Nevada
Environmental
Restoration
Project

DOE/NV--1259

# Corrective Action Decision Document for Corrective Action Unit 563: Septic Systems Nevada Test Site, Nevada

Controlled Copy No.: ___
Revision No.: 0

February 2008



Environmental Restoration
Project

U.S. Department of Energy
National Nuclear Security Administration
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# CORRECTIVE ACTION DECISION DOCUMENT FOR CORRECTIVE ACTION UNIT 563: SEPTIC SYSTEMS NEVADA TEST SITE, NEVADA

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

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**CORRECTIVE ACTION DECISION DOCUMENT FOR**
**CORRECTIVE ACTION UNIT 563:**
**SEPTIC SYSTEMS**
**NEVADA TEST SITE, NEVADA**

Approved by: /s/ Kevin J. Cabble Date: 02/26/2008

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Federal Sub-Project Director
Industrial Sites Sub-Project

Approved by: /s/ John B. Jones Date: 02/26/2008

John B. Jones
Acting Federal Project Director
Environmental Restoration Project

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# List of Acronyms and Abbreviations

| | |
|---|---|
| ACP | Asbestos concrete pipe |
| AF | Additivity factor |
| ALM | Adult Lead Methodology |
| ASTM | American Society for Testing and Materials |
| bgs | Below ground surface |
| BMP | Best management practice |
| CAA | Corrective action alternative |
| CADD | Corrective Action Decision Document |
| CAI | Corrective Action Investigation |
| CAIP | Corrective Action Investigation Plan |
| CAS | Corrective Action Site |
| CAU | Corrective Action Unit |
| CDC | Centers for Disease Control |
| CFR | *Code of Federal Regulations* |
| CLP | Contract Laboratory Program |
| cm | Centimeter |
| COC | Contaminant of concern |
| COPC | Contaminant of potential concern |
| CSM | Conceptual site model |
| DDE | Dichlorodiphenyl-dichlorethylene |
| DDT | Dichlorodiphenyl-trichloroethane |
| DOE | U.S. Department of Energy |
| dpm/100 $cm^2$ | Disintegrations per minute per 100 square centimeters |
| DQA | Data quality assessment |
| DQI | Data quality indicator |
| DQO | Data quality objective |

## *List of Acronyms and Abbreviations* *(Continued)*

| | |
|---|---|
| DRO | Diesel-range organics |
| EML | Environmental Measurements Laboratory |
| EPA | U.S. Environmental Protection Agency |
| FADL | Field activity daily log |
| FAL | Final action level |
| FD | Field duplicate |
| FFACO | *Federal Facility Agreement and Consent Order* |
| FSL | Field-screening level |
| FSR | Field-screening result |
| ft | Foot |
| gal | Gallon |
| GPR | Ground-penetrating radar |
| GPS | Global positioning system |
| HASL | Health and Safety Laboratory |
| ID | Identification |
| IDW | Investigation-derived waste |
| in. | Inch |
| LCS | Laboratory control sample |
| MDC | Minimum detectable concentration |
| mg/kg | Milligrams per kilogram |
| mi | Mile |
| MS | Matrix spike |
| MSD | Matrix spike duplicate |
| N/A | Not applicable |
| NAC | *Nevada Administrative Code* |
| NAD | North American Datum |

## *List of Acronyms and Abbreviations* *(Continued)*

| | |
|---|---|
| NCRP | National Council on Radiation Protection and Measurement |
| ND | Nondetect |
| NDEP | Nevada Division of Environmental Protection |
| NIOSH | National Institute for Occupational Safety and Health |
| NIST | National Institute of Standards and Technology |
| NNSA/NSO | U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office |
| NTS | Nevada Test Site |
| PAL | Preliminary action level |
| PbB | Blood lead |
| PCB | Polychlorinated biphenyl |
| pCi/g | Picocuries per gram |
| POC | Performance objective criteria |
| PPE | Personal protective equipment |
| PRG | Preliminary Remediation Goal |
| PSM | Potential source material |
| QA | Quality assurance |
| QAPP | Quality Assurance Project Plan |
| QC | Quality control |
| RBCA | Risk-based corrective action |
| RBSL | Risk-based screening level |
| RCRA | *Resource Conservation and Recovery Act* |
| RPD | Relative percent difference |
| SCL | Sample collection log |
| SDG | Sample delivery group |
| SNJV | Stoller-Navarro Joint Venture |
| SOP | Standard operating procedure |

## *List of Acronyms and Abbreviations* *(Continued)*

| | |
|---|---|
| SSTL | Site-specific target level |
| SVOC | Semivolatile organic compound |
| TC | Toxicity characteristic |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TPH | Total petroleum hydrocarbons |
| TSCA | *Toxic Substance Control Act* |
| UTM | Universal Transverse Mercator |
| VCP | Vitrified clay pipe |
| VOC | Volatile organic compound |
| $yd^3$ | Cubic yard |
| µg/dL | Micrograms per deciliter |
| %R | Percent recovery |

# *Executive Summary*

This Corrective Action Decision Document has been prepared for Corrective Action Unit (CAU) 563, Septic Systems, in accordance with the *Federal Facility Agreement and Consent Order* (FFACO, 1996; as amended January 2007). The corrective action sites (CASs) for CAU 563 are located in Areas 3 and 12 of the Nevada Test Site, Nevada, and are comprised of the following four sites:

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

The purpose of this Corrective Action Decision Document is to identify and provide the rationale for the recommendation of a corrective action alternative (CAA) for the four CASs within CAU 563. Corrective action investigation (CAI) activities were performed from July 17 through November 19, 2007, as set forth in the CAU 563 Corrective Action Investigation Plan (NNSA/NSO, 2007).

Analytes detected during the CAI were evaluated against appropriate final action levels (FALs) to identify the contaminants of concern (COCs) for each CAS. The results of the CAI identified COCs at one of the four CASs in CAU 563 and required the evaluation of CAAs. Assessment of the data generated from investigation activities conducted at CAU 563 revealed the following:

- CASs 03-04-02, 03-59-05, and 12-60-01 do not contain contamination at concentrations exceeding the FALs.
- CAS 12-59-01 contains arsenic and chromium contamination above FALs in surface and near-surface soils surrounding a stained location within the site.

Based on the evaluation of analytical data from the CAI, review of future and current operations at CAS 12-59-01, and the detailed and comparative analysis of the potential CAAs, the following corrective actions are recommended for CAU 563.

No further action is the preferred corrective action for CASs 03-04-02, 03-59-05, and 12-60-01. It is recommended as a best management practice (BMP) that the septic tank at CAS 03-04-02 be

removed, and the cesspool at CAS 03-59-05 be left in place and filled with sand or native soil. Also as a BMP, it is recommended that all pipes be sealed with grout.

A Clean Closure removal of the arsenic and chromium COC-impacted soil is the preferred corrective action for CAS 12-59-01. As a BMP, it is recommended that the two septic systems be closed by either removing the tanks or leaving them in place and filling them with sand or native soil. In addition, all associated open pipe ends should be sealed with grout. It is also recommended as a BMP that the chlordane-impacted soil identified at the Tank Outfall be removed.

The preferred CAAs were evaluated on technical merit focusing on performance, reliability, feasibility, safety, and cost. The alternatives were judged to meet all requirements for the technical components evaluated. The alternatives meet all applicable federal and state regulations for closure of the site and will reduce potential exposure pathways to the contaminated media to an acceptable level at CAU 563.

# 1.0 Introduction

This Corrective Action Decision Document (CADD) has been prepared for Corrective Action Unit (CAU) 563, Septic Systems, Nevada Test Site (NTS), Nevada. The corrective actions proposed 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 (FFACO, 1996; as amended January 2007). The NTS is approximately 65 miles (mi) northwest of Las Vegas, Nevada (Figure 1-1).

Corrective Action Unit 563 is comprised of the four corrective action sites (CASs) that are shown on Figure 1-2 and listed below:

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

A detailed discussion of the history of this CAU is presented in the *Corrective Action Investigation Plan* (CAIP) *for Corrective Action Unit 563: Septic Systems* (NNSA/NSO, 2007).

## 1.1 Purpose

This CADD develops and evaluates potential corrective action alternatives (CAAs) and provides the rationale for the selection of recommended CAAs for the CASs in CAU 563.

Corrective Action Unit 563, Septic Systems, consists of four inactive and abandoned sites. Two CASs (03-04-02 and 03-59-05) are located at the southern portion of the former Area 3 Subdock, which was operational from the 1970s to 1985, when operations were relocated to Area 1. These Area 3 CASs consist of the effluent collection systems for two separate toilet trailers. The two remaining CASs (12-59-01 and 12-60-01) are located at the Area 12 Drilling/Welding Shop, which was operational during the 1960s to the late 1970s or early 1980s, when it was inactivated and abandoned. Corrective Action Site 12-59-01 consists of two effluent collection systems and one combined discharge system for several toilet trailers. Also present at this CAS are two discrete (i.e.,

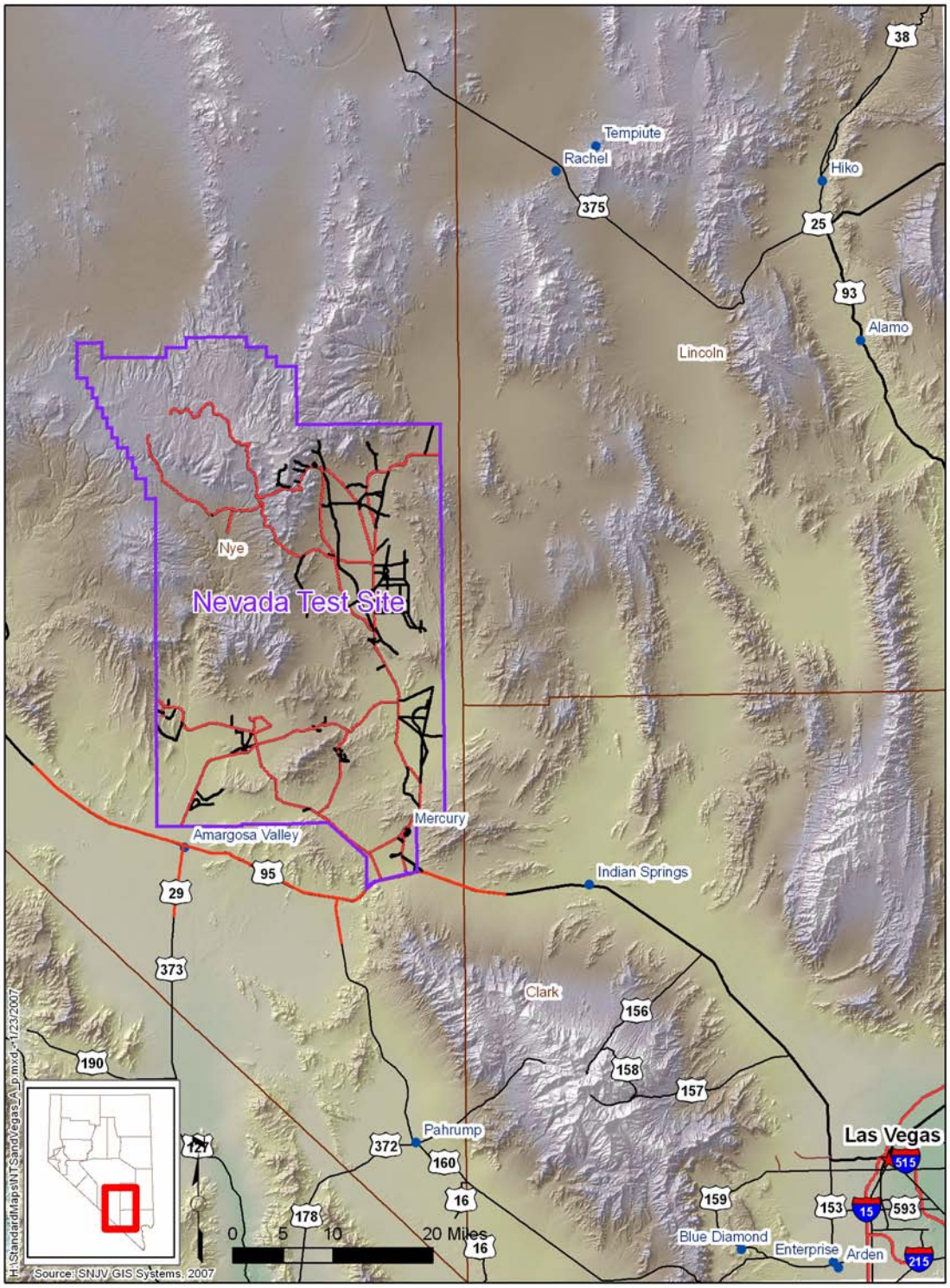


**Figure 1-1**
**Nevada Test Site**

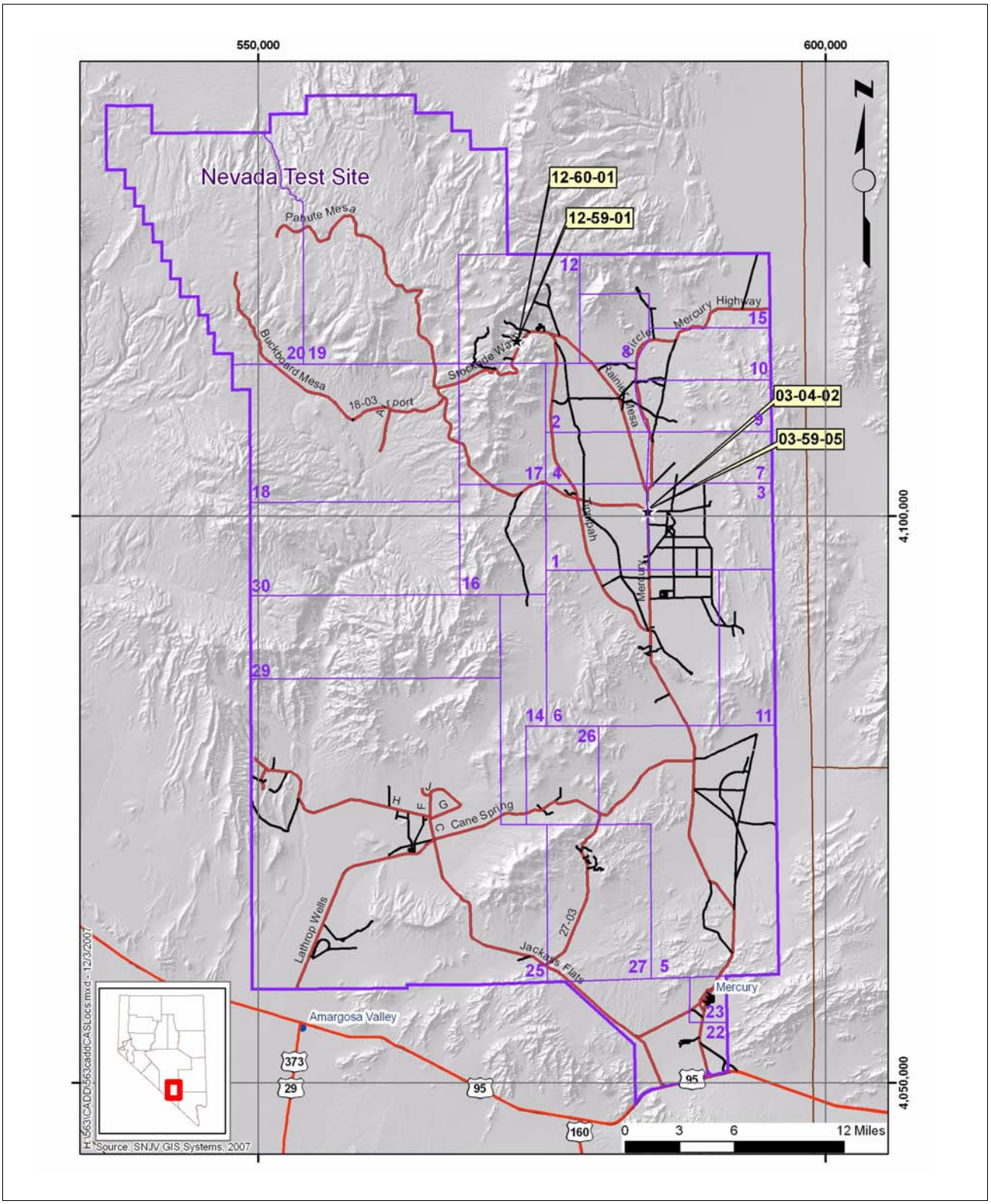


**Figure 1-2**
**Corrective Action Unit 563, CAS Location Map**

separate) stained surface soil locations. The first stain is gray in color and covers a circular area approximately 10 feet (ft) in diameter, and the second stain is a rusty brown color and covers a circular area approximately 12 ft in diameter. Corrective Action Site 12-60-01 consists of three outfall pipes used for discharge of industrial and steam cleaning effluent and for the diversion of surfacewater runoff.

## 1.2 Scope

The scope of the activities used to identify, evaluate, and recommend preferred CAAs for each CAS in CAU 563 included the following:

- Collection of environmental samples for laboratory analysis to define the nature of potential contamination (Decision I sampling).
- Collection of Decision II samples to define the lateral and vertical extent of contaminant of concern (COC) contamination.
- Collection of waste characterization samples to determine the potential to generate COCs if released to the environment.
- Collection of waste characterization samples to characterize waste streams that may be generated by future corrective actions and best management practices (BMPs).
- Collection of quality control (QC) samples.
- Evaluation of corrective action options based on analytical results of the investigation samples and the CAA screening criteria.
- Recommendation and justification of preferred CAAs.

## 1.3 Corrective Action Decision Document Contents

This CADD is divided into the following sections and appendices:

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

Section 2.0 – Corrective Action Investigation (CAI) Summary: Summarizes the investigation field activities, the results of the investigation, and the need for corrective action.

Section 3.0 – Evaluation of Alternatives: Describes, identifies, and evaluates the steps taken to determine preferred CAAs.

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

Section 5.0 – References: Provides a list of all referenced documents used in the preparation of this CADD.

Appendix A – *Corrective Action Investigation Results:* Provides a description of the project objectives, field investigation and sampling activities, investigation results, waste management, and quality assurance (QA). Sections A.3.0 through A.6.0 provide 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 data quality objective (DQO) assumptions and requirements to the investigation results.

Appendix C – *Cost Estimates:* Presents cost estimates for the construction, operation, and maintenance of the CAAs evaluated for each CAS.

Appendix D – *Evaluation of Risk*: Provides documentation of the chemical and radiological risk-based corrective action (RBCA) processes as applied to CAU 563.

Appendix E – *Project Organization*: Identifies the DOE Federal Sub-Project Director and other appropriate personnel involved with the CAU 563 characterization activities.

Appendix F – *Sample Location Coordinates*: Provides global positioning system (GPS) data for CAU 563 CAS sample locations.

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

## *1.4 Applicable Programmatic Plans and Documents*

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

- CAIP for CAU 563 (NNSA/NSO, 2007)
- *Industrial Sites Quality Assurance Project Plan* (QAPP) (NNSA/NV, 2002)
- FFACO (1996; as amended January 2007)
- Approved procedures

# 2.0 Corrective Action Investigation Summary

The following sections summarize the investigation activities and investigation results, and identify the necessity for corrective action at CAU 563. Detailed investigation activities and results for the individual CASs of CAU 563 are presented in Appendix A of this document.

## 2.1 Investigation Activities

Corrective action investigation activities were performed as set forth in the CAU 563 CAIP (NNSA/NSO, 2007) from July 17 through November 19, 2007. The purpose of the CAU 563 CAI was to address the decision statements in the project-specific DQOs by:

- Determining whether COCs are present in the soils associated with CAU 563.
- Determining the lateral and vertical extent of identified COCs.
- Ensuring adequate data have been collected to close the sites under the NDEP, *Resource Conservation and Recovery Act* (RCRA) (CFR, 2006a), *Toxic Substance Control Act* (TSCA) (CFR, 2006b), and DOE requirements.

The scope of the CAI included the following activities:

- Performing visual surveys of accessible pipelines and tank interiors using video-mole equipment to investigate the presence or absence of residual material in tanks or pipelines.
- Field screening soil samples for total alpha and beta/gamma radiation to guide collection of samples.
- 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 data quality indicators (DQIs).
- Collecting liquid and solid waste samples from septic system components to identify whether the waste contained in these structures are potential sources of environmental contamination and to support future waste disposal activities.

A judgmental sampling scheme was implemented to select sample locations and evaluate analytical results, as outlined in the CAIP (NNSA/NSO, 2007). Judgmental sampling allows the methodical

selection of sample locations that target the populations of interest (defined in the DQOs) rather than non-selective random locations.

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

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 the judgmental sampling scheme decisions was established qualitatively by validation of the conceptual site model (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 CAS 03-04-02, Area 3 Subdock Septic Tank*

This CAS is located at the southern portion of the former Area 3 Subdock and consists of potential soil contamination resulting from a domestic waste system used from the mid-1970s to 1985. The CAS components include one horizontally buried (10-by-6-ft-diameter) steel septic tank equipped with a metal vent line and a suction line that is fitted with a steel lid, and approximately 65 ft of associated subsurface asbestos concrete pipe (ACP) that originated at a former toilet trailer. The tank and pipeline are buried at approximately 2 ft below ground surface (bgs). The following sections summarize the field investigation activities conducted at CAS 03-04-02.

#### 2.1.1.1 Geophysical Survey

A geophysical survey was conducted during the preliminary assessment to identify the location of the septic tank (Fahringer, 2004). The survey results confirmed the presence and location of the septic tank as presented in the CAU 563 CAIP (NNSA/NSO, 2007).

#### 2.1.1.2 Visual Inspection

Visual inspections were conducted of tank system components and associated piping. Visual inspections were also conducted of the soil potentially impacted by a structural failure of a septic system component or by waste process operations at this CAS. No visible signs of structural failure of the tank or piping were identified during the inspections. The surface soil at the former trailer and pipe hookup were also inspected, and no biasing factors were present. The tank was empty and consisted of a single-chambered steel holding tank with one inlet and no outlet.

Inspections were conducted to identify biasing factors (i.e., staining, elevated radiation levels, odor) around the tank and the associated piping. No additional biased sample locations were identified other than those proposed in the CAU 563 CAIP (NNSA/NSO, 2007).

#### 2.1.1.3 Video Survey

Video surveys were conducted on the septic tank and associated piping to the extent possible to identify any breaches or residual material in the tank or piping, and to verify the presence and extent of piping. No breaches or residual material were identified in the tank or the existing piping, and the extent of piping is consistent with the engineering drawings (NNSA/NSO, 2007). Therefore, no additional biased sample locations were identified based on video survey results. The inlet piping to the septic tank was breached during the video survey and sampling activities, and was resealed with grout once sampling was complete at this location. A pipe stick-up and a rubber-capped pipe stick-up were not sealed with grout before or during CAI, and these are recommended to be sealed at a future date.

#### 2.1.1.4 Field Screening

Investigation samples were field screened for gross alpha and beta/gamma radiation using handheld radiological survey instruments. The field-screening results (FSRs) were compared to field-screening levels (FSLs) to guide subsequent sampling decisions. Soil samples were collected at each of these locations and submitted for laboratory analysis.

#### 2.1.1.5 Sample Collection

Decision I sampling activities at CAS 03-04-02 included the collection of three environmental soil samples (including one field duplicate [FD]) from two locations, and two QC samples. The sample identification (ID) numbers, types, and analyses are listed in Table A.3-1, and the sample locations are shown on Figure A.3-1. Samples were collected using grab sampling, hand auger, and excavation methods via backhoe. Samples were collected at various depths beneath system components to verify the integrity of the components and to determine whether contaminants have been released to the surrounding soil.

One environmental soil sample was collected from beneath the pipe and inlet connection to the septic tank to determine whether contamination had been released through overflow or connection failure from these structures. An outlet was not present from this septic tank (i.e., holding tank). One additional environmental soil sample (plus one FD) was collected from the soil beneath the septic tank to determine whether contamination had been released from the septic tank.

No Decision II samples were collected at this CAS.

#### 2.1.1.6 Conceptual Site Model Validation

A CSM for the septic system was developed to represent the release mechanisms and potential migration pathways for contaminant releases at this CAS. The CSM and associated discussion for this CAS are provided in the CAU 563 CAIP (NNSA/NSO, 2007).

Although no COCs were released to the surrounding media at CAS 03-04-02, the migration pathway and release mechanism information gathered during the CAI were consistent with the CSM, and all information gathered during the CAI supports and validates the CSM as presented in the CAU 563 CAIP (NNSA/NSO, 2007).

### 2.1.2 CAS 03-59-05, Area 3 Subdock Cesspool

This CAS is located at the southern portion of the former Area 3 Subdock and consists of potential soil contamination resulting from a domestic waste system used from the mid-1970s to 1985. The CAS components include one steel cesspool, 13 ft long by 3 ft in diameter, buried vertically at approximately 1.0 ft bgs, fitted with a vented steel lid, and 100 ft of associated subsurface vitrified clay pipe (VCP). The following sections summarize the field investigation activities conducted at CAS 03-59-05.

#### 2.1.2.1 Geophysical Survey

A geophysical survey was conducted during the preliminary assessment to identify the location of the cesspool (Fahringer, 2004). The survey results confirmed the presence and location of the cesspool as presented in the CAU 563 CAIP (NNSA/NSO, 2007).

#### 2.1.2.2 Visual Inspection

Visual inspections were conducted of the cesspool system components and associated piping. Because the cesspool was designed to release effluent to the surrounding soils, visual inspections were also conducted on soil potentially impacted by these releases. The surface soil at the former trailer and pipe hookup was inspected, and no biasing factors were present. The inside of the cesspool was inspected by removing its vented lid, and the steel was deemed to be intact. One intact inlet to the cesspool was observed, and no outlet existed by design. The bottom of the cesspool had evenly spaced rectangular open vents, and the piping interior consisted of intact VCP. Both the cesspool and piping were empty.

Inspections were conducted to identify biasing factors (i.e., staining, elevated radiation levels, odor) around the cesspool and the associated piping. No additional biased sample locations were identified other than those proposed in the 563 CAIP (NNSA/NSO, 2007).

#### 2.1.2.3 Video Survey

Video surveys were conducted of the cesspool and the cesspool piping to the extent possible to identify any breaches or residual material in either component, and to verify the presence and extent

of piping. No breaches or residual material were identified in the existing piping, and the extent of piping is consistent with the engineering drawings (NNSA/NSO, 2007). Therefore, no additional biased sample locations were identified based on video survey results. The inlet piping to the cesspool was breached during the video survey, and the breach was resealed with grout once the survey was completed at this location.

#### *2.1.2.4 Field Screening*

Investigation samples were field screened for gross alpha and beta/gamma radiation using handheld radiological survey instruments. The FSRs were compared to FSLs to guide subsequent sampling decisions. All FSRs on samples collected at this CAS did not exceed alpha or beta/gamma FSLs. Soil samples were collected at each of these locations and submitted for laboratory analysis.

#### *2.1.2.5 Sample Collection*

Decision I sampling activities at CAS 03-59-05 included the collection of four environmental soil samples (including one FD) from three locations, and three QC samples. The sample ID numbers, types, and analyses are listed in Table A.4-1, and the sample locations are shown on Figure A.4-1. Samples were collected using grab sampling, hand auger, and excavation methods via backhoe. Samples were collected at various depths beneath system components to verify the integrity of the components and to determine whether contaminants have been released to the surrounding soil.

One sample was collected beneath the inlet and pipe connection to the cesspool. Material at the bottom of the cesspool was identified as sediment that resulted from cave-in through the vent on the cesspool lid. The vent to the lid was found open before the CAI inspection, indicating that sediment could fall into the cesspool. One environmental sample of this sediment (and one FD) was collected from the bottom of the cesspool. Additionally, one environmental soil sample was collected from the soil located beneath the cesspool (adjacent to a vent) to determine whether contamination had been released from the cesspool into the surrounding soil.

No Decision II samples were collected at this CAS.

#### 2.1.2.6 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at CAU 563 CASs. The CSM and associated discussion for this CAS are provided in the CAU 563 CAIP (NNSA/NSO, 2007).

Although no COCs were released to the surrounding soils at this CAS, the migration pathway and release mechanism information gathered during the CAI were consistent with the CSM, and all information gathered during the CAI supports and validates the CSM as presented in the CAIP.

### 2.1.3 CAS 12-59-01, Drilling/Welding Shop Septic Tanks

This CAS is located adjacent to and downgradient from the Area 12 Drilling/Welding Shop and consists of potential soil contamination resulting from two domestic waste systems that were used from the 1960s to the late 1970s or early 1980s and two stained surface soil locations. The CAS components include the following: one large (32-by-8-ft-diameter) cylindrical, steel, partially buried septic tank (termed "North Tank" in this document) and associated 500 ft of subsurface VCP; one large (36-by-5-ft-diameter) cylindrical, steel, mostly buried septic tank (termed "South Tank") and associated 1,000 ft of subsurface VCP; one common outfall to both piping systems; and two areas of stained surface soil (termed "First Stained Area" and "Second Stained Area"). The First Stained Area is gray in color and covers a circular area approximately 10 ft in diameter; the Second Stained Area is a rusty brown color and covers an arc area approximately 12 ft in diameter. The following sections summarize field investigation activities conducted at CAS 12-59-01.

#### 2.1.3.1 Geophysical Survey

A geophysical survey was conducted to identify the location of the North and South Tank piping systems (Weston, 2007). The survey results confirmed the presence and location of the North and South Tank piping as presented in the CAU 563 CAIP (NNSA/NSO, 2007).

#### 2.1.3.2 Visual Inspection

Inspections were conducted on the North and South Tank system components and their associated piping. Because the combined outfall was designed to release effluent to the surrounding soils, visual

inspections were also conducted on soil potentially impacted by these releases. The surface soils at the former trailer and pipe hookup locations were also inspected, and no biasing factors were present. The outside of the steel North Tank was deemed to be intact. The South Tank was a two-chambered steel tank; both chambers held liquid at levels below the respective inlet to and outlet from the tank and were deemed to be intact. The associated pipe interiors were empty.

Inspections were conducted to identify biasing factors (i.e., staining, elevated radiation levels, odor) around the North and South Tanks and the associated piping. No additional biased samples were identified other than those proposed in the CAU 563 CAIP (NNSA/NSO, 2007).

#### *2.1.3.3 Video Survey*

Video surveys were conducted on the North Tank via the tank inlet by first breaking the existing grout seal and inserting the video-mole to the extent possible. The North Tank appeared to be empty and intact. It was not possible to determine whether the North Tank was single-chambered or multiple-chambered. The North and South Tank piping appeared to be intact with no breaches or residual material identified in either piping system. The presence and extent of piping was also verified by the video survey, and the extent was consistent with the engineering drawings (NNSA/NSO, 2007). Therefore, no additional biased sample locations were identified based on video survey results. The inlet to the North Tank was breached before conducting the video survey and was resealed with grout upon completion of the survey. Because the South Tank was noted to be holding liquid only the top, interior portion of the tank, above the liquid levels, was inspected using the video mole. The South Tank was determined to be intact.

#### *2.1.3.4 Radiological Survey*

A swipe survey of the outside of the outlet portal to the South Tank was performed, and no elevated alpha levels were recorded.

#### *2.1.3.5 Field Screening*

Investigation samples were field screened for gross alpha and beta/gamma radiation using handheld radiological survey instruments. The FSRs were compared to FSLs to guide subsequent sampling

decisions. All FSRs on samples collected at this CAS did not exceed alpha or beta/gamma FSLs. Soil samples were collected at each of these locations and submitted for laboratory analysis.

#### *2.1.3.6 Sample Collection*

Decision I sampling activities at CAS 12-59-01 included the collection of 20 environmental soil samples (plus 1 FD) from 18 locations, 5 QC samples. Additional samples were collected for waste management purposes. The sample ID numbers, types, and analyses are listed in Table A.5-1 and the sample locations are shown on Figure A.5-1. Samples were collected using grab sampling or hand auger methods. The samples were collected beneath the septic system components to verify the integrity of the components. In addition, several surface locations were sampled to determine whether contaminants have been released to the surrounding soil.

A total of four Decision I environmental soil samples were collected beneath the inlet and outlet pipe connections to the North and the South Tanks to determine whether contamination had been released through overflow or connection failure from these structures.

A total of two Decision I environmental soil samples were collected from the First and Second Stained Areas to determine whether contamination was present at these locations. Decision I sample results from the First Stained Area showed arsenic and chromium to be COCs. Therefore, four Decision II samples were collected surrounding and beneath the First Stained Area to delineate the boundary of the arsenic and chromium contamination. Refer to Figure A.7-1 for these locations.

In addition, two Decision I environmental surface soil samples were collected at two separate biased locations to determine whether contamination was present at these locations. The first sample was collected at the first depression (catchment) in the natural drainage channel downgradient of the North Tank. The second sample was collected just beneath the downgradient combined Tank Outfall. Analytical results showed a high concentration of chlordane present in the Tank Outfall sample. Therefore, 11 additional samples were collected from 9 locations and submitted for laboratory analysis to provide more information regarding chlordane. These sample locations are shown on Figure A.7-2.

#### *2.1.3.7 Conceptual Site Model Validation*

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at CAU 563 CASs. The CSM and associated discussion for this CAS are provided in the CAU 563 CAIP (NNSA/NSO, 2007).

The CSM assumed that any contamination at the CAS would be limited based on the surface drainage patterns on the downslope from the concrete pad of the former Drilling/Welding Shop, the affinity of the contaminants of potential concern (COPCs) to adhere to soil particles, and the limited infiltration of stormwater (based on low annual precipitation rates and high potential evapotranspiration rates typical of the NTS environment). The extent of the underlying soil impact was expected to be minimal and dependent upon the volume of contaminants released, the physical and chemical properties of the surrounding media, the geological conditions, and the physical and chemical properties of the COPCs.

As defined by the sampling results at this CAS, the CAI-validated contaminant migrations were limited at the First Stained Area and the Tank Outfall locations.

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

### *2.1.4 CAS 12-60-01, Drilling/Welding Shop Outfalls*

This CAS is located on the adjacent and downgradient slope beneath the concrete pad of the former Drilling/Welding Shop and consists of potential soil contamination resulting from industrial wastewater discharges from the mid-1960s through the late 1970s or early 1980s. The CAS components include three steel drainpipe outfalls (termed “Northeast Outfall,” “First Southeast Outfall,” and “Second Southeast Outfall”) that originated beneath the Drilling/Welding Shop. These outfalls received effluent from hydraulic pipe cutting, and steam cleaning operations; and water from drainage diversion efforts to stabilize the sloped land that supports the concrete foundation for the Drilling/Welding Shop. The following sections summarize the field investigation activities conducted at CAS 12-60-01.

#### 2.1.4.1 Visual Inspection

Visual inspections were conducted of the three drainpipe outfalls. Because the drainpipes were designed to release effluent to the surrounding soils, visual inspections were also conducted on soil potentially impacted by these releases.

The drains present on/at the concrete pad of the Drilling/Welding Shop were all found to be sealed; however, the three pipe outfalls are recommended to be sealed with grout at a future date. No breaches or residual material were identified in the existing drainpipes, and the extent of piping is consistent with the engineering drawings (NNSA/NSO, 2007). No additional biased samples were identified other than those proposed in the CAU 563 CAIP (NNSA/NSO, 2007).

#### 2.1.4.2 Field Screening

Investigation samples were field screened for gross alpha and beta/gamma radiation using handheld radiological survey instruments. The FSRs were compared to FSLs to guide subsequent sampling decisions. No samples had FSRs that exceeded the beta/gamma FSLs for this CAS. Soil samples were collected at each of these locations and submitted for laboratory analysis.

#### 2.1.4.3 Sample Collection

Decision I sampling activities at CAS 12-60-01 included the collection of four environmental surface soil samples (including one FD) from three locations. The sample ID numbers, types, and analyses are listed in Table A.6-1, and the sample locations are shown on Figure A.6-1. All samples were collected from surface soil using grab sampling methods.

Samples were collected directly beneath the drainpipe outfalls to determine whether contaminants have been released to the surrounding soil.

No Decision II samples were collected at this CAS.

#### 2.1.4.4 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at CAU 563 CASs. The CSM and associated discussion for this CAS are provided in the CAU 563 CAIP (NNSA/NSO, 2007).

The CSM assumed that contaminant migration would be limited based on the structural integrity of the drainpipe components, the affinity of the COPCs for soil particles, and the limited infiltration of stormwater (based on low annual precipitation rates and high potential evapotranspiration rates typical of the NTS environment). The extent of underlying soil impact was expected to be minimal and dependent upon the volume of contaminants released, the physical and chemical properties of the surrounding media, the geological conditions, and the physical and chemical properties of the COPCs.

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

## 2.2 Results

The summary of data from the CAI provided in Section 2.2.1 defines the areas within the CAU 563 CASs where the COPCs exceeded the FALs and the extent of all 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 the environmental samples and potential source material (PSM) samples collected at the CAU 563 CASs are summarized in Sections 2.2.1.1 through 2.2.1.4. Environmental samples were evaluated against FALs to determine the presence of COCs and the extent of COC contamination, if present. To determine whether a release of tank contents to the surrounding environmental media could cause the presence of a COC in the environmental media, the analytical results of the liquid content samples collected from the Area 12 South Tank were evaluated against the RCRA toxicity characteristic (TC) concentrations.

The preliminary action levels (PALs) for the CAU 563 investigation were determined during the DQO process and are discussed in Section 3.3 of the CAU 563 CAIP (NNSA/NSO, 2007). The FALs used for determining the presence of COCs and for evaluating the need for corrective action are defined in Section 3.1 of this document. 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 CAS 03-04-02, Area 3 Subdock Septic Tank*

Soil samples were collected from beneath the inlet line for environmental characterization purposes to determine whether the soils surrounding the tank contained any COCs. The septic tank was empty.

All concentrations of the reported parameters were compared to and were less than their respective PALs. The FALs were established at the corresponding PAL concentrations. No COCs were identified at CAS 03-04-02 based on analytical soil sample results. The maximum concentration of each detected contaminant at this CAS is listed in Table 2-1.

#### *2.2.1.2 CAS 03-59-05, Area 3 Subdock Cesspool*

Soil samples from beneath the inlet line to the cesspool and beneath the cesspool itself were collected for environmental characterization purposes to determine whether the soils surrounding these locations contained any COCs. The sediment at the bottom of the cesspool was determined to be slough (cave-in) and not septage. The sample collected from this sediment was analyzed for environmental characterization purposes to determine whether this sediment contained any COCs.

All concentrations of the reported parameters were compared to and were less than their respective PALs. The FALs were established at the corresponding PAL concentrations. No COCs were identified at 03-59-05 based on analytical soil sample results. The maximum concentration of each detected contaminant at this CAS is listed in Table 2-2.

## Table 2-1
## Maximum Concentration of Detected Contaminants in Soil Samples at CAS 03-04-02, Area 3 Subdock Septic Tank

| Constituent | Maximum Result | Sample Number | Depth (ft bgs) | Location | FAL | Units |
|---|---|---|---|---|---|---|
| Actinium-228 | 1.85 | 563A002 | 8.0 - 9.0 | A02 | 15 | pCi/g |
| Arsenic | 5 | 563A002 | 8.0 - 9.0 | A02 | 23 | mg/kg |
| Barium | 210 | 563A003 | 8.0 - 9.0 | A02 | 67,000 | mg/kg |
| Cadmium | 0.19 | 563A003 | 8.0 - 9.0 | A02 | 450 | mg/kg |
| Chromium | 7.7 | 563A002 | 8.0 - 9.0 | A02 | 450 | mg/kg |
| Cesium-137 | 0.83 | 563A002 | 8.0 - 9.0 | A02 | 12.2 | pCi/g |
| Diesel-Range Organics | 10 | 563A002 | 8.0 - 9.0 | A02 | 100 | mg/kg |
| Lead | 63 (J) | 563A001 | 3.5 - 4.0 | A01 | 800 | mg/kg |
| Mercury | 0.016 | 563A003 | 8.0 - 9.0 | A02 | 310 | mg/kg |
| Methylene Chloride | 0.0024 (J) | 563A003 | 8.0 - 9.0 | A02 | 21 | mg/kg |
| Lead-212 | 1.95 (J) | 563A002 | 8.0 - 9.0 | A02 | 15 | pCi/g |
| Lead-214 | 1.35 (J) | 563A001 | 3.5 - 4.0 | A01 | 15 | pCi/g |
| Lead-214 | 1.35 (J) | 563A002 | 8.0 - 9.0 | A02 | 15 | pCi/g |
| Plutonium-238 | 0.09 | 563A002 | 8.0 - 9.0 | A02 | 13 | pCi/g |
| Plutonium-239/240 | 0.72 (J) | 563A002 | 8.0 - 9.0 | A02 | 12.7 | pCi/g |
| Selenium | 1.6 | 563A001 | 3.5 - 4.0 | A01 | 5,100 | mg/kg |
| Thallium-208 | 0.58 | 563A003 | 8.0 - 9.0 | A02 | 15 | pCi/g |
| Uranium-234 | 1.3 | 563A001 | 3.5 - 4.0 | A01 | 143 | pCi/g |
| Uranium-235 | 0.065 | 563A002 | 8.0 - 9.0 | A02 | 17.6 | pCi/g |
| Uranium-238 | 1.19 | 563A001 | 3.5 - 4.0 | A01 | 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

## Table 2-2
## Maximum Concentration of Detected Contaminants in Soil Samples at CAS 03-59-05, Area 3 Subdock Cesspool

| Constituent | Maximum Result | Sample Number | Depth (ft bgs) | Location | FAL | Units |
|---|---|---|---|---|---|---|
| Actinium-228 | 1.57 | 563B003 | 13.0 - 14.0 | B02 | 15 | pCi/g |
| Aroclor 1260 | 0.01 (J) | 563B002 | 13.0 - 14.0 | B02 | 0.74 | mg/kg |
| Arsenic | 4.1 | 563B002 | 13.0 - 14.0 | B02 | 23 | mg/kg |
| Arsenic | 4.1 | 563B004 | 13.5 - 14.0 | B03 | 23 | mg/kg |
| Barium | 260 | 563B001 | 2.0 - 3.0 | B01 | 67,000 | mg/kg |
| Bis(2-ethylhexyl)Phthalate | 0.16 (J) | 563B001 | 2.0 - 3.0 | B01 | 120 | mg/kg |
| Cadmium | 0.23 | 563B002 | 13.0 - 14.0 | B02 | 450 | mg/kg |
| Chromium | 24 | 563B003 | 13.0 - 14.0 | B02 | 450 | mg/kg |
| Cesium-137 | 0.71 | 563B002 | 13.0 - 14.0 | B02 | 12.2 | pCi/g |
| Diesel-Range Organics | 34 | 563B001 | 2.0 - 3.0 | B01 | 100 | mg/kg |
| Lead | 78 (J) | 563B003 | 13.0 - 14.0 | B02 | 800 | mg/kg |
| Mercury | 0.034 | 563B001 | 2.0 - 3.0 | B01 | 310 | mg/kg |
| Methylene Chloride | 0.0026 (J) | 563B001 | 2.0 - 3.0 | B01 | 21 | mg/kg |
| Lead-212 | 1.65 (J) | 563B001 | 2.0 - 3.0 | B01 | 15 | pCi/g |
| Lead-214 | 1.21 (J) | 563B004 | 13.5 - 14.0 | B03 | 15 | pCi/g |
| Plutonium-238 | 1.96 | 563B003 | 13.0 - 14.0 | B02 | 13 | pCi/g |
| Plutonium-239/240 | 11.5 (J) | 563B003 | 13.0 - 14.0 | B02 | 12.7 | pCi/g |
| Selenium | 1.9 | 563B002 | 13.0 - 14.0 | B02 | 5,100 | mg/kg |
| Thorium-234 | 4 (J) | 563B001 | 2.0 - 3.0 | B01 | 105 | pCi/g |
| Thallium-208 | 0.56 | 563B004 | 13.5 - 14.0 | B03 | 15 | pCi/g |
| Uranium-234 | 1.35 | 563B002 | 13.0 - 14.0 | B02 | 143 | pCi/g |
| Uranium-235 | 0.099 | 563B004 | 13.5 - 14.0 | B03 | 17.6 | pCi/g |
| Uranium-238 | 1.23 | 563B004 | 13.5 - 14.0 | B03 | 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

#### *2.2.1.3 CAS 12-59-01, Drilling/Welding Shop Septic Tanks*

Soil samples were collected beneath the inlet line and outlet line to/from both the North Tank and the South Tank, for environmental characterization purposes to determine whether the soils surrounding the tanks contained any COCs. One surface soil sample was collected at the first depression, or catchment, in the natural drainage channel downgradient of the North Tank, and one surface soil sample was collected beneath the combined Tank Outfall. In addition, one surface soil sample each was collected at the First and Second Stained Areas.

The liquid contents of the South Tank were sampled to determine whether this material, if released, posed a threat of introducing COCs, to the environment surrounding the tank (i.e., is the liquid considered PSM?). The South Tank sample results were compared to the RCRA TC concentrations to be used for waste handling and disposal option determination. Section A.7.0 provides details on the evaluation of the analytical results. The North Tank was determined to be empty.

The only analytical results exceeding the PALs were arsenic and chromium (location C04, sample 563C002); total petroleum hydrocarbons (TPH)-diesel-range organics (DRO) (location C08, sample 563C007); and, chlordane (location C11, sample 563C010, and location C08, sample 563C007). For all analytes except chlordane, FALs were established at the corresponding PAL concentrations.

Sample 563C002, collected at the First Stained Area (location C04), contained arsenic and chromium at concentrations exceeding their respective FALs and are, therefore, determined to be COCs at this CAS. Four Decision II soil samples were collected at this location to define the vertical and horizontal extent of the COC contamination.

Sample 563C007, collected from the first catchment (i.e., depression) (location C08), in the natural drainage channel downgradient of the North Tank, exceeded the PAL for TPH-DRO. The TPH-DRO was moved on to a Tier 2 evaluation, which consisted of comparing the hazardous constituents of diesel fuel to their respective FALs. No individual hazardous constituents of diesel fuel exceeded PALs; therefore, TPH-DRO is not considered to be a COC at this CAS.

The pesticide chlordane is present in samples 563C007 (location C08) and 563C010 (location C11) at concentrations above the PAL. These samples were collected at the first catchment downgradient of the North Tank (location C08) and beneath the Tank Outfall (location C11) respectively. Additional

soil samples were collected surrounding the Tank Outfall (location C11) to better evaluate the chlordane contamination at this location. The presence of chlordane at this CAS is consistent with the historical use of chlordane around buildings and industrial areas at the NTS. Much like asphalt, chlordane used in this manner is ubiquitous in nature and cannot be bounded. Sporadic and discontinuous distribution of residual chlordane (shown in analytical results from past sampling effort) is likely a result of degradation, grading of surfaces, migration/translocation, etc., and is not the result of a spill or disposal; therefore, chlordane is not considered to be a COC at this CAS.

The maximum concentration of each detected COPC at this CAS is listed in Table 2-3.

**Table 2-3**
**Maximum Concentration of Detected Contaminants in Soil Samples at CAS 12-59-01, Drilling/Welding Shop Septic Tanks**
(Page 1 of 2)

| Constituent | Maximum Result | Sample Number | Depth (ft bgs) | Location | FAL | Units |
|---|---|---|---|---|---|---|
| 4,4'-DDE | 1.5 (J) | 563C010A | 0.0 - 0.5 | C11 | 7 | mg/kg |
| 4,4'-DDT | 3.1 (J) | 563C026 | 0.0 - 0.5 | C11D | 7 | mg/kg |
| Actinium-228 | 1.12 | 563C010 | 0.0 - 0.5 | C11 | 5 | pCi/g |
| Acetone | 0.085 | 563C003 | 0.0 - 0.5 | C05 | 54,000 | mg/kg |
| Americium-241 | 0.35 (J) | 563C010 | 0.0 - 0.5 | C11 | 12.7 | pCi/g |
| Arsenic | **43** | 563C002 | 0.0 - 0.5 | C04 | 23 | mg/kg |
| Barium | 1,400 | 563C010 | 0.0 - 0.5 | C11 | 67,000 | mg/kg |
| Benzo(a)Pyrene | 0.068 (J) | 563C002 | 0.0 - 0.5 | C04 | 0.21 | mg/kg |
| Benzo(b)Fluoranthene | 0.22 (J) | 563C002 | 0.0 - 0.5 | C04 | 2.1 | mg/kg |
| Benzo(g,h,i)Perylene | 0.12 (J) | 563C002 | 0.0 - 0.5 | C04 | 29,000 | mg/kg |
| Benzo(k)Fluoranthene | 0.15 (J) | 563C002 | 0.0 - 0.5 | C04 | 21 | mg/kg |
| Cadmium | 1.1 | 563C002 | 0.0 - 0.5 | C04 | 450 | mg/kg |
| Chlordane | 140 (J) | 563C010 | 0.0 - 0.5 | C11 | N/A[a] | mg/kg |
| Chromium | **3,900 (J)** | 563C002 | 0.0 - 0.5 | C04 | 450 | mg/kg |
| Chrysene | 0.069 (J) | 563C002 | 0.0 - 0.5 | C04 | 210 | mg/kg |
| Cesium-137 | 2.7 | 563C004 | 0.0 - 0.5 | C05 | 12.2 | pCi/g |
| Delta-BHC | 0.034 (J) | 563C010A | 0.0 - 0.5 | C11 | 0.36 | mg/kg |
| Diesel-Range Organics | 1,600 | 563C007 | 0.0 - 0.5 | C08 | N/A[b] | mg/kg |
| Endosulfan II | 0.089 (J) | 563C010A | 0.0 - 0.5 | C11 | 3,700 | mg/kg |
| Endosulfan sulfate | 0.86 (J) | 563C018 | 0.0 - 0.5 | C11D | 3,700 | mg/kg |

**Table 2-3**
**Maximum Concentration of Detected Contaminants in Soil Samples**
**at CAS 12-59-01, Drilling/Welding Shop Septic Tanks**
(Page 2 of 2)

| Constituent | Maximum Result | Sample Number | Depth (ft bgs) | Location | FAL | Units |
|---|---|---|---|---|---|---|
| Fluoranthene | 0.099 (J) | 563C002 | 0.0 - 0.5 | C04 | 22,000 | mg/kg |
| Indeno(1,2,3-cd)Pyrene | 0.094 (J) | 563C002 | 0.0 - 0.5 | C04 | 2.1 | mg/kg |
| Lead | 71 | 563C002 | 0.0 - 0.5 | C04 | 800 | mg/kg |
| Mercury | 0.12 | 563C005 | 2.0 - 2.5 | C06 | 310 | mg/kg |
| Lead-212 | 1.12 (J) | 563C004 | 0.0 - 0.5 | C05 | 5 | pCi/g |
| Lead-214 | 1.07 (J) | 563C010 | 0.0 - 0.5 | C11 | 5 | pCi/g |
| Plutonium-238 | 0.58 (J) | 563C010 | 0.0 - 0.5 | C11 | 13 | pCi/g |
| Plutonium-239/240 | 3.81 | 563C004 | 0.0 - 0.5 | C05 | 12.7 | pCi/g |
| Pyrene | 0.075 (J) | 563C002 | 0.0 - 0.5 | C04 | 29,000 | mg/kg |
| Selenium | 34 (J+) | 563C002 | 0.0 - 0.5 | C04 | 5,100 | mg/kg |
| Silver | 0.82 | 563C002 | 0.0 - 0.5 | C04 | 5,100 | mg/kg |
| Thallium-208 | 0.356 | 563C010 | 0.0 - 0.5 | C11 | 5 | pCi/g |
| Xylenes | 0.0066 | 563C003 | 0.0 - 0.5 | C05 | 420 | mg/kg |
| Uranium-234 | 0.67 | 563C004 | 0.0 - 0.5 | C05 | 143 | pCi/g |
| Uranium-234 | 0.67 | 563C003 | 0.0 - 0.5 | C05 | 143 | pCi/g |
| Uranium-235 | 0.045 | 563C010 | 0.0 - 0.5 | C11 | 17.6 | pCi/g |
| Uranium-238 | 0.77 | 563C003 | 0.0 - 0.5 | C05 | 105 | pCi/g |

[a]An action level is not applicable, as chlordane is present from routine insecticide application and not a release from this CAS (see Appendix D).
[b]An action level is not applicable to TPH-DRO, based on the Tier 2 evaluation presented in Appendix D.

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 reported value may be biased high.

The two chambers of the South Tank contained approximately 3,700 gallons (gal) of clear liquid. The liquid from each chamber was sampled (samples 563C501 through 563C504), and all constituents were less than RCRA TC concentrations. Therefore, the liquid was not identified to be a PSM. Sample results were compared to TC concentrations to be used for waste handling and disposal option determination. Analytical results and evaluation are presented in Section A.7.0.

#### *2.2.1.4 CAS 12-60-01, Drilling/Welding Shop Outfalls*

Surface soil samples from beneath each of the three drainpipe outfalls were collected for environmental characterization purposes to determine whether the soils found beneath and downgradient of the outfalls contained any COCs. The drainpipe outfalls were empty.

With the exception of TPH-DRO and lead, soil concentrations of the reported constituents were compared to and were less than their respective PALs.

Surface soil samples collected beneath the First and Second Southeast Outfalls (location D01, sample 563D002 and its FD 563D004; and location D02, sample 563D002) exceeded the PAL for TPH-DRO. The TPH-DRO was moved on to a Tier 2 evaluation. The Tier 2 evaluation of TPH-DRO consisted of evaluating the hazardous constituents of TPH to the FALs. Because no individual hazardous constituents of TPH-DRO exceeded their respective PALs, TPH-DRO is not considered a COC at these locations.

Lead was detected in the surface soil beneath the First Southeast Outfall (location D02, sample 563D002) at a concentration exceeding its PAL. The lead was moved on to a Tier 2 evaluation that consisted of calculating the lead site-specific target level (SSTL) based on a future industrial land use for this site. Because the highest concentration of lead (1,700 milligrams per kilogram [mg/kg]) is below the calculated SSTL (1,892 mg/kg), lead is not considered to be a COC at this location.

Although chlordane was present in the soil beneath the First Southeast Outfall (location D02, sample 563D002), it is not considered to be a COC at this location because its presence is similar to CAS 12-59-01 due to the application for pesticide control and not from a spill or disposal (see Section 2.2.1.3).

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

**Table 2-4**
**Maximum Concentration of Detected Contaminants in Soil Samples at CAS 12-60-01, Drilling/Welding Shop Outfalls**
(Page 1 of 2)

| Constituent | Maximum Result | Sample Number | Depth (ft bgs) | Location | FAL | Units |
|---|---|---|---|---|---|---|
| 2-Butanone | 0.38 | 563D002 | 0.0 - 0.5 | D02 | 110,000 | mg/kg |
| 2-Hexanone | 0.13 | 563D002 | 0.0 - 0.5 | D02 | 110,000 | mg/kg |
| 4,4'-DDE | 0.035 (J) | 563D003 | 0.0 - 0.5 | D03 | 7 | mg/kg |
| 4,4'-DDT | 0.65 (J) | 563D003 | 0.0 - 0.5 | D03 | 7 | mg/kg |
| Methyl Isobutyl Ketone | 0.041 (J) | 563D002 | 0.0 - 0.5 | D02 | 47,000 | mg/kg |
| Actinium-228 | 1.33 | 563D001 | 0.0 - 0.5 | D01 | 5 | pCi/g |
| Acetone | 1.0 | 563D002 | 0.0 - 0.5 | D02 | 54,000 | mg/kg |
| Aroclor 1254 | 0.34 (J) | 563D001 | 0.0 - 0.5 | D01 | 0.74 | mg/kg |
| Aroclor 1254 | 0.34 (J) | 563D004 | 0.0 - 0.5 | D01 | 0.74 | mg/kg |
| Arsenic | 6.1 | 563D002 | 0.0 - 0.5 | D02 | 23 | mg/kg |
| Barium | 430 | 563D002 | 0.0 - 0.5 | D02 | 67,000 | mg/kg |
| Cadmium | 5.4 | 563D002 | 0.0 - 0.5 | D02 | 450 | mg/kg |
| Chlordane | 17 (J) | 563D003 | 0.0 - 0.5 | D03 | N/A[a] | mg/kg |
| Chromium | 130 (J) | 563D002 | 0.0 - 0.5 | D02 | 450 | mg/kg |
| Cesium-137 | 2.39 | 563D002 | 0.0 - 0.5 | D02 | 12.2 | pCi/g |
| Diesel-Range Organics | 1,600 | 563D002 | 0.0 - 0.5 | D02 | N/A[b] | mg/kg |
| Lead | 1,700 (J) | 563D002 | 0.0 - 0.5 | D02 | 1,892[c] | mg/kg |
| Lead-212 | 1.58 (J) | 563D002 | 0.0 - 0.5 | D02 | 5 | pCi/g |
| Lead-214 | 0.92 (J) | 563D001 | 0.0 - 0.5 | D01 | 5 | pCi/g |
| Mercury | 0.2 | 563D002 | 0.0 - 0.5 | D02 | 310 | mg/kg |
| P-Isopropyltoluene | 0.0017 (J) | 563D001 | 0.0 - 0.5 | D01 | 2,000 | mg/kg |
| Plutonium-238 | 0.127 | 563D002 | 0.0 - 0.5 | D02 | 13 | pCi/g |
| Plutonium-239/240 | 2.43 | 563D002 | 0.0 - 0.5 | D02 | 12.7 | pCi/g |
| Selenium | 3.5 (J+) | 563D002 | 0.0 - 0.5 | D02 | 5,100 | mg/kg |
| Silver | 8.7 | 563D002 | 0.0 - 0.5 | D02 | 5,100 | mg/kg |
| Thallium-208 | 0.52 | 563D002 | 0.0 - 0.5 | D02 | 5 | pCi/g |
| Toluene | 0.0019 (J) | 563D003 | 0.0 - 0.5 | D03 | 520 | mg/kg |
| Uranium-234 | 0.74 | 563D002 | 0.0 - 0.5 | D02 | 143 | pCi/g |

**Table 2-4**
**Maximum Concentration of Detected Contaminants in Soil Samples at CAS 12-60-01, Drilling/Welding Shop Outfalls**
(Page 2 of 2)

| Constituent | Maximum Result | Sample Number | Depth (ft bgs) | Location | FAL | Units |
|---|---|---|---|---|---|---|
| Uranium-235 | 0.05 | 563D001 | 0.0 - 0.5 | D01 | 17.6 | pCi/g |
| Uranium-238 | 0.77 | 563D002 | 0.0 - 0.5 | D02 | 105 | pCi/g |

[a]An action level is not applicable as chlordane is present from routine insecticide application and not a release from this CAS (see Appendix D).
[b]An action level is not applicable to TPH-DRO, based on the Tier 2 evaluation presented in Appendix D.
[c]The action level for lead is based on the Tier 2 evaluation presented in Appendix D.

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 reported value may be biased high.

### *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 help to ensure that the DQO decisions are sound and defensible.

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

- Step 1: Review the 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 presented in tabular form in Appendix A. Based on results of the DQA presented in Appendix B, the nature and extent of COCs at CAU 563 have been adequately identified to develop and evaluate CAAs. The DQA also determined that information generated during the investigation support the CSM assumptions and that the data collected met the DQOs and supports their intended use in the decision-making process.

## 2.3 Need for Corrective Action

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 TC concentration can result in the introduction of COCs to the surrounding media.

Septic tank liquids with contaminant concentrations exceeding an equivalent TC action level would be considered to be potential source material and would require a corrective action. No COCs were identified in the samples collected from the septic tanks at CAU 563.

The only COCs identified at CAU 563 were detected at CAS 12-59-01 in soil samples collected from the First Stained Area. These COCs (arsenic and chromium) are identified in Table A.5-6, while Figure A.7-1 depicts the extent of the COC contamination. The impacted volume and characteristics are provided in each CAS-specific subsection below. Volume estimates for contaminated material to be removed from each area are shown in Section A.7.0. Corrective action alternatives are not evaluated for CASs that do not contain COCs (or potential source material).

Site-specific characteristics that might constrain remediation at each of the CASs are underground and/or overhead utilities and facility structures. The CAAs are identified in Section 3.0 and evaluated for their ability to ensure protection of the public and the environment in accordance with *Nevada Administrative Code* (NAC) 445A (NAC, 2006d), feasibility, and cost effectiveness.

### 2.3.1 CAS 03-04-02, Area 3 Subdock Septic Tank

Based on observations made and analytical results of environmental samples collected at this CAS, no COCs or PSMs are present at this CAS. Therefore, no corrective actions are needed, and CAAs

will not be evaluated for this CAS. However, per NAC 444.818 (NAC, 2006a), removal of the septic tank is recommended as a BMP for this site.

### 2.3.2 CAS 03-59-05, Area 3 Subdock Cesspool

Based on observations made and analytical results of environmental samples collected at this CAS, no COCs or PSMs are present at this CAS. Therefore, no corrective action is necessary, and CAAs will not be evaluated for this CAS. However, per NAC 444.818 (NAC, 2006a), abandonment of the cesspool (fill cesspool with sand or native soil and seal all pipe openings with grout) is recommended as a BMP for this site.

### 2.3.3 CAS 12-59-01, Drilling/Welding Shop Septic Tanks

Based on observations made and analytical results for soil samples collected at this CAS, arsenic and chromium are COCs in the near surface soil at the First Stained Area (location C04, sample 563C002). The extent of COC contamination is limited to the near surface from 0.0 to 1.0 ft bgs and extends 6.0 ft in all directions from the initial C04 sample location comprising approximately 4 cubic yards ($yd^3$). The limited distribution of the data suggests that the contamination resulted from a single spill. Based on the presence of COCs in the soil, the CAAs of Clean Closure and Close in Place will be evaluated for this CAS.

Based on the analytical results of the liquid contained in the South Tank, this material is not considered to be a PSM (liquid did not exceed the RCRA toxicity limits). However, removal of the liquid contained within the South Tank is recommended as a BMP. Also, per NAC 444.818 (NAC, 2006a), abandonment of the North and South Tanks (fill tanks with sand or native soil and seal all pipe openings with grout), or removal, is recommended as a BMP for these locations.

Removal of approximately 10 $yd^3$ of chlordane-impacted soil found at the combined Tank Outfall is also recommended as a BMP for this site. As a BMP for this location, the open outfall is recommended to be sealed with grout. Cleanup of debris scattered throughout the site is also recommended as a BMP.

### *2.3.4 CAS 12-60-01, Drilling/Welding Shop Outfalls*

Based on observations made and analytical results of environmental samples collected at this CAS, no COCs or PSMs are present at this CAS. Therefore, no corrective action is necessary, and CAAs will not be evaluated for this CAS. However, as a BMP, it is recommended that the three drainpipe openings be sealed with grout.

# 3.0 Evaluation of Alternatives

The purpose of this section is to present the corrective action objectives for CAU 563, describe the general standards and decision factors used to screen the various CAAs, and develop and evaluate a set of selected CAAs that will meet the corrective action objectives.

## 3.1 Corrective Action Objectives

The corrective action objective is to ensure that receptors are not subjected to an unacceptable risk from an exposure to a COC. A COC is defined as any contaminant exceeding a risk- or dose-based cleanup goal defined herein as 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, 2006). Multiple constituent analyses are presented in Appendix D. Implementation of the corrective action 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 all applicable laws and regulations.

The RBCA process used to establish FALs is described in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006). This process conforms with NAC 445A.227, which lists the requirements for sites with soil contamination (NAC, 2006d). For the evaluation of corrective actions, NAC Section 445A.22705 (NAC, 2006e) requires the use of the 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 (non-site-specific) conditions (i.e., the PALs established in the CAU 563 CAIP [NNSA/NSO, 2007]). 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 – Calculations are conducted for Tier 2 SSTLs using site-specific information as inputs to the same or similar methodology used to calculate Tier 1 action

levels. The Tier 2 SSTLs are then compared to individual sample results from reasonable points of exposure (as opposed to the source areas as is done in Tier 1) on a point-by-point basis. Total TPH concentrations will not be used for risk-based decisions under Tier 2 or Tier 3. Rather, the individual chemicals of concern will be compared to the SSTLs.

- Tier 3 evaluation – Calculations are conducted for Tier 3 SSTLs on the basis of more sophisticated risk analyses using methodologies described in the ASTM Method E 1739-95 that consider site-, pathway-, and receptor-specific parameters.

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 CAU 563 CAIP [NNSA/NSO, 2007]).

The following constituents detected at the CAU 563 CASs that exceeded Tier 1 action levels are:

- TPH-DRO at CASs 12-59-01 and 12-60-01
- Chlordane at CASs 12-59-01 and 12-60-01
- Lead at CAS 12-60-01
- Arsenic at CAS 12-59-01
- Chromium at CAS 12-59-01

The concentrations of all constituents at CASs not listed above were below Tier 1 action levels, and the corresponding FALs were established as the Tier 1 action levels. The FALs were established as the Tier 1 action levels for arsenic and chromium at CAS 12-59-01. Because the Tier 1 FALs were exceeded by arsenic and chromium, they are considered as COCs at CAS 12-59-01.

The evaluation of TPH-DRO at CASs 12-59-01 and 12-60-01 was moved on to a Tier 2 evaluation, which consisted of comparing the hazardous constituents of TPH to the FALs. Because the individual hazardous constituents of TPH-DRO were less than their respective FALs, TPH-DRO is not considered to be a COC at CASs 12-59-01 and 12-60-01. Additional details of the Tier 2 evaluations for TPH-DRO at these CASs are provided in Appendix D.

The evaluation of lead at CAS 12-60-01 was moved on to a Tier 2 evaluation. The Tier 2 action level was calculated using the U.S. Environmental Protection Agency's (EPA's) Adult Lead Methodology (ALM) SSTL calculator (EPA, 2007). This calculated concentration was then established as the FAL for lead at this CAS. Additional details of the Tier 2 evaluation for lead at CAS 12-60-01 are provided in Appendix D.

Although chlordane was detected at several locations at CASs 12-59-01 and 12-60-01, it is not considered to be a COC at these CASs (see Sections 2.2.1.3 and Section 2.2.1.4).

The FALs for all CAU 563 COPCs are shown in Table 3-1.

**Table 3-1**
**Definition of Final Action Levels for CAU 563**
**Contaminants of Potential Concern**

| COPCs | Tier 1 Based FALs | Tier 2 Based FALs | Tier 3 Based FALs |
|---|---|---|---|
| VOCs | All CASs | None | None |
| SVOCs | All CASs | None | None |
| PCBs | All CASs | None | None |
| Pesticides (except for chlordane) | All CASs | None | None |
| Chlordane | All CASs | None | None |
| RCRA Metals (except for arsenic, chromium and lead) | All CASs | None | None |
| Arsenic | All CASs | None | None |
| Chromium | All CASs | None | None |
| Lead | 03-04-02, 03-59-05, and 12-59-01 | 12-60-01 | None |
| TPH-DRO | 03-04-02 and 03-59-05 | 12-59-01 and 12-60-01 | None |
| Radionuclides | All CASs | None | None |

DRO = Diesel-range organics
FAL = Final action level
PCB = Polychlorinated biphenyl
RCRA = *Resource Conservation and Recovery Act*
SVOC = Semivolatile organic compound
TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

## 3.2 Screening Criteria

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

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

The general corrective action standards are as follows:

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

The remedy selection decision factors are as follows:

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

### 3.2.1 Corrective Action Standards

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

***Protection of Human Health and the Environment***

Protection of human health and the environment is a general mandate of the RCRA statute (EPA, 1994). This mandate requires that the corrective action include any necessary protective measures. These measures may or may not be directly related to media cleanup, source control, or management of wastes. The CAAs are evaluated for the ability to be protective of human health and the environment through an evaluation of risk as presented in Appendix D.

***Compliance with Media Cleanup Standards***

The CAAs are evaluated for the ability to meet the proposed media cleanup standards. The media cleanup standards are the FALs defined in Section 3.1.

***Control the Source(s) of the Release***

The CAAs are evaluated for the ability to stop further environmental degradation by controlling or eliminating additional releases that may pose a threat to human health and the environment. Unless source control measures are taken, efforts to clean up releases may be ineffective or, at best, will essentially involve a perpetual cleanup. Therefore, each CAA must provide effective source control to ensure the long-term effectiveness and protectiveness of the corrective action.

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

The CAAs are evaluated for the ability to be conducted in accordance with applicable federal and state regulations (e.g., 40 *Code of Federal Regulations* [CFR] 260-282, "Hazardous Waste Management" [CFR, 2006a]; 40 CFR 761, "Polychlorinated Biphenyls" [CFR, 2006b]; and NAC 444.842 to .9809, "Management of Hazardous Waste" [NAC, 2006b]).

### 3.2.2 Remedy Selection Decision Factors

The following text describes the remedy selection decision factors used to evaluate the CAAs.

***Short-Term Reliability and Effectiveness***

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

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

***Reduction of Toxicity, Mobility, and/or Volume***

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

***Long-Term Reliability and Effectiveness***

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

***Feasibility***

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

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

***Cost***

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

- Capital Costs – These include direct costs that may consist of materials, labor, construction materials, equipment purchase and rental, excavation and backfilling, sampling and analysis, waste disposal, demobilization, and health and safety measures. Indirect costs are separate and not included in the estimates.

- Operation and Maintenance – These costs are separate and include labor, training, sampling and analysis, maintenance materials, utilities, and health and safety measures. These costs are not included in the estimates.

## 3.3 Development of Corrective Action Alternatives

This section identifies and briefly describes the viable corrective action technologies and the CAAs considered for the CASs at CAU 563. Based on the review of existing data, future use, and current operations at the NTS, the following alternatives have been developed for consideration at CAU 563:

- Alternative 1 – No Further Action
- Alternative 2 – Clean Closure
- Alternative 3 – Close in Place

Independent of corrective action decisions, BMPs are recommended for the CASs within CAU 563. The BMPs are described in Section 4.0.

### 3.3.1 Alternative 1 – No Further Action

Under the No Further Action alternative, no corrective action activities will be implemented. This alternative is a baseline case with which to compare and assess the other CAAs and their ability to meet the corrective action standards. No Further Action is the selected alternative for CASs where no COCs were detected. This includes CASs 03-04-02, 03-59-05, and 12-60-01. Although no further action is required, BMPs may still be necessary depending on site-specific conditions. Because CAS 12-59-01 contains COCs, it does not meet the corrective action standards for the No Further Action alternative and cannot be considered for this alternative.

### 3.3.2 Alternative 2 – Clean Closure

For COC-contaminated surface and near surface soils, Alternative 2 includes excavating and disposing of all impacted soil. Once the known volume of COC-contaminated soil is removed, verification samples should be collected from the soil remaining at the bottom and sides of the excavation and analyzed for the presence of COCs. Because CASs 03-04-02, 03-59-05, and 12-60-01 do not contain COCs and therefore meet the corrective action standards for a No Further Action alternative, they will not be considered for the alternative of Clean Closure.

At CAS 12-59-01, the arsenic and chromium COC-contaminated soil is recommended for removal and disposal at an appropriate facility.

The excavated area will be returned to surface conditions compatible with the intended future use of the site. Overburden soil (as feasible), along with additional clean fill, will be used to backfill excavations after removal of the contaminated soil. Clean borrow soil may be removed from a nearby location for placement in the excavation, as necessary.

### 3.3.3 Alternative 3 – Close in Place with Administrative Controls

For contaminated surface and subsurface soil, Alternative 3 includes the administrative activities and costs associated with implementing a use restriction for CASs where contamination is present at levels that exceed the FALs. Administrative controls will restrict inadvertent contact with contaminated media by prohibiting any activity that would cause significant exposure of site occupants to the identified COCs. Because CASs 03-04-02, 03-59-05, and 12-60-01 do not contain COCs and therefore meet the corrective action standards for a No Further Action alternative, they will not be considered for the alternative of Close in Place with Administrative Controls.

At CAS 12-59-01, this alternative includes leaving the COC-contaminated soil in place, posting signage stating the restrictions, and returning on a yearly basis to maintain this area.

## 3.4 Evaluation and Comparison of Alternatives

Each CAA presented in Section 3.3 will be evaluated based on the general corrective action standards described in Section 3.2. This evaluation is presented in Table 3-2. Any CAA that does not meet the general corrective action standards will be removed from consideration. As discussed in Section 2.3, CAA No. 1 cannot be considered for CAS 12-59-01 because COCs were detected at this site. In addition, CAA No. 2 and CAA No. 3 will not be evaluated for CASs 03-04-02, 03-59-05, and 12-60-01 because COCs were not detected at these sites.

**Table 3-2**
**Evaluation of General Corrective Action Standards**
(Page 1 of 2)

| CAS 12-59-01, Drilling/Welding Shop Septic Tanks | | |
|---|---|---|
| **CAA 1, No Further Action** | | |
| Standard | Comply? | Explanation |
| Protection of Human Health and the Environment | No | COCs are present at concentrations that exceed the AF of 1 (see Appendix D). |
| Compliance with Media Cleanup Standards | No | COCs are present at concentrations that exceed the AF of 1 (see Appendix D). |
| Control the Source(s) of the Release | Yes | Septage from buildings and trailers have been discontinued and remaining liquid contents in South Tank will be removed under a BMP. |
| Comply with Applicable Federal, State, and Local Standards for Waste Management | Yes | This alternative will not generate waste. Although COCs are not going to be removed, the contents of the septic tank will be removed and managed in accordance with applicable regulations. |
| **CAA 2, Clean Closure** | | |
| Standard | Comply? | Explanation |
| Protection of Human Health and the Environment | Yes | Contamination exceeding the risk-based corrective action levels will be removed. |
| Compliance with Media Cleanup Standards | Yes | Contamination exceeding the risk-based corrective action levels will be removed. |
| Control the Source(s) of the Release | Yes | Septage from buildings has been discontinued and remaining tank contents will be removed under a BMP. |
| Comply with Applicable Federal, State, and Local Standards for Waste Management | Yes | Excavated waste can be managed in compliance with all standards. |
| **CAA 3, Close in Place with Administrative Controls** | | |
| Standard | Comply? | Explanation |
| Protection of Human Health and the Environment | Yes | Use restrictions will be implemented to protect site workers from contamination exceeding the risk-based action levels. |
| Compliance with Media Cleanup Standards | Yes | Although COCs will not be removed, site workers will not be exposed to COCs. |
| Control the Source(s) of the Release | Yes | Septage from buildings has been discontinued and remaining tank contents will be removed under a BMP. |

**Table 3-2**
**Evaluation of General Corrective Action Standards**
(Page 2 of 2)

| CAS 12-59-01, Drilling/Welding Shop Septic Tanks | | |
|---|---|---|
| **CAA 3, Close in Place with Administrative Controls** | | |
| Comply with Applicable Federal, State, and Local Standards for Waste Management | Yes | This alternative will not generate waste. Although COCs are not going to be removed, the contents of the septic tank will be removed and managed in accordance with applicable regulations. |

AF = Additivity factor
BMP = Best management practice
CAA = Corrective action alternative
COC = Contaminant of concern

The remaining CAAs for CAS 12-59-01 will be further evaluated based on the remedy selection decision factors described in Section 3.2. This evaluation is presented in Table 3-3. For each remedy selection decision factor, the CAAs are ranked relative to one another. The CAA with the least desirable impact on the remedy selection decision factor will be given a ranking of 1. The CAAs with increasingly desirable impacts on the remedy selection decision factor will receive increasing rank numbers. The CAAs that will have an equal impact on the remedy selection decision factor will receive an equal ranking number. The scoring listed in this table represents the sum of the remedy selection decision factor rankings for each CAA. The scoring does not include the BMPs because these will be performed regardless of which CAA is selected.

The CAAs of Clean Closure and Close in Place for CAS 12-59-01 were judged to meet all requirements for the general corrective action standards. These CAAs meet all applicable state and federal regulations for closure of the sites and will minimize potential future exposure pathways to the contaminated media at CAU 563.

# Table 3-3
# Evaluation of Remedy Selection Decision Factors

| CAS 12-59-01, Drilling/Welding Shop Septic Tanks | | |
|---|---|---|
| **CAA 1, No Further Action** | | |
| Factor | Rank | Explanation |
| This CAS was not evaluated, as this CAA did not meet the General Corrective Action Standards. | | |
| **CAA 2, Clean Closure** | | |
| Standard | Rank | Explanation |
| Short-Term Reliability and Effectiveness | 1 | This alternative is reliable and effective, but involves increased short-term exposure of site workers to COCs. |
| Reduction of Toxicity, Mobility, and/or Volume | 2 | This alternative will result in a decrease of toxicity and mobility, but will generate moderate waste volumes. |
| Long-Term Reliability and Effectiveness | 2 | This alternative is reliable and effective at protecting human health and the environment because removal of contaminated media will prevent future exposure of site workers to COCs. |
| Feasibility | 2 | This alternative is easily implemented and requires no maintenance. |
| Cost | 1 | The excavation and waste disposal costs for this alternative are estimated to be $124,966 (see Appendix C). |
| **Score** | **8** | |
| **CAA 3, Close in Place with Administrative Controls** | | |
| Standard | Rank | Explanation |
| Short-Term Reliability and Effectiveness | 2 | This alternative is reliable and effective in providing increased protection of human health by preventing contact with COCs. |
| Reduction of Toxicity, Mobility, and/or Volume | 1 | This alternative will not reduce toxicity or mobility of the COCs that are present, but will not generate excavation waste volumes. |
| Long-Term Reliability and Effectiveness | 1 | This alternative is reliable in the long term with ongoing maintenance. It is effective in providing increased protection of human health by preventing contact with COCs. |
| Feasibility | 1 | This alternative is easily implemented but requires maintenance. |
| Cost | 2 | The installation and ongoing maintenance costs for this alternative are estimated to be $40,135 (see Appendix C). |
| **Score** | **7** | |

CAA = Corrective action alternative
COC = Contaminant of concern

# 4.0 Recommended Alternatives

The only CAA evaluated for CASs 03-04-02, 03-59-05, and 12-60-01 was No Further Action because COCs were not detected at these sites. Because COCs were detected at CAS 12-59-01, the only CAAs judged to meet all requirements for corrective actions were Clean Closure and Close in Place. The recommended CAAs presented in this section meet all applicable state and federal regulations for closure of these sites and will minimize potential future exposure pathways to the contaminated media at CAU 563.

Alternative 1, No Further Action, is the preferred corrective action for CASs 03-04-02, Area 3 Subdock Septic Tank; 03-59-05, Area 3 Subdock Cesspool; and 12-60-01, Drilling/Welding Shop Outfalls. Selection of this CAA is consistent with past practices for CASs that do not contain COCs. As discussed in Section 2.3, this alternative will include a BMP of closing the septic systems at CASs 03-04-02 and 03-59-05 and sealing the drainpipe outfalls at CAS 12-60-01. The cesspool at CAS 03-59-05 will be filled with sand or native soil.

As discussed in Section 2.3, this alternative will include the following BMPs:

CAS 03-04-02

- Removal and disposal of all aboveground features (e.g., riser pipes and bumper posts)
- Removal and disposal of the septic tank
- Sealing of all open pipe ends with grout

CAS 03-59-05

- Removal and disposal of all aboveground features (e.g., riser pipes and bumper posts)
- Abandonment of the cesspool by filling with sand or native soil
- Sealing of all open pipe ends with grout

CAS 12-60-01

- Sealing of the three drainpipe openings with grout

Alternative 2, Clean Closure, was the highest-scoring CAA in Table 3-3 that was evaluated for CAS 12-59-01 and is selected as the preferred corrective action for CAS 12-59-01, Drilling/Welding Shop Septic Tanks. The arsenic and chromium COC-impacted soil will be removed and disposed at an appropriate facility.

As discussed in Section 2.3, this alternative will include the following BMPs for CAS 12-59-01:

- Removal and disposal of all liquids in the South Tank
- Removal and disposal of the septic tanks or abandonment in place by filling them with sand or native soil
- Sealing of all open pipe ends with grout, including the Tank Outfall pipe
- Removal of approximately 10 $yd^3$ of chlordane-impacted soil at the pipe outfall
- Clean up of debris items within the CAS as defined in the Corrective Action Plan

Alternative 3, Close in Place with Administrative Controls, was the lowest scoring CAA in Table 3-3 that was evaluated for CAS 12-59-01 and is not selected as the preferred corrective action for CAS 12-59-01, Drilling/Welding Shop Septic Tanks.

# 5.0 References

ASTM, see American Society for Testing and Materials.

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

CFR, see *Code of Federal Regulations*.

*Code of Federal Regulations*. 2006a. Title 40 CFR Parts 260 - 282, "Hazardous Waste Management." Washington, DC: U.S. Government Printing Office.

*Code of Federal Regulations*. 2006b. Title 40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce and Prohibitions." Washington, DC: U.S. Government Printing Office.

EPA, see U.S. Environmental Protection Agency.

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

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

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

NAC, see *Nevada Administrative Code*.

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.

*Nevada Administrative Code*. 2006a. NAC 444.818, "Limitations and Site Requirements." Carson City, NV. As accessed at http://www.leg.state.nv.us/nac on 21 October 2007.

*Nevada Administrative Code*. 2006b. NAC 444.842 to 444.9809, "Management of Hazardous Waste." Carson City, NV. As accessed at http://www.leg.state.nv.us/nac on 21 October 2007.

*Nevada Administrative Code*. 2006c. NAC 445A, "Water Controls." Carson City, NV. As accessed at http://www.leg.state.nv.us/nac on 21 October 2007.

*Nevada Administrative Code*. 2006d. NAC 445A.227, "Contamination of Soil: Order by Director for Corrective Action; Factors To Be Considered in Determining Whether Corrective Action Required." Carson City, NV. As accessed at http://www.leg.state.nv.us/nac on 21 October 2007.

*Nevada Administrative Code*. 2006e. NAC 445A.22705, "Contamination of Soil: Evaluation of Site by Owner or Operator; Review of Evaluation by Division." Carson City, NV. As accessed at http://www.leg.state.nv.us/nac on 21 October 2007.

SNJV GIS Systems, see Stoller-Navarro Joint Venture Geographic Information Systems.

Stoller-Navarro Joint Venture Geographic Information Systems. 2007. ESRI ArcGIS Software.

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. *Industrial Sites Project Establishment of Final Action Levels*, Rev. 0, DOE/NV--1107. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2007. *Corrective Action Investigation Plan for Corrective Action Unit 563: Septic Systems, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--1181. Las Vegas, NV.

U.S. Environmental Protection Agency. 1991. *Guidance on RCRA Corrective Action Decision Documents*, EPA/540/G-91/011. Washington, DC: Office of Research and Development.

U.S. Environmental Protection Agency. 1994. *Final RCRA Corrective Action Plan*, EPA/520-R-94-004. Washington, DC: Office of Solid Waste and Emergency Response.

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

U.S. Environmental Protection Agency. 2007. "Lead Risk Assessment." As accessed at http://www.epa.gov/superfund/lead/pbrisk.htm on 27 November.

Weston, see Weston Solutions, Inc.

Weston Solutions, Inc. 2007. *After Action Report: Technical Services for Preliminary Assessment Geophysical Investigations, Nevada Test Site, Six Corrective Action Sites, Nye County, Nevada.* Prepared for Stoller-Navarro Joint Venture. West Chester, PA.

# Appendix A

# Corrective Action Investigation Results

# A.1.0 Introduction

This appendix presents the CAI activities and analytical results for CAU 563. Corrective Action Unit 563 is located in Areas 3 and 12 of the NTS (Figure 1-1) and is comprised of the four CASs listed below:

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

***Corrective Action Site 03-04-02*** is located at the southern portion of the Area 3 Subdock and was investigated due to the potential release of contaminants from a former domestic waste sewage system into the surrounding soils. The CAS layout is shown on Figure A.3-1.

***Corrective Action Site 03-59-05*** is located at the southern portion of the Area 3 Subdock and was investigated due to the potential release of contaminants from a former domestic waste sewage system into the surrounding soils. The CAS layout is shown on Figure A.4-1.

***Corrective Action Site 12-59-01*** is located just off the E-Tunnel Access Road and downgradient of the Area 12 Drilling/Welding Shop and consists of potential soil contamination resulting from the releases of domestic sewage and possibly industrial wastewaters to two separate septic systems. These two systems are referred to in this document as the “North Tank” and the “South Tank” systems. The piping network of the North and South Tank systems eventually joined and discharged their wastes to the surface soil via one common downgradient outfall. Also included at the CAS are two surface soil stains that resulted from unknown sources. These two soil stains are referred to in this document as the “First Stained Area” and the “Second Stained Area.” A site layout of CAS 12-59-01 is shown on Figure A.5-1.

***Corrective Action Site 12-60-01*** is located just off the E-Tunnel Access Road on the downslope beneath the Area 12 Drilling/Welding Shop and consists of potential soil contamination resulting from the release of industrial wastewaters via three drain lines and respective outfalls. These three outfalls are referred to as the “Northeast Outfall,” the “First Southeast Outfall” and the “Second Southeast Outfall.” The industrial wastewaters originated from pipe rack cleaning and hydraulic pipe

cutting activities at the Drilling/Welding Shop. A site layout of CAS 12-60-01 is shown on Figure A.6-1.

Additional information regarding the history of each site, planning, and the scope of the investigation is presented in the CAU 563 CAIP (NNSA/NSO, 2007).

### A.1.1 Project Objectives

The primary objective of the investigation was to provide sufficient information to document completion of appropriate corrective actions for each CAS in CAU 563 to support a recommendation for closure of the CASs in CAU 563. This objective was achieved by identifying the absence or presence of COCs and the vertical and lateral extent of the COCs, if present.

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 CAU 563 CAIP (NNSA/NSO, 2007). The sampling strategy implemented a judgmental sampling approach at all four of the CAU 563 CASs.

### A.1.2 Content

This appendix describes the investigation and presents the results. The contents of this appendix 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 the waste management activities.
- Section A.8.0 discusses the QA and QC processes followed for the investigation and the results of the 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 as hard copy files or electronic media.

## A.2.0 Investigation Overview

Field investigation and sampling activities for the CAU 563 CAI were conducted from July 17 through November 19, 2007. Table A.2-1 lists the CAI activities that were conducted at each of the four CAU 563 CASs.

**Table A.2-1**
**Corrective Action Investigation Activities Conducted at Each Corrective Action Site To Meet Corrective Action Investigation Plan Requirements for CAU 563**

| Corrective Action Investigation Activities | Corrective Action Site | | | |
|---|---|---|---|---|
| | 03-04-02 | 03-59-05 | 12-59-01 | 12-60-01 |
| 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 geophysical surveys. | X | X | 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 | -- |
| Field screened samples for alpha and beta/gamma radiation using a handheld survey instrument. | X | X | X | X |
| Performed radiological survey for removable alpha radiation on South Septic Tank (access portal to outlet chamber). | -- | -- | X | -- |
| Collected liquid and/or sediment 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 | X | -- |
| Conducted video surveys using a video-mole survey instrument to verify the features of a component and to identify pipe contents or breaches in the associated piping. | X | X | X | X |
| Conducted analysis for total fecal coliform bacteria for the protection of workers and offsite laboratory personnel. | -- | X | X | -- |
| Submitted select samples for offsite laboratory analysis. | X | X | X | X |
| Collected global positioning system coordinates for sample locations and points of interest. | X | X | X | X |

-- = Not applicable

The investigation and sampling program was managed in accordance with the requirements set forth in the CAU 563 CAIP (NNSA/NSO, 2007). Samples were collected and documented following the CAU 563 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 CAU 563 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), average rainfall, intermittent cloudiness, and light to medium winds. Rain and nearby lightning strikes suspended site operations off and on during the first week of site activities.

The CASs were investigated by conducting radiological surface screening and geophysical surveys, sampling potential contaminant sources, and collecting surface and subsurface soil samples. 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 for alpha and beta/gamma radiation. The results were compared against screening levels to guide in the CAS-specific investigations. Samples of the septic tank liquid contents at CAS 12-59-01 were collected to support both environmental and waste characterization using a peristaltic pump with disposable mylar tubing and disposal bailers. The sediments in the cesspool at CAS 03-59-05 were sampled using a disposable dip cup fitted on a long pole.

Except as noted in the following CAS-specific sections, CAU 563 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 except where otherwise noted.

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

### *A.2.1 Sample Locations*

Investigation locations selected for sampling were based on interpretation of existing engineering drawings, aerial and land photographs, geophysical anomalies, interviews with former and current

site employees, information obtained during site visits, and site conditions as provided in the CAU 563 CAIP (NNSA/NSO, 2007). 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.7.0. In some cases, FSRs and/or laboratory analytical results determined the need for step-out sampling locations. Sample locations were marked with wooden stakes and labelled accordingly. Sample locations were surveyed with either a Trimble Pathfinder ProXRSTM GPS instrument or a Trimble GeoExplorer 2005 Series GeoXT handheld GPS instrument for determining the sample location coordinates as well as CAS points of interest. The survey data are presented in Appendix F as a tabular format.

### *A.2.2 Investigation Activities*

The investigation activities as listed in Table A.2-1 performed at CAU 563 were consistent with the field investigation activities stipulated in the CAU 563 CAIP (NNSA/NSO, 2007). The investigation strategy allowed the nature and extent of COC contamination to be established. Sections A.2.2.1 through A.2.2.6 describe the specific investigation activities that took place during the CAI at CAU 563.

#### *A.2.2.1 Geophysical Surveys*

Geophysical surveys (EM31, EM61, and ground-penetrating radar [GPR]) were performed at all four CAU 563 CASs before beginning the CAI, as part of the preliminary assessment. The surveys at the Area 3 Subdock CASs were performed to identify the presence of any subsurface anomalies. The survey at CAS 12-59-01 was performed to aid in identifying the piping networks of the North Tank and South Tank systems. The survey at CAS 12-60-01 was performed to aid in identifying any additional pipe outfalls.

#### *A.2.2.2 Field Screening*

Field-screening activities for alpha and beta/gamma radiation were performed as specified in the CAU 563 CAIP (NNSA/NSO, 2007). 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

10 background locations selected near each CAS. The radiation FSLs are instrument-specific and were established for each instrument and CAS before use.

The alpha and beta/gamma radiation screening was performed at the CAU 563 CASs using an NE Technology Electra fitted with a DP6 dual-alpha and -beta/gamma radiation scintillation probe.

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. Field-screening results are recorded on SCLs that are retained in project files.

### *A.2.2.3 Radiological Survey*

A swipe survey of the South Tank access portal to the outlet chamber was performed to check a previously reported alpha reading.

### *A.2.2.4 Piping and Septic Tank Inspections*

For those CASs with septic tanks and/or piping systems, 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 survey (i.e., video mole) or by exposing the CAS component and performing a visual inspection. Notes in the FADL and field maps provide documentation of the integrity of the individual components. The following paragraphs provide details of investigation techniques that were used to verify the integrity of the pipe, tank, and system components.

The following steps were used to inspect and sample the septic tanks and cesspool:

1. A visual inspection of the interior of the tanks and cesspool above the content levels, if present, was performed to note items such as if chambers are present, provide access for measurement of the contents, volume estimation of the contents, condition of the contents, and condition of the interior of the tanks and cesspool.

2. Discrete phased samples were collected of the contents of collection features (e.g., tanks, cesspool), if present. Samples were screened for fecal coliform. Results of the fecal coliform screenings are maintained in the project records.

3. Integrity of the collection features were evaluated by interior visual and video-mole inspection and by excavating to the base of the feature and inspecting the surrounding soil for biasing factors (such as staining and odor), to verify that there had not been a release. Visual observations were noted and recorded in the FADL and on the SCLs.

4. Samples were collected from beneath the inlet and outlet pipe connections at the distribution and collection features. Visual observations were noted and recorded in the FADL and on the SCLs.

Video-mole surveys were conducted at all four CAU 563 CASs using a video camera to look inside the septic tanks and cesspool along with associated subsurface piping to identify residual material, breaches, or unknown tie-ins. No breaches in any of the CAS piping were identified during the video-mole survey; therefore, soil sample collection was not required beneath the piping. Residual material (e.g., pebbles, twigs) identified in the piping by the video-mole surveys was not sampled due to inadequate material and volume. Sections of piping that were breached to gain access for the video mole were sealed with grout after completion of the video-mole survey.

### *A.2.2.5 Surface and Subsurface Soil Sampling*

Soil samples were collected using "scoop and trowel" (surface hand-grab sampling), hand auger, and backhoe. All samples were field screened for alpha and beta/gamma radiation 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: (1) volatile organic compound (VOC) sample containers were filled with soil directly from the sample location before field screening; (2) additional soil was transferred into a stainless-steel bowl, homogenized, and field screened for alpha and beta/gamma radiation; (3) samples for the analysis of gamma radiation and TPH-DRO were then collected from the homogenized soil; (4) all remaining sample containers were then filled with the homogenized soil; and (5) excess soil was returned to its original location, and (6) the sample containers were appropriately disposed (based on field-screening 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, 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 field-screening and analytical results indicated contamination. Subsurface soil samples were also collected at the base of septic system components, where accessible, to confirm the structural integrity of the components.

### A.2.2.6 Waste Characterization Sampling

Characterization of the CAS 12-59-01 South Tank liquid contents, the COC-impacted soils, and the chlordane-impacted soils was performed to support disposal of these potential remediation wastes and to determine whether the waste in question at this CAS could be PSM. Investigation methods included visual inspection, radiological surveys, and direct sampling of the South Tank's two chambers.

Samples were analyzed in accordance with the CAU 563 CAIP (NNSA/NSO, 2007). 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, 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 hazardous waste shipped offsite contains no "added radioactivity."

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

- Liquid contained in the South Tank chambers at CAS 12-59-01
- Surface soil from two discrete (separate) stained locations at CAS 12-59-01
- Surface soil at the combined pipe outfall at CAS 12-59-01

### A.2.3 Laboratory Analytical Information

Chemical and radiological analyses were performed by Paragon Analytics, Inc., of Fort Collins, Colorado. 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 available in the project files. Validated analytical data for CAU 563 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, 2007). Samples collected during step-out sampling were only analyzed for the COPCs that exceeded FALs in the original samples.

**Table A.2-2**
**Laboratory Analytical Parameters and Methods,**
**CAU 563 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] |
| TPH-DRO | EPA SW-846 8015B[c] (modified) |
| RCRA Metals[d] | EPA SW-846 6010B/7470A/7471A[c] |
| Polychlorinated Biphenyls | EPA SW-846 8082[c] |
| Pesticides | EPA SW-846 8081A[c] |
| TCLP Volatile Organic Compounds | EPA SW-846 1311/8260B[c] |
| TCLP Semivolatile Organic Compounds | EPA SW-846 1311/8270C[c] |
| TCLP Metals[d] | EPA SW-846 1311/6010B/7470A[c] |
| TCLP Pesticides | EPA SW-846 1311/8081A[c] |
| Gamma Spectroscopy | DOE EML HASL 300[e] Approved Laboratory SOPs[f] |
| Isotopic Uranium | DOE EML HASL-300[e], $U^{-02}$-RC Modified, Approved Laboratory SOPs[f] |
| Isotopic Plutonium | DOE EML HASL-300[e] $Pu^{-02}$-RC/$Pu^{-10}$-RC Modified, Approved Laboratory SOPs[f] |
| Strontium-90 | DOE EML HASL-300[e], $Sr^{-02}$ |
| Gross Alpha and Gross Beta | EPA 900.0[g] Modified, Approved Laboratory SOPs[f] |
| Tritium | EPA 906.0[g] Modified, Approved Laboratory SOPs[f] |

**Table A.2-2**
**Laboratory Analytical Parameters and Methods,**
**CAU 563 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]*The Procedures Manual of the Environmental Measurements Laboratory*, HASL-300 (DOE, 1997).
[f]Laboratory Standard Operating Procedures approved by SNJV in accordance with industry standards and the SNJV Model Statement of Work requirements (SNJV, 2006).
[g]*Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA, 1980).

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

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

### *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, 2006). Multiple constituent analyses are presented in Appendix D.

If COCs are present, corrective action must be considered for the CAS. The FALs for the CAU 563 investigation are defined for each CAS in Section 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 TC concentration can result in the introduction of COCs to the surrounding media.

Septic tank liquids with contaminant concentrations exceeding an equivalent TC action level will be considered a PSM requiring a corrective action.

# A.3.0 Corrective Action Site 03-04-02, Area 3 Subdock Septic Tank

Corrective Action Site 03-04-02 is located at the southern portion of the Area 3 Subdock. The CAS components consist of approximately 70 ft of Asbestos Concrete Pad (ACP) and a 2,000-gal (10-by-6-ft-diameter) steel holding tank that was pumped biweekly when active. The tank is fitted with a 2-inch (in.) diameter vent line and an 8-in. diameter suction line. The vent line rises 3 ft above grade and is located 2 ft north of the suction line. The suction line is capped by a 12-in. diameter metal cover. The tank location is identified on the surface by the vent line and suction line cover surrounded by six striped concrete bumper posts. See Figure A.3-1 for a site layout.

## A.3.1 Corrective Action Investigation

A total of three characterization samples (including one FD) were collected during investigation activities at CAS 03-04-02. The sample IDs, locations, depth, matrices, purpose, and analyses are listed in Table A.3-1.

### A.3.1.1 Visual Inspections

No features associated with the septic system, other than the septic tank and subsurface ACP, were identified within the CAS. Initial inspection indicated that the integrity of the components was intact. The buried septic tank was empty.

### A.3.1.2 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. No breaches or residual material were identified in the existing piping.

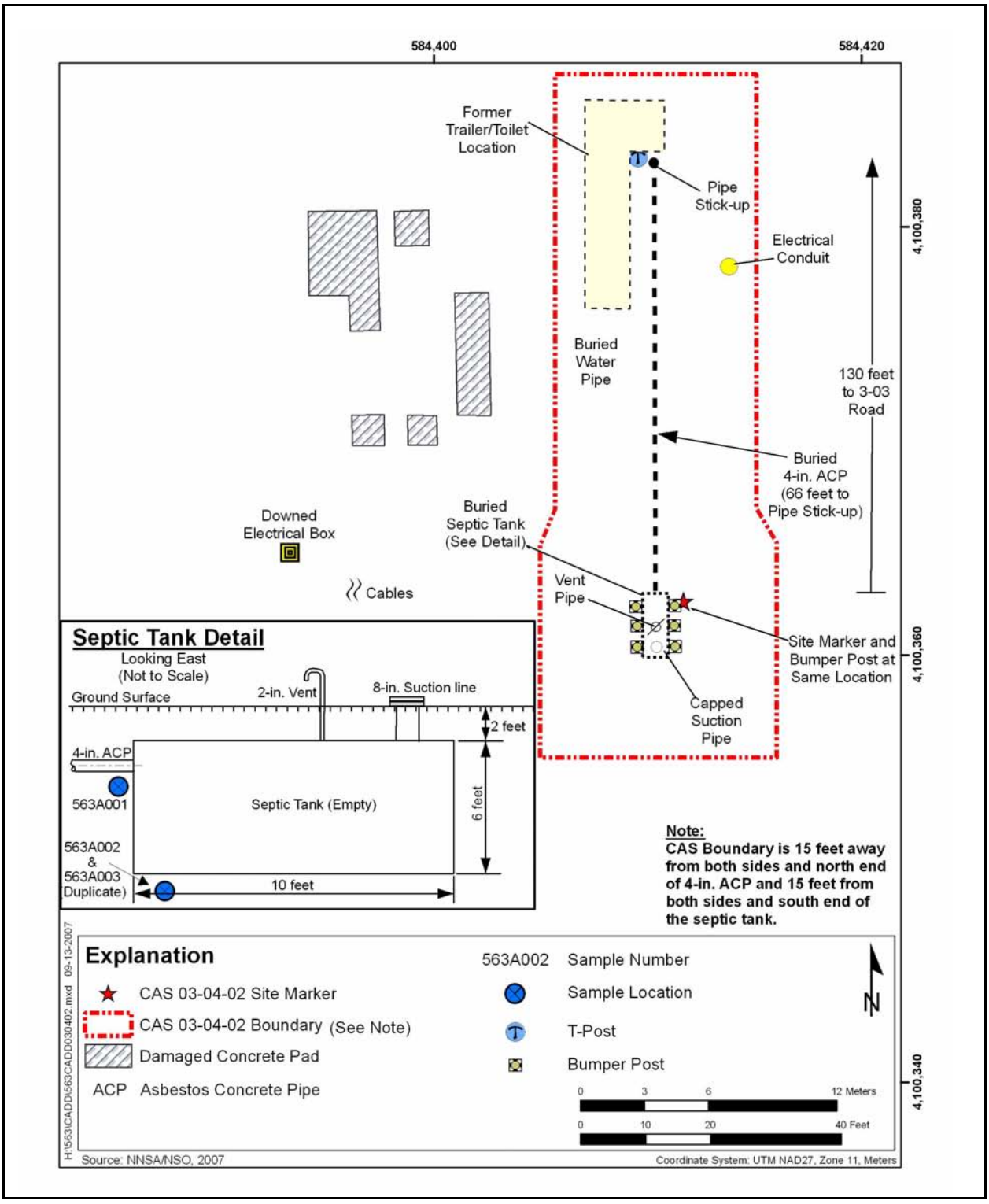


**Figure A.3-1**
**Sample Locations at CAS 03-04-02, Area 3 Subdock Septic Tank**

**Table A.3-1**
**Samples Collected at CAS 03-04-02, Area 3 Subdock Septic Tank**

| Sample Location | Sample Number | Depth (ft bgs) | Matrix | Purpose | Analyses |
|---|---|---|---|---|---|
| A01 | 563A001 | 3.5 - 4.0 | Soil | Environmental, Full Lab QC | Set 1 |
| A02 | 563A002 | 8.0 - 9.0 | Soil | Environmental | Set 1 |
| | 563A003 | 8.0 - 9.0 | Soil | Field Duplicate of #563A002 | Set 1 |
| N/A | 563A301 | N/A | Water | Field Blank | Set 1, Tritium, Gross Alpha/Beta |
| N/A | 563A302 | N/A | Water | Equipment Rinsate | Set 1, Tritium Gross Alpha/Beta |

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

bgs = Below ground surface
DRO = Diesel-range organics
ft = Foot
N/A = Not applicable
PCB = Polychlorinated biphenyl
QC = Quality control
RCRA = *Resource Conservation and Recovery Act*
SVOC = Semivolatile organic compound
TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

### *A.3.1.3 Field Screening*

Investigation samples collected at this CAS were field screened for alpha and beta/gamma radiation as specified in the CAU 563 CAIP (NNSA/NSO, 2007). The FSRs were compared to FSLs to guide subsequent sampling decisions where appropriate. Alpha and beta/gamma radiation FSLs were not exceeded during sampling activities at this CAS.

### *A.3.1.4 Sample Collection*

Decision I environmental sampling activities included the collection of biased subsurface soil samples surrounding the septic system components 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. One sample was collected directly below the inlet pipe connection to the septic tank (location A01, sample 563A001) and one sample from the soil at the base of the septic tank (locations A02, sample 563A002 and its duplicate 563A003). The sample locations and depths are shown on Figure A.3-1 and Table A.3-1.

#### A.3.1.5 Deviations

Investigation samples were collected as outlined in the CAU 563 CAIP (NNSA/NSO, 2007) and submitted for laboratory analysis. There were no deviations to the CAIP.

### 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, 2007). Investigation samples were analyzed for the CAIP-specified COPCs. The analytical parameters and laboratory methods used to analyze the investigation samples are listed in Table A.2-2. The sample-specific analytical suite for CAS 03-04-02 is listed in Table A.3-1.

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 against the FALs. Establishment of the FALs are presented in Appendix D.

#### A.3.2.1 Volatile Organic Compounds

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

#### A.3.2.2 Semivolatile Organic Compounds

No semivolatile organic compound (SVOC) analytical results for environmental samples collected at this CAS were detected above MDCs.

#### 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 samples exceeded the PAL of 100 mg/kg for TPH-DRO. Therefore, the FALs were established at the corresponding PAL concentrations.

**Table A.3-2**
**Environmental Soil Sample Results for Total VOCs Detected above Minimum Detectable Concentrations at CAS 03-04-02, Area 3 Subdock Septic Tank**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) |
|---|---|---|---|
| | | | Methylene Chloride |
| Final Action Levels[a] | | | 21 |
| A01 | 563A001 | 3.5 - 4.0 | 0.0022 (J) |
| A02 | 563A002 | 8.0 - 9.0 | 0.0022 (J) |
| | 563A003 | 8.0 - 9.0 | 0.0024 (J) |

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2006).

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

J = Estimated value

**Table A.3-3**
**Environmental Soil Sample Results for TPH-DRO Detected above Minimum Detectable Concentrations at CAS 03-04-02, Area 3 Subdock Septic Tank**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) |
|---|---|---|---|
| | | | Diesel-Range Organics |
| Final Action Levels[a] | | | 100 |
| A01 | 563A001 | 3.5 - 4.0 | 9 |
| A02 | 563A002 | 8.0 - 9.0 | 10 |
| | 563A003 | 8.0 - 9.0 | 3.3 (J) |

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

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

J = Estimated value

### *A.3.2.4 RCRA Metals*

The RCRA metals analytical results for environmental samples collected at this CAS that were detected above MDCs are presented in Table A.3-4. No metals were detected at concentrations exceeding their PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

**Table A.3-4**
**Environmental Soil Sample Results for Total RCRA Metals Detected above Minimum Detectable Concentrations at CAS 03-04-02, Area 3 Subdock Septic Tank**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium |
| **Final Action Levels** | | | **23[a]** | **67,000[b]** | **450[b]** | **450[b]** | **800[b]** | **310[b]** | **5,100[b]** |
| A01 | 563A001 | 3.5 - 4.0 | 4.1 | 200 | 0.13 | 5.7 | 63 (J) | 0.014 | 1.6 |
| A02 | 563A002 | 8.0 - 9.0 | 5 | 200 | 0.15 | 7.7 | 13 (J) | 0.015 | 0.74 |
| | 563A003 | 8.0 - 9.0 | 4.3 | 210 | 0.19 | 7.3 | 14 (J) | 0.016 | 1 |

[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, 2006).

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

J = Estimated value

### *A.3.2.5 Polychlorinated Biphenyls*

No polychlorinated biphenyl (PCB) analytical results for environmental samples collected at this CAS were detected above MDCs.

### *A.3.2.6 Gamma-Emitting Radionuclides*

The gamma-emitting radionuclide analytical results for environmental samples collected at this CAS detected above MDCs are presented in Table A.3-5. None of these results exceeded their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

**Table A.3-5**
**Environmental Soil Sample Results for Gamma-Emitting Radionuclides Detected above Minimum Detectable Concentrations at CAS 03-04-02, Area 3 Subdock Septic Tank**

| 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** | | | **15[a]** | **12.2[b]** | **15[a]** | **15[a]** | **15[a]** |
| A01 | 563A001 | 3.5 - 4.0 | 1.71 | 0.28 | 1.73 (J) | 1.35 (J) | 0.44 |
| A02 | 563A002 | 8.0 - 9.0 | 1.85 | 0.83 | 1.95 (J) | 1.35 (J) | 0.51 |
| | 563A003 | 8.0 - 9.0 | 1.29 | 0.38 | 1.87 (J) | 1.1 (J) | 0.58 |

[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, 15 pCi/g represents the PALs for these radionuclides in the shallow subsurface soil (greater than 0.5 ft bgs).
[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
NCRP = National Council on Radiation Protection and Measurements
PAL = Preliminary action level
pCi/g = Picocuries per gram

J = Estimated value

### *A.3.2.7 Isotopic Radionuclides*

Isotopic radionuclide analytical results for environmental samples collected at this CAS that were detected above MDCs are presented in Table A.3-6. No radionuclide results exceeded the PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

**Table A.3-6**
**Environmental Soil Sample Results for Isotopes Detected above Minimum Detectable Concentrations at CAS 03-04-02, Area 3 Subdock Septic Tank**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (pCi/g) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Plutonium-238 | Plutonium-239/240 | Uranium-234 | Uranium-235 | Uranium-238 |
| **Final Action Levels[a]** | | | **13** | **12.7** | **143** | **17.6** | **105** |
| A01 | 563A001 | 3.5 - 4.0 | -- | 0.24 (J) | 1.3 | -- | 1.19 |
| A02 | 563A002 | 8.0 - 9.0 | 0.09 | 0.72 (J) | 1.11 | 0.065 | 1.15 |
| | 563A003 | 8.0 - 9.0 | 0.06 | 0.39 (J) | 1.24 | -- | 1.11 |

[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
NCRP = National Council on Radiation Protection and Measurements
pCi/g = Picocuries per gram

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

### *A.3.3 Nature and Extent of Contamination*

Based on the analytical results for soil samples collected within CAS 03-04-02, there are no COCs identified at any location that was sampled within the CAS.

### *A.3.4 Revised Conceptual Site Model*

The CAIP requirements (NNSA/NSO, 2007) were met at this CAS, and no revisions were necessary to the CSM.

# A.4.0 Corrective Action Site 03-59-05, Area 3 Subdock Cesspool

Corrective Action Site 03-59-05 is located in the southern portion of the Area 3 Subdock. The septic system features consist of approximately 100 ft of Vitrified Clay Pipe (VCP) and one buried cesspool that is a 13 ft deep by 3 ft in diameter, constructed of steel, and open-bottomed. The cesspool is fitted with a single vented steel lid. The cesspool location is identified on the surface by four striped concrete bumper posts. See Figure A.4-1 for a site layout.

## A.4.1 Corrective Action Investigation

A total of four environmental soil characterization samples (including one FD) were collected during investigation activities at CAS 03-59-05. The sample IDs, locations, depth, matrices, purpose, and analyses are listed in Table A.4-1.

The sediment (slough) sample and its FD that was collected from the bottom of the cesspool were analyzed for the same parameters as the environmental soil samples.

### A.4.1.1 Visual Inspections

No features associated with the septic system, other than the cesspool and subsurface VCP, were identified within the CAS. Initial inspection indicated that the integrity of the components was intact. The buried cesspool contained sediment but not septage.

### A.4.1.2 Video Surveying

Video surveys were conducted on the septic system associated piping to the extent possible to identify any breaches, residual material, or tie-ins to the piping, and to verify the presence and extent of piping. No residual material was identified in the existing piping. No broken or breached lines were detected during video surveying or excavation activities at this CAS.

### A.4.1.3 Field Screening

Investigation soil samples from this CAS were field screened for alpha and beta/gamma radiation as specified in the CAU 563 CAIP (NNSA/NSO, 2007). The FSRs were compared to FSLs to guide

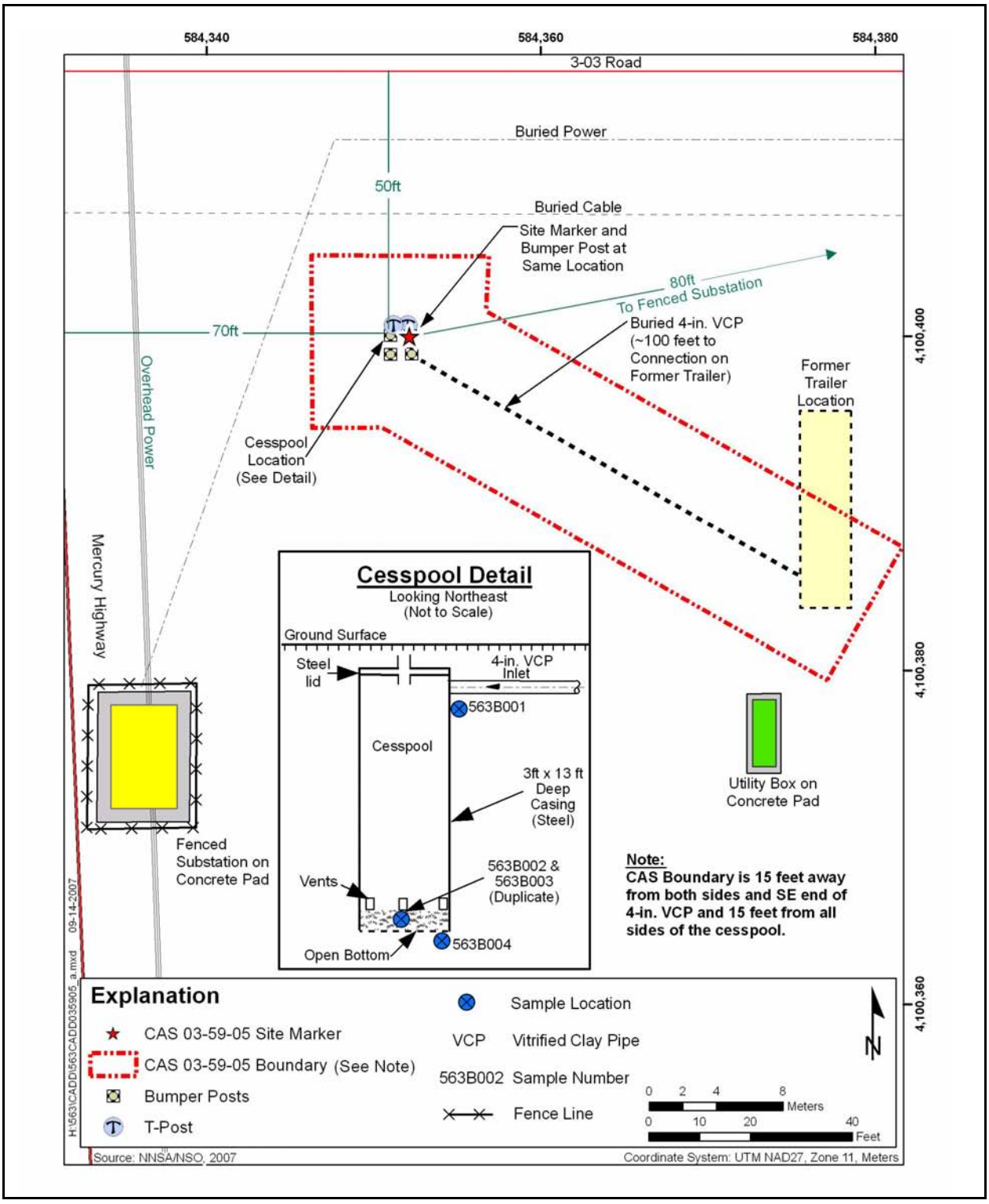


**Figure A.4-1**
**Sample Locations at CAS 03-59-05, Area 3 Subdock Cesspool**

**Table A.4-1**
**Samples Collected at CAS 03-59-05, Area 3 Subdock Cesspool**

| Sample Location | Sample Number | Depth (ft bgs) | Matrix | Purpose | Analyses |
|---|---|---|---|---|---|
| B01 | 563B001 | 2.0 - 3.0 | Soil | Environmental, Full Lab QC | Set 1 |
| B02 | 563B002 | 13.0 - 13.5 | Sediment | Environmental | Set 1 |
| | 563B003 | 13.0 - 13.5 | Sediment | Field Duplicate of #563B002 | Set 1 |
| B03 | 563B004 | 13.5 - 14.0 | Soil | Environmental | Set 1 |
| N/A | 563B301 | N/A | Water | Trip Blank | Total VOCs |
| N/A | 563B302 | N/A | Water | Trip Blank | Total VOCs |
| N/A | 563B303 | N/A | Water | Trip Blank | Total VOCs |

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

bgs = Below ground surface
DRO = Diesel-range organics
ft = Foot
N/A = Not applicable
PCB = Polychlorinated biphenyl
QC = Quality control
RCRA = *Resource Conservation and Recovery Act*
SVOC = Semivolatile organic compound
TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

subsequent sampling decisions where appropriate. Alpha and beta/gamma radiation FSLs were not exceeded during sampling activities.

### *A.4.1.4 Sample Collection*

Intrusive investigation activities (i.e., shallow subsurface soil sampling) were conducted to support investigation activities. For sampling depths greater than 4.0 ft bgs, soil samples were collected from a backhoe bucket.

Excavation of the soil surrounding the cesspool was performed to determine the design of the cesspool to guide sampling decisions. Because the cesspool was designed to release directly into the surrounding soils, a soil sample was collected just beneath the bottom of the steel casing to determine whether there has been a release from this system. Soil samples were collected directly below the inlet pipe connection to the cesspool (location B01, sample 563B001); inside at the base of the cesspool (location B02, sample 563B002 and its duplicate 563B003), and outside at the base of the cesspool (location B03, sample 563B004). The sample locations and depths are shown on Table A.4-1 and Figure A.4-1.

#### A.4.1.5 Deviations

There were no deviations to the CAIP requirements (NNSA/NSO, 2007) at this CAS.

### A.4.2 Investigation Results

The following sections provide analytical results from the environmental soil samples collected to complete investigation activities as outlined in the CAIP (NNSA/NSO, 2007). Environmental investigation samples were analyzed for the CAIP-specified COPCs. The analytical parameters and laboratory methods used to analyze the investigation samples are listed in Table A.2-2. Table A.4-1 lists the sample-specific analytical suite for CAS 03-59-05. An unedited set of all analytical data is retained in electronic format in the project files.

Analytical results from the soil results 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 against the FALs. Establishment of the FALs is presented in Appendix D.

#### A.4.2.1 Volatile Organic Compounds

Analytical results for VOCs detected in environmental soil samples above MDCs are presented in Table A.4-2. Concentrations of VOCs were not detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

#### A.4.2.2 Semivolatile Organic Compounds

Analytical results for SVOCs detected in environmental soil samples above MDCs are presented in Table A.4-3. Concentrations of SVOCs were not detected at concentrations exceeding the respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

## Table A.4-2
## Environmental Soil Sample Results for Total VOCs Detected above Minimum Detectable Concentrations at CAS 03-59-05, Area 3 Subdock Cesspool

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) |
|---|---|---|---|
| | | | Methylene Chloride |
| Final Action Levels[a] | | | 21 |
| B01 | 563B001 | 2.0 - 3.0 | 0.0026 (J) |
| B02 | 563B002 | 13.0 - 14.0 | 0.0024 (J) |
| | 563B003 | 13.0 - 14.0 | 0.0025 (J) |
| B03 | 563B004 | 13.5 - 14.0 | 0.0022 (J) |

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2006).

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

J = Estimated value

## Table A.4-3
## Environmental Soil Sample Results for Total SVOCs Detected above Minimum Detectable Concentrations at CAS 03-59-05, Area 3 Subdock Cesspool

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) |
|---|---|---|---|
| | | | Bis(2-ethylhexyl)Phthalate |
| Final Action Levels[a] | | | 120 |
| B01 | 563B001 | 2.0 - 3.0 | 0.16 (J) |

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2006).

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

J = Estimated value

### A.4.2.3 Total Petroleum Hydrocarbons

The TPH-DRO analytical results detected in environmental soil samples above MDCs are presented in Table A.4-4. No TPH-DRO constituents were detected at concentrations exceeding their respective PAL. Therefore, the FALs were established at the corresponding PAL concentrations.

**Table A.4-4**
**Environmental Soil Sample Results for TPH-DRO Detected above Minimum Detectable Concentrations at CAS 03-59-05, Area 3 Subdock Cesspool**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) |
|---|---|---|---|
| | | | Diesel-Range Organics |
| Final Action Levels[a] | | | 100 |
| B01 | 563B001 | 2.0 - 3.0 | 34 |
| B02 | 563B002 | 13.0 - 14.0 | 8.7 |
| | 563B003 | 13.0 - 14.0 | 13 |
| B03 | 563B004 | 13.5 - 14.0 | 11 |

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

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

### A.4.2.4 Polychlorinated Biphenyls

Analytical results for PCBs exceeding the MDCs in soil samples are presented in Table A.4-5. No PCBs were detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

### A.4.2.5 RCRA Metals

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

## Table A.4-5
## Environmental Soil Sample Results for PCBs Detected above Minimum Detectable Concentrations at CAS 03-59-05, Area 3 Subdock Cesspool

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) |
|---|---|---|---|
| | | | Aroclor 1260 |
| Final Action Levels[a] | | | 0.74 |
| B01 | 563B001 | 2.0 - 3.0 | 0.0045 (J) |
| B02 | 563B002 | 13.0 - 14.0 | 0.01 (J) |
| | 563B003 | 13.0 - 14.0 | 0.0047 (J) |

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2006).

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

J = Estimated value

## Table A.4-6
## Environmental Soil Sample Results for Total RCRA Metals Detected above Minimum Detectable Concentrations at CAS 03-59-05, Area 3 Subdock Cesspool

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium |
| Final Action Levels | | | 23[a] | 67,000[b] | 450[b] | 450[b] | 800[b] | 310[b] | 5,100[b] |
| B01 | 563B001 | 2.0 - 3.0 | 3.7 | 260 | 0.18 | 5.5 | 62 (J) | 0.034 | 0.9 |
| B02 | 563B002 | 13.0 - 14.0 | 4.1 | 220 | 0.23 | 7.4 | 19 (J) | 0.027 | 1.9 |
| | 563B003 | 13.0 - 14.0 | 4 | 210 | 0.17 | 24 | 78 (J) | 0.031 | 1.4 |
| B03 | 563B004 | 13.5 - 14.0 | 4.1 | 190 | 0.078 | 4.2 | 8.5 | 0.022 | 0.7 |

[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, 2006).

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

J = Estimated value

### A.4.2.6 Gamma-Emitting Radionuclides

Gamma-emitting radionuclide analytical results for soil samples detected above MDCs are presented in Table A.4-7. No gamma-emitting radionuclides were detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

**Table A.4-7**
**Environmental Soil Sample Results for Gamma-Emitting Radionuclides Detected above Minimum Detectable Concentrations at CAS 03-59-05, Area 3 Subdock Cesspool**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (pCi/g) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Actinium-228 | Cesium-137 | Lead-212 | Lead-214 | Thallium-208 | Thorium-234 |
| **Final Action Levels** | | | **15[a]** | **12.2[b]** | **15[a]** | **15[a]** | **15[a]** | **105[b]** |
| B01 | 563B001 | 2.0 - 3.0 | 1.28 | 0.243 | 1.65 (J) | 0.92 (J) | 0.413 | 4 (J) |
| B02 | 563B002 | 13.0 - 14.0 | 1.53 | 0.71 | 1.57 (J) | 1.02 (J) | 0.446 | 1.94 (J) |
| | 563B003 | 13.0 - 14.0 | 1.57 | 0.53 | 1.49 (J) | 1.05 (J) | 0.45 | -- |
| B03 | 563B004 | 13.5 - 14.0 | 1.52 | -- | 1.47 (J) | 1.21 (J) | 0.56 | -- |

[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, 15 pCi/g represents the PALs for these radionuclides in the shallow subsurface soil (greater than 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
NCRP = National Council on Radiation Protection and Measurements
PAL = Preliminary action level
pCi/g = Picocuries per gram

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

### A.4.2.7 Isotopic Radionuclides

Isotopic radionuclide analytical results for soil samples detected above MDCs are presented in Table A.4-8. No isotopic radionuclides were detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

**Table A.4-8**
**Environmental Soil Sample Results for Isotopes Detected above Minimum Detectable Concentrations at CAS 03-59-05, Area 3 Subdock Cesspool**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (pCi/g) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Plutonium-238 | Plutonium-239/240 | Uranium-234 | Uranium-235 | Uranium-238 |
| **Final Action Levels[a]** | | | **13** | **12.7** | **143** | **17.6** | **105** |
| B01 | 563B001 | 2.0 - 3.0 | -- | 0.219 (J) | 1.04 | 0.051 | 0.84 |
| B02 | 563B002 | 13.0 - 14.0 | -- | 0.088 (J) | 1.35 | -- | 1.03 |
| | 563B003 | 13.0 - 14.0 | 1.96 | 11.5 (J) | 1.13 | 0.069 | 0.93 |
| B03 | 563B004 | 13.5 - 14.0 | -- | -- | 1.18 | 0.099 | 1.23 |

[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
NCRP = National Council on Radiation Protection and Measurements
pCi/g = Picocuries per gram

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

### *A.4.3 Nature and Extent of Contamination*

Based on the analytical results, no COCs were identified in the environmental soil samples at CAS 03-59-05.

### *A.4.4 Revised Conceptual Site Model*

The CAIP requirements (NNSA/NSO, 2007) were met at this CAS, and no revisions were necessary to the CSM.

# A.5.0 Corrective Action Site 12-59-01, Drilling/Welding Shop Septic Tanks

Corrective Action Site 12-59-01 is located just downgradient of the former Area 12 Drilling/Welding Shop. The CAS components consist of two separate septic systems (one North Tank and one South Tank) and the associated networks of subsurface piping that conjoin and outfall at one common downgradient pipe. In addition, the CAS also includes two stained soil locations ("First Stained Area" and "Second Stained Area"). The North Tank septic system features consist of approximately 500 ft of subsurface VCP and one partially buried steel septic tank that is 32 ft long and 8 ft in diameter. The South Tank septic system features consist of approximately 1,000 ft of subsurface VCP and one mostly buried steel tank that is 36 ft long and 5 ft in diameter and is comprised of two chambers. See Figure A.5-1 for a site layout.

## A.5.1 Corrective Action Investigation

A total of 20 Decision I environmental soil samples (plus one FD) and 4 Decision II environmental soil samples were collected during the investigation activities at CAS 12-59-01. The sample IDs, locations, depth, matrices, purpose, and analyses performed are listed in Table A.5-1.

### A.5.1.1 Visual Inspections

No features associated with the septic system, other than the septic tank and subsurface VCP, were identified within the CAS. Initial inspection indicated that the integrity of the components was intact (other than the inlet/outlet pipes to the North Tank). The South Tank inlet and outlet chambers were noted to be holding liquid.

### A.5.1.2 Video Surveying

Video surveys were conducted on the North and South Tank septic systems' associated piping to the extent possible to identify any breaches or residual material in the piping and to verify the presence of tie-ins. No pipe contents or broken or breached lines were detected during video surveying or excavation. Because the South Tank was noted to be holding liquid, only the top, interior portion of the tank above the liquid levels could be inspected using the video mole. The South Tank was determined to be intact. The North Tank was determined to be empty.

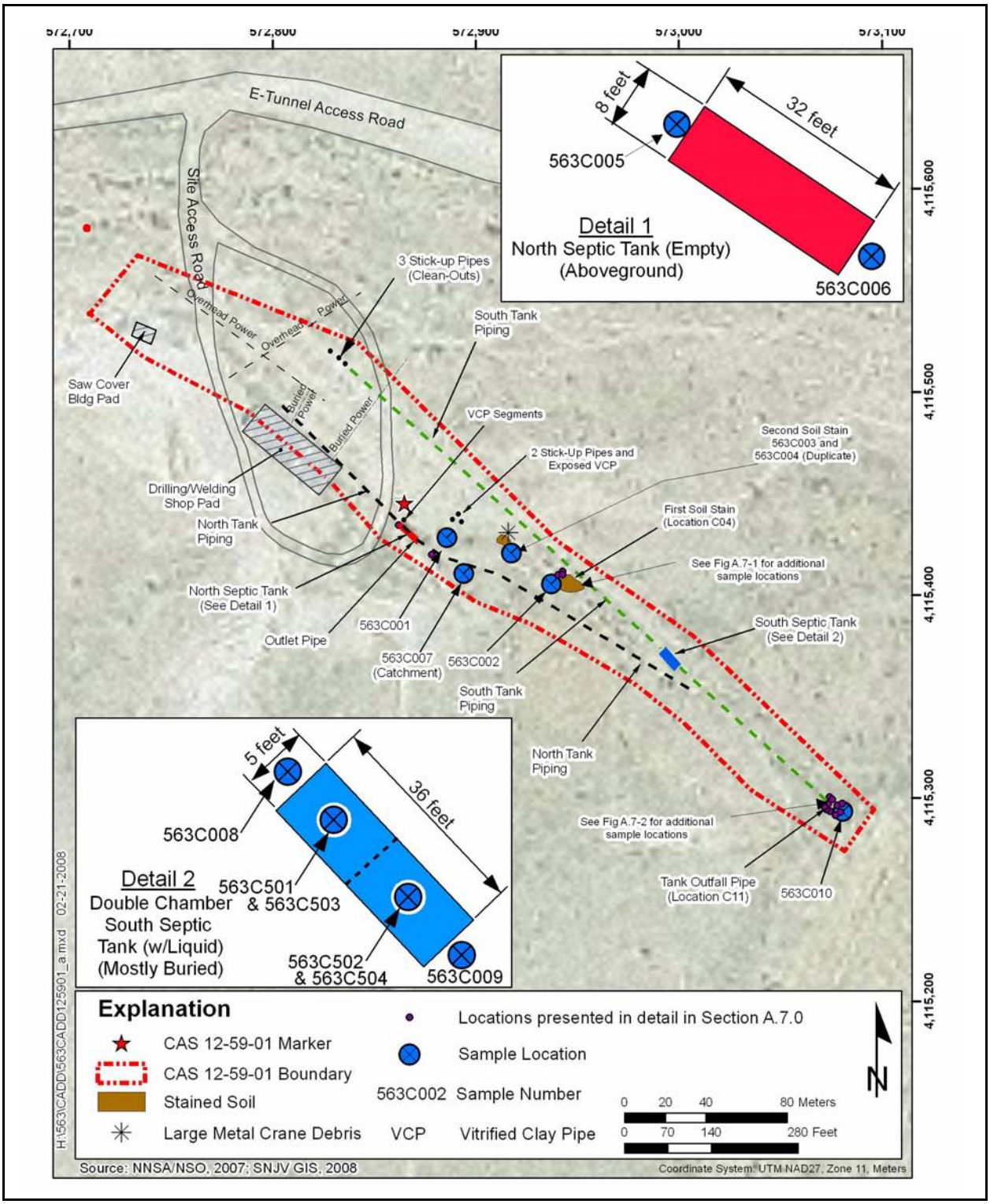


**Figure A.5-1**
**Sample Locations at CAS 12-59-01, Area 12 Drilling/Welding Shop Septic Tanks**

**Table A.5-1**
**Samples Collected at CAS 12-59-01, Drilling/Welding Shop Septic Tanks**
(Page 1 of 2)

| Sample Location | Sample Number | Depth (ft bgs) | Matrix | Purpose | Analyses |
|---|---|---|---|---|---|
| C01 South Tank Outlet Chamber | 563C502 | N/A | Liquid | Waste Management, Potential Source Material | Set 1, Tritium, Gross Alpha/Beta |
| | 563C504 | N/A | Liquid | Waste Management, Potential Source Material | Total Pesticides |
| C02 South Tank Inlet Chamber | 563C501 | N/A | Liquid | Waste Management, Potential Source Material | Set 1, Tritium, Gross Alpha/Beta |
| | 563C503 | N/A | Liquid | Waste Management, Potential Source Material | Total Pesticides |
| C03 | 563C001 | 0.0 - 0.5 | Soil | Environmental, Full Lab QC | Set 1, Total Pesticides, TCLP Pesticides |
| C04 (1st Stain) | 563C002 | 0.0 - 0.5 | Soil | Environmental | Set 1, Total Pesticides, TCLP Metals, TCLP Pesticides |
| C04A (1st Stain) | 563C020 | 0.0 - 0.5 | Soil | Waste Management | TCLP VOCs, TCLP SVOCs |
| C05 (2nd Stain) | 563C003 | 0.0 - 0.5 | Soil | Environmental | Set 1, Total Pesticides, TCLP Pesticides |
| | 563C004 | 0.0 - 0.5 | Soil | Field Duplicate of #563C003 | Set 1, Total Pesticides, TCLP Pesticides |
| C06 | 563C005 | 2.0 - 2.5 | Soil | Environmental | Set 1, Total Pesticides, TCLP Pesticides |
| C07 | 563C006 | 0.0 - 0.5 | Soil | Environmental | Set 1, Total Pesticides, TCLP Pesticides |
| C08 (1st Catchment) | 563C007 | 0.0 - 0.5 | Soil | Environmental | Set 1, Total Pesticides, TCLP Pesticides |
| C09 | 563C008 | 0.5 - 1.0 | Soil | Environmental | Set 1, Total Pesticides, TCLP Pesticides |
| C10 | 563C009 | 0.5 - 1.0 | Soil | Environmental | Set 1 |
| C11 (Tank Outfall) | 563C010 | 0.0 - 0.5 | Soil | Environmental | Set 1, Total Pesticides, TCLP Pesticides |
| | 563C010A | 0.0 - 0.5 | Soil | Waste Management | Set 2, Total Pesticides, TCLP Pesticides |
| | 563C020A | 0.5 - 1.0 | Soil | Waste Management | Total Pesticides, TCLP Pesticides |
| C11A | 563C015 | 0.5 - 1.0 | Soil | Environmental | Total Pesticides |
| C11B | 563C016 | 0.0 - 0.5 | Soil | Environmental | Total Pesticides |
| C11C | 563C017 | 0.0 - 0.5 | Soil | Environmental | Total Pesticides |

## Table A.5-1
## Samples Collected at CAS 12-59-01, Drilling/Welding Shop Septic Tanks
(Page 2 of 2)

| Sample Location | Sample Number | Depth (ft bgs) | Matrix | Purpose | Analyses |
|---|---|---|---|---|---|
| C11D | 563C018 | 0.0 - 0.5 | Soil | Environmental | Total Pesticides, TCLP Pesticides |
| | 563C026 | 0.5 - 1.0 | Soil | Environmental | Total Pesticides, TCLP Pesticides |
| C11E | 563C019 | 0.0 - 0.5 | Soil | Environmental | Total Pesticides |
| | 563C021 | 0.5 - 1.0 | Soil | Environmental | Total Pesticides |
| C12[a] | 563C022 | 0.0 - 0.5 | Soil | Environmental | Total Pesticides |
| C13[a] | 563C023 | 0.0 - 0.5 | Soil | Environmental | Total Pesticides |
| C14[a] | 563C024 | 0.0 - 0.5 | Soil | Environmental | Total Pesticides |
| C15[a] | 563C025 | 0.0 - 0.5 | Soil | Environmental | Total Pesticides |
| C20[b] | 563C011 | 0.0 - 0.5 | Soil | Environmental | Total RCRA Metals |
| C21[b] | 563C012 | 0.0 - 0.5 | Soil | Environmental | Total RCRA Metals |
| C22[b] | 563C013 | 0.0 - 0.5 | Soil | Environmental | Total RCRA Metals |
| C23[b] | 563C014 | 0.5 - 1.0 | Soil | Environmental | Total RCRA Metals |
| Area 12 | XR002 | N/A | Oil | Waste Management | Gamma Spectroscopy, PCBs |
| N/A | 563C301 | N/A | Water | Trip Blank | Total VOCs |
| N/A | 563C302 | N/A | Water | Trip Blank | Total VOCs |
| N/A | 563C303 | N/A | Water | Field Blank | Set 1 |
| N/A | 563C304 | N/A | Water | Trip Blank | Total VOCs |
| N/A | 563C305 | N/A | Water | Trip Blank | Total VOCs |

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

[a]Sample locations C12 through C15 correspond to location C11 (Tank Outfall) step-out samples.
[b]Sample locations C20 through C23 correspond to location C04 (1st Stain) step-out samples.

bgs = Below ground surface
ft = Foot
DRO = Diesel-range organics
N/A = Not applicable
PCB = Polychlorinated biphenyl
QC = Quality control
RCRA = *Resource Conservation and Recovery Act*
SVOC = Semivolatile organic compound
TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

Several tie-ins were noted in the North Tank system, indicating that the two systems joined just downgradient of the South Tank and discharged via one outfall located further downgradient (Figure A.5-1).

### A.5.1.3 Field Screening

Investigation samples collected were field screened for alpha and beta/gamma radiation as specified in the CAU 563 CAIP (NNSA/NSO, 2007). The FSRs were compared to FSLs to guide subsequent sampling decisions where appropriate. Alpha and beta/gamma radiation FSLs were not exceeded during sampling activities at this CAS.

### A.5.1.4 Radiological Surveys

A swipe survey of the South Tank outlet chamber access portal was performed to determine the alpha levels. Results for the swipe survey were 800 disintegrations per minute per 100 square centimeters (dpm/100 $cm^2$) for alpha, which did not indicate elevated alpha levels.

### A.5.1.5 Sample Collection

Intrusive investigation activities (i.e., surface and shallow subsurface soil sampling) were conducted to support investigation activities. Soil samples were collected using a scoop and trowel or hand auger sampling equipment.

Decision I sampling activities at CAS 12-59-01 included the collection of 20 environmental soil samples (plus one FD) from 18 locations. These locations represented areas of potential release as detailed in the CAU 563 CAIP (NNSA/NSO, 2007). Sampling included collecting soil from two stained areas, beneath inlet and outlet lines leading to and from the septic tanks, at the first catchment in a drainage channel downgradient of the North Tank, and surrounding the North and South Tank Outfall.

Additional sampling activities include Decision II sampling for arsenic and chromium at the First Stained Area, and additional Decision I sampling for chlordane at the Tank Outfall.

***COC-impacted soil:*** One surface soil sample result from the First Stained Area at CAS 12-59-01 (location C04, sample 563C002) exceeded the PALs for arsenic and chromium. Four Decision II samples were collected from location C04, in an effort to bound the COC contamination in both the horizontal and vertical directions. Three surface soil samples (563011, 563C012, and 563013) were collected at radial distances of 6 ft from the C04 location, and one vertical sample (563C014) was collected beneath location C04 at a depth of 0.5 to 1.0 ft bgs. The analytical results from these samples were less than PALs, thus defining the impacted volume of the COC-impacted soils at this location. Refer to Figure A.7-1 for the Decision II sample locations at the First Stained Area.

***Chlordane-impacted soil at concentrations greater than 6.5 mg/kg:*** Five lateral step-out samples (563C015 through 563C019) were collected surrounding location C11 and analyzed for total pesticides. Results from this round of soil sampling indicated bounding in three of four lateral directions. Additional step-outs were then collected surrounding this fourth location that consisted of four surface soil samples (563C022 through 563C025), which bounded the horizontal extent to a 280 square foot area. The samples collected from 0.5 to 1.0 ft bgs at the C11 and C11D locations demonstrated a decreasing trend with depth. Refer to Figure A.7-2 for the Decision I sample locations at the Tank Outfall.

The liquid contents of the South Tank were sampled through the access ports to each of the two chambers. The contents were clear and appeared to be rainwater. Samples from the two chambers (locations C01 and C02) were collected to determine whether the contents constituted a potential contamination source, if they were to be left in place; and for waste management purposes, if the contents were to be removed.

### A.5.1.6 Deviations

There were no deviations to the CAIP requirements (NNSA/NSO, 2007) at this CAS.

## 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, 2007). Environmental investigation samples were analyzed for the CAIP-specified COPCs, plus pesticides. 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 12-59-01.

Analytical results from the soil and liquid tank contents with concentrations exceeding MDCs are summarized in Sections A.5.2.1 through A.5.2.8 An evaluation was conducted on all contaminants detected above MDCs by comparing individual concentration or activity results against the FALs. Establishment of the FALs is presented in Appendix D. If the contaminant concentrations were below their respective PALs, the FALs were established as the corresponding PAL concentrations or activities.

The liquid content sample results (outlet chamber location C01, samples 563C502 and 563C504; and inlet chamber location C02, samples 563C501 and 563C503) were evaluated against TC limits, and were determined not to be a PSM if left in place. Additional waste management information regarding these samples is provided in Section A.7.2.

### *A.5.2.1 Volatile Organic Compounds*

Analytical results for VOCs detected in soil samples 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.

From the South Tank, no VOC analytical results for the liquid samples collected exceeded MDCs.

### *A.5.2.2 Semivolatile Organic Compounds*

Analytical results for SVOCs detected in soil samples above MDCs are presented in Table A.5-3. No SVOCs were detected at concentrations exceeding the respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

From the South Tank, no SVOC analytical results for the liquid samples collected exceeded MDCs.

### *A.5.2.3 Total Petroleum Hydrocarbons*

The TPH-DRO analytical results detected in soil samples above MDCs are presented in Table A.5-4. One sample at this CAS exceeded the PAL of 100 mg/kg for TPH-DRO at the first catchment location

## Table A.5-2
## Environmental Soil Sample Results for Total VOCs Detected above Minimum Detectable Concentrations at CAS 12-59-01, Drilling/Welding Shop Septic Tanks

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) | |
|---|---|---|---|---|
| | | | Acetone | Xylenes |
| **Final Action Levels[a]** | | | **54,000** | **420** |
| C03 | 563C001 | 0.0 - 0.5 | 0.012 (J) | -- |
| C05 (2nd Stain) | 563C003 | 0.0 - 0.5 | 0.085 | 0.0066 |
| | 563C004 | 0.0 - 0.5 | 0.055 | -- |

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2006).

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

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

## Table A.5-3
## Environmental Soil Sample Results for Total SVOCs Detected above Minimum Detectable Concentrations at CAS 12-59-01, Drilling/Welding Shop Septic Tanks

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Benzo(a)Pyrene | Benzo(b)Fluoranthene | Benzo(g,h,i)Perylene | Benzo(k)Fluoranthene | Chrysene | Fluoranthene | Indeno(1,2,3-cd)Pyrene | Pyrene |
| **Final Action Levels[a]** | | | **0.21** | **2.1** | **29,000** | **21** | **210** | **22,000** | **2.1** | **29,000** |
| C04 (1st Stain) | 563C002 | 0.0 - 0.5 | 0.068 (J) | 0.22 (J) | 0.12 (J) | 0.15 (J) | 0.069 (J) | 0.099 (J) | 0.094 (J) | 0.075 (J) |
| C05 (2nd Stain) | 563C003 | 0.0 - 0.5 | -- | 0.15 (J) | -- | 0.14 (J) | -- | -- | -- | -- |
| | 563C004 | 0.0 - 0.5 | -- | 0.14 (J) | -- | 0.14 (J) | -- | -- | -- | -- |

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2006).

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

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

downgradient of the North Tank. The TPH-DRO was moved to a Tier 2 evaluation, and FALs were established for the hazardous constituents of TPH-DRO. The Tier 2 evaluation determined that none of the hazardous constituents of TPH-DRO were identified at concentrations above their respective PALs. Therefore, the TPH-DRO detected in the soil at this CAS is not considered to be a COC. The establishment of FALs for the hazardous constituents of TPH-DRO is presented in Appendix D.

From the South Tank, no TPH-DRO analytical results for the liquid samples collected exceeded MDCs.

**Table A.5-4**
**Environmental Soil Sample Results for TPH-DRO Detected above Minimum Detectable Concentrations at CAS 12-59-01, Drilling/Welding Shop Septic Tanks**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) |
|---|---|---|---|
| | | | Diesel-Range Organics |
| **Preliminary Action Levels[a]** | | | **100** |
| C03 | 563C001 | 0.0 - 0.5 | 22 |
| C04 (1st Stain) | 563C002 | 0.0 - 0.5 | 25 |
| C05 (2nd Stain) | 563C003 | 0.0 - 0.5 | 50 |
| | 563C004 | 0.0 - 0.5 | 58 |
| C07 | 563C006 | 0.0 - 0.5 | 28 |
| C08 (1st Catchment) | 563C007 | 0.0 - 0.5 | **1,600** |
| C09 | 563C008 | 0.5 - 1.0 | 4.8 (J) |
| C11 (Tank Outfall) | 563C010 | 0.0 - 0.5 | 57 |

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

Note: Bold text indicates value exceeding the action level.

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

J = Estimated value

### *A.5.2.4 Total Pesticides*

Analytical results for pesticides detected above MDCs are presented in Table A.5-5. Chlordane was detected at several locations downgradient of the building pad where pesticides might have been applied. Locations C08 and C11 are suspected examples of this accumulation. Sporadic and discontinuous distribution of residual chlordane (shown in analytical results from past sampling effort) is likely a result of degradation, grading of surfaces, migration/translocation, etc. Therefore, chlordane is not considered to be associated with a release from this CAS and is not considered to be a COC at this CAS. No CAS-related contaminants exceeded their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

Although chlordane is not considered to be a COC in the soils at this CAS, it was determined that the higher concentrations at the Tank Outfall (location C11) would be removed as a BMP.

From the South Tank, no pesticide analytical results for the liquid samples collected exceeded MDCs.

**Table A.5-5**
**Environmental Soil Sample Results for Total Pesticides Detected above Minimum Detectable Concentrations at CAS 12-59-01, Drilling/Welding Shop Septic Tanks**
(Page 1 of 2)

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 4,4'-DDE | 4,4'-DDT | Chlordane | Delta-BHC | Endosulfan II | Endosulfan Sulfate |
| **Final Action Levels[a]** | | | **7** | **7** | **N/A[b]** | **0.36** | **3,700** | **3,700** |
| C03 | 563C001 | 0.0 - 0.5 | -- | 0.32 (J) | 1.7 (J) | -- | -- | -- |
| C04 (1st Stain) | 563C002 | 0.0 - 0.5 | -- | 0.65 (J) | 3.9 (J) | -- | -- | -- |
| C05 (2nd Stain) | 563C003 | 0.0 - 0.5 | 0.027 (J) | 0.59 (J) | 6.7 (J) | -- | -- | -- |
| | 563C004 | 0.0 - 0.5 | 0.034 (J) | 0.68 (J) | 7.2 (J) | -- | -- | -- |
| C06 | 563C005 | 2.0 - 2.5 | -- | 0.024 (J) | 0.43 (J) | -- | -- | -- |
| C07 | 563C006 | 0.0 - 0.5 | -- | 0.28 (J) | 4.6 (J) | -- | -- | -- |

## Table A.5-5
## Environmental Soil Sample Results for Total Pesticides Detected above Minimum Detectable Concentrations at CAS 12-59-01, Drilling/Welding Shop Septic Tanks
(Page 2 of 2)

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 4,4'-DDE | 4,4'-DDT | Chlordane | Delta-BHC | Endosulfan II | Endosulfan Sulfate |
| **Final Action Levels[a]** | | | **7** | **7** | **N/A[b]** | **0.36** | **3,700** | **3,700** |
| C08 (1st Catchment) | 563C007 | 0.0 - 0.5 | 0.091 (J) | 0.14 (J) | 22 (J) | -- | -- | -- |
| C09 | 563C008 | 0.5 - 1.0 | -- | 0.014 (J) | 0.31 (J) | -- | -- | -- |
| C11 (Tank Outfall) | 563C010A | 0.0 - 0.5 | 1.5 (J) | 2.9 (J) | 100 (J) | 0.034 (J) | 0.089 (J) | 0.84 (J) |
| | 563C010 | 0.0 - 0.5 | 0.24 (J) | 2.4 (J) | 140 (J) | -- | -- | -- |
| | 563C020A | 0.5 - 1.0 | 0.57 (J) | 1 (J) | 47 (J) | 0.021 (J) | -- | 0.11 (J) |
| C11A | 563C015 | 0.0 - 0.5 | 0.0052 (J) | 0.013 (J) | 0.28 | 0.0055 (J) | -- | -- |
| C11B | 563C016 | 0.0 - 0.5 | -- | 0.13 (J) | 1.2 (J) | -- | -- | -- |
| C11C | 563C017 | 0.0 - 0.5 | -- | 0.1 (J) | 2 (J) | -- | -- | -- |
| C11D | 563C018 | 0.0 - 0.5 | 0.64 (J) | 3 (J) | 65 (J) | -- | 0.062 (J) | 0.86 (J) |
| | 563C026 | 0.5 - 1.0 | 0.71 (J) | 3.1 (J) | 68 (J) | 0.02 (J) | -- | 0.28 (J) |
| C11E | 563C019 | 0.0 - 0.5 | 0.026 (J) | 0.12 (J) | 2.5 (J) | -- | -- | -- |
| | 563C021 | 0.5 - 1.0 | 0.017 (J) | 0.074 (J) | 1.6 (J) | -- | -- | -- |
| C12 | 563C022 | 0.0 - 0.5 | 0.025 (J) | 0.16 (J) | 1.9 (J) | -- | -- | -- |
| C13 | 563C023 | 0.0 - 0.5 | 0.053 (J) | 0.29 (J) | 4.7 (J) | -- | -- | -- |
| C14 | 563C024 | 0.0 - 0.5 | 0.006 (J) | 0.017 (J) | 0.34 (J) | 0.003 (J) | -- | -- |
| C15 | 563C025 | 0.0 - 0.5 | -- | 0.0081 (J) | 0.055 (J) | -- | -- | -- |

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2006).
[b]An action level is not applicable as chlordane is present from routine insecticide application and not a release from this CAS.

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram
N/A = Not applicable

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

### *A.5.2.5 Polychlorinated Biphenyls*

No PCB analytical results for soil samples collected at this CAS were above MDCs. Therefore, the FALs were established at the corresponding PAL concentrations.

From the South Tank, no PCB analytical results for the liquid samples collected exceeded MDCs.

### *A.5.2.6 Total RCRA Metals*

Analytical results for RCRA metals detected in soil samples above MDCs are presented in Table A.5-6. Arsenic and chromium were detected above FALs in soil samples from the First Stained Area (location C04). Therefore, arsenic and chromium are considered to be COCs at this CAS. For all other analytes, FALs were established using corresponding PAL concentrations.

From the South Tank, no RCRA metal analytical results for the liquid samples collected exceeded MDCs.

**Table A.5-6**
**Environmental Soil Sample Results for Total RCRA Metals Detected above Minimum Detectable Concentrations at CAS 12-59-01, Drilling/Welding Shop Septic Tanks**
(Page 1 of 2)

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
| **Final Action Levels** | | | **23[a]** | **67,000[b]** | **450[b]** | **450[b]** | **800[b]** | **310[b]** | **5,100[b]** | **5,100[b]** |
| C03 | 563C001 | 0.0 - 0.5 | 4.5 | 130 | -- | 8.4 (J) | 55 | 0.091 | -- | -- |
| C04 (1st Stain) | 563C002 | 0.0 - 0.5 | **43** | 100 | 1.1 | **3,900 (J)** | 71 | 0.045 | 34 (J+) | 0.82 |
| C23 | 563C014 | 0.5 - 1.0 | 4.9 | 100 | 0.53 | 26 | 22 | 0.051 | | |
| C05 (2nd Stain) | 563C003 | 0.0 - 0.5 | 4.4 | 220 | 0.66 | 7.9 (J) | 51 | 0.053 | -- | -- |
| | 563C004 | 0.0 - 0.5 | 3.9 | 210 | 0.65 | 7.5 (J) | 52 | 0.041 | -- | -- |
| C06 | 563C005 | 2.0 - 2.5 | 4.4 | 80 | 0.15 | 5.6 | 23 | 0.12 | -- | 0.086 |
| C07 | 563C006 | 0.0 - 0.5 | 4.4 | 120 | 0.49 | 9.9 | 41 | 0.091 | 0.53 | 0.07 |

**Table A.5-6**
**Environmental Soil Sample Results for Total RCRA Metals Detected above Minimum Detectable Concentrations at CAS 12-59-01, Drilling/Welding Shop Septic Tanks**
(Page 2 of 2)

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
| **Final Action Levels** | | | **23[a]** | **67,000[b]** | **450[b]** | **450[b]** | **800[b]** | **310[b]** | **5,100[b]** | **5,100[b]** |
| C08 (1st Catchment) | 563C007 | 0.0 - 0.5 | 4.9 | 210 | 0.64 | 13 | 60 | 0.1 | -- | 0.51 |
| C09 | 563C008 | 0.5 - 1.0 | 7.4 | 78 | 0.084 | 5.8 | 12 | 0.077 | 0.56 | -- |
| C10 | 563C009 | 0.5 - 1.0 | 6.2 | 74 | 0.077 | 6.1 | 7.8 | 0.031 | -- | -- |
| C11 (Tank Outfall) | 563C010 | 0.0 - 0.5 | 4.7 | 1,400 | 0.56 | 8.9 | 38 | 0.093 | 0.43 | 0.18 |
| C20 | 563C011 | 0.0 - 0.5 | 4.5 | 160 | 0.4 | 7.5 | 47 | 0.068 | -- | -- |
| C21 | 563C012 | 0.0 - 0.5 | 4.1 | 120 | 0.38 | 27 | 43 | 0.08 | -- | -- |
| C22 | 563C013 | 0.0 - 0.5 | 4.2 | 87 | 0.21 | 50 | 23 | 0.069 | -- | -- |

[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, 2006).

Note: Bold text indicates value exceeding the action level.

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.5.2.7 Gamma-Emitting Radionuclides*

The gamma-emitting radionuclide analytical results for soil samples detected above the MDCs are presented on Table A.5-7. No gamma-emitting radionuclide analytical results for the soil samples collected from the CAS exceeded their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

From the South Tank, no gamma-emitting radionuclide analytical results for the liquid samples collected exceeded MDCs.

# Table A.5-7
# Environmental Soil Sample Results for Gamma-Emitting Radionuclides Detected above Minimum Detectable Concentrations at CAS 12-59-01, Drilling/Welding Shop Septic Tanks

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (pCi/g) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Actinium-228 | Americium-241 | Cesium-137 | Lead-212 | Lead-214 | Thallium-208 |
| **Final Action Levels** | | | **5/15[a]** | **12.7[b]** | **12.2[b]** | **5/15[a]** | **5/15[a]** | **5/15[a]** |
| C03 | 563C001 | 0.0 - 0.5 | 0.52 | -- | 0.364 | 0.72 | 0.59 (J) | 0.172 |
| C04 (1st Stain) | 563C002 | 0.0 - 0.5 | 0.87 | -- | 1.12 | 0.98 | 0.77 (J) | 0.31 |
| C05 (2nd Stain) | 563C003 | 0.0 - 0.5 | 0.98 | -- | 2.51 | 1.1 (J) | 0.83 (J) | 0.31 |
| | 563C004 | 0.0 - 0.5 | 1.06 | -- | 2.7 | 1.12 (J) | 0.93 (J) | 0.344 |
| C06 | 563C005 | 2.0 - 2.5 | 0.69 | -- | 0.254 | 0.89 (J) | 0.84 (J) | 0.197 |
| C07 | 563C006 | 0.0 - 0.5 | 1.01 | -- | 1.13 | 1.04 (J) | 0.94 (J) | 0.317 |
| C08 (1st Catchment) | 563C007 | 0.0 - 0.5 | 0.83 | -- | 2.21 | 1.04 (J) | 1.01 (J) | 0.335 |
| C09 | 563C008 | 0.5 - 1.0 | 0.7 | -- | 0.288 | 0.82 | 0.75 (J) | 0.199 |
| C10 | 563C009 | 0.5 - 1.0 | 0.7 | -- | 0.177 | 0.82 | 0.71 (J) | 0.229 |
| C11 (Tank Outfall) | 563C010 | 0.0 - 0.5 | 1.12 | 0.35 (J) | 1.29 | 1.1 (J) | 1.07 (J) | 0.356 |

[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).

[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
DOE = U.S. Department of Energy
ft = Foot
NCRP = National Council on Radiation Protection and Measurements
PAL = Preliminary action level
pCi/g = Picocuries per gram

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

### *A.5.2.8 Isotopic Radionuclides*

Isotopic radionuclide analytical results for soil samples detected above MDCs are presented in Table A.5-8. No isotopic radionuclides in the soil samples were detected at concentrations exceeding the respective PALs at this CAS. Therefore, the FALs were established at the corresponding PAL concentrations.

**Table A.5-8**
**Environmental Soil Sample Results for Isotopes Detected above Minimum Detectable Concentrations at CAS 12-59-01, Drilling/Welding Shop Septic Tanks**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (pCi/g) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Plutonium-238 | Plutonium-239/240 | Uranium-234 | Uranium-235 | Uranium-238 |
| **Final Action Levels[a]** | | | **13** | **12.7** | **143** | **17.6** | **105** |
| C03 | 563C001 | 0.0 - 0.5 | 0.215 | 1.05 | 0.61 | -- | 0.56 |
| C04 (1st Stain) | 563C002 | 0.0 - 0.5 | 0.123 | 1.5 | 0.57 | -- | 0.57 |
| C05 (2nd Stain) | 563C003 | 0.0 - 0.5 | 0.267 | 2.98 | 0.67 | 0.025 | 0.77 |
| | 563C004 | 0.0 - 0.5 | 0.335 | 3.81 | 0.67 | 0.037 | 0.65 |
| C06 | 563C005 | 2.0 - 2.5 | 0.096 (J) | 0.59 (J) | 0.55 | -- | 0.51 |
| C07 | 563C006 | 0.0 - 0.5 | 0.124 (J) | 0.9 (J) | 0.58 | -- | 0.61 |
| C08 (1st Catchment) | 563C007 | 0.0 - 0.5 | 0.279 (J) | 1.45 (J) | 0.66 | -- | 0.58 |
| C09 | 563C008 | 0.5 - 1.0 | 0.144 (J) | 1.05 (J) | 0.55 | -- | 0.62 |
| C10 | 563C009 | 0.5 - 1.0 | -- | -- | 0.58 | -- | 0.59 |
| C11 (Tank Outfall) | 563C010 | 0.0 - 0.5 | 0.58 (J) | 2.61 (J) | 0.61 | 0.045 | 0.69 |

[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
NCRP = National Council on Radiation Protection and Measurements
pCi/g = Picocuries per gram

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

From the South Tank, no isotopic radionuclide analytical results for the liquid samples collected exceeded MDCs.

### A.5.3 Nature and Extent of Contamination

Based on the analytical results, arsenic and chromium exceed their FALs and are therefore defined as COCs at the First Stained Area (location C04). The extent of COC contamination has been defined at this location by step-out and step-down sample results. The COC-impacted soil encompasses a surface area of approximately 12 ft in diameter and extends to a depth of less than 1.0 ft bgs. The volume of soil recommended for removal is estimated at 4 $yd^3$. For more details on the arsenic and chromium COC-impacted soil at this location, see Section A.7.2.1.2 and Figure A.7-1.

Although chlordane is not defined as a COC at this CAS, it was detected at higher concentrations in surface and shallow subsurface soils at a downgradient depression (location C08) and at the common Tank Outfall (location C11). The volume of soil estimated for removal under a BMP is approximately 10 $yd^3$ (20 ft by 14 ft by 1.0 ft bgs). The C08 location was not considered for BMP removal during corrective action planning discussions. For more details on the chlordane-impacted soil at this location, see Section A.7.2.1.2 and Figure A.7-2.

### A.5.4 Revised Conceptual Site Model

The results of the CAI at CAS 12-59-01 did not contradict the CSM. No revision of the CSM was necessary.

#### A.5.4.1 Potential Source Material

For the South Tank, it was determined that the contents were clear and appeared to be rainwater. The samples were collected to determine if the contents were PSM and the data could be used to determine proper disposal methods. Laboratory analysis determined that all results were lower than the MDCs. The analytical results are presented as Table A.5-9. Based on the sample results, the contents of the South Tank are not PSM.

## Table A.5-9
## Waste Management Sample Results Detected
## at CAS 12-59-01, Drilling/Welding Shop Septic Tanks

| Sample Location | Sample Number | Matrix | Parameter | Result | Units |
|---|---|---|---|---|---|
| C01 (Outlet Chamber) | 563C502 | Liquid | Barium | 0.0034 (J-) | mg/L |
| | | | Chromium | 0.00094 | mg/L |
| | | | Gross Beta | 8 | pCi/L |
| | | | Strontium-90 | 0.45 (J) | pCi/L |
| | | | Uranium-234 | 0.085 | pCi/L |
| | 563C504 | Liquid | 4,4'-DDE | 0.024 (J) | µg/L |
| C02 (Inlet Chamber) | 563C501 | Liquid | Barium | 0.004 (J-) | mg/L |
| | | | Chromium | 0.00049 | mg/L |
| | | | Gross Beta | 9.5 | pCi/L |
| | 563C503 | Liquid | Endosulfan II | 0.052 | µg/L |
| | | | 4,4'-DDE | 0.028 (J) | µg/L |

mg/L = Milligrams per liter
pCi/L = Picocuries per liter
µg/L = Micrograms per liter

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

# A.6.0 Corrective Action Site 12-60-01, Drilling/Welding Shop Outfalls

Corrective Action Site 12-60-01 is located at the former Area 12 Drilling/Welding Shop. The CAS components consist of three drain lines and respective outfalls originating from pipe rack cleaning and hydraulic pipe cutting activities at the Drilling/Welding Shops. The three drain lines are inactive, abandoned, and located just beneath the concrete pad of the Area 12 Drilling/Welding shop, which primarily supported the maintenance of equipment used during the E-Tunnel drilling and testing activities. The drain lines and outfall pipes are comprised of 8-in. and 12-in. diameter steel piping. Additional detail is provided in the CAIP. See Figure A.6-1 for a site layout.

## A.6.1 Corrective Action Investigation

A total of four environmental soil characterization samples (including one FD and one full lab QC) were collected during investigation activities at CAS 12-60-01. The sample IDs, locations, depth, matrices, purpose, and analyses are listed in Table A.6-1.

### A.6.1.1 Visual Inspections

No features associated with the collection system (outfall pipes) were identified within the CAS. Initial inspection indicated that the integrity of the components was intact. The outfalls were empty.

### A.6.1.2 Video Surveying

Video surveys were conducted on the pipe outfalls and associated piping to the extent possible to identify any breaches or residual material in the piping, and to verify the presence and extent of the piping. No breaches or residual materials were identified in the existing piping or outfalls. The outfall pipes were empty.

### A.6.1.3 Field Screening

The soil samples were field screened for alpha and beta/gamma radiation. The FSRs were compared to FSLs to guide subsequent sampling decisions where appropriate. Alpha and beta/gamma radiation FSLs were not exceeded during sampling activities.

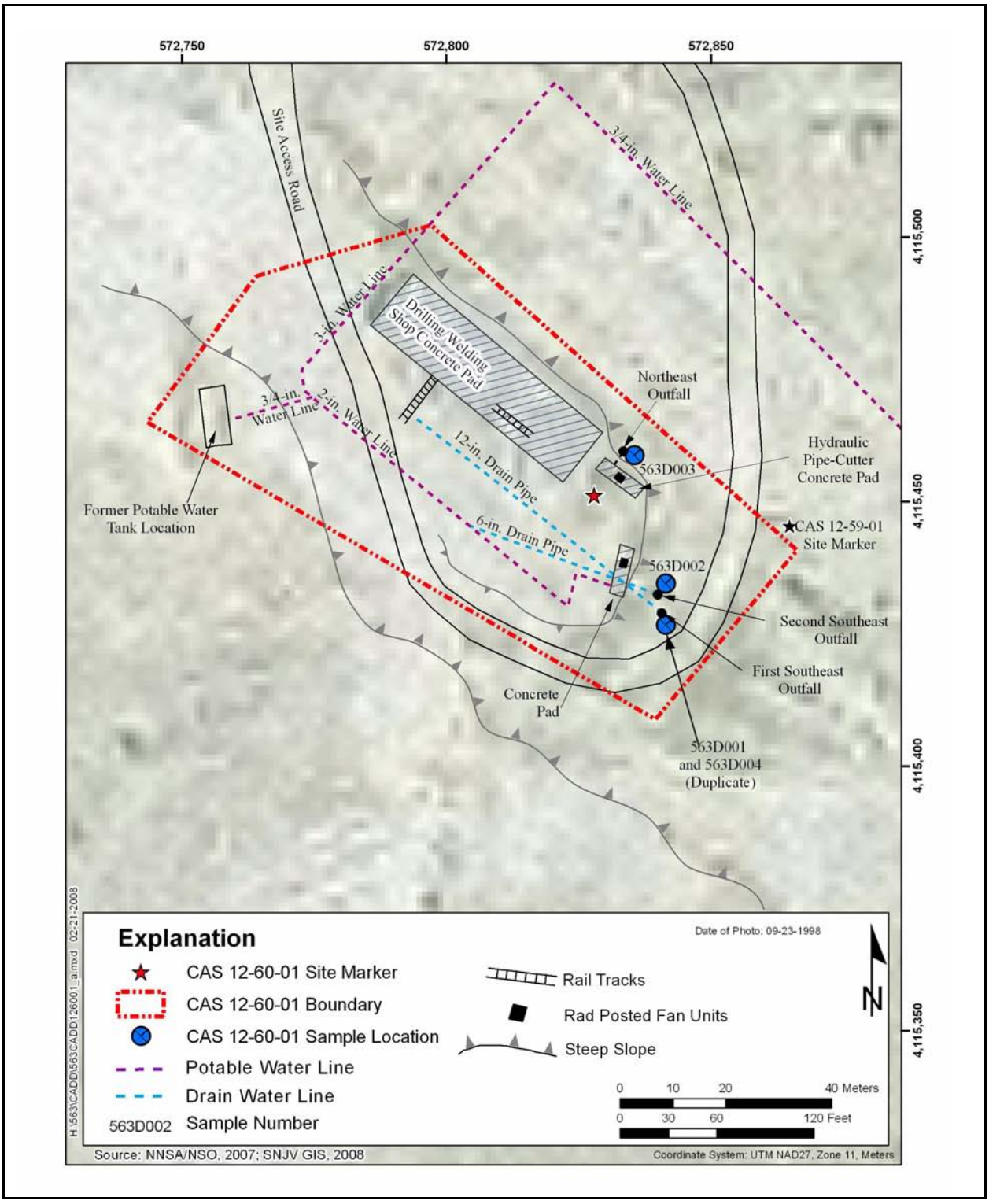


**Figure A.6-1**
**Sample Locations at CAS 12-60-01, Area 12 Drilling/Welding Shop Outfalls**

**Table A.6-1**
**Samples Collected at CAS 12-60-01, Drilling/Welding Shop Outfalls**

| Sample Location | Sample Number | Depth (ft bgs) | Matrix | Purpose | Analyses |
|---|---|---|---|---|---|
| D01 | 563D001 | 0.0 - 0.5 | Soil | Environmental | Set 1 |
| | 563D004 | 0.0 - 0.5 | Soil | Field Duplicate of #563D001 | Set 1 |
| D02 | 563D002 | 0.0 - 0.5 | Soil | Environmental | Set 1, TCLP Metals |
| D03 | 563D003 | 0.0 - 0.5 | Soil | Environmental, Full Lab QC | Set 1, Pesticides, TCLP Pesticides |

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

bgs = Below ground surface
ft = Foot
DRO = Diesel-range organics
PCB = Polychlorinated biphenyl
QC = Quality control
RCRA = *Resource Conservation and Recovery Act*
SVOC = Semivolatile organic compound
TCLP = Toxicity Characteristic Leaching Procedure
TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

### *A.6.1.4 Sample Collection*

Decision I sampling activities at CAS 12-60-01 included the collection of four environmental soil samples (including one FD) from three locations. Sample locations were located directly beneath the outfall pipes (Figure A.6-1). These locations represented areas of potential release as detailed in the CAU 563 CAIP (NNSA/NSO, 2007).

### *A.6.1.5 Deviations*

Investigation samples were collected as outlined in the CAU 563 CAIP (NNSA/NSO, 2007) and submitted for laboratory analysis. There were no deviations from the CAIP.

## *A.6.2 Investigation Results*

The following sections provide analytical results from the samples collected to complete investigation activities as outlined in the CAIP. Environmental investigation samples were analyzed for the CAIP-specified COPCs, which included VOCs, SVOCs, TPH-DRO, RCRA metals, PCBs, gamma-emitting radionuclides, isotopic U, isotopic Pu, and strontium-90.

### A.6.2.1 Total 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 their respective PALs. Therefore, FALs were established at the corresponding PAL concentrations.

**Table A.6-2**
**Environmental Soil Sample Results for Total VOCs Detected above Minimum Detectable Concentrations at CAS 12-60-01, Drilling/Welding Shop Outfalls**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-Butanone | 2-Hexanone | Acetone | Methyl Isobutyl Ketone | P-Isopropyltoluene | Toluene |
| **Final Action Levels[a]** | | | **110,000** | **110,000** | **54,000** | **47,000** | **2,000** | **520** |
| D01 | 563D001 | 0.0 - 0.5 | -- | -- | 0.061 | -- | 0.0017 (J) | -- |
| | 563D004 | 0.0 - 0.5 | -- | -- | 0.035 | -- | -- | -- |
| D02 | 563D002 | 0.0 - 0.5 | 0.38 | 0.13 | 1 | 0.041 (J) | -- | -- |
| D03 | 563D003 | 0.0 - 0.5 | -- | -- | 0.023 | -- | -- | 0.0019 (J) |

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2006).

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

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

### A.6.2.2 Total Semivolatile Organic Compounds

No SVOCs were detected above MDCs at CAS 12-60-01. Therefore, FALs were established at the corresponding PAL concentrations.

### A.6.2.3 Total Petroleum Hydrocarbons

The TPH-DRO analytical results detected in soil samples above MDCs are presented in Table A.6-3. Three surface soil samples at this CAS exceeded the PAL of 100 mg/kg for TPH-DRO — two samples (one is an FD) at the Northeast pipe outfall, and one sample at the first Southeast pipe outfall. The TPH-DRO was moved to a Tier 2 evaluation. The Tier 2 evaluation determined that none of the hazardous constituents of TPH-DRO were identified at concentrations above their respective PALs. Therefore, the TPH-DRO detected at this CAS is not considered to be a COC. The establishment of the FALs is presented in Appendix D.

**Table A.6-3**
**Environmental Soil Sample Results for TPH-DRO Detected above Minimum Detectable Concentrations at CAS 12-60-01, Drilling/Welding Shop Outfalls**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) |
|---|---|---|---|
| | | | Diesel-Range Organics |
| **Preliminary Action Levels[a]** | | | **100** |
| D01 | 563D001 | 0.0 - 0.5 | **100** |
| | 563D004 | 0.0 - 0.5 | **310 (J)** |
| D02 | 563D002 | 0.0 - 0.5 | **1,600** |
| D03 | 563D003 | 0.0 - 0.5 | 27 |

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

Note: Bold text indicates value exceeding the action level.

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

J = Estimated value

### A.6.2.4 Total Pesticides

Analytical results for total pesticides detected above MDCs are presented in Table A.6-4. All constituents were below the respective PALs except for chlordane. Chlordane was detected at one location at this CAS exceeding its PAL of 6.5 mg/kg. An action level for chlordane is not applicable because the chlordane is likely present from routine pesticide application. Chlordane application on constructed surfaces (e.g., concrete pads) most likely was washed into the collection system and was deposited through outfalls onto surface soils. An accumulation of chlordane can be seen at this CAS

**Table A.6-4**
**Environmental Soil Sample Results for Total Pesticides Detected above Minimum Detectable Concentrations at CAS 12-60-01, Drilling/Welding Shop Outfalls**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) | | |
|---|---|---|---|---|---|
| | | | 4,4'-DDE | 4,4'-DDT | Chlordane |
| Final Action Levels[a] | | | 7 | 7 | N/A[b] |
| D03 | 563D003 | 0.0 - 0.5 | 0.035 (J) | 0.65 (J) | **17 (J)** |

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2006).
[b]An action level is not applicable as chlordane is present from routine insecticide application and not a release from this CAS.

Note: Bold text indicates value exceeding the action level.

bgs = Below ground surface
ft = Foot
mg/kg = Milligrams per kilogram
N/A/ = Not applicable

J = Estimated value

in surface soil beneath the second Southeast pipe outfall (location D03). Chlordane is very immobile in soil, which may have resulted in an accumulation of chlordane in the soil beneath and near the second Southeast pipe outfall at this CAS. Therefore, chlordane is not considered to be associated with a release from this CAS and is not considered to be a COC at this CAS. No CAS-related contaminants exceeded their respective PALs. Therefore, FALs were established at the corresponding PAL concentrations.

### *A.6.2.5 Polychlorinated Biphenyls*

Analytical results for PCBs exceeding the MDCs in soil samples are presented in Table A.6-5. Polychlorinated biphenyls were not detected at concentrations exceeding their respective PALs. Therefore, FALs were established at the corresponding PAL concentrations.

### *A.6.2.6 Total RCRA Metals*

Analytical results for total RCRA metals detected in soil samples above MDCs are presented in Table A.6-6. No RCRA metals exceed their PALs, except for lead at the first Southeast Pipe Outfall; therefore, the FALs were established at the PAL concentrations and the lead was moved to a Tier 2 evaluation. The FAL for lead was established at 1,892 mg/kg. Because the maximum detected lead concentration did not exceed the FAL, lead is not considered to be a COC at this CAS.

## Table A.6-5
## Environmental Soil Sample Results for PCBs Detected above Minimum Detectable Concentrations at CAS 12-60-01, Drilling/Welding Shop Outfalls

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) |
|---|---|---|---|
| | | | Aroclor 1254 |
| **Final Action Levels[a]** | | | **0.74** |
| D01 | 563D001 | 0.0 - 0.5 | 0.34 (J) |
| | 563D004 | 0.0 - 0.5 | 0.34 (J) |
| D02 | 563D002 | 0.0 - 0.5 | 0.23 |

[a]Based on U.S. Environmental Protection Agency, *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2006).

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

J = Estimated value

## Table A.6-6
## Environmental Soil Sample Results for Total RCRA Metals Detected above Minimum Detectable Concentrations at CAS 12-60-01, Drilling/Welding Shop Outfalls

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (mg/kg) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
| **Final Action Levels** | | | **23[a]** | **67,000[b]** | **450[b]** | **450[b]** | **800[b]** | **310[b]** | **5,100[b]** | **5,100[b]** |
| D01 | 563D001 | 0.0 - 0.5 | 4.6 | 200 | 1.4 | 33 (J) | 470 (J) | 0.079 | 1 (J+) | 4.3 |
| | 563D004 | 0.0 - 0.5 | 4.5 | 190 | 0.85 | 23 (J) | 460 (J) | 0.073 | 0.55 (J+) | 0.19 |
| D02 | 563D002 | 0.0 - 0.5 | 6.1 | 430 | 5.4 | 130 (J) | **1,700 (J)** | 0.2 | 3.5 (J+) | 8.7 |
| D03 | 563D003 | 0.0 - 0.5 | 4.4 | 110 | -- | 7.8 (J) | 21 (J) | 0.071 | -- | -- |

[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, 2006)

Note: Bold text indicates value exceeding the action level.

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.

### A.6.2.7 Gamma-Emitting Radionuclides

Gamma-emitting radionuclide analytical results for soil samples detected above MDCs are presented in Table A.6-7. Radionuclides were not detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

**Table A.6-7**
**Environmental Soil Sample Results for Gamma-Emitting Radionuclides Detected above Minimum Detectable Concentrations at CAS 12-60-01, Drilling/Welding Shop Outfalls**

| 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 | 563D001 | 0.0 - 0.5 | 1.33 | 0.71 | 1.44 (J) | 0.92 (J) | 0.49 |
| | 563D004 | 0.0 - 0.5 | 1.25 | 0.63 | 1.3 (J) | 0.89 (J) | 0.45 |
| D02 | 563D002 | 0.0 - 0.5 | 1.25 | 2.39 | 1.58 (J) | 0.89 (J) | 0.52 |
| D03 | 563D003 | 0.0 - 0.5 | 0.97 | 0.57 | 0.86 (J) | 0.89 (J) | -- |

[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
NCRP = National Council on Radiation Protection and Measurements
pCi/g = Picocuries per gram

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

### A.6.2.8 Isotopic Radionuclides

Isotopic radionuclide analytical results for soil samples detected above MDCs are presented in Table A.6-8. Isotopic radionuclides were not detected at concentrations exceeding their respective PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

**Table A.6-8**
**Environmental Soil Sample Results for Isotopes Detected above Minimum Detectable Concentrations at CAS 12-60-01, Drilling/Welding Shop Outfalls**

| Sample Location | Sample Number | Depth (ft bgs) | Contaminants of Potential Concern (pCi/g) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Plutonium-238 | Plutonium-239/240 | Uranium-234 | Uranium-235 | Uranium-238 |
| **Final Action Levels[a]** | | | **13** | **12.7** | **143** | **17.6** | **105** |
| D01 | 563D001 | 0.0 - 0.5 | 0.105 | 0.378 | 0.68 | 0.05 | 0.62 |
| | 563D004 | 0.0 - 0.5 | 0.036 | 0.253 | 0.62 | -- | 0.61 |
| D02 | 563D002 | 0.0 - 0.5 | 0.127 | 2.43 | 0.74 | -- | 0.77 |
| D03 | 563D003 | 0.0 - 0.5 | 0.083 | 1.67 | 0.55 | 0.032 | 0.57 |

[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
NCRP = National Council on Radiation Protection and Measurements
pCi/g = Picocuries per gram

-- = Not detected above minimum detectable concentrations.

### *A.6.3 Nature and Extent of Contamination*

Based on the analytical results for soil samples collected within CAS 12-60-01, no detected contaminant concentrations exceeded their respective FALs. Therefore, no COCs have been identified at this CAS.

### *A.6.4 Revised Conceptual Site Model*

The CAIP requirements (NNSA/NSO, 2007) were met at this CAS, and no revisions were necessary to the CSM.

# A.7.0 Waste Management

Section A.7.1 addresses investigation-derived waste (IDW) and Section A.7.2 addresses potential remediation wastes. During the investigation, a glass jug of oil was found at CAS 12-59-01. This oil was sampled and determined that it could be recycled. It is, therefore, not addressed herein as a waste.

## A.7.1 Investigation-Derived Waste

Investigation-derived waste was generated during the field investigation activities of CAU 563. The waste streams generated include disposable personal protective equipment (PPE), disposable sampling equipment, plastic sheeting, and sample jars. The amount, type, and source of waste placed into each drum was recorded in waste management logbooks that are maintained in the project file.

### A.7.1.1 Waste Generated

The disposable PPE and sampling debris generated during the investigation were consolidated into a single waste drum. The volume of this waste stream is approximately 27 gal. During the investigation, testing for fecal coliform generated another waste stream of approximately 1 gal.

### A.7.1.2 Waste Characterization

Both IDW waste streams were characterized as industrial waste based on process knowledge, site environmental samples, and direct samples of the waste. The characterization and disposition was based on federal and state regulations, permit limitations, and acceptance criteria.

### A.7.1.3 Waste Disposal

Both IDW waste streams will be shipped to the Area 9 U10c Industrial Landfill.

### A.7.2 Potential Remediation Wastes

The following subsections describe the potential wastes that may be generated from the recommended corrective actions and BMPs. Table A.7-1 presents a summary of the estimated volumes, likely waste characterizations, and likely disposition pathways of these potential waste streams for each CAS.

The projected disposal pathways are listed in Table A.7-1; however, these may change based on the actual waste generated.

#### A.7.2.1 Waste Streams

The following potential waste streams were identified:

- Tank Liquids
- Contaminated Soils
- Steel Tanks and Concrete Posts

##### A.7.2.1.1 Tank Liquids

The BMP recommendation of the removal of liquid contents of the CAS 12-59-01 South Tank may generate a liquid waste. This waste is estimated to consist of approximately 3,700 gal of aqueous liquid contained in two chambers of the septic tank. The analytical results are presented in Table A.5-9.

##### A.7.2.1.2 Contaminated Soils

The corrective action recommendation of Clean Closure for CAS 12-59-01 will generate a soil waste from the removal of soil contaminated with chromium and arsenic at concentrations above the FALs. The TCLP analytical results are presented in Table A.7-2. The volume of this waste stream is estimated to be approximately 4 $yd^3$. The location of this recommended removal action is depicted in Figure A.7-1.

## Table A.7-1
## CAU 563 Projected Waste Inventory and Preliminary Disposal Recommendation Summary

| CAS | Waste Item | Volume Capacity | Process Knowledge | Analytical Suite | Landfill Limits | NTS POC | Lagoon Criteria | Recommended Disposal Pathway |
|---|---|---|---|---|---|---|---|---|
| 03-04-02 | Steel Septic Tank (empty) | 10 ft long x 6 ft diameter | Industrial Waste | N/A | Meets | Meets | N/A | Area 9; U10c Landfill[a] |
| | Concrete Bumper Posts | 6 each | Industrial Waste | N/A | Meets | Meets | N/A | Area 9; U10c Landfill[a] |
| 03-59-05 | Concrete Bumper Posts | 4 each | Industrial Waste | N/A | Meets | Meets | N/A | Area 9; U10c Landfill[a] |
| 12-59-01 | Steel North Tank (empty) | 32 ft long x 8 ft diameter | Industrial Waste | N/A | Meets | Meets | N/A | Area 9; U10c Landfill[a] |
| | South Tank Liquid | 3,700 gallons | N/A | Full[b,c] | Meets | Meets | Meets | Area 23 Lagoon |
| | Steel South Tank Structure | 36 ft long x 5 ft diameter | Industrial Waste | N/A | Meets | Meets | N/A | Area 9; U10c Landfill[a] |
| | Chlordane-impacted Soil at Outfall | 10 cubic yards | N/A | Full[a,b,d] | TBD[e] | TBD[e] | TBD[e] | TBD[e] |
| | Arsenic, Chromium-impacted Soil at First Stained Area | 4 cubic yards | N/A | Full[b,d,f] | Meets | Meets | N/A | Area 9; U10c Landfill |

[a]Additional radiological screening on debris and containers will be required before disposal.
[b]Full analytical suite consists of the following analyses: Total VOCs, Total SVOCs, PCBs, RCRA Metals, TPH-DRO, Total pesticides and radiological (gamma, isotopic uranium, isotopic plutonium and strontium).
[c]Septic liquids dispositioned to go to the lagoons include fecal coliform, gross alpha/beta and tritium.
[d]TCLP analyses performed for pesticides.
[e]To be determined. Waste may be hazardous or industrial; final determination must be made after generation of the waste.
[f]TCLP analyses performed for VOCs, SVOCs, RCRA metals.

DRO = Diesel-range organics
ft = Foot
N/A = Not applicable
NTS = Nevada Test Site
PCB = Polychlorinated biphenyl
POC = Performance objective criteria
RCRA = *Resource Conservation and Recovery Act*
SVOC = Semivolatile organic compound
TBD = To be determined
TCLP = Toxicity Characteristic Leaching Procedure
TPH = Total petroleum hydrocarbons
VOC = Volatile organic compound

The BMP recommendation of limited soil removal for CAS 12-59-01 will generate a soil waste from the removal of soil with elevated concentrations of the pesticide chlordane. The volume of this waste stream is estimated to be approximately 10 $yd^3$. The location of this potential removal action is depicted in Figure A.7-2.

**Table A.7-2**
**TCLP Pesticides and TCLP Metals Detected at**
**CAS 12-59-01, Drilling/Welding Shop Septic Tanks**

| Sample Location | Sample Number | Depth (ft bgs) | Matrix | Parameter | Result | Criteria[a] (TC Levels) | Units |
|---|---|---|---|---|---|---|---|
| C04 (1st Stain) | 563C002 | 0.0 - 0.5 | Soil | Chromium | 0.0058 | 5.0 | mg/L |
| C05 (2nd Stain) | 563C003 | 0.0 - 0.5 | Soil | Chlordane | 0.0028 (J) | 0.03 | mg/L |
| | 563C004 | 0.0 - 0.5 | Soil | Chlordane | 0.0037 (J) | 0.03 | mg/L |
| C11 (Tank Outfall) | 563C010 | 0.0 - 0.5 | Soil | Chlordane | 0.048 (J) | 0.03 | mg/L |
| | 563C010A | 0.0 - 0.5 | Soil | Chlordane | 0.027 | 0.03 | mg/L |
| | 563C020A | 0.5 -1.0 | Soil | Chlordane | 0.03 | 0.03 | mg/L |
| C11D | 563C018 | 0.0 - 0.5 | Soil | Chlordane | 0.08 (J) | 0.03 | mg/L |
| | 563C026 | 0.5 - 1.0 | Soil | Chlordane | 0.034 | 0.03 | mg/L |

[a]Based on *Code of Federal Regul*ations, Title 40 CFR Part 261, "Identification and Listing of Hazardous Waste" (CFR, 2006).

ft bgs = Feet below ground surface
mg/L = Milligram per liter
J = Estimated value

### *A.7.2.1.3 Steel Tanks and Concrete Posts*

A waste stream of one empty steel septic tank and ten concrete bumper posts will be generated as part of the BMP recommendations for CAS 03-04-02 and CAS 03-59-05. The CAS 03-04-02 tank measures approximately 10 ft long and 6 ft in diameter. There are two tanks present at CAS 12-59-01 measuring as follows: the North Tank is approximately 32 ft long and 8 ft in diameter and the South Tank is approximately 36 ft long and 5 ft in diameter. If it is decided to remove the two steel tanks at CAS 12-59-01, the waste stream may include the two empty steel septic tanks (the liquid will be removed from the South Tank prior to disposal).

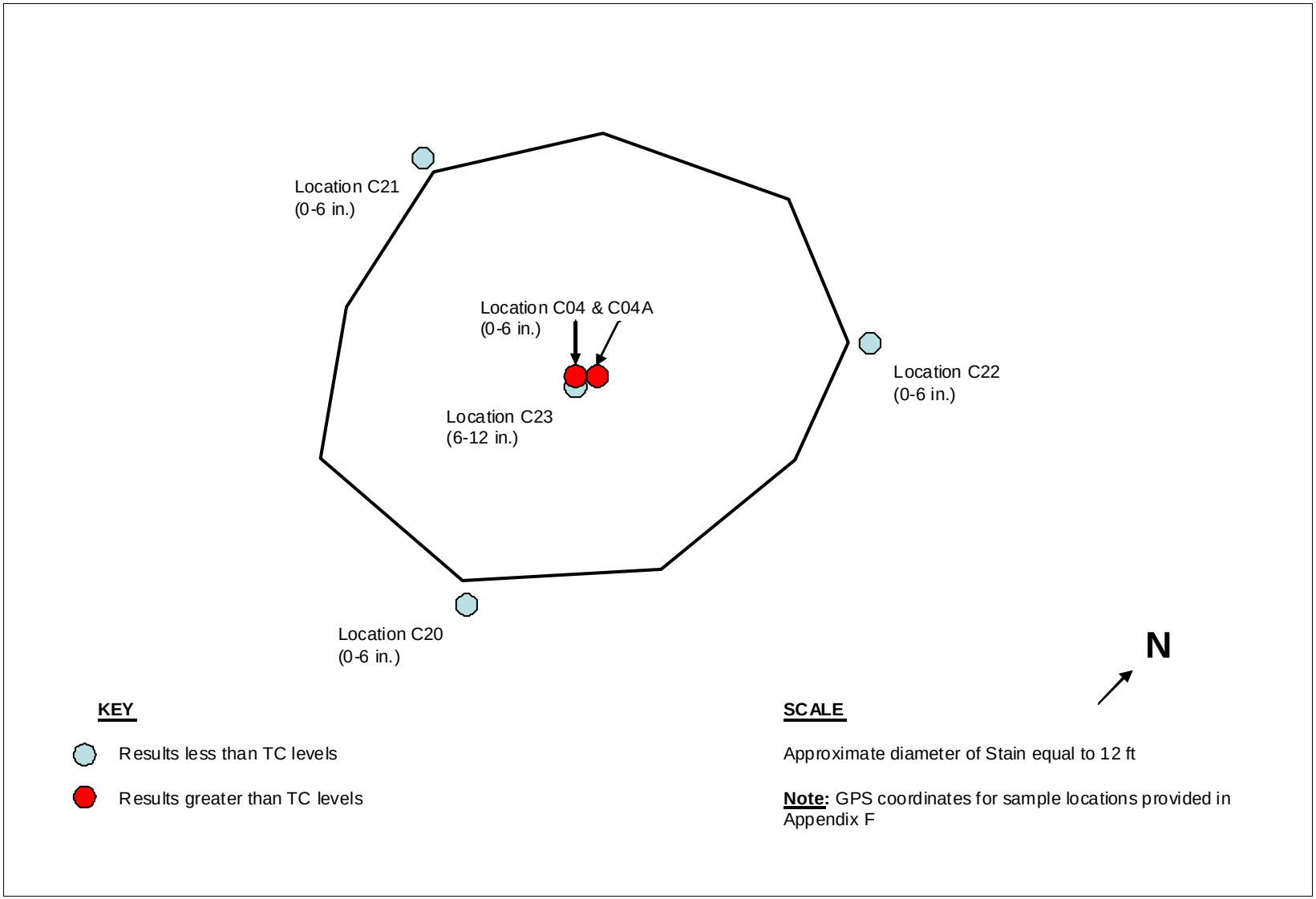


**Figure A.7-1**
**Arsenic and Chromium COC-Impacted Soils at First Stained Area at CAS 12-59-01**

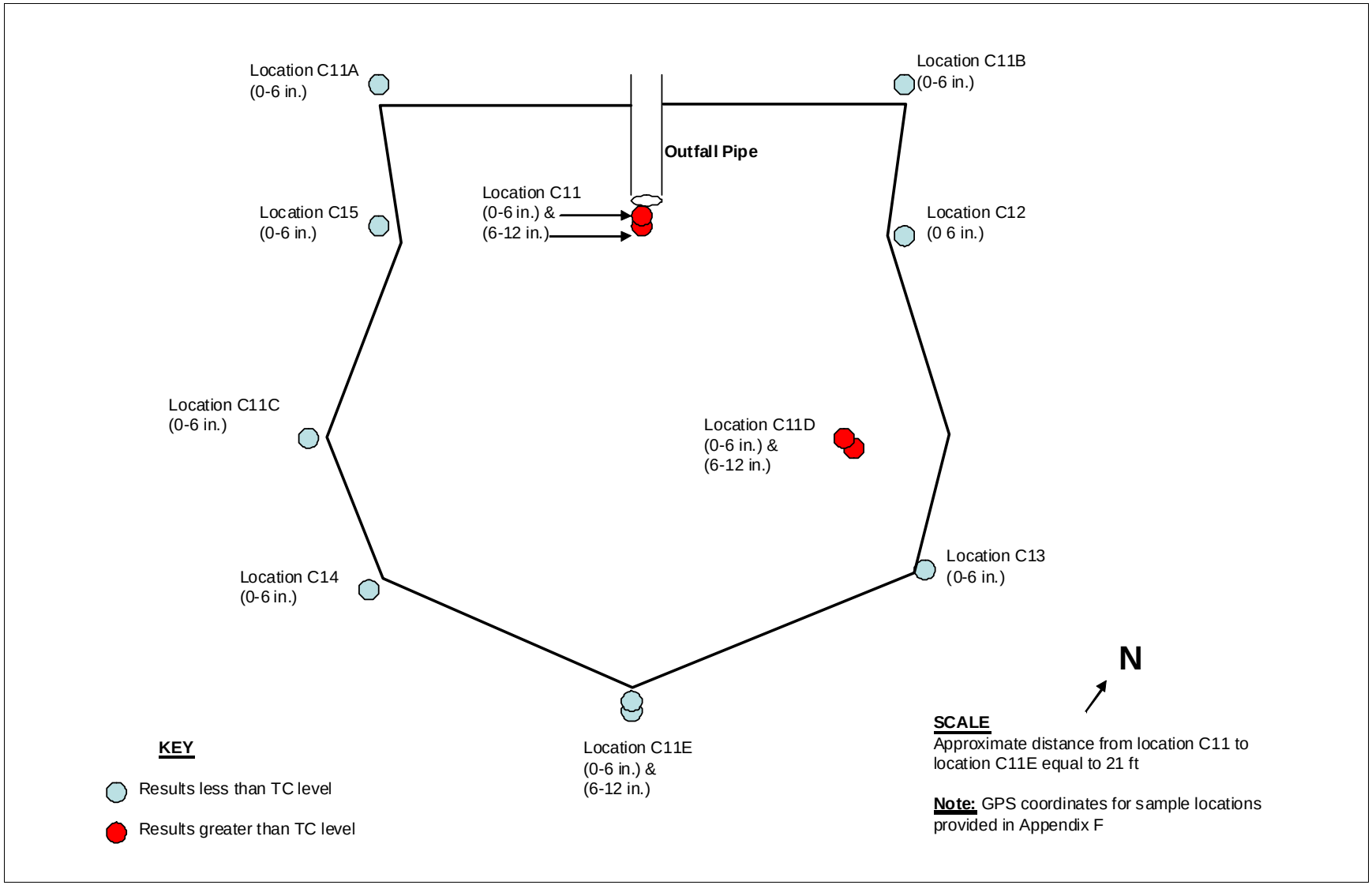


**Figure A.7-2**
**Chlordane-Impacted Soil at Tank Outfall Location at CAS 12-59-01**

### A.7.2.2 Waste Characterization and Disposition

All preliminary estimates of these potential remediation waste streams are based on process knowledge, radiological surveys, site samples, and/or direct samples of the waste. These estimated characterizations and disposition pathways are shown in Table A.7-1 and are based on current federal and state regulations, permit limitations, and acceptance criteria. Final waste characterization will be performed following generation of the wastes and will be based on the actual as-generated waste streams.

### A.7.2.3 Tank Liquids

A preliminary evaluation of the CAS 12-59-01 potential liquid waste from the South Tank determined that this waste may be characterized as sanitary waste and meets the acceptance criteria for disposal at the Area 23 Lagoon for evaporation.

#### A.7.2.3.1 Contaminated Soils

A preliminary evaluation of the potential chromium and arsenic contaminated soil waste stream from the corrective action at CAS 12-59-01 has determined that it may be characterized as an industrial waste because it meets the acceptance criteria for the Area 9, U10c Industrial Landfill (see Tables A.7-1 and A.7-2).

A preliminary evaluation of the potential chlordane contaminated soil waste stream from the BMP limited soil removal at CAS 12-59-01 may be characterized as a sanitary waste or as a hazardous waste requiring treatment and disposal in accordance with federal requirements. The characterization of this waste cannot be determined accurately until the waste is generated.

#### A.7.2.3.2 Steel Tanks and Concrete Posts

A preliminary evaluation of the potential waste streams that will result from the BMPs to be conducted at CASs 03-04-02, 03-59-05, and 12-59-01 may be characterized as industrial waste that meets the acceptance criteria for the Area 9, U10c Industrial Landfill (see Table A.7-1). The potential waste streams include one empty steel septic tank and six concrete bumper posts at CAS 03-04-02, four concrete bumper posts at CAS 03-59-05, and two empty septic tanks at CAS 12-59-01.

# 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 563 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 Industrial Sites QAPP (NNSA/NV, 2002).

## A.8.1 Data Validation

Data validation was performed in accordance with the Industrial Sites QAPP and approved protocols and procedures. All laboratory data from samples collected and analyzed for CAU 563 were evaluated for data quality in a tiered process 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 as a 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

A 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.
- Significant problems and/or nonconformances stated in cover letter or case narrative.
- Completeness of certificates of analysis.

- Completeness of Contract Laboratory Program (CLP) or CLP-like data packages.
- Completeness of signatures, dates, and times on chain of custody.
- (Condition-upon-receipt variance) Laboratory login report form included.
- Requested analyses performed on all samples.
- Date received/analyzed given for each sample.
- Correct concentration units indicated.
- Electronic data (transfer) deliverable 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*

A 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 (MS)/matrix spike duplicate (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.

A 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*

A 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 of Lakewood, Colorado. Tier II and Tier III results were compared and where differences were noted, data were reviewed and changes were made accordingly. This review included the following additional evaluations:

- Case narrative, chain of custody, and sample receipt forms
- Lab qualifiers (applied appropriately)

- Method of analyses performed as dictated by the chain of custody
- Raw data, including chromatograms, instrument printouts, preparation logs, and analytical logs
- Manual integrations to determine whether the response is appropriate
- Data package for completeness

Determine sample results qualifiers through the evaluation of (but not limited to):

- Tracers and QC sample results (e.g., duplicates, LCSs, blanks, MSs) evaluated and used to determine sample results qualifiers
- Sample preservation, sample preparation/extraction and run logs, sample storage, and holding time
- Instrument and detector tuning
- Initial and continuing calibrations
- Calibration verification (initial, continuing, second source)
- Retention times
- Second column and/or second detector confirmation
- Mass spectra interpretation
- Interference check samples and serial dilutions
- Post digestion spikes and method of standard additions
- Breakdown evaluations

Calculation checks of:

- At least one analyte per QC sample its recovery
- At least one analyte per initial calibration curve, continuing calibration verification, and second source recovery
- At least one analyte per sample that contains positive results (hits); radiochemical results only require calculation checks on activity concentrations (not error).

Verify that target compound detects identified in the raw data are reported on the results form.

Document any anomalies for the laboratory to clarify or rectify. The contractor should be notified of any anomalies.

### A.8.2 Field Quality Control Samples

Field QC samples consisted of seven trip blanks, one equipment rinsate blank, two field blanks, four full lab QCs, and four FDs 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.

Field blanks and equipment rinsates were analyzed for the applicable parameters listed in Table A.2-2, and trip blanks were analyzed for VOCs only.

During the CAI, four FDs were sent as blind samples to the laboratory to be analyzed for the investigation parameters listed in Table A.2-2. For these samples, the duplicate results precision (i.e., RPDs between the environmental sample results and their corresponding 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 method blanks 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 project files as both hard copy and electronic media.

The laboratory included a preparation blank, LCS, and a 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 CAU 563 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. Eleven nonconformances 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 563. The following summarizes the results for each CAS.

***CAS 03-04-02, Area 3 Subdock Septic Tank***

Based on the observations, the geophysical surveys conducted, and the analytical results from the environmental samples collected, no COCs are present at this CAS. Therefore, no corrective action is required; however, removal of the septic tank will be conducted as a BMP in compliance with NAC 444.818 (NAC, 2006a), and all associated open pipe ends will be sealed with grout to prevent future entry of potential contaminants.

***CAS 03-59-05, Area 3 Subdock Cesspool***

Based on the observations, and the analytical results from the environmental samples collected, no COCs are present at this CAS. Therefore, no corrective action is required; however, abandonment of the cesspool will be conducted as a BMP in compliance with NAC 444.818 (NAC, 2006a), and all associated open pipe ends will be sealed with grout to prevent future entry of potential contaminants.

***CAS 12-59-01, Drilling/Welding Shop Septic Tanks***

Based on analytical results of the environmental samples collected, the only COCs identified in the soil were arsenic and chromium at the First Stained Area (location C04). Therefore, corrective action is required at this CAS. A Clean Closure of removal of the impacted soil is recommended for this CAS. Additionally, removal or abandonment of the septic tanks will be conducted as a BMP in compliance with NAC 444.818 (NAC, 2006a), and all associated open pipe ends will be sealed with grout to prevent future entry of potential contaminants. Also, a BMP will be implemented to remove the chlordane-impacted soil at the Tank Outfall.

***CAS 12-60-01, Drilling/Welding Shop Outfalls***

Based on analytical results of the environmental samples collected, no COCs are present at this CAS. Therefore, no corrective action is required; however, as a BMP, all open pipe outfalls will be sealed with grout.

## A.10.0 References

BN, see Bechtel Nevada.

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

CFR, see Code of Federal Regulations.

*Code of Federal Regulations*. 2006. Title 40 CFR Part 261, "Identification and Listing of Hazardous Waste." Washington, DC. U.S. Government Printing Office.

DOE, see U.S. Department of Energy.

EPA, see U.S. Environmental Protection Agency.

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

NAC, see *Nevada Administrative Code*.

NBMG, see Nevada Bureau of Mines and Geology.

NCRP, see National Council on Radiation Protection and Measurements.

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

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

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

*Nevada Administrative Code*. 2006a. NAC 444.818, "Limitations and Site Requirements." Carson City, NV. As accessed at http://www.leg.state.nv.us/nac on 21 October 2007.

*Nevada Administrative Code*. 2006b. NAC 445A.2272, "Contamination of Soil: Establishment of Action Levels." Carson City, NV. As accessed at http://www.leg.state.nv.us/nac on 21 October 2007.

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

SNJV, see Stoller-Navarro Joint Venture.

Stoller-Navarro Joint Venture. 2006. *Model Statement of Work for Analytical Laboratories*, Revision 0. February. Las Vegas, NV.

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

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

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

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2007. *Corrective Action Investigation Plan for Corrective Action Unit 563: Septic Systems, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--1181. Las Vegas, NV.

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

U.S. Environmental Protection Agency. 1996. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd Edition, CD-ROM PB97-501928GEI. Washington, DC.

U.S. Environmental Protection Agency. 2006. *Region 9 Preliminary Remediation Goals (PRGs)*. As accessed at http://www.epa.gov/region09/waste/sfund/prg/index.htm on 27 November 2007.

# 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 563 CAIP (NNSA/NSO, 2007) 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 outputs from the DQO process to provide context for analyzing the data. Confirm the limits on committing false negative or false positive decision errors. Review 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 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 CAU 563 CAIP (NNSA/NSO, 2007). 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 Section A.4.1 of the CAU 563 CAIP: "Is any COC present in environmental media within the CAS?" (NNSA/NSO, 2007).

Decision I Rules:

- If the population parameter of any COPC in the Decision I population of interest (i.e., target population) exceeds the corresponding FAL, then that contaminant is identified as a COC.
- If a COC is identified, then the Decision II statement must be resolved; if COCs are not identified, then the investigation is complete.
- If a waste is present and, if released, has the potential to cause contamination of the site environmental media in the future, then a corrective action will be determined; otherwise, no further action will be necessary.

#### 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.
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 563 DQOs [NNSA/NSO, 2007]) were used in selecting sample locations.

1. Selection of sampling locations associated with field screening results was accomplished by analyzing samples for alpha- and beta/gamma-emitting radionuclides using a handheld NE Technology Electra, and gamma-emitting radionuclides using a gamma spectroscopy.

2. Selection of sampling locations associated with a release of effluent to the surrounding soils from pipe and tank tie-in locations was accomplished by conducting visual inspections of the tank and pipe interiors for corrosion or wear.

3. Selection of sampling locations associated with surface and subsurface staining, odors, presence of debris, and other items was accomplished by visual field observations.

4. Selection of sampling locations associated with outfalls was accomplished by identifying the following areas:

    - A: At the discharge point of the outfall

    - B: Select locations within washes and accumulation areas

    - C: Downgradient from the discharge (may be multiple locations based on COCs)

5. 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 3-2 of the CAU 563 CAIP and for the radiological and chemical constituents listed in Tables 3-4 and 3-5 of the CAU 563 CAIP (NNSA/NSO, 2007). In this appendix, 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 identified in Sections 3.2 through 3.4 of the CAIP (NNSA/NSO, 2007). In addition, samples from CASs 12-59-01 and 12-60-01 were analyzed for pesticides because initial analyses of samples from these CASs indicated the potential presence of pesticides.

**Table B.1-1**
**CAU 563 Analyses Performed**

| CAS Location | Total VOCs | Total SVOCs | PCBs | RCRA Metals | TPH-DRO | Pesticides | Gamma Spectroscopy | Isotopic Uranium | Isotopic Plutonium | Strontium-90 |
|---|---|---|---|---|---|---|---|---|---|---|
| 03-04-02 | RS | RS | RS | RS | RS | -- | RS | RS | RS | RS |
| 03-59-05 | RS | RS | RS | RS | RS | -- | RS | RS | RS | RS |
| 12-59-01 | RS | RS | RS | RS | RS | S | RS | RS | RS | RS |
| 12-60-01 | RS | RS | RS | RS | RS | S | RS | RS | RS | RS |

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

RS = Required and submitted
R = Required but not submitted
S = Not required but submitted
-- = Not required or submitted

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 Section 6.2.8 of the CAU 563 CAIP (NNSA/NSO, 2007) is that analytical detection limits will be less than or equal to the corresponding FALs. This criterion was not achieved for the analytical results listed in Table B.1-2. Results not meeting the sensitivity acceptance criterion will be assessed for usability and potential impacts on meeting the site characterization objectives. 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, representativeness, accuracy, comparability, and completeness, as defined in the Industrial Sites QAPP (NNSA/NV, 2002). The DQI acceptance criteria are presented in Table 6-1 of the CAU 563 CAIP (NNSA/NSO, 2007). As presented in Tables B.1-2 through B.1-6 of this appendix, these criteria were not met for every one of the DQIs.

**Table B.1-2**
**Constituents Failing Sensitivity Criteria for CAU 563**

| Sample Number | Constituent | Minimum Detectable Concentration (mg/kg) | Final Action Level (mg/kg) |
|---|---|---|---|
| 563C006 | Toxaphene | 2.8 | 1.6 |
| 563C007 | Aldrin | 0.19 | 0.1 |
| 563C007 | Dieldrin | 0.2 | 0.11 |
| 563C007 | Toxaphene | 14 | 1.6 |
| 563C010 | Aldrin | 0.74 | 0.1 |
| 563C010 | Alpha-BHC | 0.72 | 0.36 |
| 563C010 | Delta-BHC | 0.93 | 0.36 |
| 563C010 | Dieldrin | 0.76 | 0.11 |
| 563C010 | Heptachlor | 1.1 | 0.38 |
| 563C010 | Heptachlor Epoxide | 0.74 | 0.19 |
| 563C010 | Toxaphene | 55 | 1.6 |

mg/kg = Milligrams per kilogram

*Precision*

Precision was evaluated as described in Section 6.2.3 of the CAU 563 CAIP (NNSA/NSO, 2007). Table B.1-3 of this appendix provides the precision analysis results for the chemical and radiological constituents qualified for precision.

**Table B.1-3**
**Precision Measurements for CAU 563**

| Constituent | User Test Panel | Number of Analytes Qualified | Number of Measurements Performed | Percent within Criteria |
|---|---|---|---|---|
| Lead | Metals | 5 | 25 | 80 |
| Plutonium-238 | Plutonium | 6 | 21 | 71.4 |
| Plutonium-239/240 | Plutonium | 12 | 21 | 42.9 |

As shown in Table B.1-3, the precision rate for lead is at the CAIP acceptance criterion of 80 percent. The precision rates for Pu-238 and Pu-239/240 are below the CAIP acceptance criteria of 80 percent. The precision rate for all other analytes is 100 percent. The sample results for Pu-238 and Pu-239/240 were qualified as estimated for duplicate recovery exceeding the QC limits. High

variability in the sampled matrix may indicate the potential that discrete particles of contamination are present within the sample. Therefore, mixing will not produce homogeneity. This does not mean the precision of the measurement is poor but that activities are variable within the sample. This is commonly observed in isotopic Pu results, as a single particle of plutonium within a sample can result in detectable activities attributed to the entire sample. Therefore, when a duplicate sample is analyzed for isotopic Pu, the results can be significantly different depending on how many discrete particles are contained in each sample.

However, there is a low potential for a false negative DQO decision error for Pu-238 and Pu-239/240 because all of the highest reported activities are still less than the corresponding FAL. Therefore, these results can be used to support DQO decisions. The precision rates for all other chemical constituents exceed the acceptance criteria for precision, and the dataset is determined to be acceptable for the DQI of precision.

*Accuracy*

Accuracy was evaluated as described in Section 6.2.4 of the CAU 563 CAIP (NNSA/NSO, 2007). Table B.1-4 of this appendix provides the chemical accuracy analysis results for all constituents qualified for accuracy. Accuracy rates are above the CAIP criterion of 80 percent, except for lead, which has a rate of 76 percent.

**Table B.1-4**
**Accuracy Measurements for CAU 563**

| Parameter | User Test Panel | Number of Measurements Qualified | Number of Measurements Performed | Percent within Criteria |
|---|---|---|---|---|
| Diesel-Range Organics | DRO | 1 | 21 | 95.2 |
| Trichloroethene | VOCs | 1 | 21 | 95.2 |
| Chlorobenzene | VOCs | 2 | 21 | 90.5 |
| Lead | Metals | 6 | 25 | 76 |

DRO = Diesel-range organics
VOC = Volatile organic compound

Of the 25 lead results qualified for accuracy, 6 samples from CASs 03-04-02 and 03-59-05 were associated with multiple QA sample MS and MSD lead recoveries that exceeded QC limits. However, there is negligible potential for a false negative DQO decision error because all of the

associated lead concentrations were qualified as being estimated results, and the reported values are small in comparison to the action level; as the highest impacted reported concentration (78 mg/kg) is less than 1/10$^{th}$ of the FAL (800 mg/kg). Because the lead results qualified as estimates, these results have no reasonable impact on DQO decisions. The accuracy rate for all other constituents meets the acceptance criteria for accuracy, and the dataset is determined to be acceptable for the DQI of accuracy.

*Representativeness*

The DQO process as identified in Appendix A of the CAU 563 CAIP (NNSA/NSO, 2007) was used to address sampling and analytical requirements for CAU 563. 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 563 CAI are considered representative of the population parameters.

*Comparability*

Field sampling, as described in the CAU 563 CAIP (NNSA/NSO, 2007), 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 methods used in industry and government practices. Therefore, project datasets are considered comparable to other datasets generated using standard industry procedures, thereby meeting DQO requirements.

*Completeness*

The CAU 563 CAIP (NNSA/NSO, 2007) defines acceptable criteria for completeness to be that the dataset is sufficiently complete to be able to make the DQO decisions. This is initially evaluated as 80 percent of CAS-specific non-targeted contaminants identified in the CAIP having usable results, and 100 percent of the targeted contaminants (including Decision II samples) having usable results. The only targeted contaminant identified for CAU 563 was 1,1,1-Trichloroethene for CASs 12-59-01 and 12-60-01. However, because TPH-DRO was detected above the PAL of 100 mg/kg in several samples collected at CASs 12-59-01, and these detects were passed on to a Tier II risk evaluation (see

Appendix D), the hazardous constituents of TPH-DRO are treated as targeted contaminants for these samples.

Rejected data (either qualified 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. All data met the 80 percent completeness criteria. Although results for the 13 hazardous constituents of TPH-DRO met the completeness criterion of 80 percent, chemical interferences in the analysis of 4 of these samples (563C007, 563D002, 563D001 and its duplicate sample, 563D004) prohibited a completion criterion of 100 percent for 7 of the hazardous constituents of TPH-DRO. All other hazardous constituents of TPH-DRO met the 100 percent completeness criterion for targeted contaminants. For samples collected at CAS 12-60-01, one hazardous constituent of TPH-DRO was detected above its MDC. For samples collected at CAS 12-59-01, 7 hazardous constituents of TPH-DRO were detected above MDCs; however, all these results were well below their corresponding FALs as presented in Table D.1-3. Therefore, there is sufficient information to make a reasonable conclusion that hazardous constituents of TPH-DRO are not present at this site at concentrations exceeding their respective FALs. The dataset meets the primary criterion for completeness in that sufficient information is available.

#### *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 appropriate qualifications are applied when necessary.

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.

**Table B.1-5**
**Rejected Measurements for CAU 563**

| Constituent | Analytical Method | Number of Measurements Rejected | Number of Measurements Performed | Percent within Criteria |
|---|---|---|---|---|
| Benzo(a)Anthracene[a] | SVOCs | 2 | 21 | 90.5 |
| Bis(2-ethylhexyl)Phthalate | SVOCs | 2 | 21 | 90.5 |
| Butyl Benzyl Phthalate | SVOCs | 2 | 21 | 90.5 |
| Chrysene[a] | SVOCs | 2 | 21 | 90.5 |
| Di-n-octyl Phthalate | SVOCs | 2 | 21 | 90.5 |
| Pyrene[a] | SVOCs | 2 | 21 | 90.5 |
| Benzo(a)Pyrene[a] | SVOCs | 4 | 21 | 81 |
| Benzo(b)Fluoranthene[a] | SVOCs | 4 | 21 | 81 |
| Benzo(g,h,i)Perylene[a] | SVOCs | 4 | 21 | 81 |
| Benzo(k)Fluoranthene[a] | SVOCs | 4 | 21 | 81 |
| Dibenzo(a,h)Anthracene | SVOCs | 4 | 21 | 81 |
| Indeno(1,2,3-cd)Pyrene | SVOCs | 4 | 21 | 81 |

[a]This compound is a constituent of diesel.

SVOC = Semivolatile organic compound

### *B.1.1.2 Decision II*

The Decision II statement as presented in Section A.4.1 of the CAU 563 CAIP states: "If a COC is present, is sufficient information available to evaluate appropriate corrective action alternatives?" (NNSA/NSO, 2007). Sufficient information is defined to include:

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

Decision rules applicable to Decision II:

- If the population parameter (i.e., the observed concentration of any COC) in a Decision II population of interest (i.e., the target analyte) exceeds the corresponding FAL in any bounding

direction, then additional samples will be collected to complete the determination of the extent.

- If the observed COC concentrations in a sample from all bounding directions 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.

- If wastes are to be generated as part of a corrective action, waste characterization samples will be collected to sufficiently characterize the potential wastes, or additional samples will be collected to do so.

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 has been defined at CAS 12-59-01. The sample locations for the contaminants driving the extent of contamination are shown on Figure A.7-1. The surface soils at CAS 12-59-01, First Stained Area, reveal arsenic and chromium at concentrations exceeding their FAL (refer to Table A.5-6). To define the extent of contamination within this area, three additional lateral samples were collected at 6-ft

intervals from the initial sample, and one vertical sample was collected beneath the initial sample at a depth of 0.5 to 1.0 ft bgs.

**Criterion 2:**

All Decision II samples collected from the First Stained Area were analyzed for the COCs present at the corresponding CAS:

- CAS 12-59-01 - Arsenic and chromium

**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, representativeness, comparability, and completeness, as defined in the Industrial Sites QAPP (NNSA/NV, 2002). The DQI discussion is presented under Criterion 3 for Decision I.

#### *B.1.1.2.2 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 appropriate qualifications are applied when necessary.

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.1.1.3 Sampling Design*

The CAU 563 CAIP (NNSA/NSO, 2007) made the following commitment for sampling: Locations, numbers, and types of samples were collected and analyzed per the CAIP.

### 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 non-conformance report when data quality does not meet contractual requirements. Not all data received from the analytical laboratory met contractual requirements, and 11 QA non-conformance reports were generated. Tier II validation evaluated the nonconformances and qualified the data where appropriate.

### 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 that were absorbed onto the soils.<br>Exposure to contamination is limited to occasional use industrial site workers, construction/remediation workers, and to military personnel conducting training. |
| **Affected Media** | Surface and shallow subsurface soils. |
| **Location of Contamination/Release Points** | Surface and shallow subsurface soil at or near tank inlet or outlet pipe connections, beneath and downgradient of outfalls. |
| **Transport Mechanisms** | Surface transport may occur as a result of a spill or storm water runoff. Surface transport beyond shallow substrate is not a concern. |
| **Preferential Pathways** | None. |
| **Lateral and Vertical Extent of Contamination** | Surface and subsurface contamination is contiguous and decreases with distance and depth from the source. |
| **Groundwater Impacts** | None. |
| **Future Land Use** | Non-residential (i.e., industrial). |
| **Other Data Quality Objective Assumptions** | None. |

### B.1.4 Verify the Assumptions

The results of the investigation support the key assumptions identified in the CAU 563 DQOs and in Table B.1-6 of this appendix. All data collected during the CAI supported the CSM for CAU 563, and no revision to the CSM was necessary.

### B.1.5 Draw Conclusions from the Data

This section resolves the two DQO decisions for each of the CAU 563 CASs.

#### 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: Arsenic and chromium were identified as COCs at CAS 12-59-01 during Decision I sampling, and Decision II sampling was performed at this location.

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

Result: All COPCs at all CASs (other than arsenic and chromium at CAS 12-59-01) were less than the corresponding FALs. Therefore, no further action was identified for these three sites.

#### 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: Concentrations of COCs in samples used to define the extent of contamination for arsenic and chromium at CAS 12-59-01 location C04, First Stained Area, did not exceed their FALs. Therefore, no additional Decision II sampling was required at this location.

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 COC concentrations in Decision II sampling were less than their FALs; therefore, the extent of contamination has been defined in the lateral and vertical directions. The extent of COC contamination at CAS 12-59-01 location C04, First Stained Area, is displayed in Appendix A as Figure A.7-1.

## 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. 2007. *Corrective Action Investigation Plan for Corrective Action Unit 563: Septic Systems, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--1181. Las Vegas, NV.

# Appendix C

# Cost Estimates

# C.1.0 Cost Estimates

The cost estimates presented within this appendix are based on the volume estimates calculated from sample location results. These volume estimates do not reflect the added volume that may result from an expansion factor after excavation and during disposal preparation.

An estimated 4 $yd^3$ of arsenic and chromium COC-impacted soil are recommended to be removed from the First Stained Area at CAS 12-59-01 and disposed accordingly as a CAA of Clean Closure.

**NATIONAL SECURITY TECHNOLOGIES**

**COST ESTIMATE PROPOSAL DATA SHEET**

EST ID: CAU 563
CAS 12-59-01 soil removal

Date: 7-Nov-07

TO: Grant Evenson

FROM: Rebecca King

SUBJECT: CADD Alternative Cost Estimates for CAU 563: CAS 12-59-01 Drilling/Welding Shop Septic Tanks - Soil removal

ESTIMATOR: Rebecca King

REF #:

| TYPE OF ESTIMATE: | | | TYPE OF WORK: | |
|---|---|---|---|---|
| X | ORDER OF MAGNITUDE | | TITLE II | | NON-MANUAL ONLY |
| | PRELIMINARY / PLANNING / STUDY | | WORK ORDER | | MANUAL ONLY |
| | CONCEPTUAL / BUDGET | | COMPARATIVE | X | MANUAL & NON-MANUAL |
| | TITLE I | | OTHER | | OTHER |

PROJECT WORK SCOPE IS EXPECTED TO BE PERFORMED BY:

| | | | |
|---|---|---|---|
| DOE PRIME (LUMP SUM) | | SUBCONTRACT | |
| NSTec CONSTRUCTION | X | GPP | |
| NSTec MAINTENANCE | | OTHER | |

## *STATEMENT OF WORK*

This estimate has been prepared to provide remedial alternative costs for the closure of Corrective Action Site (CAS)12-59-01(contaminated soil removal portion), which is included within Corrective Action Unit (CAU) 563. CAU 563 CAS 12-59-01 is an environmental restoration site listed in the Federal Facility Agreement and Consent Order (FFACO). CAS 12-59-01 is specifically described within the FFACO as two separate septic systems, the associated abandoned piping, and surrounding soil located on the south side of the intersection of the E-Tunnel access road and the Drilling Maintenance Shop access road in Area 12 of the NTS. Three alternatives have been evaluated for closure of the CAS: I. Close In Place and II. Clean Closure. This estimate will be used to identify the most cost-effective alternative for closure of the site while remaining protective of human health and the environment. The total estimated costs are intended for comparative analysis of remedial fieldwork cost only. Cost for project management, plan preparation, project support and/or other activities are not included herein.

## *SCOPE:*

Provide site closure using one of the following alternatives:

I) CLEAN CLOSURE
II) CLOSURE IN PLACE

## *BASIS:*

The least costly alternative is the preferred action. Site closure estimates for each alternative were priced using standard construction references such as RS Means, Richardson's, and the NSTec estimating database.

## *ALTERNATIVE SPECIFIC BASIS OF ESTIMATE/ASSUMPTIONS*

**Alternative I: Closure In Place**
a. Use restriction survey, installation of fence and postings, and implementation of administrative control

**Alternative II: Clean Closure**
a Remove & package approximately 4 CY of arsenic/chromium contaminated soil
b. Collect verification samples
c. Backfill open excavated area with clean fill material and grade
d. Dispose of waste offsite

***ASSUMPTIONS:***

- No corrective actions are required for the surrounding areas outside the CAS boundary.
- All COCs at the site have been identified during the site investigation and analytical data accurately represents site conditions and waste characteristics.
- Equipment will remain operational to support the planned/scheduled completion of each CADD alternative.
- Waste volumes are based on field measurements collected during the corrective action investigation provided by the characterization contractor.
- Work to be performed by NSTec during a "normal" workday (no provision for overtime has been provided). Shifts are based on 10-hour days / 4-days per week.
- This estimate does not include the efficiencies which may be realized if work for similar activities at similar sites can be completed concurrently.
- Dimensions, volumes, measurements, and analytical data provided by the characterization contractor accurately represent site conditions and waste characteristics.

**This estimate does not include costs for preparation of required project plans, permits, reports, or project management.**

***ESCALATION:***

No escalation factors have been applied.

***CONTINGENCY:***

Contingency costs are not included in this estimate.

***RATES:***

Rates are based on FY07 direct rates escalated 3% and FY08 Rev.0 indirect rates.

***COST ALTERNATIVES SUMMARY:***

**Alternative I:** **Closure In Place** **$40,135**

Use restriction survey, installation of fence and postings,
and implementation of administrative control

**Alternative II:** **Clean Closure** **$124,966**

Remove & package approximately 4 CY of arsenic/chromium contaminated soil
Collect verification samples
Backfill open excavated area with clean fill material and grade
Dispose of waste offsite

***REVIEW / CONCURRENCE:***

/s/ Thomas A. Thiele 12/17/2007
Project Manager Date

/s/ Yim Liu-Bacon 12/17/2007
Business Manager Date

/s/ George C. Henckel 12/17/2007
Project Controls Date

# Appendix D

# Evaluation of Risk

# D.1.0 Evaluation of Risk

The RBCA process used to establish FALs is described in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006). This process conforms with NAC Section 445A.227 (NAC, 2006a), which lists the requirements for sites with soil contamination. 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. For this evaluation, the following conservative assumptions were made:

- Any physical waste 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 waste.
- Any liquid waste containing a contaminant exceeding the RCRA TC concentration would cause a COC to be present in the surrounding media if the liquid was released.
- Any non-liquid waste containing a contaminant exceeding an equivalent FAL concentration would cause a COC to be present in the surrounding media.

This section contains documentation of the RBCA process used to establish FALs described in the Industrial Sites Project Establishment of FALs (NNSA/NSO, 2006). 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 (non-site-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 risk-based corrective action decision process stipulated in the Industrial Sites Project Establishment of FALs (NNSA/NSO, 2006) is summarized in Figure D.1-1.

### *D.1.1 A. Scenario*

Corrective Action Unit 563, Septic Systems, consists of the following four inactive sites that lie within Area 3 and Area 12 of the NTS:

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

***Corrective Action Site 03-04-02*** is located at the southern portion of the Area 3 Subdock and consists of potential soil contamination resulting from the release of contaminants to and from a former domestic waste sewage system into the surrounding soils. The system was used by personnel working at the Area 3 Subdock from the 1970s to 1985 and is currently inactive and abandoned.

***Corrective Action Site 03-59-05*** is located at the southern portion of the Area 3 Subdock and consists of potential soil contamination resulting from the release of contaminants to and from a former domestic waste sewage system into the surrounding soils. The system was used by personnel working at the Area 3 Subdock from the 1970s to 1985 and is currently inactive and abandoned.

***Corrective Action Site 12-59-01*** is located just off the E-Tunnel Access Road and downgradient of the Area 12 Drilling/Welding Shop and consists of potential soil contamination resulting from the release of contaminants to and from a former domestic sewage and possibly former industrial wastewater systems. The piping network of these two systems eventually join and discharged effluent to the surface soil via one common downgradient outfall. Also included at the CAS are two surface soil stains that resulted from unknown sources.

***Corrective Action Site 12-60-01*** is located just off the E-Tunnel Access Road on the downslope beneath the Area 12 Drilling/Welding Shop and consists of potential soil contamination resulting from the release of contaminants with industrial wastewaters via three drain lines and respective outfalls. The industrial wastewaters originated from pipe rack cleaning and hydraulic pipe cutting activities at the Drilling/Welding Shop.

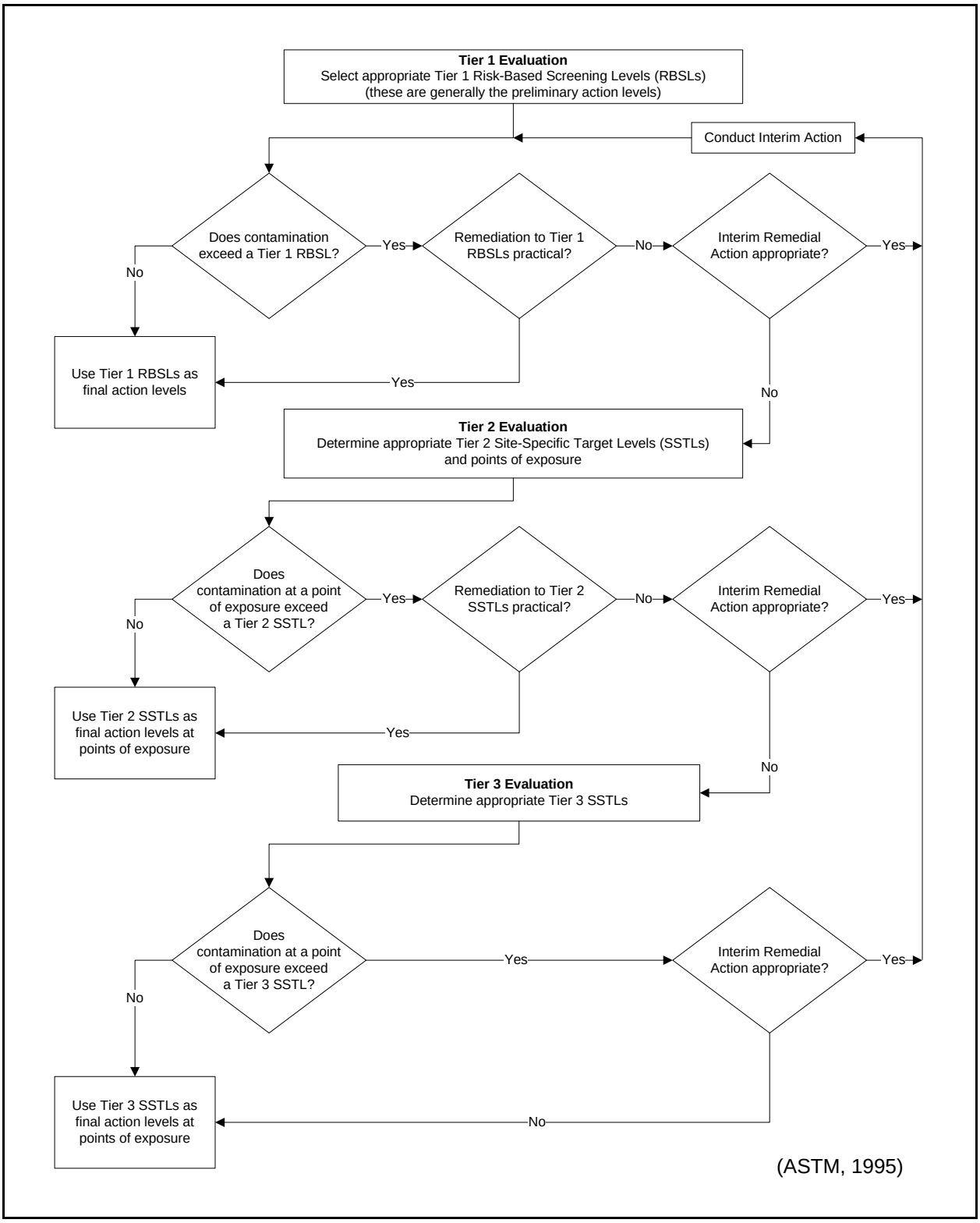


**Figure D.1-1**
**Risk-Based Corrective Action Decision Process**

### D.1.2 B. Site Assessment

The CAI at CASs 03-04-02, 03-59-05, and 12-60-01 involved visual inspections through video survey and/or excavation and soil sampling adjacent to and/or beneath structural components identified in the CAU 563 CAIP as potential sources for contaminant releases (NNSA/NSO, 2007). The CAI results indicate that residual materials are not present in the septic tank, cesspool or drainpipes, and that the structural integrity of the system components (e.g., tanks, piping) at each of these CASs are intact, either closed or covered by soil, and are not releasing contaminants to the surrounding environment.

The CAI at CAS 12-59-01 involved a visual inspection through video survey and/or excavation and soil sampling adjacent to and/or beneath the structural components of two separate waste systems (the "North Tank" and the "South Tank" systems) identified in the CAU 563 CAIP as potential sources for contaminant releases (NNSA/NSO, 2007). The CAI results indicate that liquid is present in both chambers of the South Tank at this CAS and that the structural integrity of both effluent collection system components (e.g., tanks, piping) is intact and is not releasing contaminants to the surrounding environment.

The CAI at CAS 12-59-01 also involved the visual inspection and soil sampling of two separate, or discrete, stained areas (the "First Stained Area" and the "Second Stained Area") identified in the CAU 563 CAIP as potential sources of additional contaminant releases (NNSA/NSO, 2007). The CAI results indicate that COC contamination is present in the First Stained Area, and that extent of contamination has been defined in both the vertical and horizontal directions.

The maximum concentration of contaminants identified at each CAS and their corresponding PALs are presented in Table D.1-1.

### D.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 (ASTM, 1995).

**Table D.1-1**
**Maximum Reported Value for Tier 1 Comparison**
(Page 1 of 2)

| Parameter | Preliminary Action Level | Units | CAS 03-04-02 | CAS 03-59-05 | CAS 12-59-01 | CAS 12-60-01 |
|---|---|---|---|---|---|---|
| 2-Butanone | 110,000 | mg/kg | -- | -- | -- | 0.38 |
| 2-Hexanone | 110,000 | mg/kg | -- | -- | -- | 0.13 |
| 4,4'-DDE | 7 | mg/kg | -- | -- | 1.5 (J) | 0.035 (J) |
| 4,4'-DDT | 7 | mg/kg | -- | -- | 3.1 (J) | 0.65 (J) |
| Acetone | 54,000 | mg/kg | -- | -- | 0.085 | 1.0 |
| Aroclor 1254 | 0.74 | mg/kg | -- | -- | -- | 0.34 (J) |
| Aroclor 1260 | 0.74 | mg/kg | -- | 0.01 (J) | -- | -- |
| Arsenic | 23 | mg/kg | 5 | 4.1 | **43** | 6.1 |
| Barium | 67,000 | mg/kg | 210 | 260 | 1,400 | 430 |
| Benzo(a)pyrene | 0.21 | mg/kg | -- | -- | 0.068 (J) | -- |
| Benzo(b)fluoranthene | 2.1 | mg/kg | -- | -- | 0.22 (J) | -- |
| Benzo(ghi)perylene | 29,000 | mg/kg | -- | -- | 0.12 (J) | -- |
| Benzo(k)fluoranthene | 21 | mg/kg | -- | -- | 0.15 (J) | -- |
| Bis(2-ethylhexyl)phthalate | 120 | mg/kg | -- | 0.16 (J) | -- | -- |
| Cadmium | 450 | mg/kg | 0.19 | 0.23 | 1.1 | 5.4 |
| Chlordane | 6.5 | mg/kg | -- | -- | **140 (J)** | **17 (J)** |
| Chromium | 450 | mg/kg | 7.7 | 24 | **3,900 (J)** | 130 (J) |
| Chrysene | 210 | mg/kg | -- | -- | 0.069 (J) | -- |
| Delta-BHC | 0.36 | mg/kg | -- | -- | 0.034 (J) | -- |
| Endosulfan II | 3,700 | mg/kg | -- | -- | 0.089 (J) | -- |
| Endosulfan sulfate | 3,700 | mg/kg | -- | -- | 0.86 (J) | -- |
| Fluoranthene | 22,000 | mg/kg | -- | -- | 0.099 (J) | -- |
| Indeno(1,2,3-cd)pyrene | 2.1 | mg/kg | -- | -- | 0.094 (J) | -- |
| Lead | 800 | mg/kg | 63 (J) | 78 (J) | 71 | **1,700 (J)** |
| Mercury | 310 | mg/kg | 0.016 | 0.034 | 0.12 | 0.2 |
| Methyl isobutyl ketone | 47,000 | mg/kg | -- | -- | -- | 0.041 (J) |
| Methylene chloride | 21 | mg/kg | 0.0024 (J) | 0.0026 (J) | -- | -- |
| p-Isopropyltoluene | 2,000 | mg/kg | -- | -- | -- | 0.0017 (J) |

**Table D.1-1**
**Maximum Reported Value for Tier 1 Comparison**
(Page 2 of 2)

| Parameter | Preliminary Action Level | Units | CAS 03-04-02 | CAS 03-59-05 | CAS 12-59-01 | CAS 12-60-01 |
|---|---|---|---|---|---|---|
| Pyrene | 29,000 | mg/kg | -- | -- | 0.075 | -- |
| Selenium | 5,100 | mg/kg | 1.6 | 1.9 | 34 (J+) | 3.5 (J+) |
| Silver | 5,100 | mg/kg | -- | -- | 0.82 | 8.7 |
| Toluene | 520 | mg/kg | -- | -- | -- | 0.0019 (J) |
| Total Xylenes | 420 | mg/kg | -- | -- | 0.0066 | -- |
| TPH-DRO | 100 | mg/kg | 10 | 34 | **1,600** | **1,600** |
| Actinium-228[a] | 5/15 | pCi/g | 1.85 | 1.57 | 1.12 | 1.33 |
| Americium-241 | 12.7 | pCi/g | -- | -- | 0.35 (J) | -- |
| Cesium-137 | 12.2 | pCi/g | 0.83 | 0.71 | 2.7 | 2.39 |
| Lead-212[a] | 5/15 | pCi/g | 1.95 (J) | 1.65 (J) | 1.12 (J) | 1.58 (J) |
| Lead-214[a] | 5/15 | pCi/g | 1.35 (J) | 1.21 (J) | 1.07 (J) | 0.92 (J) |
| Plutonium-238 | 13 | pCi/g | 0.09 | 1.96 | 0.58 (J) | 0.127 |
| Plutonium-239/240 | 12.7 | pCi/g | 0.72 (J) | 11.5 (J) | 3.81 | 2.43 |
| Thorium-234 | 105 | pCi/g | -- | 4.0 (J) | -- | -- |
| Thallium-208[a] | 5/15 | pCi/g | 0.58 | 0.56 | 0.356 | 0.52 |
| Uranium-234 | 143 | pCi/g | 1.3 | 1.35 | 0.67 | 0.74 |
| Uranium-235 | 17.6 | pCi/g | 0.065 | 0.099 | 0.045 | 0.05 |
| Uranium-238 | 105 | pCi/g | 1.19 | 1.23 | 0.77 | 0.77 |

[a]Except for CAS 12-60-01, PALs are 15 pCi/g.
Note: Bold text indicates value exceeding the action level.

DRO = Diesel-range organics
mg/kg = Milligrams per kilogram
PAL = Preliminary action level
pCi/g = Picocuries per gram
TPH = Total petroleum hydrocarbons

J = Estimated value
J+ = Result is an estimated quantity but may be biased high.
-- = No analytical results were above PALs.

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. At CAS 12-59-01, COCs were identified that may pose long-term threats to human health, safety, or the environment and have been determined to be a Classification 3 site as defined by ASTM Method E 1739-95. The

other three CASs were determined to be Classification 4 sites as defined by ASTM Method E 1739-95 and pose no demonstrated near- or long-term threats.

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

The 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 are very conservative estimates of risk, are preliminary in nature, and are 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 final action level is practical. The Tier 1 action levels are the PALs defined as the following concentrations or activities listed in the CAU 563 CAIP (NNSA/NSO, 2007):

- EPA *Region 9 Risk-Based Preliminary Remediation Goals (PRGs)* for Industrial Soils (EPA, 2006).
- 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).
- 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 National Council on Radiation Protection and Measurements (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 563 CASs in Area 3 and Area 12 are not assigned work stations and are considered to be in remote or occasional use areas, the use of industrial reuse-based PALs is conservative.

### D.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 563 are localized near the release point and have not migrated more than 10 ft vertically or 25 ft laterally. Because COCs were only identified in the surface and near-surface soils at CAS 12-59-01, 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 supports the selection and evaluation of only surface and shallow subsurface contact as the complete exposure pathways. Groundwater is not considered to be a significant exposure pathway.

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

All analytical results from CAU 563 samples were less than corresponding Tier 1 action levels (i.e., PALs) except for those listed in Table D.1-2.

### D.1.7 G. Evaluation of Tier 1 Results and Remedial Actions

For all contaminants at all CASs not listed in Table D.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.

As presented in Table D.1-2, arsenic, chlordane, chromium, lead, and TPH-DRO exceeded Tier 1 RSBLs at CAS 12-59-01 and CAS 12-60-01, as appropriate.

**Table D.1-2**
**Contaminants of Potential Concern Detected at CAU 563**
**above Preliminary Action Levels**

| Parameter | Preliminary Action Level | Units | Maximum Reported Value | |
|---|---|---|---|---|
| | | | CAS 12-59-01 | CAS 12-60-01 |
| Arsenic | 23 | mg/kg | 43 | -- |
| Chlordane | 6.5 | mg/kg | 140 (J) | 17 (J) |
| Chromium | 450 | mg/kg | 3,900 (J) | -- |
| Lead | 800 | mg/kg | -- | 1,700 (J) |
| Diesel-Range Organics | 100 | mg/kg | 1,600 | 1,600 |

mg/kg = Milligrams per kilogram

J = Estimated value
-- = No analytical results were above PALs

### *Arsenic and Chromium Evaluation*

The FALs for the arsenic and chromium contaminants listed in Table D.1-2 at CAS 12-59-01 were also established as the Tier 1 RBSLs. It was determined that corrective action is practical for these contaminants at this CAS. Therefore, a correction action of Clean Closure is proposed for this site. This remedial action will consist of removing and disposing of the soil containing these COCs.

### *Chlordane Evaluation*

It was determined by U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) that remediation of chlordane at CASs 12-59-01 and 12-60-01 is not practical. Therefore, a Tier 2 evaluation will be conducted for chlordane at CASs 12-59-01 and 12-60-01 to determine whether development of a Tier 2 SSTL is needed for these CASs.

### *Lead Evaluation*

It was determined by NNSA/NSO that remediation of lead at CAS 12-60-01 is not practical. Therefore, a Tier 2 evaluation will be conducted for this contaminant at CAS 12-60-01.

### *TPH-DRO Evaluation*

It was determined by NNSA/NSO that remediation of TPH-DRO at CASs 12-59-01 and 12-60-01 is not practical to remediate to Tier 1 action levels due to the widespread and discontinuous nature of

contamination at these CASs (e.g., isolated locations in drainage catchment and beneath drainpipe outfalls). Therefore, no actions to remediate these sites to Tier 1 action levels for TPH-DRO are proposed, and a Tier 2 evaluation will be conducted for the hazardous constituents of diesel.

### D.1.8 H. Tier 2 Evaluation

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

### D.1.9 J. Development of Tier 2 Table of Site-Specific Target Levels

***Development of Chlordane SSTLs***

Chlordane and other pesticides were used extensively to control insects at buildings around the NTS. In areas where there are buildings located in close proximity, residual pesticides in soil around buildings can be expected throughout the entire area. Much like asphalt, chlordane is ubiquitous in nature and cannot be bounded. Sporadic and discontinuous distribution of residual chlordane (shown in analytical results from past sampling effort) is likely a result of degradation, grading of surfaces, migration/translocation, etc. For these reasons, it was determined during the CAU 538 CAA meeting between Stoller-Navarro Joint Venture (SNJV), DOE, and NDEP held on October 5, 2006, that contamination associated with common pesticides in industrial areas would not be addressed if the residual pesticides can be ascribed to normal use and not from spills or improper disposal. This determination is also applicable to CAU 563, and chlordane is not considered to be a COC at CASs 12-59-01 and 12-60-01. Therefore, a Tier 2 SSTL will not be established for chlordane.

***Development of TPH-DRO SSTLs***

Method E 1739-95 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 E 1739-95 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 E 1739-95 in ASTM, 1995). Therefore, the individual potentially hazardous constituents in TPH-DRO were compared to corresponding Tier 2 SSTLs to evaluate the need for corrective action at CASs12-59-01 and 12-60-01. The Tier 2 SSTLs were established for each of these constituents at their corresponding Tier 1 concentrations. These

SSTLs and the maximum reported level for each diesel constituent per CAS are presented in Table D.1-3.

**Table D.1-3**
**Maximum Values for Tier 2 SSTL Results for Hazardous Constituents of Diesel Fuel (mg/kg) for CASs 12-59-01 and 12-60-01**

| Common Name | SSTL | CAS 12-59-01 | CAS 12-60-01 |
|---|---|---|---|
| Benzo(a)Pyrene | 0.21 | 0.068 (J) | ND |
| Benzene | 1.4 | ND | ND |
| Benzo(a)Anthracene | 2.1 | ND | ND |
| Benzo(b)Fluoranthene | 2.1 | 0.22 (J) | ND |
| Benzo(k)fluoranthene | 21 | 0.15 (J) | ND |
| 1,3,5-Trimethylbenzene | 70 | ND | ND |
| Naphthalene | 190 | ND | ND |
| 2-Methylnaphthalene | 190 | ND | ND |
| Chrysene | 210 | 0.069 (J) | ND |
| n-Propylbenzene | 240 | ND | ND |
| n-Butylbenzene | 240 | ND | ND |
| Ethylbenzene | 400 | ND | ND |
| Total Xylenes[a] | 420 | ND | ND |
| Toluene | 520 | ND | 0.0019 (J) |
| Fluoranthene | 22,000 | 0.099 (J) | ND |
| Fluorene | 26,000 | ND | ND |
| Benzo(g,h,i)Perylene | 29,000 | 0.12 (J) | ND |
| Pyrene | 29,000 | 0.075 (J) | ND |
| Anthracene | 100,000 | ND | ND |
| Phenanthrene | 100,000 | ND | ND |

[a]Combination of o-, m-, and p-xylenes.

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

J = Estimated value

### *Development of Lead SSTLs*

The EPA's risk assessment for lead is unique because a reference dose value for lead is not available. Because the toxicokinetics of lead (the absorption, distribution, metabolism, and excretion of toxins

in the body) are well understood, lead is regulated based on blood lead (PbB) concentration. The EPA and the Centers for Disease Control and Prevention (CDC) have determined that childhood PbB concentrations at or above 10 micrograms per deciliter (µg/dL) of blood present risks to children's health. The EPA risk reduction goal for contaminated sites is to limit the probability of a child's PbB exceeding 10 µg/dL to 5 percent or less after cleanup. The EPA's Adult Lead Methodology (ALM) has been developed to estimate the concentration of lead in the blood of pregnant women and developing fetuses who might be exposed to non-residential lead-contaminated soils (EPA, 2007).

In the commercial/industrial setting, the most sensitive receptor is the fetus of a worker who has a non-residential exposure to lead. Based on the available scientific data, a fetus is more sensitive to the adverse effects of lead than an adult (National Academy of Sciences, 1993). The EPA assumes that cleanup levels that are protective of a fetus will also afford protection for male or female adult workers. The ALM (EPA, 2007) was developed to calculate cleanup goals such that there would be no more than a 5 percent probability that fetuses exposed to lead would exceed a PbB concentration of 10 µg/dL of blood. This same approach also appears to be protective for the effect of lead on blood pressure in adult males.

Therefore, EPA's ALM was used to develop an SSTL of 1,872 mg/kg for lead at CAS 12-60-01.

### *D.1.10 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 COC originating from a CAS. For CAU 563, the Tier 2 action levels were compared to maximum contaminant concentrations from each sample location.

As shown in Table D.1-3, the SSTLs of the hazardous constituents of TPH-DRO were not exceeded for any constituent. The FALs for the hazardous constituents of TPH-DRO were established as their corresponding Tier 2 SSTLs.

The maximum concentration of lead at CAS 12-60-01 of 1,700 mg/kg was less than the Tier 2 SSTL for lead of 1,872 mg/kg. The FAL for lead was established as the Tier 2 SSTL.

### *D.1.11 L. Tier 2 Remedial Action Evaluation*

Because the maximum concentrations of lead at CAS 12-60-01 and the hazardous constituents of TPH-DRO at CASs 12-59-01 and 12-60-01 were less than their corresponding FALs, contamination at these sites do not pose an unacceptable risk to human health and the environment. Therefore, no remedial actions are required at these CASs within CAU 563 based on a Tier 2 remedial action evaluation.

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

## D.2.0 Recommendations

All of the site contaminant concentrations in soils from the analysis of CAU 563 samples were less than the corresponding FALs, with the exception of arsenic and chromium at CAS 12-59-01.

At CASs 03-04-02, 03-59-05, and 12-60-01, it was determined that contamination does not pose a significant risk to human health or the environment; therefore, corrective action is not warranted at these sites. In addition, because the SSTL for lead at CAS 12-60-01 is greater than the Industrial Use FAL, it is not recommended that an administrative Use Restriction be applied at this site. However, this does not preclude the consideration for protective measures at these sites that may be implemented as BMPs (e.g., removal of the septic tank, abandonment of the cesspool, and grouting of all open pipe ends).

At CAS 12-59-01, it was determined that arsenic and chromium contaminants are COCs; therefore, corrective action is warranted at this site. A corrective action recommendation of Clean Closure will be protective of human health, safety, and the environment. The arsenic and chromium COC-impacted soil will be removed and disposed at an appropriate facility. This does not preclude the consideration for other additional protective measures at this site that may be implemented as BMPs (e.g., removal of the septic tank contents, removal or abandonment of the septic tanks, grouting of all open pipe ends, and removal of the chlordane-impacted soil).

## D.3.0 References

ASTM, see American Society for Testing and Materials.

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

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.

DOE, see U.S. Department of Energy.

EPA, see U.S. Environmental Protection Agency.

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

NAC, see *Nevada Administrative Code*

NBMG, see Nevada Bureau of Mines and Geology.

NCRP, see National Council on Radiation Protection and Measurements.

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

National Academy of Sciences. 1993. *Measuring Lead Exposure in Infants, Children, and Other Sensitive Populations.* Washington, DC: National Academy Press.

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

*Nevada Administrative Code.* 2006a. NAC 445A.227, "Contamination of Soil: Order by Director for Corrective Action; Factors To Be Considered in Determining Whether Corrective Action Required." Carson City, NV. As accessed at http://www.leg.state.nv.us/nac on 21 October 2007.

*Nevada Administrative Code.* 2006b. NAC 445A.22705, "Contamination of Soil: Evaluation of Site by Owner or Operator; Review of Evaluation by Division." Carson City, NV. As accessed at http://www.leg.state.nv.us/nac on 21 October 2007.

*Nevada Administrative Code*. 2006c. NAC 445A.2272, "Contamination of Soil: Establishment of Action Levels." Carson City, NV. As accessed at http://www.leg.state.nv.us/nac on 21 October 2007.

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

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

U.S. Department of Energy, Nevada Operations Office. 2004. *NV/YMP Radiological Control Manual*, DOE/NV--11718-079, Rev. 5. Las Vegas, NV.

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

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2007. *Corrective Action Investigation Plan for Corrective Action Unit 563: Septic Systems, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--1181. Las Vegas, NV.

U.S. Environmental Protection Agency. 2006. *Region 9 Preliminary Remediation Goals (PRGs)*. As accessed at http://www.epa.gov/region09/waste/sfund/prg/index.htm on 27 November 2007.

U.S. Environmental Protection Agency. 2007. "Lead Risk Assessment." As accessed at http://www.epa.gov/superfund/lead/pbrisk.htm on 27 November.

# Appendix E

# Project Organization

# E.1.0 Project Organization

The NNSA/NSO Federal Sub-Project Director is Kevin Cabble, who can be reached at (702) 295-5000. The NNSA/NSO Task Manager is Janis Romo, who can be reached at (702) 295-0838.

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

# Appendix F

# Sample Location Coordinates

# F.1.0 Sample Location Coordinates

Sample location coordinates were collected during the CAI for CAU 563 using a Trimble GPS, Model TSCI, or GeoXT. These coordinates identify the field sampling locations (e.g., Northing/Easting, elevation) at CAU 563 and are presented in Table F.1-1.

**Table F.1-1**
**Sample Location Coordinates and Locations of Interest at CAU 563**
(Page 1 of 2)

| Northing | Easting | Sample Location |
|---|---|---|
| **CAS 03-04-02, Area 3 Subdock Septic Tank** | | |
| 4100362.317 | 584411.300 | Site Marker |
| 4100365.182 | 584409.318 | A01 |
| 4100365.711 | 584409.393 | A02 |
| **CAS 03-59-05, Area 3 Subdock Cesspool** | | |
| 4100400.070 | 384352.327 | Site Marker |
| 4100398.041 | 584352.920 | B01 |
| 4100398.092 | 584351.966 | B02 |
| 4100398.092 | 584351.966 | B03 |
| **CAS 12-59-01, Drilling/Welding Shop Septic Tanks** | | |
| 4115445.261 | 572864.901 | Site Marker |
| 4115367.171 | 572999.011 | C01 |
| 4115373.421 | 572992.323 | C02 |
| 4115440.518 | 572904.684 | C03 |
| 4115426.731 | 572920.392 | C04 (1st Soil Stain) |
| 4115503.459 | 573272.012 | C04 Step-out (C20) |
| 4115425.850 | 572918.739 | C04 Step-out (C21) |
| 4115427.546 | 572921.038 | C04 Step-out (C22) |
| 4115426.075 | 572921.100 | C04 Step-down (C23) |
| 4115428.382 | 572911.503 | C05 (2nd Soil Stain) |
| 4115434.466 | 572862.096 | C06 |
| 4115427.662 | 572870.320 | C07 |
| 4115420.024 | 572878.410 | C08 (1st Catchment) |
| 4115374.627 | 572991.548 | C09 |
| 4115366.352 | 572999.841 | C10 |

**Table F.1-1**
**Sample Location Coordinates and Locations of Interest at CAU 563**
(Page 2 of 2)

| Northing | Easting | Sample Location |
|---|---|---|
| 4115297.211 | 573073.384 | C11 (Tank Outfall) |
| 4115295.707 | 573071.775 | C11 Step-out (C11A) |
| 4115300.481 | 573074.076 | C11 Step-out (C11B) |
| 4115293.678 | 573074.364 | C11 Step-out (C11C) |
| 4115296.488 | 573077.854 | C11 Step-out (C11D) |
| 4115293.251 | 573079.455 | C11 Step-out (C11E) |
| 4115299.464 | 5730795.565 | C11 Step-out (C12) |
| 4115297.561 | 573080.298 | C11 Step-out (C13) |
| 4115291.698 | 573076.983 | C11 Step-out (C14) |
| 4115294.656 | 573072.508 | C11 Step-out (C15) |
| **CAS 12-60-01, Drilling/Welding Shop Outfalls** | | |
| 4115459.487 | 572833.373 | Site Marker |
| 4115428.449 | 572841.157 | D01 |
| 4115430.579 | 572840.684 | D02 |
| 4115421.844 | 572878.009 | D03 |
| 4115435.178 | 572861.449 | D04 |

# Appendix G

# Nevada Division of Environmental Protection Comments

(1 page)

# NEVADA ENVIRONMENTAL RESTORATION PROJECT

## DOCUMENT REVIEW SHEET

| | |
|---|---|
| **1. Document Title/Number:** Draft Corrective Action Decision Document for Corrective Action Unit 563: Septic Systems, Nevada Test Site, Nevada | **2. Document Date:** 01/29/2008 |
| **3. Revision Number:** 0 | **4. Originator/Organization:** Stoller-Navarro |
| **5. Responsible NNSA/NV ERP Project Manager:** Kevin J. Cabble | **6. Date Comments Due:** 01/31/2008 |
| **7. Review Criteria:** Full | |
| **8. Reviewer/Organization/Phone No:** Tim Murphy and Jeff MacDougall, NDEP, 486-2850 | **9. Reviewer's Signature:** |

| 10. Comment Number/Location | 11. Type* | 12. Comment | 13. Comment Response | 14. Accept |
|---|---|---|---|---|
| 1.) General | Mandatory | Throughout the document, reference is made to 'inert material' when describing the disposition of the septic systems. NNSA/NSO has proposed to either remove and/or leave the tanks in place, and filling them with 'inert material'. NDEP requires that this material be either sand or native soil. Use of any other material will not be approved by NDEP.<br><br>Please change the references to this material in the final document to reflect this requirement. | When describing the disposition of the septic systems in the final version of the CADD, the BMP to either remove and/or leave the tanks in place and fill them with 'inert material' now refers to this material as being 'sand or native soil.' | |

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