--	--	--	--	0.0134 (J)	--	0.0242 (J)	--	0.0894 (J)	--	0.0117 (J)	0.0163 (J)
C17	190C024	0.0 - 1.0	--	--	--	--	0.0127 (J)	0.0257 (J)	--	--	--	--	--	0.0178 (J)	--	0.0295 (J)	--	--	--	0.0155 (J)	0.0279 (J)
C18	190C025	0.0 - 1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0112 (J)	--	--	--	--	0.0117 (J)
C19	190C026	0.0 - 1.0	--	--	--	--	0.0126 (J)	0.0237 (J)	--	--	--	--	--	0.0187 (J)	--	0.0255 (J)	--	--	--	0.0108 (J)	0.0265 (J)

[a]Based on U.S. Environmental Protection Agency, R*egion 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram

J = Estimated value
-- = Not detected above minimum detectable concentrations.

Table A.5-4
Sample Results for TPH-DRO and -GRO Detected above Minimum Detectable Concentrations at CAS 11-59-01, Tweezer Facility Septic System

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
			Diesel-Range Organics	Gasoline-Range Organics
Final Action Levels[a]			100	100
C02	190C001	3.0 - 3.5	1.26 (J)	--
	190C002	3.0 - 3.5	3.26 (J)	--
C03	190C004	3.0 - 3.5	27.1	--
	190C005	7.5 - 8.0	1.31 (J)	0.0393 (J)
C04	190C006	2.5 - 3.0	7.94 (J)	--
	190C007	2.5 - 3.0	1.12 (J)	--
C05	190C008	2.5 - 3.0	18.2	--
	190C009	2.5 - 3.0	3.95 (J)	--
C06	190C010	0.0 - 1.0	4.29 (J)	--
C07	190C011	0.0 - 1.0	7.58 (J)	--
C08	190C012	0.0 - 1.0	40.2	--
C09	190C013	0.0 - 1.0	6.33 (J)	--
C10	190C014	0.0 - 1.0	2.14 (J)	--
C11	190C015	0.0 - 1.0	1.53 (J)	--
C12	190C016	0.0 - 1.0	3.97 (J)	--
C13	190C017	0.0 - 1.0	2.53 (J)	--
	190C018	3.0 - 4.0	1.3 (J)	--
C15	190C020	0.0 - 1.0	74.9 (J)	--
C16	190C023	0.0 - 1.0	4.57 (J)	--
C17	190C024	0.0 - 1.0	1.91 (J)	--
C18	190C025	0.0 - 1.0	4.59 (J)	--
C19	190C026	0.0 - 1.0	2.23 (J)	--

Table A.5-4
Sample Results for TPH-DRO and -GRO Detected above Minimum Detectable Concentrations at CAS 11-59-01, Tweezer Facility Septic System

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
			Diesel-Range Organics	Gasoline-Range Organics
Final Action Levels[a]			100	100

[a]Based on *Nevada Administrative Code,* "Contamination of Soil: Establishment of Action Levels" (NAC, 2006).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram
J = Estimated value
-- = Not detected above minimum detectable concentrations.

A.5.2.4 RCRA Metals and Beryllium

The RCRA metals and beryllium analytical results for environmental samples collected at this CAS that were detected above MDCs are presented in Table A.5-5. Chromium was detected at location C03 (below a crack in the effluent pipe coming from the septic tank) at 463 mg/kg, which is just above the PAL of 450 mg/kg. The FAL for all the metals were established at the corresponding PALs. Values exceeding the action level are indicated in bold.

Table A.5-5
Sample Results for Metals Detected above Minimum Detectable Concentrations at CAS 11-59-01, Tweezer Facility Septic System
(Page 1 of 3)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Final Action Levels			23[a]	67,000[b]	1,900[b]	450[b]	450[b]	800[b]	310[b]	5,100[b]	5,100[b]
C02	190C001	3.0 - 3.5	6.7	70.9 (J)	0.33 (J)	0.39 (J)	10.9	30.7	0.017 (J)	--	25
	190C002	3.0 - 3.5	6.1	261 (J)	0.77	0.59	11.4	9.7	0.021 (J)	--	17.4
	190C003	7.5 - 8.0	4.5	210 (J)	0.69	0.31 (J)	5.4	10.9	0.0048 (J)	--	1.1

Table A.5-5
Sample Results for Metals Detected above Minimum Detectable Concentrations at CAS 11-59-01, Tweezer Facility Septic System
(Page 2 of 3)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Final Action Levels			**23[a]**	**67,000[b]**	**1,900[b]**	**450[b]**	**450[b]**	**800[b]**	**310[b]**	**5,100[b]**	**5,100[b]**
C03	190C004	3.0 - 3.5	3.4	95.3 (J)	0.8	0.26 (J)	463	23.2	0.03 (J)	1.8 (J+)	271
	190C005	7.5 - 8.0	3.7	139 (J)	0.45 (J)	--	7	6.3	0.0048 (J)	1 (J)	14.2
C04	190C006	2.5 - 3.0	4.7	164 (J)	0.73	--	6.4	10	0.021 (J)	0.9 (J)	1.3
	190C007	2.5 - 3.0	3.4	117 (J)	0.52 (J)	--	8.8	7.7	0.0033 (J)	0.88 (J)	1.7
C05	190C008	2.5 - 3.0	3.3	153 (J)	0.73	--	405	24.3	0.034 (J)	2.2	723
	190C009	2.5 - 3.0	4	228 (J)	0.59	--	5.7	9.6	0.0032 (J)	0.79 (J)	2
C06	190C010	0.0 - 1.0	4.5	93.2 (J)	0.51 (J)	--	5.2	8.8	0.033 (J)	0.76 (J)	3.7
C07	190C011	0.0 - 1.0	4	113 (J)	0.62	--	7.5	9.9	0.019 (J)	1.1 (J)	4.6
C08	190C012	0.0 - 1.0	4.8	116 (J)	0.77	--	8.8	10.7	0.016 (J)	0.93 (J)	10.6
C09	190C013	0.0 - 1.0	3.6	104 (J)	0.58	--	5.3	8	0.018 (J)	0.84 (J)	--
C10	190C014	0.0 - 1.0	5.5	135 (J)	0.75	--	7.3	11.3	0.044 (J)	0.9 (J)	--
C11	190C015	0.0 - 1.0	4.6	116 (J)	0.91	--	10	12.5	0.015 (J)	0.99 (J)	--
C12	190C016	0.0 - 1.0	5	144 (J)	0.82	--	23.4	13.6	0.017 (J)	1.1 (J)	140

Table A.5-5
Sample Results for Metals Detected above Minimum Detectable Concentrations at CAS 11-59-01, Tweezer Facility Septic System
(Page 3 of 3)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)								
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Final Action Levels			**23[a]**	**67,000[b]**	**1,900[b]**	**450[b]**	**450[b]**	**800[b]**	**310[b]**	**5,100[b]**	**5,100[b]**
C13	190C017	0.0 - 1.0	5.5	187 (J)	1.1	--	10	13.1	0.027 (J)	0.84 (J)	--
	190C018	3.0 - 4.0	5	130 (J)	0.64	--	6.8	8.3	0.013 (J)	1.3 (J)	--
C14	190C019	0.0 - 1.0	4.4	144 (J)	0.8	--	8.1	11.2	0.029 (J)	0.82 (J)	--
C15	190C020	0.0 - 1.0	4	139 (J)	0.66	--	6.9	15.1	0.025 (J)	1.3 (J)	--
	190C021	3.0 - 4.0	5.4	344 (J)	0.53	--	4.8	17.4	0.0077 (J)	1 (J)	--
	190C022	3.0 - 4.0	3.9	134 (J)	0.41 (J)	--	4.3	7.6	0.015 (J)	0.76 (J)	--
C16	190C023	0.0 - 1.0	5	133 (J)	0.91	--	197	18.4	0.015 (J)	1.8	874
C17	190C024	0.0 - 1.0	2.9	120 (J)	0.46 (J)	--	5.3	7.5	0.0078 (J)	--	73.8
C18	190C025	0.0 - 1.0	4.2	201 (J)	0.75	--	8.9	20.6	0.009 (J)	1.2 (J)	11.2
C19	190C026	0.0 - 1.0	5.2	124 (J)	0.88	--	9	11.3	0.046 (J)	--	1.2
	190C027	3.0 - 4.0	3.7	129 (J)	0.46 (J)	--	5	11.5	0.0095 (J)	--	--

[a]Based on the background concentrations for metals. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram
J = Estimated value
J+ = The result is an estimated quantity, but the result may be biased high.
-- = Not detected above minimum detectable concentrations.

A.5.2.5 Polychlorinated Biphenyls

Polychlorinated biphenyls detected above MDCs are presented in Table A.5-6. No PCBs were detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PALs.

Table A.5-6
Sample Results for PCBs Detected above Minimum Detectable Concentrations at CAS 11-59-01, Tweezer Facility Septic System

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)		
			Aroclor 1242	Aroclor 1254	Aroclor 1260
Final Action Levels[a]			**0.74**	**0.74**	**0.74**
C02	190C001	3.0 - 3.5	--	0.0071 (J)	0.0028 (J)
	190C002	3.0 - 3.5	--	0.0068 (J)	0.003 (J)
C03	190C004	3.0 - 3.5	--	0.064 (J)	0.0175 (J)
C05	190C008	2.5 - 3.0	--	0.018 (J)	--
C12	190C016	0.0 - 1.0	--	0.0068 (J)	--
C16	190C023	0.0 - 1.0	0.0039 (J)	0.0075 (J)	0.0024 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram
J = Estimated value
-- = Not detected above minimum detectable concentrations.

A.5.2.6 Gamma-Emitting Radionuclides

Gamma-emitting radionuclides analytical results for environmental samples collected at this CAS that were detected above MDCs are presented in Table A.5-7. No gamma-emitting radionuclides were detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

A.5.3 Nature and Extent of Contamination

Based on the analytical results for soil samples collected within CAS 11-59-01, the only COCs identified are chromium and benzo(a)pyrene at locations C03 and C15 (Figure A.5-1). The chromium is limited to the interval just below the effluent pipe coming from the septic tank that was

Table A.5-7
Sample Results for Gamma-Emitting Radionuclides Detected above Minimum Detectable Concentrations at CAS 11-59-01, Tweezer Facility Septic System
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)			
			Actinium-228	Lead-212	Lead-214	Thallium-208
Final Action Levels[a]			5	5	5	5
C02	190C001	3.0 - 3.5	1.44	1.47	0.942	0.384
	190C002	3.0 - 3.5	1.58	1.51	0.962	0.422
	190C003	7.5 - 8.0	1.97	1.77	1.18	0.515
C03	190C004	3.0 - 3.5	2.45	1.83	1.17	0.653
	190C005	7.5 - 8.0	1.38	1.67	1.11	0.554
C04	190C006	2.5 - 3.0	1.7	1.85	1.09	0.493
	190C007	2.5 - 3.0	1.53	1.78	0.947	0.517
C05	190C008	2.5 - 3.0	2.05	1.71	1.33	0.528
	190C009	2.5 - 3.0	2.01	1.77	1.15	0.668
C06	190C010	0.0 - 1.0	1.45	1.71	1.39	0.579
C07	190C011	0.0 - 1.0	1.68	1.44	1.17	0.602
C08	190C012	0.0 - 1.0	1.61	1.6	1.11	0.677
C09	190C013	0.0 - 1.0	1.62	1.79	0.955	0.596
C10	190C014	0.0 - 1.0	1.69	1.55	1.18	0.543
C11	190C015	0.0 - 1.0	1.65	1.89	1.1	0.76
C12	190C016	0.0 - 1.0	1.86	1.55	1.25	0.403
C13	190C017	0.0 - 1.0	1.77	1.8	1.25	0.651
	190C018	3.0 - 4.0	1.44	1.41	0.991	0.433
C14	190C019	0.0 - 1.0	1.78	1.65	1.21	0.563
C15	190C020	0.0 - 1.0	1.68	1.67	1.12	0.484
	190C021	3.0 - 4.0	1.65	1.72	1.26	0.49
	190C022	3.0 - 4.0	1.83	1.83	1.01	0.523
C16	190C023	0.0 - 1.0	2.13	1.87	1.11	0.53

Table A.5-7
Sample Results for Gamma-Emitting Radionuclides Detected above Minimum Detectable Concentrations at CAS 11-59-01, Tweezer Facility Septic System
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Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)			
			Actinium-228	Lead-212	Lead-214	Thallium-208
Final Action Levels[a]			5	5	5	5
C17	190C024	0.0 - 1.0	2.19	1.97	1.17	0.654
C18	190C025	0.0 - 1.0	1.85	1.76	1.07	0.493
C19	190C026	0.0 - 1.0	1.65	1.77	1.13	0.596
	190C027	3.0 - 4.0	1.49	1.87	0.992	0.557

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, thallium-208, and thorium-232, 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 cm of soil and 15 pCi/g for deeper soils (DOE, 1993). For purposes of this document, 15 cm is assumed to be equivalent to 0.5 ft (6 inches); therefore, 5 pCi/g represents the PALs for these radionuclides in the surface soil (0 to 0.5 ft depth).

bgs = Below ground surface
cm = Centimeter
ft = Foot
PAL = Preliminary action level
pCi/g = Picocuries per gram

observed to be cracked. Concentrations decrease vertically to concentrations below the FALs in sample (190C005) collected at the base of the tank. This suggests that the extent of this contamination is limited to the area just below the pipe. The chromium concentration of 463 mg/kg exceeded the FAL of 450 mg/kg in the immediate area below the effluent pipe from the septic tank.

Benzo(a)pyrene was detected at location C15, at 0.347 mg/kg, which exceeds the FAL of 0.21 mg/kg. Deeper samples (190C021 and 190C022) were collected at this location that did not detect benzo(a)pyrene. A sample was collected of the Orangeburg leachpipe and results showed concentrations of benzo(a)pyrene above the FAL. Decision II sampling activities included the collection of three samples at a radius approximately 3 ft from the C15 location. Sample results (190C028 through 190C030) indicate COCs have not migrated to these three locations.

A.5.4 Revised Conceptual Site Model

The CAIP requirements (NNSA/NSO, 2006a) were met at this CAS, and no revisions were necessary to the CSM.

A.5.4.1 Potential Source Material

The samples (190C501 through 190C503) were collected to determine whether the contents of the septic tank were PSM. Sample 190C504 was collected to determine whether the Orangeburg pipe was PSM. Septic tank analytical results for liquid and sludge samples and the Orangeburg pipe sample collected at this CAS that were detected above MDCs are presented in Table A.5-8. Both the septic tank sludge and the Orangeburg pipe contained results above the PSM criteria.

Additionally, the sludge in the septic tank was sampled and analyzed to characterize the material for waste disposal. Although analysis for total chromium indicated concentrations in the sludge that appeared to be hazardous, the TCLP analysis indicated the sludge was not hazardous. Therefore, the underlying chromium-impacted soil at the septic and distribution box effluent pipes (downstream from the tank) was also determined to be non-hazardous.

Table A.5-8
Septic Tank Potential Source Material Samples at CAS 11-59-01,
Tweezer Facility Septic System
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Sample Location	Sample Number	Matrix	Parameter	Result	Units	PSM Criteria
C01	190C501	Liquid	Barium	0.0051 (J)	mg/L	100
			Chromium	0.0031 (J)	mg/L	5
	190C502		Barium	0.0066 (J)	mg/L	100
			Chromium	0.0037 (J)	mg/L	5
	190C503	Sludge	Uranium-233/234	1.6	pCi/g	143
			Uranium-238	0.539 (J)	pCi/g	105
			Lead	199	mg/kg	800
			Silver	9,400	mg/kg	5,100
			Arsenic	61.3 (J)	mg/kg	23
			Barium	2,040 (J)	mg/kg	67,000
			Cadmium	10.4 (J)	mg/kg	450
			Chromium	1,510 (J)	mg/kg	450
			Chromium	0.012 (J)	mg/L	0.60

Table A.5-8
Septic Tank Potential Source Material Samples at CAS 11-59-01,
Tweezer Facility Septic System
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Sample Location	Sample Number	Matrix	Parameter	Result	Units	PSM Criteria
C01 (continued)	190C503 (continued)	Sludge	Selenium	15.2 (J)	mg/kg	5,100
			Mercury	1.5	mg/kg	310
			Diesel-Range Organics	4,230	mg/kg	100
			1,2,4-Trimethylbenzene	0.374 (J)	mg/kg	170
			Toluene	0.113 (J)	mg/kg	520
			Chlorobenzene	0.0185 (J)	mg/kg	530
			Xylenes (Total)	0.0624 (J)	mg/kg	420
			Acetone	0.594 (J)	mg/kg	54,000
			Carbon Disulfide	0.0488 (J)	mg/kg	720
			2-Butanone	0.187 (J)	mg/kg	110,000
			Ethylbenzene	0.0259 (J)	mg/kg	400
			N-Butylbenzene	0.119 (J)	mg/kg	240
			Bis(2-Ethylhexyl)phthalate	3.31 (J)	mg/kg	120
			Fluoranthene	0.495 (J)	mg/kg	22,000
			Phenanthrene	0.574 (J)	mg/kg	100,000
			Dieldrin	0.186 (J)	mg/kg	0.110
			4,4'-DDE	0.258 (J)	mg/kg	7.0
			Aroclor 1254	1.08 (J)	mg/kg	0.74
			1,4-Dichlorobenzene	8.41 (J)	mg/kg	7.9
			1,2,4-Trichlorobenzene	0.439 (J)	mg/kg	220
			4-Isopropyltoluene	46.7 (J)	mg/kg	2000

Table A.5-8
Septic Tank Potential Source Material Samples at CAS 11-59-01,
Tweezer Facility Septic System
(Page 3 of 3)

Sample Location	Sample Number	Matrix	Parameter	Result	Units	PSM Criteria
N/A	190C504	Solid	Diesel-Range Organics	48,800 (J)	mg/kg	100
			Dibenzofuran	142 (J)	mg/kg	1,600
			Naphthalene	19.6 (J)	mg/kg	190
			2-Methylnaphthalene	17.1 (J)	mg/kg	190
			Anthracene	2,050 (J)	mg/kg	100,000
			Pyrene	15,800 (J)	mg/kg	29,000
			Benzo(g,h,i)perylene	3,150 (J)	mg/kg	29,000
			Indeno(1,2,3-cd)pyrene	3,400 (J)	mg/kg	2.1
			Benzo(b)fluoranthene	14,600 (J)	mg/kg	2.1
			Fluoranthene	19,900 (J)	mg/kg	22,000
			Phenanthrene	8,310 (J)	mg/kg	100,000
			Fluorene	432 (J)	mg/kg	26,000
			Carbazole	1,680 (J)	mg/kg	86
			Chrysene	9,270 (J)	mg/kg	210
			Benzo(a)pyrene	7,880 (J)	mg/kg	0.21
			Dibenzo(a,h)anthracene	1,840 (J)	mg/kg	0.21
			Benzo(a)anthracene	9,570 (J)	mg/kg	2.1
			2,3,4,6-Tetrachlorophenol	1,020 (J)	mg/kg	18,000
			Acenaphthene	424 (J)	mg/kg	29,000

mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
N/A = Not applicable
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
PSM = Potential source material
µg/kg = Micrograms per kilogram
µg/L = Micrograms per liter

J = Estimated value
J+ = The result is an estimated quantity, but the result may be biased high.

A.6.0 Corrective Action Site 14-23-01, LTU-6 Test Area

This CAS is located in Area 14 of the NTS near the Mine Mountain Road and Mid Valley Road (Saddle Mountain Road) junction. Corrective Action Site 14-23-01 consists of the soil in the LTU-6 Test Area that may have been impacted by fragments of metallic debris. The site is the location of the High-Explosive Simulation Test (HEST) area and the LTU-6 Test Area. Specific information regarding activities that occurred at LTU-6 is uncertain due to the sensitive nature and limited information available. However, it is known that before LTU-6 test program use, the site was used for three HEST tests. This CAS is defined as the potential release of COCs into the soil from pie-shaped portion of the circular testing area shown in Figure A.6-1.

Several components were identified in the CAIP for investigation and as a BMP, including the collection of soil samples from beneath the metallic fragments. Additional detail is provided in the CAIP (NNSA/NSO, 2006a).

A.6.1 Corrective Action Investigation

A total of 15 characterization samples (including two FD and one MS/MSD) were collected during investigation activities at CAS 14-23-01. The sample locations, IDs, types, and analyses are listed in Table A.6-1. The specific CAI activities conducted to satisfy the CAIP requirements at this CAS (NNSA/NSO, 2006a) are described in the following sections.

A.6.1.1 Field Screening

Investigation samples were field screened for alpha and beta/gamma radiation. The FSLs were not exceeded in samples collected at this CAS.

A.6.1.2 Radiological Surveys

A radiological swipe survey and static and scanning surveys were conducted on the metallic fragments that were removed before sampling beneath them. Results from these surveys showed elevated fixed contamination and removable alpha and beta/gamma radiation did not exceed background levels. The swipes collected from the debris were analyzed using gamma spectroscopy to confirm the presence of DU.

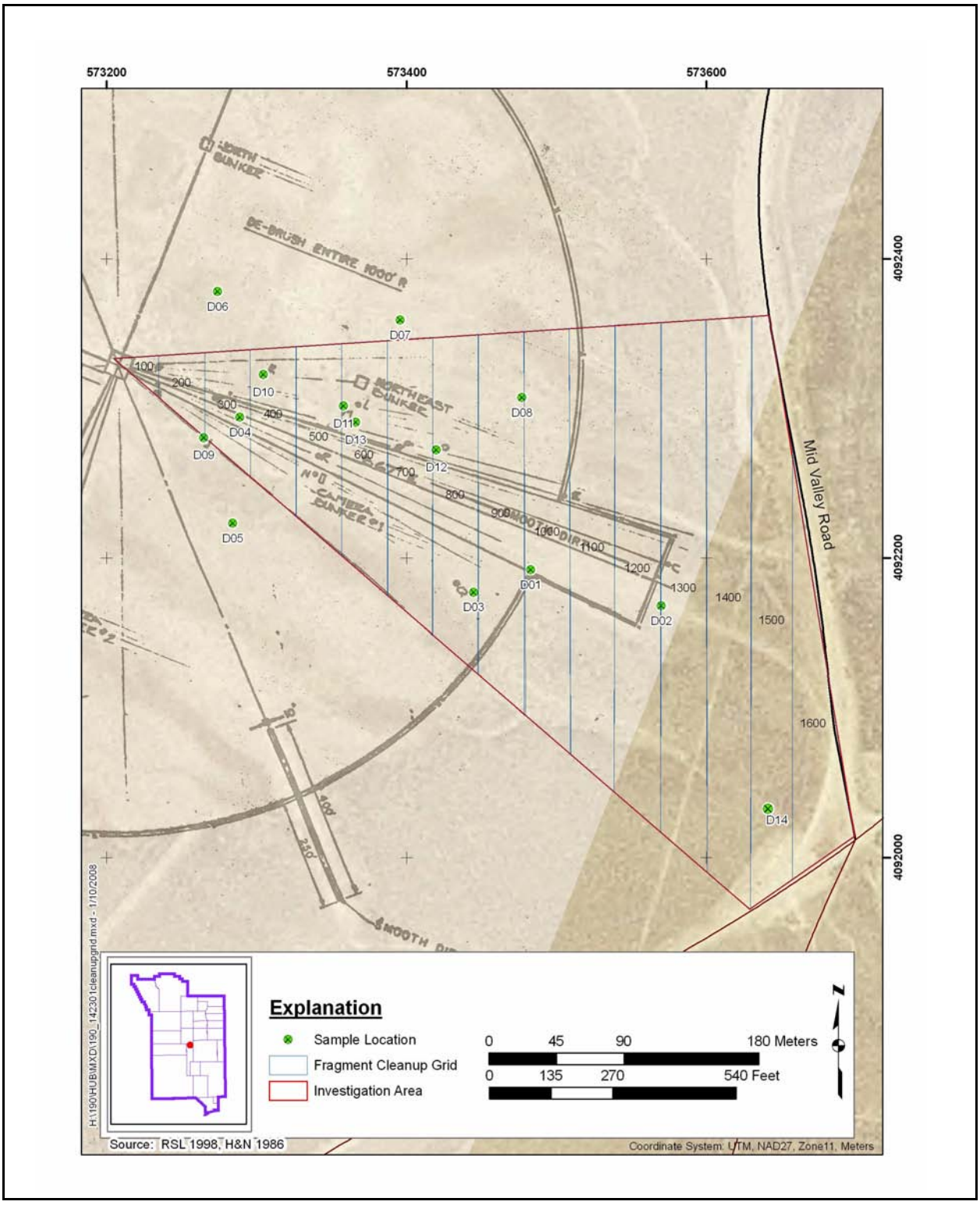

Figure A.6-1
Sample Locations at CAS 14-23-01, LTU-6 Test Area

Table A.6-1
Samples Collected at CAS 14-23-01, LTU-6 Test Area

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	Analyses
D01	190D001	0.0 - 0.5	Soil	Environmental	Set 5
	190D002	0.0 - 0.5	Soil	Field Duplicate of #190D001	Set 5
	190D501	0.0 - 0.5	Soil	Waste Management	Set 6
D02	190D003	0.0 - 0.5	Soil	Environmental	Set 5
D03	190D004	0.0 - 0.5	Soil	Environmental, MS/MSD	Set 5
D04	190D005	0.0 - 0.5	Soil	Environmental	Set 5
D05	190D006	0.0 - 0.5	Soil	Environmental	Set 5
D06	190D007	0.0 - 0.5	Soil	Environmental	Set 5
D07	190D008	0.0 - 0.5	Soil	Environmental	Set 5
D08	190D009	0.0 - 0.5	Soil	Environmental	Set 5
D09	190D012	0.0 - 0.5	Soil	Environmental	Set 5
D10	190D013	0.0 - 0.5	Soil	Environmental	Set 5
D11	190D010	0.0 - 0.5	Soil	Environmental	Set 5
D12	190D011	0.0 - 0.5	Soil	Environmental	Set 5
D13	190D014	0.0 - 0.5	Soil	Environmental	Set 5
D14	190D015	0.5 - 1.0	Soil	Environmental	Set 5
N/A	190D301	N/A	Water	Field Blank	Set 5
N/A	190D302	N/A	Water	Trip Blank	VOCs

Set 5 = RCRA Metals, Beryllium, Gamma Spectroscopy, Uranium, Explosives
Set 6 = VOCs, SVOCs, TPH-DRO and -GRO, PCBs, Plutonium, Strontium-90, Tritium, Pesticides, Herbicides, Pesticides

bgs = Below ground surface
DRO = Diesel-range organics
ft = Foot
GRO = Gasoline-range organics
MS = Matrix spike
MSD = Matrix spike duplicate
N/A = Not applicable
PCB = Polychlorinated biphenyl
RCRA = *Resource Conservation and Recovery Act*
SVOC = Semivolatile organic compound
TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

A.6.1.3 Visual Inspections

Several features associated with the LTU-6 Test Area were identified and inspected within the CAS. These features consisted of radiologically elevated spots identified during the walkover survey, former debris locations, and current debris locations. Several additional biased sample locations were identified other than the planned locations because additional elevated debris fragments were found.

A.6.1.4 Sample Collection

Decision I environmental sampling activities included the collection of biased surface soil samples at the radiologically elevated locations, former debris locations, and current debris locations (Figure A.6-1) to determine whether there has been a release from the debris to the soil. All samples were collected from the surface interval (0 to 0.5 ft bgs) using disposable scoops.

A.6.1.5 Deviations

Investigation samples were collected as outlined in the CAIP (NNSA/NSO, 2006a) and submitted for laboratory analysis. The were no deviations to the planned sampling locations.

A.6.2 Investigation Results

The following sections provide analytical results from the samples collected to complete investigation activities as outlined in the CAIP (NNSA/NSO, 2006a). Investigation samples were analyzed for the CAIP-specified COPCs, which included RCRA metals, beryllium, gamma spectroscopy, uranium, and explosives. The analytical parameters and laboratory methods used to analyze the investigation samples are listed in Table A.2-2. Table A.6-1 lists the sample-specific analytical suite for CAS 14-23-01.

Analytical results from the soil samples with concentrations exceeding MDCs are summarized in the following sections. An evaluation was conducted on all contaminants detected above MDCs by comparing individual concentration or activity results to the FALs. Establishment of the FALs are presented in Appendix C.

A.6.2.1 Volatile Organic Compounds

Analytical results for VOCs detected in soil samples above MDCs are presented in Table A.6-2. No VOCs were detected at concentrations exceeding the respective PALs at this CAS. Therefore, FALs were established at the corresponding PALs.

Table A.6-2
Sample Results for VOCs Detected above Minimum Detectable Concentrations at CAS 14-23-01, LTU-6 Test Area

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)	
			Styrene	Toluene
Final Action Levels[a]			1,700	520
D01	190D501	0.0 - 0.5	0.000701 (J)	0.000572 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram

J = Estimated value

A.6.2.2 Semivolatile Organic Compounds

Analytical results for SVOCs detected in soil samples above MDCs are presented in Table A.6-3. No SVOCs were detected at concentrations exceeding the respective PALs at this CAS. Therefore, FALs were established at the corresponding PALs.

A.6.2.3 Total Petroleum Hydrocarbons

Analytical results for TPH detected in soil samples above MDCs are presented in Table A.6-4. No concentrations of TPH-DRO were detected at concentrations exceeding the respective PALs. Therefore, the FALs were established at the corresponding PALs.

Table A.6-3
Sample Results for SVOCs Detected above Minimum Detectable Concentrations at CAS 14-23-01, LTU-6 Test Area

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)		
			Benzoic Acid	Dibenzo(a,h)anthracene	Indeno(1,2,3-c,d)pyrene
Final Action Levels[a]			**100,000**	**0.21**	**2.1**
D01	190D501	0.0 - 0.5	0.421 (J)	0.103 (J)	0.0856 (J)

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram

J = Estimated value

Table A.6-4
Sample Results for TPH-DRO Detected above Minimum Detectable Concentrations at CAS 14-23-01, LTU-6 Test Area

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)
			Diesel-Range Organics
Final Action Levels[a]			**100**
D01	190D501	0 - 0.5	1.85 (J)

[a]Based on *Nevada Administrative Code,* "Contamination of Soil: Establishment of Action Levels" (NAC, 2006).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram

J = Estimated value

A.6.2.4 RCRA Metals and Beryllium

Analytical results for RCRA metals and beryllium detected in soil samples above MDCs are presented in Table A.6-5. No metals were detected at concentrations exceeding the respective PALs at this CAS. Therefore, the FALs were established at the corresponding PALs.

Table A.6-5
Sample Results for Metals Detected above Minimum Detectable Concentrations at CAS 14-23-01, LTU-6 Test Area

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (mg/kg)							
			Arsenic	Barium	Beryllium	Chromium	Lead	Mercury	Selenium	Silver
Final Action Levels			**23[a]**	**67,000[b]**	**1,900[b]**	**450[b]**	**800[b]**	**310[b]**	**5,100[b]**	**5,100[b]**
D01	190D001	0.0 - 0.5	4.3	197 (J)	1.1	12.5	14.7	0.014 (J)	1.3 (J)	--
	190D002	0.0 - 0.5	4.7	249 (J)	1.2	12.8	25	0.021 (J)	1.6	--
D02	190D003	0.0 - 0.5	4.6	205 (J)	0.95	11.6	14.3	0.02 (J)	1.1 (J)	--
D03	190D004	0.0 - 0.5	4.3	185 (J)	0.95	12.2	14.5	0.016 (J)	1.1 (J)	--
D04	190D005	0.0 - 0.5	4.1	217 (J)	1.4	9.9	14	0.033 (J)	1.1 (J)	--
D05	190D006	0.0 - 0.5	4	176 (J)	1.1	9	16.1	0.025 (J)	0.8 (J)	--
D06	190D007	0.0 - 0.5	4.1	154 (J)	1.4	11.2	13	0.035 (J)	1.8	--
D07	190D008	0.0 - 0.5	3.6	150 (J)	0.8	10	10.6	0.016 (J)	1.1 (J)	--
D08	190D009	0.0 - 0.5	3.6	196 (J)	0.96	9.2	10.9	0.02 (J)	1.4 (J)	--
D09	190D012	0.0 - 0.5	2.5	211 (J)	0.86	5	12	0.032 (J)	1 (J)	--
D10	190D013	0.0 - 0.5	4.5	159 (J)	1.1	8.7	13.3	0.03 (J)	--	--
D11	190D010	0.0 - 0.5	3.8	205 (J)	1	6.6	11.2	0.03 (J)	1.2 (J)	--
D12	190D011	0.0 - 0.5	3.8	135 (J)	0.78	7.4	11.3	0.028 (J)	--	--
D13	190D014	0.0 - 0.5	4.4	151 (J)	1.1	8	13	0.034 (J)	0.67 (J)	--
D14	190D015	0.5 - 1.0	4.9 (J)	139 (J)	1.2	0.25 (J)	12.5 (J)	0.012 (J-)	--	0.84 (J)

[a]Based on the background concentrations for metals. Background is considered the mean plus two times the standard deviation for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (NBMG, 1998; Moore, 1999).
[b]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004).

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram
J = Estimated value
J- = The result is an estimated quantity, but the result may be biased low.
-- = Not detected above minimum detectable concentrations.

A.6.2.5 Explosives

Analytical results for explosives in environmental samples collected at this CAS were not detected above MDCs. Therefore, the FALs were established at the corresponding PALs.

A.6.2.6 Gamma-Emitting Radionuclides

Gamma-emitting radionuclides analytical results for environmental samples collected at this CAS that were detected above MDCs are presented in Table A.6-6. No gamma-emitting radionuclides were detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PALs.

Table A.6-6
Sample Results for Gamma-Emitting Radionuclides Detected above Minimum Detectable Concentrations at CAS 14-23-01, LTU-6 Test Area
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)				
			Actinium-228	Cesium-137	Lead-212	Lead-214	Thallium-208
Final Action Levels			**5[a]**	**12.2[b]**	**5[a]**	**5[a]**	**5[a]**
D01	190D001	0.0 - 0.5	2.13	--	2.08	1.24	0.751
	190D002	0.0 - 0.5	2.09	--	2.07	1.25	0.673
D02	190D003	0.0 - 0.5	2.01	0.225	2.06	1.3	0.721
D03	190D004	0.0 - 0.5	2.05	--	2.04	1.34	0.612
D04	190D005	0.0 - 0.5	1.86	--	1.85	1.05	0.544
D05	190D006	0.0 - 0.5	1.82	--	1.91	1.04	0.583
D06	190D007	0.0 - 0.5	1.82	--	1.88	1.15	0.64
D07	190D008	0.0 - 0.5	1.89	--	1.9	1.25	0.55
D08	190D009	0.0 - 0.5	1.76	--	2.06	1.23	0.643
D09	190D012	0.0 - 0.5	1.81	--	1.78	0.904	0.55
D10	190D013	0.0 - 0.5	1.86	--	1.91	0.955	0.598

Table A.6-6
Sample Results for Gamma-Emitting Radionuclides Detected above Minimum Detectable Concentrations at CAS 14-23-01, LTU-6 Test Area
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)				
			Actinium-228	Cesium-137	Lead-212	Lead-214	Thallium-208
Final Action Levels			**5[a]**	**12.2[b]**	**5[a]**	**5[a]**	**5[a]**
D11	190D010	0.0 - 0.5	1.82	--	1.93	0.992	0.682
D12	190D011	0.0 - 0.5	1.81	--	1.89	1.03	0.588
D13	190D014	0.0 - 0.5	1.79	--	1.78	0.827	0.623
D14	190D015	0.5 - 1.0	1.7	--	2.11 (J)	1.21 (J)	4.41

[a]Taken from the generic guidelines for residual concentrations of actinium-228, bismuth-214, lead-212, lead-214, thallium-208, and thorium-232, 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 cm of soil and 15 pCi/g for deeper soils (DOE, 1993). For purposes of this document, 15 cm is assumed to be equivalent to 0.5 ft (6 inches); therefore, 5 pCi/g represents the PALs for these radionuclides in the surface soil (0 to 0.5 ft depth).
[b]Taken from the construction, commercial, 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 25-millirem-per-year-dose.

bgs = Below ground surface
cm = Centimeter
ft = Foot
PAL = Preliminary action level
pCi/g = Picocuries per gram

J = Estimated value
-- = Not detected above minimum detectable concentrations.

A.6.2.7 Isotopic Uranium

Isotopic uranium analytical results for environmental samples collected at this CAS that were detected above MDCs are presented in Table A.6-7. No isotopic uranium were detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PALs.

Table A.6-7
Sample Results for Isotopic Uranium Detected above Minimum Detectable Concentrations at CAS 14-23-01, LTU-6 Test Area

Sample Location	Sample Number	Depth (ft bgs)	Contaminants of Potential Concern (pCi/g)	
			Uranium-234	Uranium-238
Final Action Levels[a]			**143**	**105**
D01	190D001	0.0 - 0.5	1.35	2.31
	190D002	0.0 - 0.5	0.889	2.65
D02	190D003	0.0 - 0.5	1.28	0.65
D03	190D004	0.0 - 0.5	0.988	0.959
D04	190D005	0.0 - 0.5	1.26 (J)	0.951 (J)
D05	190D006	0.0 - 0.5	1.07	1.37
D06	190D007	0.0 - 0.5	0.877	0.979
D07	190D008	0.0 - 0.5	1.01	0.755
D08	190D009	0.0 - 0.5	1.1	0.908
D09	190D012	0.0 - 0.5	1.22	0.989
D10	190D013	0.0 - 0.5	1.11	0.875
D11	190D010	0.0 - 0.5	1.23	1.04
D12	190D011	0.0 - 0.5	0.754	0.898
D13	190D014	0.0 - 0.5	1.09	1.09
D14	190D015	0.5 - 1.0	1.48	3.61

[a]Taken from the construction, commercial, 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 25-millirem-per-year-dose.

bgs = Below ground surface
ft = Foot
pCi/g = Picocuries per gram
J = Estimated value

A.6.3 Nature and Extent of Contamination

Based on the analytical results for soil samples collected within CAS 14-23-01, no COCs were identified.

A.6.4 Potential Source Material

The screening results for the metallic debris showed the presence of fixed and removed radioactivity. The elevated screening results were determined to be associated with DU embedded in the surface of metallic debris. The debris with elevated screening results were conservatively assumed to be PSM.

A.6.5 Revised Conceptual Site Model

The CAIP requirements (NNSA/NSO, 2006a) were met at this CAS, and no revisions were necessary to the CSM.

A.7.0 Waste Management

Waste management areas were established and managed as specified in the CAIP. The amount, type, and source of regulated waste placed into each waste container was recorded at the time of generation. Characterization and disposal were completed within regulatory requirements and acceptance criteria.

All waste dispositions were based on process knowledge, radiological surveys, site samples, and direct samples of the waste, when necessary. The characterization and disposition was based on federal and state regulations, permit limitations, and acceptance criteria. The load verification and shipping documentation for CAU 190 are in Appendix F.

A.7.1 Sanitary Waste

Personal protective equipment (PPE) and disposable sampling equipment generated during the site activities were determined to be sanitary based on observation and process knowledge. The waste was bagged, marked, and placed in a roll-off for disposition at the industrial landfill.

A.7.2 Waste Minimization

Investigation-derived waste (IDW) was generated during the field activities. In an effort to reduce the amount of waste generated, waste minimization techniques were integrated into the field activities and waste was segregated to the greatest extent possible. Controls were in place to minimize the use of hazardous materials and the unnecessary generation of hazardous and/or mixed waste. Decontamination activities were planned and executed to minimize the volume of rinsate generated. Lead bricks were recovered from the centrifuge (CAS 11-02-01) and transferred for reuse by another agency.

A.7.3 Waste Streams Disposal

The following CAU 190 waste streams were managed and shipped:

- Disposable PPE and sampling equipment (e.g., jars, plastic, scoops)
- Debris (e.g., hydraulic hose, ladder, debris)

- Solids
- Plastic liner and sand bags
- Solid low-level waste

A.7.3.1 Corrective Actions CAS 11-02-01

One drum containing approximately 100 pounds (lb) of hydraulic hoses and one drum containing approximately 100 lb of solidified hydraulic fluid were shipped to the Area 9 – 10C Landfill. Lead bricks removed from the site were transferred to another agency for reuse.

A.7.3.2 Corrective Actions CAS 11-02-02

Five shipments of debris/soil were sent to the A9 Industrial Landfill. The waste shipments included:

- 1,440 lb of metal drainage pipe from cooling tower to the outfall and miscellaneous debris.
- 8,700 lb cooling tower and piping.
- 32,280 lb water tank #1 and insulated piping from the water tank.
- 1,100 lb water tank #2 and insulated piping from the water tank.
- 21,100 lb of COC-impacted soil.

A.7.3.3 Corrective Actions CAS 11-59-01

Wastes were generated at this CAS by removing the contents of the tank, removing the tank and distribution structure, removing the pipes and grouting all pipes. Three waste shipments from this CAS included:

- Septic tank contents - Approximately 700 gallons of aqueous liquid was pumped from the two chambers of the septic tank and sent to the A12 Lagoon.

- Septic tank structure and pipe – The concrete septic tank, distribution structure, surrounding soil, and solids, were removed and shipped (approximately 35,000 lb total weight) to the A9 Industrial Landfill.

- Soil from the leachfield - Approximately 100 ft^3 of soil and Orangeburg leachpipe from the leachfield were removed, shipped (approximately 23,000 lb total weight) via dump truck to the A9 Industrial Landfill.

- Solids from field screening – Fecal coliform tests on water from the tanks were completed, resulting in waste, which was solidified and disposed of as industrial waste.

A.7.3.4 Corrective Actions CAS 14-23-01

Visible debris fragments were picked up resulting in one drum (195 lb) of DU waste characterized as solid low-level waste to be disposed in the Area 5 Radioactive Waste Management Complex.

A waste summary for CAU 190 is shown in Table A.7-1.

Table A.7-1
Waste Summary for CAU 190

CAS Number	Waste Items	Waste Characterization				Waste Disposition			
		Hazardous	Hydrocarbon	Polychlorinated Biphenyls	Radiological	Disposal Facility	Waste Volume	Disposal Date	Disposal Document[a]
11-02-01	Hydraulic Fluid High-Pressure Hydraulic Hoses and Chain	No	Yes	No	No	Area 9 – U10C	200 lb	11/07/2007	LVF
11-02-02	Metal Drainage Pipe and Miscellaneous Debris	No	Yes	No	No	Area 9 – U10C	1,440 lb	10/30/2007	LVF
	Hydrocarbon Impacted Soil	No	Yes	No	No	Area 9 – U10C	21,100 lb	12/06/2007	LVF
	Cooling Tower and Insulated Piping	No	No	No	No	Area 9 – U10C	8,700 lb	10/30/2007	LVF
	Water Tank #1 and Insulated Piping	No	No	No	No	Area 9 – U10C	32,280 lb	10/30/2007	LVF
	Water Tank #2 and Insulated Piping	No	No	No	No	Area 9 – U10C	1,100 lb	10/30/2006	LVF
11-59-01	Septic Tank, Chromium-impacted Soil, Tank Solids, Distribution Box and Piping	No	Yes	No	No	Area 9 – U10C	34,380 lb	11/06/2007	LVF
	Liquid from Septic Tank	No	No	No	No	Area 12 – Lagoon	700 gal	10/31/2007	BOL
	Orangeburg Pipe and Benzo(a)pyrene Impacted Soil	No	Yes	No	No	Area 9 – U10C	23,000 lb	11/07/2007	LVF
14-23-01	Depleted Uranium	No	No	No	Yes (LLW)	Area 5 – RWMC	195 lb	02/28/2008	CD
Building 23-153	Solids from Field Screening	No	No	No	No	Area 9 – U10C	45 lb	02/28/2008	FADL

[a]Copies of waste disposal documents are located in Appendix F.

BOL = Bill of Lading
CD = Certificate of Disposal
FADL = Field Activity Daily Log
gal = Gallon
lb = Pound
LVF = Load Verification Form
LLW = Low-level waste
RWMC = Radioactive Waste Management Complex

A.8.0 Quality Assurance

This section contains a summary of QA/QC measures implemented during the sampling and analysis activities conducted in support of the CAU 190 CAI. The following sections discuss the data validation process, QC samples, and nonconformances. A detailed evaluation of the DQIs is presented in Appendix B.

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 analysis. Detailed information regarding the QA program is contained in the QAPP (NNSA/NV, 2002).

A.8.1 Data Validation

Data validation was performed in accordance with the QAPP (NNSA/NV, 2002) and approved protocols and procedures. All laboratory data from samples collected and analyzed for CAU 190 were evaluated for data quality in a tiered process with the exception of National Institute for Occupational Safety and Health analyses and are presented in Sections A.8.1.1 through A.8.1.3. Data were reviewed to ensure that samples were appropriately processed and analyzed, and the results were evaluated using validation criteria. Documentation of the data qualifications resulting from these reviews is retained in project files in hard copy and electronic media.

One hundred percent of the data analyzed as part of this investigation were subjected to Tier I and Tier II evaluations. A Tier III evaluation was performed on approximately 5 percent of the data analyzed.

A.8.1.1 Tier I Evaluation

Tier I evaluation for chemical and radiochemical analysis examines, but is not limited to:

- Sample count/type consistent with chain of custody.
- Analysis count/type consistent with chain of custody.
- Correct sample matrix and nonconformances.

- 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.

A.8.1.2 Tier II Evaluation

Tier II evaluation for chemical analysis examines, but is not limited to:

- Correct detection limits achieved.
- Sample date, preparation date, and analysis date for each sample.
- Holding time criteria met.
- Quality control 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.
- Matrix spike/MSD percent recoveries (%R) and relative percent differences (RPDs) evaluated and qualifiers applied to laboratory results, as necessary.
- Field duplicate RPDs evaluated using professional judgment and qualifiers applied to laboratory results, as necessary.
- Laboratory duplicate RPDs evaluated and qualifiers applied to laboratory results, as necessary.
- Surrogate %R evaluated and qualifiers applied to laboratory results, as necessary.
- Laboratory control sample (LCS) %R evaluated and qualifiers applied to laboratory results, as necessary.
- Initial and continuing calibration evaluated and qualifiers applied to laboratory results, as necessary.
- Internal standard evaluation.

- Mass spectrometer tuning criteria.
- Organic compound quantitation.
- Inductively coupled plasma interference check sample evaluation.
- Graphite furnace atomic absorption QC.
- Inductively coupled plasma serial dilution effects.
- Recalculation of 10 percent of laboratory results from raw data.

Tier II evaluation for radiochemical analysis examines, but is not limited to:

- 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 MDC evaluated.
- Detector system calibrated with 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 or weekly 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.

A.8.1.3 Tier III Evaluation

The Tier III review is an independent examination of the Tier II evaluation. A Tier III review of 5 percent of the sample analytical data was performed by TLI Solutions, Inc., of Lakewood, Colorado. Tier II and Tier III results were compared and where differences are noted, data were reviewed and changes made accordingly. This review included the following additional evaluations:

Chemical:

- Recalculation of all laboratory results from raw data.

Radioanalytical:

- Quality control sample results (e.g., calibration source concentration, %R, and RPD) verified.
- Radionuclides and their concentration validated as appropriate considering their decay schemes, half-lives, and process knowledge and history of the facility and 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.

A.8.2 Field Quality Control Samples

Field QC samples consisted of seven trip blanks, one equipment rinsate blank, two field blank, five FDs, and five MS/MSDs collected and submitted for analysis by the laboratory analytical methods shown in Table A.2-2. The QC 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.

During the CAI, five FDs were sent to the laboratory to be analyzed as blind samples 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 FD sample results) were evaluated.

A.8.2.1 Laboratory Quality Control Samples

Analysis of preparation 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. The results of these analyses were used to qualify associated environmental sample results. Documentation of data qualifications resulting from the application of these guidelines is retained in the project files in hard copy and electronic media.

The laboratory included a PB, LCS, and laboratory duplicate sample with each batch of field samples analyzed for radionuclides.

A.8.3 Field Nonconformances

There were no field nonconformances identified for the CAI.

A.8.4 Laboratory Nonconformances

Laboratory nonconformances are generally due to inconsistencies in the analytical instrumentation operation, sample preparations, extractions, missed holding times, and fluctuations in internal standard and calibration results. Fifty-one nonconformances that may or may not have resulted in qualifying data were issued by the laboratories. These laboratory nonconformances have been accounted for and resolved during the data qualification process.

A.9.0 Summary

Organic, inorganics, and radionuclide contaminants detected in environmental samples during the CAI were evaluated against FALs to determine the nature and extent of COCs for CAU 190. Assessment of the data generated from investigation activities indicates the FALs were exceeded for benzo(a)pyrene and dibenzo(a,h)anthracene in two surface soil samples in CASs 11-02-02. The FALs were exceeded for benzo(a)pyrene in one surface soil sample and chromium in one surface soil sample at CAS 11-59-01. The following summarizes the results for each CAS.

CAS 11-02-01 Underground Centrifuge

Based on the observations made, the radiological surveys conducted, and the analytical results of the environmental samples collected at this CAS, no COCs are present in the soil at this CAS. Therefore, no further action is required at this CAS.

As a BMP, removal of the two hydraulic hoses and lead bricks inside the centrifuge was performed. The hydraulic hoses were placed in drums for disposal. The ladder was placed in the floor of the centrifuge. The lead bricks were surveyed for release and sent offsite for reuse at another laboratory.

See Appendix D for additional closure activities performed at this CAS.

CAS 11-02-02, Drain Lines and Outfall

Based on field observations, radiological surveys conducted, and the analytical results for soil samples collected within CAS 11-02-02, the only COCs that were identified are benzo(a)pyrene and dibenzo(a,h)anthracene in the environmental soil samples at this CAS. These COCs were identified at the pipe outfall and near the pipe outfall.

As shown by samples collected at locations B01 and B02 (Figure A.4-1 and Table A.4-3 and Table A.4-4), the COCs are limited to the surface interval (0.0 to 1.5 ft bgs), where concentrations decrease laterally to concentrations below the FALs within 5 ft of the outfall, and decrease to values below the FALs within the top 1.5 ft of soil. A corrective action of clean closure ensured removal of the outfall pipe and COC-impacted soil. No COCs remain at this CAS.

As a BMP, the cooling tower and associated steel pipe leading to the outfall, and two aboveground water tanks and piping were removed. See Appendix D for closure activities performed at this CAS.

CAS 11-59-01, Tweezer Facility Septic System

Based on field observations and the analytical results for soil, Orangeburg pipe, and septage samples collected within CAS 11-59-01, the only COCs identified are chromium at location C03 and benzo(a)pyrene at location C15 (Figure A.5-1).

The chromium is limited to the interval just below the effluent pipe coming from the septic tank that was observed to be cracked. This volume of soil was removed during closure activities when the septic tank was removed. Benzo(a)pyrene was detected at location C15 above the FAL. A deeper sample was collected at this location did not detect benzo(a)pyrene. A corrective action of clean closure ensured removal of the COC-impacted soil, the PSM inside the septic tank, and the Orangeburg leachpipe. No COCs remain at this CAS.

As a BMP, the septic tank, distribution box, and surface debris, were removed. See Appendix D for closure activities performed at this CAS.

CAS 14-23-01, LTU-6 Test Area

Based on the observations made, radiological surveys conducted, and analytical results of the environmental samples collected at this CAS, no COCs are present in the soil at this CAS. Therefore, no further action is required at this CAS.

As a BMP, removal of the fragments of metallic debris was performed during closure activities. See Appendix D for closure activities performed at this CAS.

A.10.0 References

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Appendix B

Data Assessment

B.1.0 Data Assessment

The DQA process is the scientific evaluation of the actual investigation results to determine whether the DQO criteria established in the CAU 190 CAIP (NNSA/NSO, 2006) were met and whether DQO decisions can be resolved at the desired level of confidence. The DQO process ensures that the right type, quality, and quantity of data will be available to support the resolution of those decisions at an appropriate level of confidence. Using both the DQO and DQA processes help to ensure that DQO decisions are sound and defensible.

The DQA involves five steps that begin with a review of the DQOs and end with an answer to the DQO decisions. The five steps are briefly summarized as follows:

Step 1: Review DQOs and Sampling Design – Review the DQO Process to provide context for analyzing the data. State the primary statistical hypotheses; confirm the limits on decision errors for committing false negative (Type I) or false positive (Type II) decision errors; and review any special features, potential problems, or deviations to the sampling design.

Step 2: Conduct a Preliminary Data Review – Perform a preliminary data review by reviewing QA reports and inspecting the data both numerically and graphically, validating and verifying the data to ensure that the measurement systems performed are in accordance with the criteria specified, and using the validated dataset to determine whether the quality of the data is satisfactory.

Step 3: Select the Test – Select the test based on the population of interest, population parameter, and hypotheses. Identify the key underlying assumptions that could cause a change in one of the DQO decisions.

Step 4: Verify the Assumptions – Perform tests of assumptions. If data are missing or are censored, determine the impact on DQO decision error.

Step 5: Draw Conclusions from the Data – Perform the calculations required for the test.

B.1.1 Review DQOs and Sampling Design

This section contains a review of the DQO process presented in Appendix A of the CAIP (NNSA/NSO, 2006). The DQO decisions are presented with the DQO provisions to limit false negative or false positive decision errors. Special features, potential problems, or any deviations to the sampling design are also presented.

B.1.1.1 Decision I

The Decision I statement as presented in the CAIP: "Is a contaminant present within a CAS at a concentration that could pose an unacceptable risk to human health and the environment?" (NNSA/NSO, 2006).

Decision I Rules:

- If the population parameter of any COPC in a target population exceeds the FAL for COPC, then the COPC is identified as a COC.
- If a COC is detected, then the Decision II statement must be resolved.
- If COCs are not identified, then the investigation is complete.

B.1.1.1.1 DQO Provisions To Limit False Negative Decision Error

A false negative decision error (where consequences are more severe) was controlled by meeting the following criteria:

1. Having a high degree of confidence that locations selected will identify COCs, if present anywhere within the CAS, at an acceptable level of sensitivity.
2. Having a high degree of confidence that analyses conducted will be sufficient to detect any COCs present in the samples.
3. Having a high degree of confidence that the dataset is of sufficient quality and completeness.

Criterion 1:

The following methods (stipulated in the CAU 190 DQOs [NNSA/NSO, 2006]) were used in selecting sample locations.

1. Selection of sampling locations associated with FSRs was accomplished by analyzing samples for alpha and beta/gamma emitting radionuclides using a handheld NE Technology Electra.
2. Selection of sampling locations associated with breaches in piping was accomplished by performing a video survey of the pipes.
3. Selection of sampling locations associated with a release of effluent to the surrounding soils from pipe tie-in locations was accomplished by conducting visual inspections of the pipes for corrosion or wear.
4. Selection of sampling locations associated with surface and subsurface staining, odors, presence of debris, and other items was accomplished by visual field observations.
5. Selection of sampling locations associated with outfalls was accomplished by identifying the following four areas:
    - A: The discharge point of the outfall
    - B: Upgradient locations within washes or discharge features
    - C: Downgradient from the discharge (may be multiple locations based on COCs)
    - D: Media samples from concrete, pipes, or pipe contents if available
6. Selection of sampling locations associated with professional judgment based on acceptable knowledge was accomplished by:
    - Source and location of release
    - Chemical nature and fate properties
    - Physical transport pathways and properties
    - Transport drivers

Criterion 2:

All samples were analyzed using the analytical methods listed in Table 3-5 of the CAIP and for the chemical and radiological constituents listed in Table 3-4 of the CAIP (NNSA/NSO, 2006). Table B.1-1 provides a reconciliation of samples analyzed to the planned analytical program.

Samples were submitted for all of the analytical methods specified in the analytical program specified in Section A.3.2 of the CAIP (NNSA/NSO, 2006).

Sample results were assessed against the acceptance criterion for the DQI of sensitivity as defined in the Industrial Sites QAPP (NNSA/NV, 2002). The sensitivity acceptance criterion defined in the CAIP is that analytical detection limits will be less than the corresponding action level (NNSA/NSO, 2006). This criterion was not achieved for the analytical results listed in Table B.1-2. Results not meeting the sensitivity acceptance criterion will not be used in making DQO decisions

Table B.1-1
CAU 190 Analyses Performed

CAS	Total VOCs	Total SVOCs	PCBs	Metals	TPH-DRO	TPH-GRO	Herbicides	Explosives	Gamma Spectroscopy	Isotopic Uranium	Beryllium
11-02-01	--	--	--	--	RS	--	--	--	--	--	--
11-02-02	RS	RS	RS	S	S	S	--	--	RS	--	--
11-59-01	RS	RS	RS	RS	RS	RS	--	--	RS	--	--
14-23-01	--	--	--	RS	--	--	S	RS	RS	RS	RS

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

RS = Required and submitted
S = Not required but submitted
-- = Not applicable

Table B.1-2
Constituents Failing Sensitivity Criteria for CAU 190

Sample Number	Constituent	Minimum Detectable Concentration (mg/kg)	Final Action Level (mg/kg)
190B001	N-Nitroso di-n-propylamine	0.699	0.25
190B002	N-Nitroso di-n-propylamine	0.699	0.25
190C019	N-Nitroso di-n-propylamine	0.289	0.25

mg/kg = Milligrams per kilogram

and will therefore be considered as rejected data. The impact on DQO decisions is addressed in the assessment of completeness.

Criterion 3:

To satisfy the third criterion, the entire dataset, as well as individual sample results, were assessed against the acceptance criteria for the DQIs of precision, accuracy, comparability, completeness, and representativeness, as defined in the QAPP (NNSA/NV, 2002). The DQI acceptance criteria are presented in Table 6-1 of the CAIP (NNSA/NSO, 2006). As presented in Tables B.1-2 through B.1-5, these criteria were met for each of the DQIs.

Precision

Precision was evaluated as described in Section 6.2 of the CAIP (NNSA/NSO, 2006). Table B.1-3 provides the chemical and radiological precision analysis results for all constituents that were qualified for precision. The only chemical constituents qualified for precision was lead.

Table B.1-3
Precision Measurements for CAU 190

Constituent	User Test Panel	Number of Analytes Qualified	Number of Measurements Performed	Percent within Criteria
Lead	Metals	3	45	93.3

As shown in Table B.1-3, the precision rate for lead was above the CAIP acceptance criterion of 80 percent. The precision rate for all other constituents is 100 percent. As the precision rates for all constituents meet the acceptance criteria for precision, the dataset is determined to be acceptable for the DQI of precision.

Accuracy

Accuracy was evaluated as described in Section 6.2 of the CAIP (NNSA/NSO, 2006). Table B.1-4 provides the chemical accuracy analysis results for all constituents qualified for accuracy. Accuracy rates are above the CAIP criterion of 80 percent with the exception of barium and dicamba. There were no radiological data qualified for accuracy.

Table B.1-4
Accuracy Measurements for CAU 190
(Page 1 of 4)

Constituents	User Test Panel	Number of Measurements Qualified	Number of Measurements Performed	Percent within Criteria
2,4-Dinitrotoluene	SVOCs	1	51	98
1,1,1,2-Tetrachloroethane	VOCs	1	34	97.1
1,1,1-Trichloroethane	VOCs	1	34	97.1
1,1,2,2-Tetrachloroethane	VOCs	1	34	97.1
1,1,2-Trichloroethane	VOCs	1	34	97.1
1,1-Dichloroethane	VOCs	1	34	97.1

Table B.1-4
Accuracy Measurements for CAU 190
(Page 2 of 4)

Constituents	User Test Panel	Number of Measurements Qualified	Number of Measurements Performed	Percent within Criteria
1,1-Dichloroethene	VOCs	1	34	97.1
1,2,4-Trichlorobenzene	VOCs	1	34	97.1
1,2,4-Trimethylbenzene	VOCs	1	34	97.1
1,2-Dibromo-3-Chloropropane	VOCs	1	34	97.1
1,2-Dichlorobenzene	VOCs	1	34	97.1
1,2-Dichlorethylene (cis)	VOCs	1	34	97.1
1,2-Dichloropropane	VOCs	1	34	97.1
1,3,5-Trimethylbenzene	VOCs	1	34	97.1
1,3-Dichlorobenzene	VOCs	1	34	97.1
1,4-Dioxane	VOCs	1	34	97.1
2-Butanone	VOCs	1	34	97.1
2-Chlorotoluene	VOCs	1	34	97.1
2-Hexanone	VOCs	1	34	97.1
Acetone	VOCs	1	34	97.1
Acetonitrile	VOCs	1	34	97.1
Allyl Chloride	VOCs	1	34	97.1
Benzene	VOCs	1	34	97.1
Bromodichloromethane	VOCs	1	34	97.1
Bromoform	VOCs	1	34	97.1
Carbon Disulfide	VOCs	1	34	97.1
Carbon Tetrachloride	VOCs	1	34	97.1
Chlorobenzene	VOCs	1	34	97.1
Chloroform	VOCs	1	34	97.1
Chloroprene	VOCs	1	34	97.1
Dibromochloromethane	VOCs	1	34	97.1
Dichlorodifluoromethane	VOCs	1	34	97.1
Ethyl Chloride	VOCs	1	34	97.1
Ethyl Methacrylate	VOCs	1	34	97.1

Table B.1-4
Accuracy Measurements for CAU 190
(Page 3 of 4)

Constituents	User Test Panel	Number of Measurements Qualified	Number of Measurements Performed	Percent within Criteria
Ethylbenzene	VOCs	1	34	97.1
Ethylene Dichloride	VOCs	1	34	97.1
Isobutyl Alcohol	VOCs	1	34	97.1
Isopropylbenzene	VOCs	1	34	97.1
Methacrylonitrile	VOCs	1	34	97.1
Methyl Bromide	VOCs	1	34	97.1
Methyl Chloride	VOCs	1	34	97.1
Methyl Isobutyl Ketone	VOCs	1	34	97.1
Methyl Methacrylate	VOCs	1	34	97.1
Methylene Chloride	VOCs	1	34	97.1
n-Butylbenzene	VOCs	1	34	97.1
n-Propylbenzene	VOCs	1	34	97.1
p-isopropyltoluene	VOCs	1	34	97.1
Perchloroethylene	VOCs	1	34	97.1
Sec-Butylbenzene	VOCs	1	34	97.1
Styrene	VOCs	1	34	97.1
Tert-Butylbenzene	VOCs	1	34	97.1
Total Xylenes	VOCs	1	34	97.1
Trichloroethene	VOCs	1	34	97.1
Trichlorofluoromethane	VOCs	1	34	97.1
Vinyl Acetate	VOCs	1	34	97.1
Vinyl Chloride	VOCs	1	34	97.1
1,4-Dichlorobenzene	VOCs	2	34	94.1
Aroclor 1221	PCBs	2	34	94.1
Aroclor 1232	PCBs	2	34	94.1
Aroclor 1242	PCBs	2	34	94.1
Aroclor 1248	PCBs	2	34	94.1
Aroclor 1254	PCBs	2	34	94.1

Table B.1-4
Accuracy Measurements for CAU 190
(Page 4 of 4)

Constituents	User Test Panel	Number of Measurements Qualified	Number of Measurements Performed	Percent within Criteria
Aroclor 1260	PCBs	2	34	94.1
Aroclor 1268	PCBs	2	34	94.1
PCBs (low risk)	PCBs	2	34	94.1
Toluene	VOCs	2	34	94.1
Diesel-Range Organics	DRO	3	51	94.1
Lead	Metals	3	45	93.3
Gasoline-Range Organics	GRO	6	31	80.6
Barium	Metals	45	45	0
Dicamba	Herbicides	1	1	0

DRO = Diesel-range organics
GRO = Gasoline-range organics
PCB = Polychlorinated biphenyl
SVOC = Semivolatile organic compound
VOC = Volatile organic compound

Of the 45 barium results qualified for accuracy, all 45 were associated with an MS recovery that was outside the control limits. This indicates that the associated samples may have been reported at concentrations higher or lower than actual. This inaccuracy could impact a DQO decision by causing a false positive decision error. However, there is negligible potential for a false negative DQO decision error because the reported values are small in comparison to the action level (the FAL [67,000 mg/kg] is significantly higher than the highest reported barium concentration [344 mg/kg]). Therefore, the barium results that were qualified for reasons of accuracy can be used confidently to support DQO decisions.

The dicamba result was qualified for accuracy because of an MS recovery that was outside the control limit. However, there is negligible potential for a false negative DQO decision error because the reported value is small in comparison to the action level (the FAL of 18,000 mg/kg is many times higher than the reported dicamba concentration of 0.0017 mg/kg). Therefore, the dicamba result that was qualified for reasons of accuracy can be confidently used to support DQO decisions.

As the accuracy rate for all other constituents exceed the acceptance criteria for accuracy, the dataset is determined to be acceptable for the DQI of accuracy.

Representativeness

The DQO process as identified in Appendix A of the CAIP (NNSA/NSO, 2006) was used to address sampling and analytical requirements for CAU 190. During this process, appropriate locations were selected that enabled the samples collected to be representative of the population parameters identified in the DQO (the most likely locations to contain contamination and locations that bound COCs). The sampling locations identified in the Criterion 1 discussion meet this criterion. Therefore, the analytical data acquired during the CAU 190 CAI are considered representative of the population parameters.

Comparability

Field sampling, as described in the CAIP (NNSA/NSO, 2006), 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 analyze, report, and validate the data. These are comparable to other methods used not only in industry and government practices, but most importantly are comparable to other investigations conducted for the NTS. Therefore, project datasets are considered comparable to other datasets generated using these same standardized DOE procedures, thereby meeting DQO requirements.

Additionally, standard, approved field and analytical methods ensured that data were appropriate for comparison to the investigation action levels specified in the CAIP.

Completeness

The CAIP (NNSA/NSO, 2006) defines acceptable criteria for completeness to be that the dataset is sufficiently complete to be able to make the DQO decisions. This is evaluated initially as 80 percent of CAS-specific noncritical constituents targeted analytes or critical constituents identified in the CAIP as having valid results, and 100 percent of critical analytes (including Decision II samples) having valid results. The only critical analyte identified for CAU 190 was uranium-238 at CAS 14-23-01.

Rejected data (qualified either as rejected or data that failed the criterion of sensitivity) were not used in the resolution of DQO decisions and are not counted toward meeting the completeness acceptance criterion. Table B.1-5 provides the rejected data for the site, and Table B.1-2 provides data that failed the sensitivity criteria that use target analytes. The only target analyte for CAU 190 was uranium-238. All data for target analytes were within the acceptable criteria.

Table B.1-5
Rejected Measurements for CAU 190

Constituents	Analytical Method	Number of Measurements Rejected	Number of Measurements Performed	Percent within Criteria
Benzo(k)fluoranthene	SVOCs	1	51	98
Di-n-octyl phthalate	SVOCs	1	51	98
Americium-241	Gamma	1	45	97.8
Cesium-137	Gamma	1	45	97.8

SVOC = Semivolatile organic compound

B.1.1.1.2 DQO Provisions To Limit False Positive Decision Error

The false positive decision error was controlled by assessing the potential for false positive analytical results. Quality assurance/QC samples such as field blanks, trip blanks, LCSs, and method blanks were used to determine whether a false positive analytical result may have occurred. This provision is evaluated during the validation process and appropiate qualifications are applied.

Proper decontamination of sampling equipment and the use of certified clean sampling equipment and containers also minimized the potential for cross contamination that could lead to a false positive analytical result.

B.1.1.2 Decision II

Decision II as presented in the CAIP: “If a COC is present, is sufficient information available to evaluate appropriate corrective action alternatives?” (NNSA/NSO, 2006). Sufficient information is defined to include:

- Identifying the volume of media containing any COC bounded by analytical sample results in lateral and vertical directions.

- The information needed to determine potential remedial waste types.

- The information needed to evaluate the feasibility of remediation alternatives (i.e., bioassessment if natural attenuation or biodegradation is considered, and geotechnical data if construction or evaluation of barriers is considered).

Decision Rules:

- If the observed concentration of any COC in a Decision II sample exceeds the PALs, then additional samples will be collected to complete the determination of the extent.

- If observed COC concentrations in a sample from all bounding directions are less than the PALs, then the decision will be that the extent of contamination has been defined in the lateral and/or vertical direction.

- If wastes are to be generated as part of a corrective action, samples will be collected to sufficiently characterize the potential wastes.

Population Parameters – The population parameters for Decision II data will be the observed concentration of each unbounded COC in any sample or the observed concentration of each sample used to characterize the potential waste streams.

B.1.1.2.1 DQO Provisions To Limit False Negative Decision Error

A false negative decision error (where consequences are more severe) is controlled by meeting the following criteria:

1. Having a high degree of confidence that the sample locations selected will identify the extent of the COCs.

2. Having a high degree of confidence that analyses conducted will be sufficient to detect any COCs present in the samples.

3. Having a high degree of confidence that the dataset is of sufficient quality and completeness.

4. Having a high degree of confidence that the potential waste streams are characterized.

Criterion 1:

In general, soil sample results demonstrated that the vertical and lateral extent of COCs were defined. The extent sample locations and concentrations for the contaminants driving the extent of contamination are discussed below.

For CAS 11-02-02, as shown by samples collected at locations B01 and B02 (Figure A.4-1 and Tables A.4-3 and A.4-4), the COCs are limited to the surface interval (0.0 to 1.5 ft bgs); where concentrations decrease laterally to concentrations below the FALs within 5 ft of the outfall and decrease to values below the FALs within the top 1.5 ft of soil.

For CAS 11-59-01, the only COCs that were identified are chromium at location C03 and benzo(a)pyrene at location C15 (Figure A.5-1). Deeper samples were collected at these locations and did not contain COCs.

Decision II (verification samples) sampling activities included the collection of three samples at location C15 at a radius approximately 3 ft from the initial C15 location. Results indicate that COCs have not migrated to these three locations.

Criterion 2:

All samples were analyzed for the COCs present at the corresponding CASs.

The second criterion for extent (sensitivity) was accomplished for all analyses as demonstrated in Tables B.1-2 and B.1-3.

Criterion 3:

To satisfy the third criterion for extent, the entire dataset, as well as individual sample results, were assessed against the DQIs of precision, accuracy, comparability, completeness, and representativeness, as defined in the QAPP (NNSA/NV, 2002). The DQI discussion is presented under Criterion 3 for Decision I.

B.1.1.3 Sampling Design

The CAIP (NNSA/NSO, 2006) made the following commitments for sampling.

Biased locations will have soil samples collected beneath and/or adjacent to collection and distribution systems and debris locations to identify releases of contaminants.

Result: All collection and distribution system components and debris locations at each CAS were investigated by excavation or hand sampling and soil samples were collected adjacent to and from beneath the required components such as the base of tanks, distribution boxes, outfall, debris locations, and breaches in piping.

B.1.2 Conduct a Preliminary Data Review

A preliminary data review was conducted by reviewing QA reports and inspecting the data. The contract analytical laboratories generate a QA nonconformance report when data quality does not meet contractual requirements. All data received from the analytical laboratories met contractual requirements; therefore, QA a nonconformance report was not generated. Data were validated and verified to ensure that the measurement systems performed in accordance with the criteria specified. The validated dataset quality was found to be satisfactory.

B.1.3 Select the Test and Identify Key Assumptions

The test for making DQO Decision I was the comparison of the maximum analyte result from each CAS to the corresponding FAL. The test for making DQO Decision II was the comparison of all COC analyte results from each bounding sample to the corresponding FALs.

The key assumptions that could impact a DQO decision are listed in Table B.1-6.

Table B.1-6
Key Assumptions

Exposure Scenario	Site workers are only exposed to contaminants of concern (COCs) through oral ingestion, inhalation, external exposure to radiation, or dermal contact (by absorption) of COCs absorbed onto the soils. Exposure to contamination is limited to industrial site workers, construction/remediation workers, and military personnel conducting training.
Affected Media	Surface soil, shallow subsurface soil, and potentially perched (shallow) groundwater. Deep groundwater contamination is not a concern. Contaminants migrating to regional aquifers are not considered.
Location of Contamination/Release Points	The area of contamination is contiguous. The extent of COC concentration decreases away from the area of contamination.
Transport Mechanisms	Surface transport may occur as a result of a spill or stormwater runoff. Surface transport beyond shallow substrate is not a concern.
Preferential Pathways	None.
Lateral and Vertical Extent of Contamination	Subsurface contamination, if present, is contiguous and decreases with distance and depth from the source. Surface contamination may occur laterally as a result of a spill or stormwater runoff.
Groundwater Impacts	None.
Future Land Use	Nonresidential.
Other Data Quality Objective Assumptions	Contamination may be present in the soils adjacent to a feature due to run-off or intended use (e.g., decontamination pad).

B.1.4 Verify the Assumptions

The results of the investigation support the key assumptions identified in the CAU 190 CAIP DQOs (NNSA/NSO, 2006) and Table B.1-6.

All data collected during the CAI supported CSMs presented in the CAIP, nor did they necessitate revisions to the CSMs.

B.1.5 Draw Conclusions from the Data

This section resolves the two DQO decisions for each CAU 190 CAS.

B.1.5.1 Decision Rules for Decision I

Decision Rule: If the concentration of any COPC in a target population exceeds the FAL for that COPC during the initial investigation, then that COPC is identified as a COC and Decision II sampling will be conducted.

Result: The following COCs were identified in the following CASs.

- 11-02-02 – Benzo(a)pyrene, and dibenzo(a,h)anthracene
- 11-59-01 – Chromium and benzo(a)pyrene

The extent of the COC-impacted soil was defined (Decision II)

Decision Rule: If all COPC concentrations are less than the corresponding FALs, then the decision will be no further action.

Result: No COCs were identified in samples collected from CAS 11-02-01 and CAS 14-23-01. No further action was identified as the corrective action for these CASs.

B.1.5.2 Decision Rules for Decision II

Decision Rule: If the observed concentration of any COC in a Decision II sample exceeds the FALs, then additional samples will be collected to complete the determination of the extent.

Result: Samples to define extent were collected from CASs 11-02-01 and 11-59-01.

Decision Rule: If all observed COC population parameters are less than the FALs, then the decision will be that the extent of contamination has been defined in the lateral and/or vertical direction.

Result: The vertical and lateral extent of contamination at CASs 11-02-01 and 11-59-01 were defined.

B.2.0 References

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

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

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

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2006. *Corrective Action Investigation Plan for Corrective Action Unit* 190*: Contaminated Waste Sites, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--1175. Las Vegas, NV.

Appendix C

Risk Assessment

C.1.0 Risk Assessment

The risk-based corrective action (RBCA) process used to establish FALs is described in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006a). This process conforms with NAC Section 445A.227, which lists the requirements for sites with soil contamination (NAC, 2006a). For the evaluation of corrective actions, NAC Section 445A.22705 (NAC, 2006b) requires the use of ASTM Method E 1739-95 (ASTM, 1995) to "conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards (i.e., FALs) or to establish that corrective action is not necessary."

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

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

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

This section contains documentation of the RBCA process used to establish FALs described in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006a). This process defines three tiers (or levels) to establish FALs used to evaluate DQO decisions:

- Tier 1 – Sample results from source areas (highest concentrations) compared to risk-based screening levels (RBSLs) (i.e., PALs) based on generic (nonsite-specific) conditions.

- Tier 2 – Sample results from exposure points compared to SSTLs calculated using site-specific inputs and Tier 1 formulas.

- Tier 3 – Sample results from exposure points compared to SSTLs and points of compliance calculated using chemical fate/transport and probabilistic modeling.

The RBCA decision process stipulated in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006a) is summarized in Figure C.1-1.

C.1.1 A. Scenario

Corrective Action Unit 190, Contaminated Waste Sites, consists of the following four inactive sites within Area 11 and Area 14 of the NTS:

- 11-02-01, Underground Centrifuge
- 11-02-02, Drain Lines and Outfall
- 11-59-01, Tweezer Facility Septic System
- 14-23-01, LTU-6 Test Area

Three CASs are located within the Tweezer Facility in Area 11 of the NTS and consist of an underground centrifuge, drain lines and outfall, and a septic system and leachfield. The specific activities conducted at the Tweezer Facility are classified. The facility generated hazardous, sanitary, and possibly radioactive wastes and originally discharged these wastes via process waste lines and septic systems from approximately 1972 to 2001. The building structures were removed in 2004; however, the original concrete building pads, floor drains, septic tanks, and piping remained in place. The septic tank, distribution box, water tanks, cooling tower, piping, and lead bricks were removed during closure activities listed in Appendix D.

The fourth site is at the LTU-6 Test Area in the northern part of Area 14, near the Mine Mountain Road and Mid Valley Road (Saddle Mountain Road) junction. This site consists of potentially contaminated soil from the ejected debris from MX missile testing. Historical documents indicate a release of radiological contamination in the area, which was verified during field activities.

C.1.2 B. Site Assessment

The CAI at CASs 11-02-01 (Underground Centrifuge) and CAS 11-02-02 (Drain Lines and Outfall), involved visual inspections through observations, photography and/or excavation and soil sampling

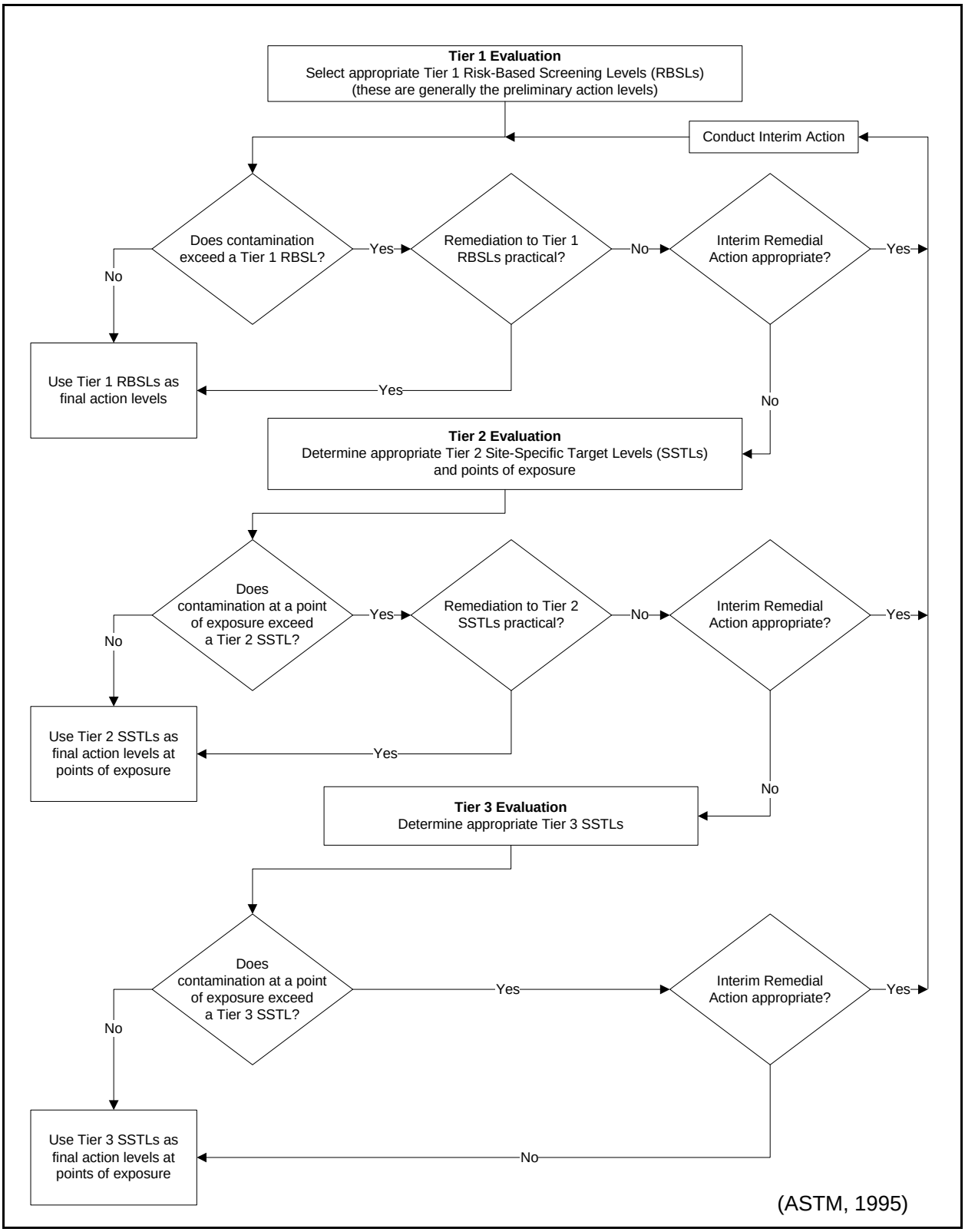

Figure C.1-1
Risk-Based Corrective Action Decision Process

adjacent to and/or beneath structural components identified as potential sources for contaminant releases. The CAI results indicate residual materials are not present in the storage tanks and the structural integrity of system components (e.g., tanks, piping) are intact, closed, or covered by soil, and are not releasing contaminants to the surrounding environment. However, SVOCs were identified in subsurface soils at the outfall pipe in concentrations exceeding PALs. The contaminants are limited to two surface locations and contiguous with the source release point of discharge from the outfall. The source, release point, and nature and extent of the contamination is consistent with the CSM presented in the CAIP (NNSA/NSO, 2006b).

The CAI at CAS 11-59-01 (Tweezer Facility Septic System) involved visual inspection through video survey and/or excavation and soil sampling adjacent to and/or beneath structural components identified in the CAIP as potential sources for contaminant releases (NNSA/NSO, 2006b). The CAI results indicate residual materials are present in the septic tanks; however, the structural integrity of the effluent collection/distribution system components (e.g., tanks, piping) are intact, not open to the surface, and not releasing contaminants to the surrounding environment. However, COCs (specifically SVOCs) were identified in subsurface soils surrounding the leachpipe. Additionally, chromium was identified as a COC just below the effluent pipe coming from the septic tank. The COCs are limited to two subsurface locations and contiguous with the source release point of discharge from the leachpipe. The source, release point, and nature and extent of the COCs is consistent with the CSM presented in the CAIP (NNSA/NSO, 2006b).

The CAI at CAS 14-23-01 involved visual inspections through site walks and photography and hand soil sampling adjacent to and/or beneath ejected debris identified in the CAIP as potential sources for contaminant releases. The CAI results indicate COCs are not present and the ejected debris are not releasing contaminants to the surrounding environment. However, some of the debris were found to be contaminated with DU and considered PSM. The source, release point, and nature and extent of the COCs is consistent with the CSM presented in the CAIP (NNSA/NSO, 2006b).

The maximum concentration of contaminant identified at each CAS, and their corresponding PALs are presented in Table C.1-1. Values exceeding the action level are indicated in bold.

Table C.1-1
Maximum Reported Value for Tier 1 Comparison
(Page 1 of 5)

Constituent	Maximum Result	Sample Number	Depth (ft bgs)	Location	PAL	Units
CAS 11-02-01, Underground Centrifuge						
Anthracene	0.0101 (J)	190A002	0.0 - 0.5	A01	100,000	mg/kg
Benzo(a)anthracene	0.0179 (J)	190A002	0.0 - 0.5	A01	2.1	mg/kg
Benzo(a)pyrene	0.0451 (J)	190A001	0.0 - 0.5	A01	0.21	mg/kg
Benzo(b)fluoranthene	0.0355 (J)	190A001	0.0 - 0.5	A01	2.1	mg/kg
Benzo(g,h,i)perylene	0.065 (J)	190A001	0.0 - 0.5	A01	29,000	mg/kg
Benzo(k)fluoranthene	0.0371 (J)	190A001	0.0 - 0.5	A01	21	mg/kg
Benzoic acid	0.445 (J)	190A002	0.0 - 0.5	A01	100,000	mg/kg
Chrysene	0.0256 (J)	190A001	0.0 - 0.5	A01	210	mg/kg
Dibenzo(a,h)anthracene	0.164 (J)	190A001	0.0 - 0.5	A01	0.21	mg/kg
Diesel-Range Organics	11.4	190A003	0.0 - 0.5	A02	100	mg/kg
Indeno(1,2,3-cd)pyrene	0.143 (J)	190A001	0.0 - 0.5	A01	2.1	mg/kg
CAS 11-02-02, Drain Lines and Outfall						
2-Butanone	0.0146 (J)	190B001	0.0 - 0.5	B01	110,000	mg/kg
2-Hexanone	0.393	190B001	0.0 - 0.5	B01	110,000	mg/kg
2-Methylnaphthalene	0.00777 (J)	190B004	0.0 - 0.5	B02	190	mg/kg
Acenaphthene	0.0745 (J)	190B004	0.0 - 0.5	B02	29,000	mg/kg
Acetone	0.0283	190B001	0.0 - 0.5	B01	54,000	mg/kg
Actinium-228	1.9	190B002	0.0 - 0.5	B01	5	pCi/g
Anthracene	0.125 (J)	190B004	0.0 - 0.5	B02	100,000	mg/kg
Arsenic	12.6	190B002	0.0 - 0.5	B01	23	mg/kg
Barium	238 (J-)	190B002	0.0 - 0.5	B01	67,000	mg/kg
Benzo(a)anthracene	0.306 (J)	190B004	0.0 - 0.5	B02	2.1	mg/kg
Benzo(a)pyrene	**0.282**	190B004	0.0 - 0.5	B02	0.21	mg/kg
Benzo(b)fluoranthene	0.345	190B004	0.0 - 0.5	B02	2.1	mg/kg
Benzo(g,h,i)perylene	0.242 (J)	190B004	0.0 - 0.5	B02	29,000	mg/kg
Benzo(k)fluoranthene	0.129 (J)	190B004	0.0 - 0.5	B02	21	mg/kg
Bis(2-ethylhexyl)phthalate	0.0737 (J)	190B008	1 - 1.5	B01	120	mg/kg

Table C.1-1
Maximum Reported Value for Tier 1 Comparison
(Page 2 of 5)

Constituent	Maximum Result	Sample Number	Depth (ft bgs)	Location	PAL	Units
Cadmium	0.56	190B002	0.0 - 0.5	B01	450	mg/kg
Carbazole	0.0625 (J)	190B004	0.0 - 0.5	B02	86	mg/kg
Chromium	19.8	190B003	0.5 - 1.0	B01	450	mg/kg
Chrysene	0.347	190B004	0.0 - 0.5	B02	210	mg/kg
Dibenzo(a,h)anthracene	**0.305 (J)**	190B003	0.5 - 1.0	B01	0.21	mg/kg
Diesel-Range Organics	**1,850**	190B001	0.0 - 0.5	B01	100	mg/kg
Fluoranthene	0.657	190B004	0.0 - 0.5	B02	22,000	mg/kg
Fluorene	0.0399 (J)	190B004	0.0 - 0.5	B02	26,000	mg/kg
Gasoline-Range Organics	0.793 (J)	190B001	0.0 - 0.5	B01	100	mg/kg
Indeno(1,2,3-cd)pyrene	0.271 (J)	190B003	0.5 - 1.0	B01	2.1	mg/kg
Lead	104 (J-)	190B003	0.5 - 1.0	B01	800	mg/kg
Lead-212	1.91	190B003	0.5 - 1.0	B01	5	pCi/g
Lead-214	1.28	190B001	0.0 - 0.5	B01	5	pCi/g
Mercury	0.019 (J)	190B003	0.5 - 1.0	B01	310	mg/kg
Phenanthrene	0.509	190B004	0.0 - 0.5	B02	100,000	mg/kg
Pyrene	0.567	190B004	0.0 - 0.5	B02	29,000	mg/kg
Silver	1.7 (J)	190B003	0.5 - 1.0	B01	5,100	mg/kg
Thallium-208	0.605	190B001	0.0 - 0.5	B01	5	pCi/g
CAS 11-59-01, Tweezer Facility Septic System						
1,4-Dichlorobenzene	0.000384 (J)	190C004	0.0 - 0.5	C03	7.9	mg/kg
2,3,4,6-Tetrachlorophenol	0.162 (J)	190C010	0.0 - 1.0	C06	18,000	mg/kg
Acenaphthene	0.018 (J)	190C020	0.0 - 1.0	C15	29,000	mg/kg
Acetone	0.00678 (J)	190C021	3.0 - 4.0	C15	54,000	mg/kg
Actinium-228	2.45	190C004	0.0 - 0.5	C03	5	pCi/g
Anthracene	0.0908 (J)	190C020	0.0 - 1.0	C15	100,000	mg/kg
Aroclor 1242	0.0039 (J)	190C023	0.0 - 1.0	C16	0.74	mg/kg
Aroclor 1254	0.064 (J)	190C004	0.0 - 0.5	C03	0.74	mg/kg
Aroclor 1260	0.0175 (J)	190C004	0.0 - 0.5	C03	0.74	mg/kg

Table C.1-1
Maximum Reported Value for Tier 1 Comparison
(Page 3 of 5)

Constituent	Maximum Result	Sample Number	Depth (ft bgs)	Location	PAL	Units
Arsenic	6.7	190C001	0.0 - 0.5	C02	23	mg/kg
Barium	344 (J)	190C021	3.0 - 4.0	C15	67,000	mg/kg
Benzo(a)anthracene	0.443	190C020	0.0 - 1.0	C15	2.1	mg/kg
Benzo(a)pyrene	**0.347**	190C020	0.0 - 1.0	C15	0.21	mg/kg
Benzo(b)fluoranthene	0.623 (J)	190C020	0.0 - 1.0	C15	2.1	mg/kg
Benzo(g,h,i)perylene	0.179 (J)	190C020	0.0 - 1.0	C15	29,000	mg/kg
Benzo(k)fluoranthene	0.0132 (J)	190C010	0.0 - 1.0	C06	21	mg/kg
Benzoic acid	0.5 (J)	190C010	0.0 - 1.0	C06	100,000	mg/kg
Beryllium	1.1	190C017	0.0 - 1.0	C13	1,900	mg/kg
Bis(2-ethylhexyl)phthalate	1.99	190C030	2.0 - 3.0	C15C	120	mg/kg
Cadmium	0.59	190C002	0.0 - 0.5	C02	450	mg/kg
Carbazole	0.0845 (J)	190C020	0.0 - 1.0	C15	86	mg/kg
Chromium	**463**	190C004	0.0 - 0.5	C03	450	mg/kg
Chrysene	0.395	190C020	0.0 - 1.0	C15	210	mg/kg
Dibenzo(a,h)anthracene	0.154 (J)	190C020	0.0 - 1.0	C15	0.21	mg/kg
Diesel-Range Organics	74.9 (J)	190C020	0.0 - 1.0	C15	100	mg/kg
Fluoranthene	0.832	190C020	0.0 - 1.0	C15	22,000	mg/kg
Fluorene	0.0199 (J)	190C020	0.0 - 1.0	C15	26,000	mg/kg
Gasoline-Range Organics	0.0393 (J)	190C005	0.0 - 0.5	C03	100	mg/kg
Indeno(1,2,3-cd)pyrene	0.231 (J)	190C020	0.0 - 1.0	C15	2.1	mg/kg
Lead	30.7	190C001	0.0 - 0.5	C02	800	mg/kg
Lead-212	1.97	190C024	0.0 - 1.0	C17	5	pCi/g
Lead-214	1.39	190C010	0.0 - 1.0	C06	5	pCi/g
Mercury	0.046 (J)	190C026	0.0 - 1.0	C19	310	mg/kg
Methylene Chloride	0.00248 (J)	190C015	0.0 - 1.0	C11	21	mg/kg
Pentachlorophenol	0.183 (J)	190C010	0.0 - 1.0	C06	9	mg/kg
Phenanthrene	0.351	190C020	0.0 - 1.0	C15	100,000	mg/kg
Pyrene	0.559	190C020	0.0 - 1.0	C15	29,000	mg/kg

Table C.1-1
Maximum Reported Value for Tier 1 Comparison
(Page 4 of 5)

Constituent	Maximum Result	Sample Number	Depth (ft bgs)	Location	PAL	Units
Selenium	2.2	190C008	0.0 - 0.5	C05	5,100	mg/kg
Silver	874	190C023	0.0 - 1.0	C16	5,100	mg/kg
Styrene	0.00067 (J)	190C010	0.0 - 1.0	C06	1,700	mg/kg
Thallium-208	0.76	190C015	0.0 - 1.0	C11	5	pCi/g
Toluene	0.000468 (J)	190C004	0.0 - 0.5	C03	520	mg/kg
CAS 14-23-01, LTU-6 Test Area						
Actinium-228	2.13	190D001	0.0 - 0.5	D01	5	pCi/g
Arsenic	4.9 (J)	190D015	0.5 - 1.0	D14	23	mg/kg
Barium	249 (J)	190D002	0.0 - 0.5	D01	67,000	mg/kg
Benzoic Acid	0.421 (J)	190D501	0.0 - 0.5	D01	100,000	mg/kg
Beryllium	1.4	190D005	0.0 - 0.5	D04	1,900	mg/kg
Beryllium	1.4	190D007	0.0 - 0.5	D06	1,900	mg/kg
Cesium-137	0.225	190D003	0.0 - 0.5	D02	12.2	pCi/g
Chromium	12.8	190D002	0.0 - 0.5	D01	450	mg/kg
Dibenzo(a,h)anthracene	0.103 (J)	190D501	0.0 - 0.5	D01	0.21	mg/kg
Diesel-Range Organics	1.85 (J)	190D501	0.0 - 0.5	D01	100	mg/kg
Indeno(1,2,3-c,d)pyrene	0.0856 (J)	190D501	0.0 - 0.5	D01	2.1	mg/kg
Lead	25	190D002	0.0 - 0.5	D01	800	mg/kg
Lead-212	2.11 (J)	190D015	0.5 - 1.0	D14	5	pCi/g
Lead-214	1.34	190D004	0.0 - 0.5	D03	5	pCi/g
Mercury	0.035 (J)	190D007	0.0 - 0.5	D06	310	mg/kg
Selenium	1.8	190D007	0.0 - 0.5	D06	5,100	mg/kg
Silver	0.84 (J)	190D015	0.5 - 1.0	D14	5,100	mg/kg
Thallium-208	0.751	190D001	0.0 - 0.5	D01	5	pCi/g
Thorium-234	4.41	190D015	0.5 - 1.0	D14	105	pCi/g
Toluene	0.000572 (J)	190D501	0.0 - 0.5	D01	520	mg/kg

Table C.1-1
Maximum Reported Value for Tier 1 Comparison
(Page 5 of 5)

Constituent	Maximum Result	Sample Number	Depth (ft bgs)	Location	PAL	Units
Uranium-234	1.35	190D001	0.0 - 0.5	D01	143	pCi/g
Uranium-238	3.61	190D015	0.5 - 1.0	D14	105	pCi/g

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram
PAL = Preliminary action level
pCi/g = Picocuries per gram

J = Estimated value
J- = The result is an estimated quantity, but the result may be biased low.
Values exceeding the action level are indicated in bold.

C.1.3 C. Site Classification and Initial Response Action

The four major site classifications listed in Table 3 of the ASTM Standard are (1) immediate threat to human health, safety, and the environment; (2) short-term (0 to 2 years) threat to human health, safety, and the environment; (3) long-term (greater than 2 years) threat to human health, safety, or the environment; and (4) no demonstrated long-term threats.

Based on the CAI, none of the CASs present an immediate threat to human health, safety, and the environment; therefore, no interim response actions are necessary at these sites. Based on this information, two of the four CASs are determined to be Classification 4 sites as defined by ASTM Method E 1739-95 (ASTM, 1995) and pose no demonstrated near- or long-term threats. At CAS 11-02-02 and 11-59-01, COCs were identified that may pose long-term threats to human health, safety, or the environment, and have been determined to be Classification 3 sites, as defined in ASTM Method E 1739-95.

C.1.4 D. Development of Tier 1 Lookup Table of Risk-Based Screening Levels

Tier 1 action levels have been defined as the PALs established during the DQO process. The PALs are a tabulation of chemical-specific (but not site-specific) screening levels based on the type of media (soil) and potential exposure scenarios (industrial). These estimates of risk are conservative, preliminary in nature, and used as action levels for site screening purposes. Although the PALs are not intended to be used as FALs, a FAL may be defined as the Tier 1 action level (i.e., PAL) value if

individual contaminant analytical results are below the corresponding Tier 1 action level value. The FAL may also be established as the Tier 1 action level value if individual contaminant analytical results exceed the corresponding Tier 1 action level value and implementing a corrective action based on the FAL is practical. The PALs are defined as:

- The EPA Region 9 Risk-Based Preliminary Remediation Goals (PRGs) for Industrial Soils (2004).
- Background concentrations for RCRA metals will be evaluated when natural background exceeds the PAL, as is often the case with arsenic. Background is considered the mean plus two times the standard deviation of the mean based on data published in Mineral and Energy Resource Assessment of the Nellis Air Force Range (NBMG, 1998; Moore, 1999).
- The TPH concentrations above the action level of 100 mg/kg per NAC 445A.2272 (NAC, 2006c).
- For COPCs without established PRGs, a protocol similar to EPA Region 9 will be used to establish an action level; otherwise, an established PRG from another EPA region may be chosen.
- The PALs for material, equipment, and structures with residual surface contamination are the allowable total residual surface contamination values for unrestricted release of material and equipment listed in the DOE Order 5400.5 (DOE, 1993), which is also Table 4-2 of the *NV/YMP Radiological Control Manual* (NNSA/NSO, 2004).
- The PALs for radioactive contaminants are based on the NCRP Report No. 129 recommended screening limits for construction, commercial, industrial land-use scenarios (NCRP, 1999) scaled to 25-millirem-per-year-dose constraint (Appenzeller-Wing, 2004) and the generic guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993).

The PALs were developed based on an industrial scenario. Because the CAU 190 CASs in Areas 11 and 14 are not assigned work stations, and considered to be in remote or occasional use areas, the use of industrial reuse based PALs is conservative. The Tier 1 lookup table is defined as the PAL concentrations or activities defined in the CAIP (NNSA/NSO, 2006b).

C.1.5 E. Exposure Pathway Evaluation

The DQOs stated that site workers would only be exposed to COCs through oral ingestion, inhalation, or dermal contact (absorption) due to exposure to potentially contaminated media (i.e., soil) at the CASs. The results of the CAI showed that all COCs identified at CASs within CAU 190 are localized

near the release point and have not migrated more than 15 ft vertically or laterally. Because COCs were only identified in the soil at the outfall (CAS 11-02-01) and the soil beneath the Orangeburg pipe and effluent pipe from the septic tank at CAS 11-59-01, the only potential exposure pathways would be through worker contact with the contaminated soil. The limited migration demonstrated by the analytical results, elapsed time since the suspected release, and depth to groundwater, support the selection and evaluation only surface and shallow subsurface contact as the complete exposure pathways. Groundwater is not considered to be a significant exposure pathway.

C.1.6 F. Comparison of Site Conditions with Tier 1 Risk-Based Screening Levels

All analytical results from CAU 190 soil samples were less than corresponding Tier 1 action levels (i.e., PALs) except for those listed in Table C.1-2. All analytical results from CAU 190 PSM samples were less than corresponding PSM criteria except for those listed in Table C.1-3. Radiological screening of some metallic debris fragments at CAS 14-23-01 identified the presence of DU on the surface of the debris. This was conservatively assumed to be a PSM.

Table C.1-2
Contaminants of Potential Concern Detected above Preliminary Action Levels

Parameter	Maximum Reported Value	Preliminary Action Level	Units
CAS 11-02-02, Drain Lines and Outfall			
Benzo(a)pyrene	0.282	0.21	mg/kg
Dibenzo(a,h)anthracene	0.305 (J)	0.21	mg/kg
TPH-DRO	1,850 (J)	100	mg/kg
CAS 11-59-01, Tweezer Facility Septic System			
Benzo(a)pyrene	0.347	0.21	mg/kg
Chromium	463	450	mg/kg

DRO = Diesel-range organics
mg/kg = Milligrams per kilogram
TPH = Total petroleum hydrocarbons

J = Estimated value

Table C.1-3
Potential Source Material Contaminants

Parameter	Maximum Reported Value	PSM Criteria	Units
CAS 11-59-01, Tweezer Facility Septic System			
1,4-dichlorobenzene	11.2 (J)	7.9	mg/kg
Aroclor-1254	1.08 (J)	0.74	mg/kg
Arsenic	61.3 (J)	23	mg/kg
Benzo(a)anthracene	9,570 (J)	2.1	mg/kg
Benzo(a)pyrene	7,880 (J)	0.21	mg/kg
Benzo(B)fluoranthene	14,600 (J)	2.1	mg/kg
Carbazole	1,680 (J)	86	mg/kg
Chromium	1,510 (J)	450	mg/kg
Chrysene	9,270 (J)	210	mg/kg
Dibenzo(a,h)anthracene	1,840 (J)	0.21	mg/kg
Dieldrin	0.186 (J)	0.11	mg/kg
Diesel-Range Organics	48,800 (J)	100	mg/kg
Indeno(1,2,3-cd)pyrene	3,400 (J)	2.1	mg/kg
Pentachlorophenol	1,130 (J)	9	mg/kg
Silver	9,400	5,100	mg/kg

mg/kg = Milligrams per kilogram
PSM = Potential source material

J = Estimated value

C.1.7 G. Evaluation of Tier 1 Results

For all contaminants at all CASs not listed in Table C.1-2, the FALs were established as the Tier 1 RBSLs. It was determined that no further action is required for these contaminants at these CASs.

Except for TPH-DRO at CAS 11-02-02, the FALs for all contaminants listed in Table C.1-2 were also established as the Tier 1 RBSLs. It was determined that corrective action is practical for these contaminants at these CASs. Therefore, a correction action will be proposed for these sites.

It was determined by NNSA/NSO that remediation of the TPH-DRO at CAS 11-02-02 was not practical. Therefore, a Tier 2 SSTL will be calculated for TPH-DRO at CAS 11-02-02.

C.1.8 H. Tier 1 Remedial Action Evaluation

The contaminants listed in Table C.1-2 other than TPH and the PSM contaminants listed in Section C.1.6 were identified as COCs at CASs 11-02-02 and 11-59-01. At CAS 11-02-02, the SVOCs were removed by excavation for disposal. At CAS 11-59-01 the Orangeburg Pipe, septic tank, benzo(a)pyrene, and chromium-impacted soil were removed for disposal. The COCs and the impacted materials were removed during closure activities discussed in Appendix D.

TPH-DRO Evaluation

The TPH-DRO at CAS 11-02-02 was not practical or technically feasible to remediate to Tier 1 action levels due to the widespread and discontinuous nature of contamination at the CAS. Therefore, additional soil removals needed to meet the Tier 1 action level for TPH-DRO at CAS 11-02-02 is not proposed and TPH-DRO at CAS 11-02-02 was moved to a Tier 2 evaluation.

C.1.9 I. Tier 2 Evaluation

No additional data was needed to complete a Tier 2 evaluation.

C.1.10 J. Development of Tier 2 Table of Site-Specific Target Levels

Evaluation of TPH-DRO SSTLs

Method E1739-95 stipulates that risk evaluations for TPH-DRO contamination be calculated and evaluated based on the risk posed by the potentially hazardous constituents of TPH-DRO. Section 6.4.3 (“Use of Total Petroleum Hydrocarbon Measurements”) of ASTM Method E1739-95 states: “TPHs should not be used for risk assessment because the general measure of TPH-DRO provides insufficient information about the amounts of individual chemical(s) of concern present” (see also Sections X1.5.4 and X1.42 of Method E1739-95 in ASTM, 1995). Therefore, the individual potentially hazardous constituents in will be evaluated for risk in place of TPH-DRO. The SSTLs were established for the individual potentially hazardous constituents in TPH-DRO at the corresponding PAL concentrations (Note: the PALs were based on an industrial use scenario in the

CAIP). These SSTLs and the maximum reported level for each diesel constituent per CAS are presented in Table C.1-4.

C.1.11 K. Comparison of Site Conditions with Tier 2 Table Site-Specific Target Levels

The Tier 2 action levels are typically compared to individual sample results from reasonable points of exposure (as opposed to the source areas as is done in Tier 1) on a point-by-point basis. Points of exposure are defined as those locations or areas at which an individual or population may come in contact with a contaminant of concern originating from a CAS. For CAU 190, the Tier 2 action levels were compared to maximum contaminant concentrations from each sample location.

As shown in Table C.1-1, the maximum concentration of the hazardous constituents for TPH-DRO from CAS 11-02-02 are less than corresponding Tier 2 action levels except for benzo(a)pyrene. The FALs for all the hazardous constituents of TPH-DRO at CAS 11-02-02 were established as the corresponding Tier 2 SSTLs.

C.1.12 L. Tier 2 Remedial Action Evaluation

Based on the Tier 2 evaluation of the TPH-DRO hazardous constituents, only benzo(a)pyrene poses an unacceptable risk to human health and the environment. Therefore, benzo(a)pyrene is considered to be a COC at CAS 11-02-02. The remediation of benzo(a)pyrene at CAS 11-02-02 is evaluated in Section C.1.8. No further action concerning TPH-DRO required at the CAS11-02-02.

As all contaminant FALs were established as Tier 1 or Tier 2 action levels, a Tier 3 evaluation was not considered necessary.

Table C.1-4
Tier 2 SSTLs and CAS 11-02-02 Results for Hazardous Constituents of Diesel

Common Name	SSTL (mg/kg)	Maximum Reported Value (mg/kg)
		CAS 11-02-02
1,3,5-Trimethylbenzene	70	ND
2-Methylnaphthalene[a]	190	0.00777
Benz(a)anthracene	2.1	0.306
Benzene	1.4	ND
Benzo(a)pyrene	0.2	**0.282**
Ethylbenzene	400	ND
Naphthalene	190	ND
Toluene	520	ND
Xylenes[b]	420	ND
n-Butylbenzene	240	ND
n-Propylbenzene	240	ND
Benzo(k)fluoranthene	21	0.129
Benzo(b)fluoranthene	21	0.163
Fluorene	26,000	0.0399
Phenanthrene	100,000	0.509
Fluoranthene	22,000	0.657
Pyrene	29,000	0.567
Chrysene	210	0.347
Anthracene	100,000	0.125
Benzo(g,h,i)perylene	29,000	0.242

[a]Uses preliminary remediation goal for napthalene as surrogate
[b]Total of m-, o-, and p-xylenes

mg/kg = Milligrams per kilogram
ND = Nondetect
SSTL = Site-specific target level

Values exceeding the action level are indicated in bold.

C.2.0 Recommendations

All of the site contaminant concentrations exceeding FALs and all PSMs were removed as a corrective action. As all remaining site contaminant concentrations in soils from the analysis of CAU 190 samples are less than the corresponding FALs at all locations, it was determined that contamination at these locations does not pose a significant risk to human health or the environment and, therefore, do not warrant further corrective action.

C.3.0 References

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Appenzeller-Wing, J., U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2004. Letter to T.A. Maize (NDEP) entitled, "Submittal of Proposed Radiological Preliminary Action Levels (PALs) for the Industrial Sites Project," 15 January. Las Vegas, NV.

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Appendix D

Closure Activity Summary

D.1.0 Closure Activity Summary

The following sections document the CAU 190 closure activities completed during October through December 2007 in accordance with decisions made at the corrective action alternative meeting held July 9, 2007, with NNSA/NSO and NDEP.

D.1.1 CAS 11-02-01 Closure Activities

No COCs were detected at CAS 11-02-01. Figures D.1-1 through D.1-3 document closure activities conducted at this CAS. As a BMP on October 25, 2007, the following activities were completed:

- Welded the centrifuge hatch shut (Figure D.1-3).
- Placed a cap on the pipe housing the removed hydraulic lines (Figure D.1-3).
- Installed chicken-wire fencing around centrifuge area (Figure D.1-3).

D.1.2 CAS 11-02-02 Closure Activities

The following were completed during closure activities:

- Shipped the ASTs and drainage piping to U-10C landfill for disposal on October 30, 2007 (Figure D.1-4).
- Disassembled the ASTs on October 29 and staged onsite for removal and disposal (Figure D.1-5).
- Removed steel drainage pipe (100 ft) on October 29 and staged onsite for removal and disposal (Figure D.1-5).
- Verified the aboveground storage tanks (ASTs) were empty of contents on October 25, 2007 (Figure D.1-6).
- Removed and disposed of approximately 75 ft^3 of impacted soil at pipe outfall (Figure D.1-6).
- Collected verification samples around the removed soil area (Figure D.1-6).

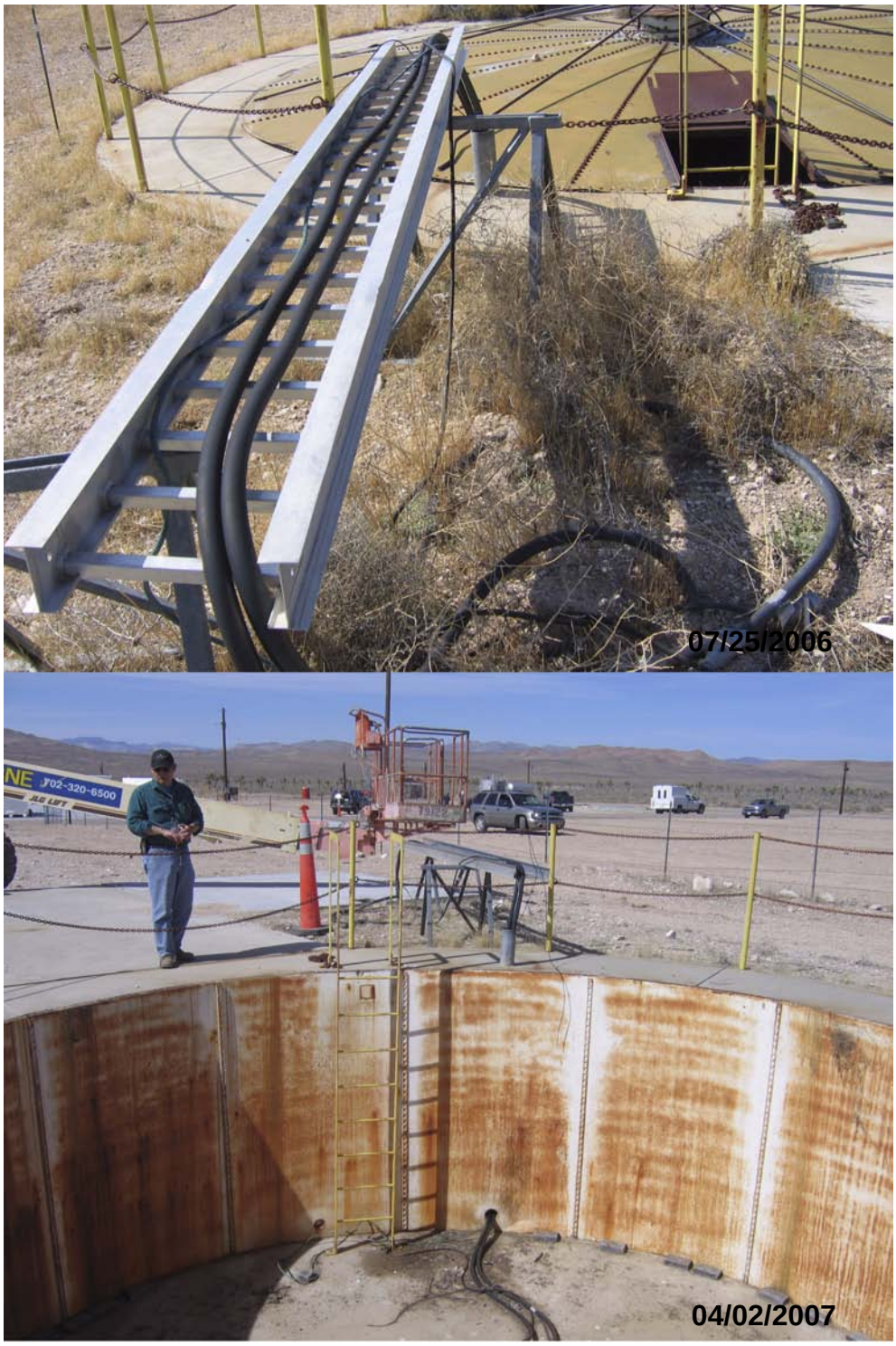

Figure D.1-1
Photographs of Hydraulic Lines and Centrifuge Lid (CAS 11-02-01)

Figure D.1-2
Photographs of Ladder and Centrifuge (CAS 11-02-01)

Figure D.1-3
Photographs of Chicken Fence and Pipe Cap
after Corrective Action Activities (CAS 11-02-01)

A total of six verification soil samples (190B012 to 190B017 present in Section A.4.0) were collected around the outfall after the COC-impacted soil was removed. These samples were collected from the bottom walls of the excavation at depths of 1 to 2 ft bgs. Soil samples were collected using disposable scoops. The soil sample analytical results from this CAS did not detect TPH-DRO or SVOCs in concentrations above the FALs. The corrective action of clean closure, which was accomplished using a backhoe, a front-end loader, and end dumps, ensured removal of the stained and contaminated soil and debris for disposal in the A9 Industrial Landfill as discussed in Section A.7.2. The load verification and shipping documentation for CAU 190 are provided in Appendix F.

The analytical results of the verification samples support the closure of this CAS.

D.1.3 CAS 11-59-01 Closure Activities

The following were completed during closure activities:

- Liquid contents in the septic tank system were removed and transferred into the A12 Sewage Lagoon (October 31, 2007)
- Removed and disposed of septic tank, distribution box, and benzo(a)pyrene impacted soil near leachfield (November 5, 2007)
- Removed and disposed of Orangeburg piping (approximately 400 ft) (November 7, 2007)

A total of three soil samples were collected around location C15 (Figure A.5-1) to verify that the soil remaining was no longer contaminated with TPH-DRO or SVOCs. The verification sample collected after the COC-contaminated soil was removed did not detect TPH-DRO or SVOCs in concentrations above the FALs. The analytical results (Section A.5.0) of the verification samples support the closure of this CAS.

The corrective action clean closure, which was accomplished using a backhoe, front-end loader and end dumps, ensured removal of the contaminated soil and debris for disposal in the A9 Industrial Landfill as discussed in Section A.7.2. The load verification and shipping documentation for CAU 190 are produced in Appendix F.

Figure D.1-4
Photographs of Water Tanks and Debris (CAS 11-02-02)

Figure D.1-5
Photographs of Water Pressure Tank and Removed Steel Pipe Outfall (CAS 11-02-02)

Figure D.1-6
Photographs of Verification Sampling at COC-Impacted Soil Area and Water Pressure Tank (CAS 11-02-02)

Figures D.1-7 through D.1-9 document closure activities conducted at this CAS.

D.1.4 CAS 14-23-01 Closure Activities

To support clean closure, all visible metallic debris fragments considered to be PSM were removed from this CAS. The study area was generated into 100-ft grids and walked by four field personnel who picked up visible debris fragments (Figure A.6-1). This waste was added to the existing drum of low-level IDW as discussed in Section A.7.2 (Figure D.1-10). The load verification and shipping documentation for CAU 190 are in Appendix F.

Figure D.1-10 documents closure activities conducted at this CAS.

Figure D.1-7
Photographs of Septic Tank Sampling and Grouted Septic Tank Pipe (CAS 11-59-01)

Figure D.1-8
Photographs of Uncovered Distribution Box and Septic Tank (CAS 11-59-01)

Figure D.1-9
Photographs of Inside Septic Tank and Removal of Orangeburg Leachpipe (CAS 11-59-01)

Figure D.1-10
Photographs of Fragment Sample Location and Drum Containing Removed Debris Fragments (CAS 14-23-01)

Appendix E

GPS Sample Location Coordinates

E.1.0 Sample Location Coordinates

Sample location coordinates for the CAI sampling were determined using a Trimble 5800 GPS Unit with centimeter-level accuracy. These coordinates identify the Decision I and II sampling locations (easting and northing positions) and ground surface elevations at CAU 190.

The CAU 190 sample locations and other points of interest (e.g., former tank locations, debris locations) are shown on Figures A.3-1, A.4-1, A.5-1, and A.6-1. The corresponding coordinates for CAU 190 sample locations are listed in Table E.1-1.

Table E.1-1
Sample Location Coordinates and Locations of Interest for CAU 190
(Page 1 of 2)

Easting	Northing	Location
CAS 11-02-01		
592777.32	4089513.67	A01
592777.78	4089513.64	A02
CAS 11-02-02		
592761.50	4089628.15	B01
592759.71	4089628.51	B02
592758.21	4089629.53	B03
592761.00	4089629.55	B04
592759.61	4089626.51	B05
CAS 11-59-01		
592648.60	4089786.98	C01
592649.01	4089786.91	C02
592647.84	4089788.29	C03
592645.95	4089791.88	C04
592645.50	4089792.71	C05
592643.85	4089796.55	C06
592655.56	4089805.51	C07
592640.39	4089801.50	C08
592731.15	4089613.22	C09

Table E.1-1
Sample Location Coordinates and Locations of Interest for CAU 190
(Page 2 of 2)

Easting	Northing	Location
592717.42	4089603.12	C10
592705.06	4089595.05	C11
592718.70	4089600.45	C12
592707.72	4089592.15	C13
592720.44	4089597.28	C14
592709.07	4089589.12	C15
592715.47	4089608.39	C16
592727.32	4089614.75	C17
592713.91	4089606.44	C18
592701.28	4089598.66	C19
CAS 14-23-01		
573483.00	4092192.00	D01
573570.00	4092168.00	D02
573445.00	4092177.00	D03
573289.00	4092294.00	D04
573284.00	4092223.00	D05
573274.00	4092378.00	D06
573396.00	4092359.00	D07
573477.00	4092307.00	D08
573264.87	4092280.32	D09
573304.61	4092322.41	D10
573358.16	4092301.45	D11
573419.83	4092272.07	D12
573366.09	4092290.49	D13
573640.57	4092033.79	D14

Appendix F

NTS Landfill Load Verification

(10 Pages)

NSTec Form FRM-0918

NTS LANDFILL LOAD VERIFICATION

08/23/06 Rev. 0 Page 1 of 2

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

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

REQUIRED: WASTE GERERATOR INFORMATION

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

Waste Generator: Stoller-Navarro Joint Venture Phone Number: 295-2033

Location / Origin: CAU 190, CAS 11-02-01, Drums #190A01 and 190A02 (Hydrocarbon contaminated solids and debris)

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

REQUIRED: WASTE CONTENTS ALLOWABLE WASTES

Check all allowable wastes that are contained within this load:

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

Acceptable waste at any NTS landfill:

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

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

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

Additional waste accepted at the Area 9 U10c Landfill:

☐ Non-friable asbestos	☐ Drained automobiles and military vehicles	☒ Solid fractions from sand/oil/water separator 05 11-6-07	
☐ Light ballasts (contact SWO)	☐ Drained fuel filters (gas & diesel)	☐ Deconned Underground and Above Ground Tanks 05 11-6-07	
☒ Hydrocarbons (contact SWO)	☐ Other _____		

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

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

REQUIRED: WASTE GENERATOR SIGNATURE

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

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

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

Print Name: John M. Fowler

Signature: /s/ John M. Fowler Date: 11/06/07

Radiological Survey Release for Waste Disposal

RCT Initials

- ✓ **This container/load meets the criteria for no added man-made radioactive material**
- ____ **This container/load meets the criteria for Radcon Manual Table 4.2 release limits.**
- ____ **This container/load is exempt from survey due to process knowledge and origin.**

SIGNATURE: /s/ Juvencio Castro **DATE:** 10-30-07

BN-0646 (10/05)

here. Onsite use only.

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

SWO USE ONLY

Load Weight (net from scale or estimate): 200 11-7-07 Signature of Certifier: /s/ Douglass R. Looney

NSTec Form FRM-0918

NTS LANDFILL LOAD VERIFICATION

08/23/06 Rev. 0 Page 1 of 2

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

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

REQUIRED: WASTE GERERATOR INFORMATION

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

Waste Generator: Stoller-Navarro Joint Venture Phone Number: 295-2033

Location / Origin: CAU 190, CAS 11-02-02, Waste Items: Metal Drainage Pipe (190A11-03), and misc. debris

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

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

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

REQUIRED: WASTE CONTENTS ALLOWABLE WASTES

Check all allowable wastes that are contained within this load:

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

Acceptable waste at any NTS landfill:

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

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

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

Additional waste accepted at the Area 9 U10c Landfill:

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

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

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

REQUIRED: WASTE GENERATOR SIGNATURE

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

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

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

Print Name: John M. Fowler

Signature: /s/ John Fowler Date: 10/30/07

Radiological Survey Release for Waste Disposal

RCT Initials

- ✓ **This container/load meets the criteria for no added man-made radioactive material.**
- ____ **This container/load meets the criteria for Radcon Manual Table 4.2 release limits.**
- ____ **This container/load is exempt from survey due to process knowledge and origin.**

SIGNATURE: /s/ Juvencio Castro **DATE:** 10/30/07

BN-0646 (10/05)

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

SWO USE ONLY

Load Weight (net from scale or estimate): 1440 10-30-07 Signature of Certifier: /s/ Donald J. Bickford

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NSTec Form FRM-0918

NTS LANDFILL LOAD VERIFICATION

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

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

REQUIRED: WASTE GERERATOR INFORMATION

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

Waste Generator: Stoller-Navarro Joint Venture Phone Number: 295-2033

Location / Origin: CAU 190, CAS 11-02-02, Waste Items: Cooling Tower (190A11-05), and insulated piping (190A11-06)

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

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

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

REQUIRED: WASTE CONTENTS ALLOWABLE WASTES

Check all allowable wastes that are contained within this load:

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

Acceptable waste at any NTS landfill:

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

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

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

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

Additional waste accepted at the Area 9 U10c Landfill:

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

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

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

REQUIRED: WASTE GENERATOR SIGNATURE

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

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

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

Print Name: John M. Fowler

Signature: /s/ John M. Fowler Date: 10/30/07

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

Radiological Survey Release for Waste Disposal

RCT Initials

- ☒ **This container/load meets the criteria for no added man-made radioactive material**
- ____ **This container/load meets the criteria for Radcon Manual Table 4.2 release limits.**
- ____ **This container/load is exempt from survey due to process knowledge and origin.**

SIGNATURE: /s/ Juvencio Castro **DATE:** 10/30/07

BN-0646 (10/05)

SWO USE ONLY

Load Weight (net from scale or estimate): 8,700 10-30-07 Signature of Certifier: /s/ Donald J. Bickford

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NSTec Form FRM-0918

NTS LANDFILL LOAD VERIFICATION

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

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

REQUIRED: WASTE GERERATOR INFORMATION

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

Waste Generator: Stoller-Navarro Joint Venture Phone Number: 295-2033

Location / Origin: CAU 190, CAS 11-02-02, Waste Items: Water Tank #1 (190A11-08), and insulated piping (190A11-09)

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

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

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

REQUIRED: WASTE CONTENTS ALLOWABLE WASTES

Check all allowable wastes that are contained within this load:

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

Acceptable waste at any NTS landfill:

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

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

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

Additional waste accepted at the Area 9 U10c Landfill:

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

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

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

REQUIRED: WASTE GENERATOR SIGNATURE

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

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

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

Print Name: John M. Fowler

Signature: /s/ John M. Fowler Date: 10/30/07

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

Radiological Survey Release for Waste Disposal

RCT Initials

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

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

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

SIGNATURE /s/ Juvencio Castro **DATE:** 10/30/07

BN-0646 (10/05)

SWO USE ONLY

Load Weight (net from scale or estimate): 32280 10-30-07 Signature of Certifier: /s/ Donald J. Bickford

(6)

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NTS LANDFILL LOAD VERIFICATION

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

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

REQUIRED: WASTE GERERATOR INFORMATION

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

Waste Generator: Stoller-Navarro Joint Venture Phone Number: 295-2033

Location / Origin: CAU 190, CAS 11-59-01, Waste Items #190A11-14 and 190A11-15 (Septic tank, solids, box and piping) and 190A11-16 05 11-5-07

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

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

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

REQUIRED: WASTE CONTENTS ALLOWABLE WASTES

Check all allowable wastes that are contained within this load:

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

Acceptable waste at any NTS landfill:

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

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

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

Additional waste accepted at the Area 9 U10c Landfill:

☐ Non-friable asbestos	☐ Drained automobiles and military vehicles	☒ Solid fractions from sand/oil/water separators 05 11-6-07
☐ Light ballasts (contact SWO)	☐ Drained fuel filters (gas & diesel)	☐ Deconned Underground and Above Ground Tanks
☒ Hydrocarbons (contact SWO)	☐ Other _____	

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

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

REQUIRED: WASTE GENERATOR SIGNATURE

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

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

To the best of my knowledge, the waste described above contains only th site. I have verified this through the waste characterization method identif prohibited and allowable waste items. I have contacted Property Managen is approved for disposal in the landfill.

Print Name: John M. Fowler

Signature: /s/ John M. Fowler Date: 11/06/07

Radiological Survey Release for Waste Disposal

RCT Initials

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

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

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

SIGNATURE: /s/ Juvencio Castro **DATE:** 10/30/07

BN-0646 (10/05)

here. **Onsite use only.**

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

SWO USE ONLY

Load Weight (net from scale or estimate): 34380 11-6-07 Signature of Certifier: /s/ Donald J. Bickford

Shipper: NSTec FOR USDOE

Shipper No.:

Date: 10/31/07

Purchase/Customer Order No.

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown) marked, consigned, and destined shown below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or rail-water shipment; or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

Consignee:

Stoller-Navarro Joint Venture
CAU 190, CAS 11-59-01,
Septic Tank Contents,

Carrier: NSTec

PRO NO.:

CAR OR VEHICLE INITIALS & NO.

SEAL #: Foxy Pump Truck

Route:

CARRIER NO.

SECTION 13712 TENDER NO.:

No. PKGS.	HM	Description of Articles (Subject to Correction), Kind of Package, Special Marks and Exemptions (See NMFC Item (Rule) 360)	Weight (Subject to Correction)	Class	Rate	Charges
1		Liquid from Septic Tank at CAS 11-59-01 12 BM 10/31/07 to the ~~A23~~, Lagoon. Est Volume: 7000 gal				

Subject to Section 7 of conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

NSTec
Signature of Consignor

If freight charges are to be prepaid write or stamp here "TO BE PREPAID"

TO BE PF

Note: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding

$_____ per lb.

*Job order, reference, account, or work order number

Savings:
$

IN THE EVENT OF AN EMERGENCY, PHONE John Fowler 702-630-0263 - 24 HOUR

ITEM NO.	NMFC 100-	NPM NO.		

*Label(s) applied

Remarks: (If you receive this shipment damaged, please note on delivery receipt. Contact NSTec Traffic at (702) 295-3266, Reference Shippers Number).

FOR SNJV TRACKING PURPOSES ONLY

* Placard(s) Required

TECHNICAL CONTACT: John Fowler 702-295-1858

This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation. (Applicable for Hazardous Materials Only.)

Shipper: NSTec for USDOE

U.S. Dept of Energy

Per: _____ Date: _____

P. O. Box 98521, Las Vegas, NV 89193
TRANSPORTATION DEPT. - Permanent Post Office Address Of Shipper

This shipment is for U.S. Department of Energy and the actual total transportation charges paid to the carrier(s) by the consignor or consignee are assignable to, and shall be reimbursed by, the U.S. Government and is subject to the terms and conditions set forth in the standard form of the U.S. Government Bill of Lading and to any available special rates or charges (41 CFR 109-40.50 and 41 CFR 40.3)

☐ YES ☐ NO

* The addition on the face hereof and to the terms and conditions are hereby noted:

Carrier: Doug AS R Looney /s/ Douglas R. Looney

Per: _____ Date: 10/31/07

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FRM-0948 (08/06)

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NTS LANDFILL LOAD VERIFICATION

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

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

REQUIRED: WASTE GERERATOR INFORMATION

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

Waste Generator: Stoller-Navarro Joint Venture Phone Number: 295-2033

Location / Origin: CAU 190, CAS 11-59-01, Waste Items: Orangeburg Pipe (190A11-17), and Impacted Soil (190A11-18)

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

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

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

REQUIRED: WASTE CONTENTS ALLOWABLE WASTES

Check all allowable wastes that are contained within this load:

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

Acceptable waste at any NTS landfill:

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

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

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

Additional waste accepted at the Area 9 U10c Landfill:

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

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

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

REQUIRED: WASTE GENERATOR SIGNATURE

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

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

To the best of my knowledge, the waste described above contains only th site. I have verified this through the waste characterization method identi prohibited and allowable waste items. I have contacted Property Manage is approved for disposal in the landfill.

Radiological Survey Release for Waste Disposal

RCT Initials

- ✓ **This container/load meets the criteria for no added man-made radioactive material**
- ____ **This container/load meets the criteria for Radcon Manual Table 4.2 release limits.**
- ____ **This container/load is exempt from survey due to process knowledge and origin.**

SIGNATURE: /s/ Juvencio Castro **DATE:** 10/30/07

BN-0646 (10/05)

Print Name: John M. Fowler

Signature: /s/ John Fowler Date: 11/06/07

Radiological Release Sticker here. Onsite use only.

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

SWO USE ONLY

Load Weight (net from scale or estimate): 23,000 11-7-07 Signature of Certifier /s/ Douglas R. Looney

NSTec Form FRM-0918

NTS LANDFILL LOAD VERIFICATION

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

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

REQUIRED: WASTE GERERATOR INFORMATION

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

Waste Generator: Stoller-Navarro Joint Venture Phone Number: 295-2033

Location / Origin: CAU 190, CAS 11-02-02, Waste Item #190A11-04 (Hydrocarbon impacted soil)

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

REQUIRED: WASTE CONTENTS ALLOWABLE WASTES

Check all allowable wastes that are contained within this load:

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

Acceptable waste at any NTS landfill:

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

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

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

Additional waste accepted at the Area 9 U10c Landfill:

☐ Non-friable asbestos	☐ Drained automobiles and military vehicles	☒ Solid fractions from sand/oil/water separator DS 11-14-07
☐ Light ballasts (contact SWO)	☐ Drained fuel filters (gas & diesel)	☐ Deconned Underground and Above Ground Tanks
☒ Hydrocarbons (contact SWO)	☐ Other _____	

DS 11-14-07

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

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

REQUIRED: WASTE GENERATOR SIGNATURE

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

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

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

Print Name: John M. Fowler

Signature: /s/ John M. Fowler Date: 11/14/07

Radiological Survey Release for Waste Disposal

RCT Initials

- ✓ **This container/load meets the criteria for no added man-made radioactive material**
- ____ **This container/load meets the criteria for Radcon Manual Table 4.2 release limits.**
- ____ **This container/load is exempt from survey due to process knowledge and origin.**

SIGNATURE: /s/ Juvencio Castro **DATE:** 10-30-07

BN-0646 (10/05)

here. Onsite use only.

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

SWO USE ONLY

Load Weight (net from scale or estimate): 21,000 12/6/07 Signature of Certifier: /s/ Steven Childs

NSTec Form FRM-0918

NTS LANDFILL LOAD VERIFICATION

08/23/06 Rev. 0 Page 1 of 2

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

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

REQUIRED: WASTE GERERATOR INFORMATION

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

Waste Generator: Stoller-Navarro Joint Venture Phone Number: 295-2033

Location / Origin: CAU 190, CASs 11-02-01, 11-02-02, and 11-59-01, Decontaminated Solids, plastic liner and sand bags

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

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

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

REQUIRED: WASTE CONTENTS ALLOWABLE WASTES

Check all allowable wastes that are contained within this load:

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

Acceptable waste at any NTS landfill:

			☐ Paper	☒ Rocks / unaltered geologic materials	DS 11-14-07 ☒ Empty containers	
☒ Asphalt	☐ Metal	☐ Wood	☒ Soil	☐ Rubber (excluding tires)	☐ Demolition debris	
☒ Plastic	☐ Wire	☐ Cable	☐ Cloth	☐ Insulation (non-Asbestosform)	☐ Cement & concrete	

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

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

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

Additional waste accepted at the Area 9 U10c Landfill:

☐ Non-friable asbestos	☐ Drained automobiles and military vehicles	DS 11-14-07 ☒ Solid fractions from sand/oil/water
☐ Light ballasts (contact SWO)	☐ Drained fuel filters (gas & diesel)	☐ Deconned Underground and Above Ground Tanks
☒ Hydrocarbons (contact SWO)	☐ Other _____	

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

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

REQUIRED: WASTE GENERATOR SIGNATURE

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

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

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

Print Name: John M. Fowler

Signature: /s/ John M. Fowler Date: 11/14/07

Radiological Survey Release for Waste Disposal

RCT Initials

- _____ **This container/load meets the criteria for no added man-made radioactive material**
- _____ **This container/load meets the criteria for Radcon Manual Table 4.2 release limits.**
- _____ **This container/load is exempt from survey due to process knowledge and origin.**

SIGNATURE: /s/ Juvencio Castro **DATE:** 10/30/07

BN-0646 (10/05)

here. Onsite use only.

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

SWO USE ONLY

Load Weight (net from scale or estimate): 6.00 12/6/07 Signature of Certifier: /s/ Steven Childs

Certificate of Disposal

This is to certify that the Waste Stream No. LITN-000000006, Rev. 11, shipment number ITL08006, with container 190D01 was shipped and received at the Nevada Test Site Radioactive Waste Management Site in Area 5 for disposal as stated below.

René Robles	Stoller-Navarro Joint Venture	Waste Coordinator
Shipped by	Organization	Title
/s/ Rene Robles		2/28/08
Signature		Date
Nancy Etheridge	NSTec	Tech Staff
Received by	Organization	Title
/s/ Nancy Etheridge		2.28.08
Signature		Date

Appendix G

Nevada Division of Environmental Protection Comments

(1 Page)

ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

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

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administra

January 28, 2008

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

RE: Review of the draft Corrective Action Decision Document / Closure Report (CADD/CR) Corrective Action Unit (CAU) 190: Contaminated Waste Sites *Federal Facility Agreement and Consent Order*

Dear Mr. Jones,

The Nevada Division of Environmental Protection, Bureau of Federal Facilities (NDEP) staff has received and reviewed the draft Corrective Action Decision Document / Closure Report (CADD/CR) for Corrective Action Unit (CAU) 190: Contaminated Waste Sites. NDEP's review of this document did not indicate any deficiencies.

Address any questions regarding this matter to Jeff MacDougall, Ph.D. at (702) 486-2850 ext 233 or to myself at (702) 486-2850 ext 231.

Sincerely,

/s/ Tom H. Murphy

T. H. Murphy
Chief
Bureau of Federal Facilities

THM/JJM/jjm

ACTION
INFO ERP WMP PSG
NSO/MGR ~
AMEM ~
AMNS
AMSO
AMSS

cc: E.F. DiSanza, WMP, NNSA/NSO
FFACO Group, PSG, NNSA/NSO, Las Vegas, NV
David C. Loewer, DTRA/CXT1, M/S 645, Mercury, NV
J. A. Ciucci, NSTec, Las Vegas, NV
A. L. Primrose, NSTec, Las Vegas, NV
J. L. Smith, NSTec, Las Vegas, NV
NSTec Technical Information Officer, Las Vegas, NV
K. J. Cabble, ERP, NNSA/NSO, Las Vegas, NV

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