Nevada
Environmental
Restoration
Project

DOE/NV--1319

National Nuclear Security Administration

Corrective Action Decision Document/ Closure Report for Corrective Action Unit 557: Spills and Tank Sites Nevada Test Site, Nevada

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May 2009

Environmental Restoration
Project

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

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CORRECTIVE ACTION DECISION DOCUMENT/CLOSURE REPORT FOR CORRECTIVE ACTION UNIT 557: SPILLS AND TANK SITES NEVADA TEST SITE, NEVADA

Approved by: /s/ Kevin Cabble Date: 4/22/2009

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U.S. Department of Energy
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Las Vegas, Nevada

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List of Acronyms and Abbreviations

Ac	Actinium
Am	Americium
ASTM	American Society for Testing and Materials
bgs	Below ground surface
BMP	Best management practice
CADD	Corrective action decision document
CAI	Corrective action investigation
CAIP	Corrective action investigation plan
CAS	Corrective action site
CAU	Corrective action unit
CLP	Contract Laboratory Program
COC	Contaminant of concern
COPC	Contaminant of potential concern
CP	Control Point
CR	Closure report
Cs	Cesium
CSM	Conceptual site model
DOE	U.S. Department of Energy
DQA	Data quality assessment
DQI	Data quality indicator
DQO	Data quality objective
DRO	Diesel-range organics
EMAD	Engine Maintenance, Assembly, and Disassembly
EML	Environmental Measurements Laboratory
EPA	U.S. Environmental Protection Agency
ETSM	Engine Transport System Maintenance

List of Acronyms and Abbreviations *(Continued)*

Eu	Europium
FAL	Final action level
FD	Field duplicate
FFACO	*Federal Facility Agreement and Consent Order*
FSL	Field-screening level
FSR	Field-screening result
ft	Foot
ID	Identification
IDW	Investigation-derived waste
in.	Inch
LCS	Laboratory control sample
LLVF	Landfill Load Verification Form
m	Meter
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
NCRP	National Council on Radiation Protection and Measurements
ND	Nondetect
NDEP	Nevada Division of Environmental Protection
NIST	National Institute of Standards and Technology
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office

List of Acronyms and Abbreviations (Continued)

NTS	Nevada Test Site
NV/YMP	Nevada Yucca Mountain Project
PAL	Preliminary action level
Pb	Lead
PB	Preparation blank
PCB	Polychlorinated biphenyl
pCi/g	Picocuries per gram
PID	Photoionization detector
POC	Performance objective criteria
PPE	Personal protective equipment
ppm	Parts per million
PRG	Preliminary remediation goal
PSM	Potential source material
Pu	Plutonium
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RadCon	Radiological Control
RAIS	Risk Assessment Information System
RBCA	Risk-based corrective action
RBSL	Risk-based screening level
RCRA	*Resource Conservation and Recovery Act*
RESRAD	Residual Radioactive
ROTC	Record of Technical Change
RPD	Relative percent difference
SCL	Sample collection log

List of Acronyms and Abbreviations (Continued)

SDG	Sample delivery group
SNJV	Stoller-Navarro Joint Venture
Sr	Strontium
SSL	Soil screening level
SSTL	Site-specific target level
SVOC	Semivolatile organic compound
TBD	To be determined
TC	Toxicity characteristic
TCE	Trichloroethene
TCLP	Toxicity characteristic leaching procedure
Tl	Thallium
TPH	Total petroleum hydrocarbons
U	Uranium
UST	Underground storage tank
UTM	Universal Transverse Mercator
VOC	Volatile organic compound
yd^3	Cubic yard
%R	Percent recovery

Executive Summary

This Corrective Action Decision Document/Closure Report has been prepared for Corrective Action Unit (CAU) 557, Spills and Tank Sites, in Areas 1, 3, 6, and 25 of the Nevada Test Site, Nevada, in accordance with the *Federal Facility Agreement and Consent Order.* Corrective Action Unit 557 comprises the following corrective action sites (CASs):

- 01-25-02, Fuel Spill
- 03-02-02, Area 3 Subdock UST
- 06-99-10, Tar Spills
- 25-25-18, Train Maintenance Bldg 3901 Spill Site

The purpose of this Corrective Action Decision Document/Closure Report is to identify and provide the justification and documentation that supports the recommendation for closure of the CAU 557 CASs with no further corrective action. To achieve this, a corrective action investigation (CAI) was conducted from May 5 through November 24, 2008. The CAI activities were performed as set forth in the *Corrective Action Investigation Plan for Corrective Action Unit 557: Spills and Tank Sites, Nevada Test Site, Nevada*.

The purpose of the CAI was to fulfill the following data needs as defined during the data quality objective (DQO) process:

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

The CAU 557 dataset from the investigation results was evaluated based on the data quality indicator parameters. This evaluation demonstrated the quality and acceptability of the dataset for use in fulfilling the DQO data needs.

Analytes detected during the CAI were evaluated against appropriate final action levels established in this document to identify the presence or absence of COCs at each of the CAU 557 CASs. Results of the CAI did not indicate the presence of contaminants at concentrations exceeding their corresponding final action levels at any of the sites; therefore, the DQO data needs were met, and it was determined that no corrective action (based on risk to human receptors) is necessary for the site.

Based on the evaluation of the data quality indicator parameters for the CAI, the quality and acceptability of the dataset were demonstrated by fulfilling the DQO needs. Therefore, the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office provides the following recommendations:

- No further action is necessary for CAU 557.
- A Notice of Completion to the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office is requested from the Nevada Division of Environmental Protection for closure of CAU 557.
- Corrective Action Unit 557 should be moved from Appendix III to Appendix IV of the *Federal Facility Agreement and Consent Order.*

1.0 Introduction

This Corrective Action Decision Document (CADD)/Closure Report (CR) presents information supporting closure of Corrective Action Unit (CAU) 557, Spills and Tank Sites, Nevada Test Site (NTS), Nevada. The corrective actions presented in this document have been completed 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 February 2008).

The NTS is approximately 65 miles (mi) northwest of Las Vegas, Nevada (Figure 1-1). Corrective Action Unit 557 comprises the following four corrective action sites (CASs):

- 01-25-02, Fuel Spill
- 03-02-02, Area 3 Subdock UST
- 06-99-10, Tar Spills
- 25-25-18, Train Maintenance Bldg 3901 Spill Site

Corrective Action Sites 01-25-02, 03-02-02, and 06-99-10 are located at the western, central, and southwestern portions of the Yucca Flat Region in Areas 1, 3, and 6. Corrective Action Site 25-25-18 is located at the central portion of the Jackass Flats Region in Area 25 (Figure 1-2).

A detailed discussion of the history of this CAU is presented in the *Corrective Action Investigation Plan* (CAIP) *for Corrective Action Unit* 557*:* Spills and Tank Sites*, Nevada Test Site, Nevada* (NNSA/NSO, 2008). This CADD/CR provides or references the specific information necessary to support closure of the four CAU 557 CASs.

1.1 Purpose

This CADD/CR provides justification why no further corrective action is necessary for CAU 557. This justification is based on results of investigative activities conducted at the sites, which were performed in accordance with the CAIP (NNSA/NSO, 2008).

Corrective Action Site 01-25-02 consists of historical diesel fuel soil contamination remaining at the bottom of a backfilled excavation at the Area 1 Batch Plant. The contamination or CAS is associated

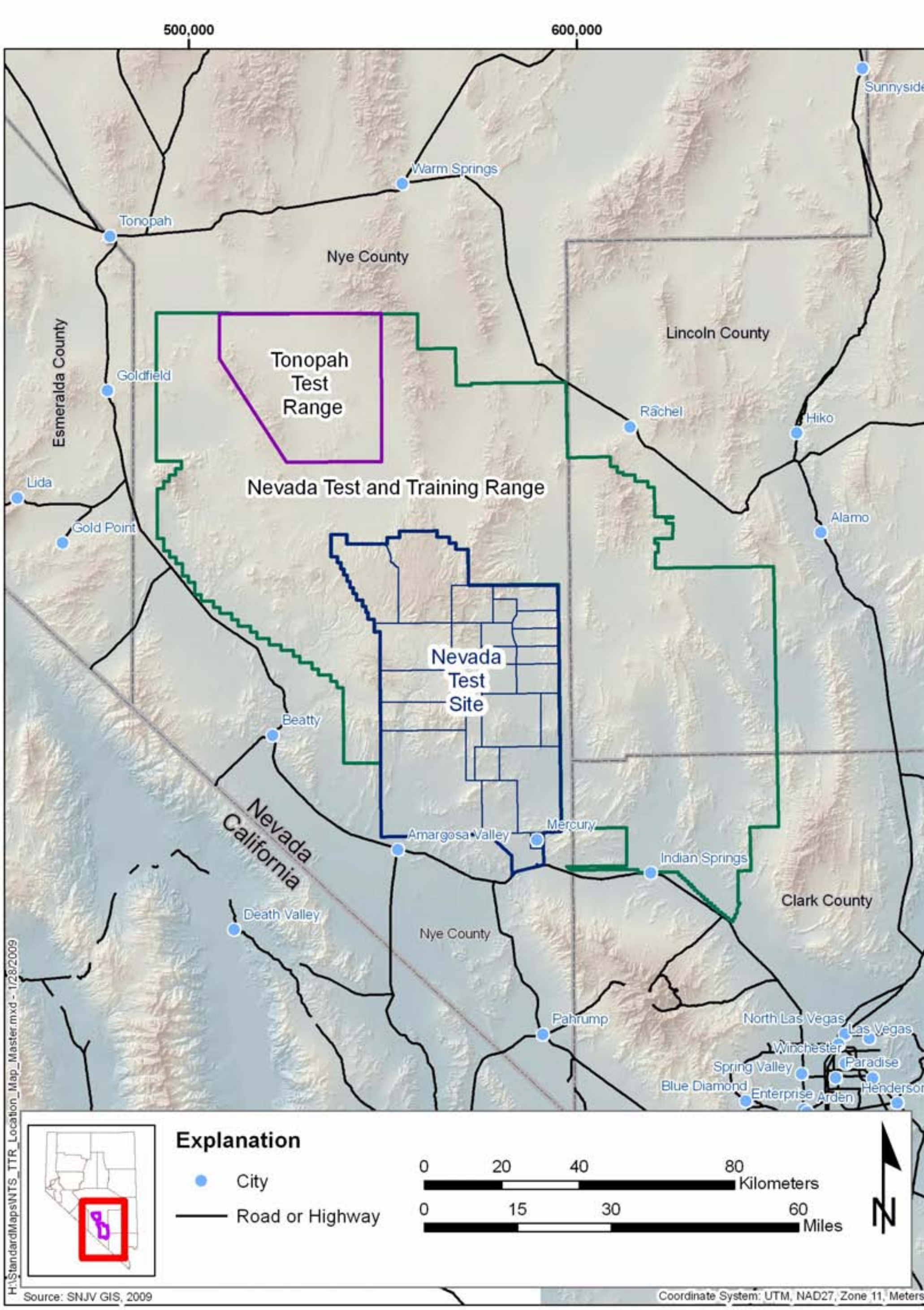

Figure 1-1
Nevada Test Site

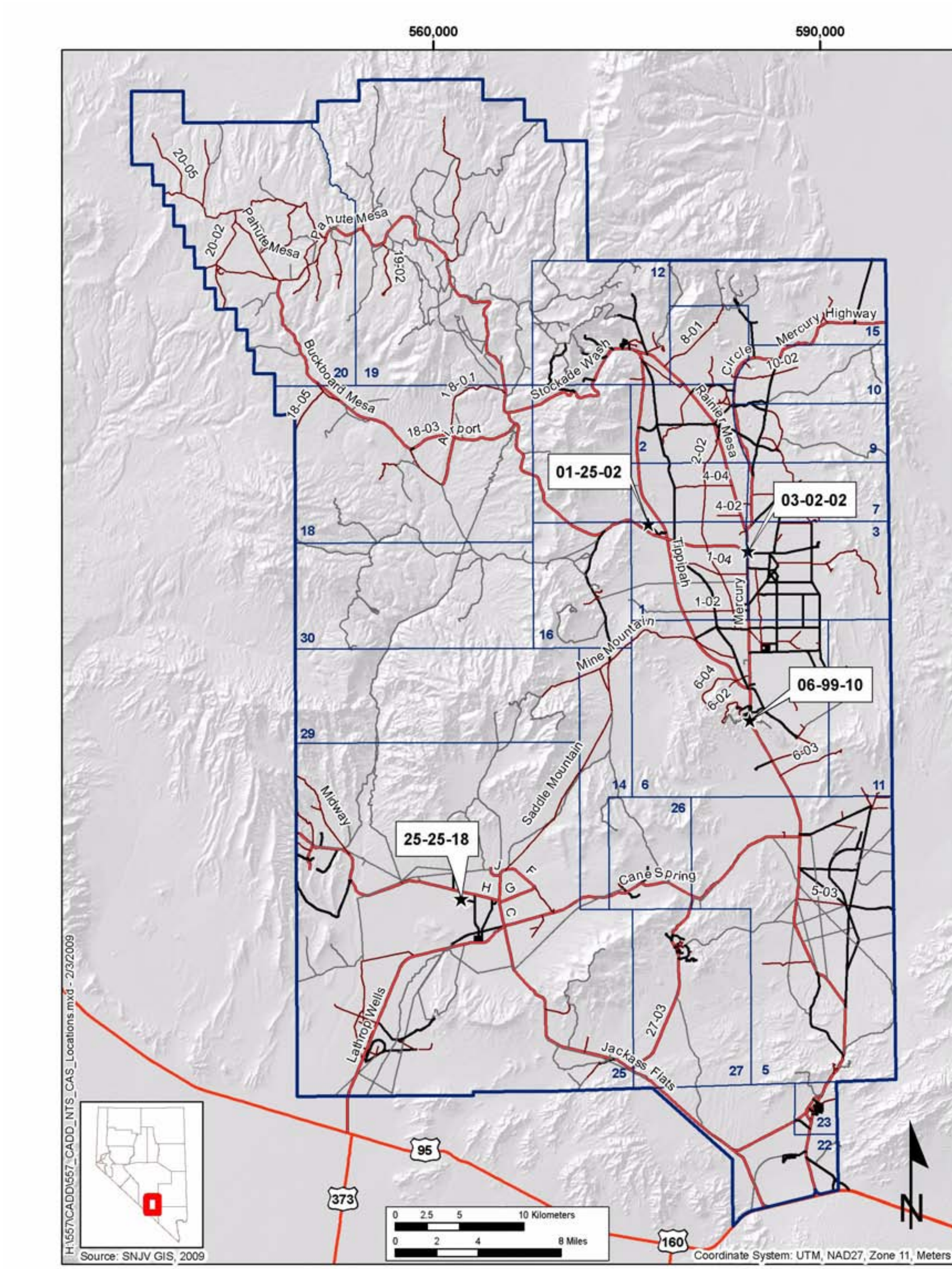

Figure 1-2
Corrective Action Unit 557, CAS Location Map

with a historical diesel fuel release that was remediated through excavation of the contaminated soil in late 1993 and early 1994, at which time the excavation was backfilled to grade with clean native soil (REECo, 1994a and b). However, it was reported that the diesel contamination was not completely removed, as a diesel concentration of 1,740 milligrams per kilogram (mg/kg) remained at the bottom of the excavation (REECo, 1994c).

Corrective Action Site 03-02-02 consists of an undocumented subsurface feature located at the Area 3 Subdock that was reportedly used for the diversion and drainage of surface water and subsequent dispersion and release of the effluent into the surrounding soils. The Area 3 Subdock was used for degreasing, cleaning, and repairing worn drill bits and realigning bent drill rods from the 1970s through 1985, when it was relocated to Area 1.

Corrective Action Site 06-99-10 consists of a tar material spill released from an unknown source located approximately 500 feet (ft) south of the Control Point-72 (CP-72) Building in Area 6, just west of an utility access road that runs parallel to Mercury Highway. The spill site is not associated with any known activities; however, it is suspected to be a release of unused tar that was allocated for road paving material.

Corrective Action Site 25-25-18 consists of two stained areas of soil situated on either side of the railroad tracks leading into the north bay of the Engine Transport System Maintenance (ETSM) Building within the Engine Maintenance, Assembly, and Disassembly (EMAD) facility that is located in Area 25. The ETSM Building (i.e., Bldg 3901) was used to perform maintenance of trains and equipment and was operational from 1965 to 1985. The spills were reportedly associated with the discharge of used engine oil from the north end of Bldg 3901.

1.2 Scope

The purpose of this CADD/CR is to justify that no further corrective action is required at CAU 557, Spills and Tank Sites. The scope of the investigation performed to accomplish this purpose included the following activities:

- Performed a radiological walkover survey at CASs 03-02-02 and 25-25-18.
- Performed field screening.

- Collected environmental samples for laboratory analysis.
- Collected potential source material (PSM) samples to determine the potential to generate contaminants of concern (COCs) if released to the surrounding media.
- Collected potential waste samples to determine proper disposal.
- Collected quality control (QC) samples.

1.3 Corrective Action Decision Document/Closure Report Contents

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

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

Section 2.0 – Corrective Action Investigation (CAI) Summary: Summarizes the investigation field activities and results of the investigation, and justifies that no further corrective actions are needed.

Section 3.0 – Recommendation: States why no further corrective action is required for CAU 557.

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

Appendix A – *Corrective Action Investigation Results:* Provides a description of the project objectives, field investigation and sampling activities, investigation results, waste management, 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 – *Risk Assessment*: Presents an evaluation of risk associated with the establishment of final action levels (FALs).

Appendix D – *Borehole and Sample Location Coordinates*: Provides investigation sample location coordinates.

Appendix E - Nevada Division of Environmental Protection (NDEP) comments.

1.3.1 Applicable Programmatic Plans and Documents

Investigation activities were performed in accordance with the following documents:

- CAIP for CAU 557, Spills and Tank Sites (NNSA/NSO, 2008)
- *Industrial Sites Quality Assurance Project Plan* (QAPP) (NNSA/NV, 2002)
- FFACO (1996, as amended February 2008)
- Approved procedures

1.3.2 Data Quality Assessment Summary

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

The DQA process as presented in Appendix B comprises the following steps:

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

Sample locations that support the absence of COC contamination at each CAS are shown in Sections A.3.0 through A.6.0 of Appendix A. Based on the results of the DQA presented in Appendix B, the absence of COCs at the CAU 557 CASs has been adequately identified to support a corrective action of no further action at each site. The DQA also determined that information generated during the investigation supports the conceptual site model (CSM) assumptions, and the data collected met the DQOs and support their intended use in the decision-making process.

2.0 Corrective Action Investigation Summary

The following sections summarize the investigation activities and investigation results, and justify why no further corrective action is needed at CAU 557. Detailed investigation activities and results for individual CAU 557 CASs are presented in Appendix A of this document.

2.1 Investigation Activities

Corrective action investigation activities were performed as set forth in the CAU 557 CAIP (NNSA/NSO, 2008) from May 5 through November 24, 2008. The purpose of the CAU 557 CAI was to provide additional information needed to address the decision statements in the project-specific DQOs. This was accomplished by:

- Determining whether COCs are present in the soils associated with CAU 557.
- If COCs were present in the soil, determining the lateral and vertical extent of the identified COCs.
- Ensuring adequate data have been collected to close the sites under FFACO requirements (FFACO, 1996; as amended in February 2008).

The scope of the CAI included the following activities:

- Performing radiological surveys.
- Field screening soil samples for volatile organic compounds (VOCs) and total (gross) alpha and beta/gamma radiation.
- Collecting environmental samples for laboratory analyses to determine the presence or absence of COCs and to define the vertical and lateral extent of COCs, if present.
- Collecting QC samples for laboratory analyses to ensure that the data generated from the analysis of investigation samples meet the requirements of the DQIs.
- Collecting waste to identify whether it represents potential sources of environmental contamination and to support waste decisions.

A judgmental sampling scheme was implemented for the CAU 557 CAI to select sample locations and evaluate analytical results, as outlined in the CAIP (NNSA/NSO, 2008). Judgmental sampling allows the methodical selection of sample locations that target the populations of interest (defined in the DQOs) rather than nonselective random locations generated by statistical methods.

For the judgmental sampling scheme, individual sample results (rather than average concentrations) are used for comparison to FALs. Therefore, statistical methods used to generate site characteristics (averages) are not necessary (EPA, 2006). If good prior information is available on the target site of interest, then the sampling may be designed to collect samples only from areas known or likely 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.

The judgmental sampling design was used to confirm the absence of contamination at specific locations. Confidence in judgmental sampling scheme decisions was established qualitatively by validation of the CSM and justification that sampling locations are the most likely locations to contain a COC, if a COC exists.

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

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

2.1.1 Fuel Spill (CAS 01-25-02)

The following sections summarize the field activities conducted at CAS 01-25-02.

2.1.1.1 Visual Inspection

Subsurface soils were visually inspected during drilling activities at CAS 01-25-02 to identify biasing factors (i.e., staining, soil discoloration) and to identify the boundary between excavation backfill material and the underlying native soil. Backfill material consisting of light brown gravelly sand was observed from 0 ft below ground surface (bgs) to approximately 13 ft bgs. At 13 ft bgs, a distinct color change to orange-brown moist sand was observed that may represent the native soil interface; however, a distinct boundary between backfill material and native soil was not identified. This is attributed to the backfill material, consisting of gravelly sands, being similar in composition to the geology of the Area 1 Batch Plant (accumulations of well to poorly sorted sandy wash sediments). Therefore, field-screening results (FSRs) and other biasing factors were used to identify the soil interval most likely to contain contamination. No additional biased samples were collected other than those proposed in the CAU 557 CAIP (NNSA/NSO, 2008).

2.1.1.2 Field Screening

Investigation samples were field screened for VOCs using a photoionization detector (PID) and for gross alpha and beta/gamma radiation using handheld radiological survey instruments. The FSRs were compared to field-screening levels (FSLs) to guide subsequent sampling decisions. Core material retrieved during drilling was field screened for VOCs at 5-ft intervals (or more often based on biasing factors). Screening began at 12 ft bgs (a depth slightly shallower than the expected bottom of the former excavation) and continued into native soil to a depth of 25 ft bgs. All VOC FSRs were below 20 parts per million (ppm), with the highest recorded FSR of 5.5 ppm at a depth of 14.0 to 14.5 ft bgs (sample 557A001 and field duplicate [FD] 557A002). The FSRs decreased with depth from this interval to 3.5 ppm at 20 ft bgs and to 3.0 ppm at 25 ft bgs. No samples exceeded alpha or beta/gamma FSLs.

2.1.1.3 Sample Collection

Three environmental soil samples were collected at this CAS to determine whether diesel contamination beneath the previously removed contaminated soil exceeds FALs. The sample location and identification (ID) number, types, and analyses are listed in Table A.3-1, and the locations are shown on Figure A.3-1. Soil samples were collected using drilling methods at a location in the middle of the former excavation at depths where the greatest concentration of contaminants were expected to be found, based on the 1993-1994 sampling results. Because the exact depth of the former excavation was not known, screening for VOCs began at a depth of 12 ft bgs during this CAI to approximate the bottom of the former excavation. Sample 557A001 (and FD 557A002) was collected from the 14.0 to 14.5 ft bgs interval because the FSR for VOC headspace was the highest (5.5 ppm) at this interval. This was also the interval of a distinct soil change from light brown gravelly sand to orange brown sand with more moisture. Additional deeper soil intervals were field screened for VOCs to verify that contamination decreases with depth. One soil sample (557A003) was collected from 24.5 to 25.0 ft bgs, which is the interval in native soil with the lowest FSR of 3.0 ppm. The CAIP for CAU 557 planned for a second boring to be drilled only if contamination in the first boring was shown to increase with depth. Because this was not the case, only one boring was drilled, and the lateral extent has been established by the former excavation sidewalls (NNSA/NSO, 2008).

2.1.1.4 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at this CAS. The CSM and associated discussion for CAS 01-25-02 are provided in the CAU 557 CAIP (NNSA/NSO, 2008).

The CSM assumed that contaminant migration would be minimal based on the affinity of the contaminants of potential concern (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 the underlying soil impact at this CAS was expected to be minimal and dependent upon the volume of contaminants remaining in the soil at depth.

The information gathered during the CAI supported and validated the CSM as presented in the CAU 557 CAIP (NNSA/NSO, 2008).

2.1.2 Area 3 Subdock UST (*CAS 03-02-02*)

The following sections summarize the field activities conducted at CAS 03-02-02.

2.1.2.1 Geophysical Survey

Before the CAI, a preliminary geophysical survey was performed at CAS 03-02-02 that identified two large anomalies and several linear anomalies. The first anomaly corresponds to the main feature of the CAS, a vertical steel casing with a lid that is flush with the ground surface and mostly covered with soil. The second large anomaly is located approximately 5 ft northeast of the steel casing and was interpreted to be a second feature connected to the steel casing by subsurface piping at a depth of 1 meter or less. A series of three parallel trenches were excavated (within the limits of two nearby underground utility lines) to a total depth of 6 ft bgs in the area northeast of the steel casing. It was determined that no subsurface features, debris, or other biasing factors were identified in the area of the anomaly that would warrant the collection of environmental samples. Also, soil was excavated along the east-northeast side of the steel casing and confirmed that there are no subsurface connections to other features. Two additional trenches were excavated on the south side of the steel casing to investigate the smaller linear anomalies. It was determined that the anomalies south of the steel casing corresponded to inactive telecommunication lines (typical of the NTS) that were uncovered at a depth of 1.0 to 1.5 ft bgs.

2.1.2.2 Radiological Survey

A preliminary radiological survey was performed at CAS 03-02-02 before the CAI. Results of the survey did not detect areas of concern at this CAS, and sample locations were not identified based on the survey results.

2.1.2.3 Visual Inspection

Visual inspections were conducted during excavation activities to determine the configuration of the CAS feature(s) and to identify any biasing factors that would warrant sample collection. The visual inspection of the vertical steel casing feature did not identify additional system features or piping associated within the CAS. An 8-inch (in.) diameter access portal was identified as part of the lid. Initial inspection indicated that the casing was punctured with abundant 2- to 4-in. diameter circular perforations spaced near the top and continuing to the bottom at 13 ft bgs to allow liquid outflow; however, no pipe tie-ins were identified. Soil intervals were continuously monitored during hand augering and excavation activities to identify biasing factors. Biased samples were collected from dark-stained, rust-stained, and debris-containing soils that were identified in soil sample intervals during hand augering within the steel casing. Trenches that were excavated to uncover geophysical anomalies were also inspected (see Section 2.1.2.1).

2.1.2.4 Video Surveys

A video survey was conducted inside the casing to the extent possible to identify breaches, residual material, and/or pipe tie-ins. The casing had 3 ft of void space before soil was encountered. The steel design was perforated; however, no other breaches or pipe tie-ins were observed. Therefore, no additional sample locations were identified at this CAS based on the video survey.

2.1.2.5 Field Screening

Investigation soil samples were screened in the field for VOCs and for gross alpha and beta/gamma radioactivity. A PID was used for screening VOCs by the headspace method. A handheld survey instrument was used to screen for alpha and beta/gamma radioactivity before soil samples were placed in sample jars. The radiological FSRs were compared to FSLs to guide subsequent sampling decisions. Both the radiological and VOC FSRs were below their respective FSLs.

2.1.2.6 Sample Collection

Six environmental soil samples were collected at this CAS to determine whether contamination exists in soils found within and outside the vertical casing at concentrations above FALs. The sample ID numbers, locations, types, and analyses are listed in Table A.4-1, and sample locations are shown on Figure A.4-1. Samples obtained from inside the casing were collected using a hand auger until refusal was encountered at a depth of 9.5 ft bgs. Samples obtained from surrounding and beneath the casing were collected using a backhoe.

Samples of the sand/sediment found within the casing (location B01) were collected from three intervals based on the presence of dark-stained, rust-stained, or debris-containing soil (location B01; samples 557B001, 557B002, and 557B003). Additional bounding soil samples were collected from locations surrounding the casing (location B02; sample 557B004), at the bottom of the casing (location B02; sample 557B005), and from native soil beneath the bottom of the casing (location B03; sample 557B006).

2.1.2.7 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at this CAS. The CSM and associated discussion for CAS 03-02-02 are provided in the CAU 557 CAIP (NNSA/NSO, 2008).

The CSM assumed that contaminant migration would be minimal based on the design and structural integrity of the system 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 the soil impact at this CAS was minimal and appeared to remain within the vertical casing. Information gathered during the CAI supports and validates the CSM as presented in the CAIP.

2.1.3 Tar Spills (CAS 06-99-10)

The following sections summarize the field activities conducted at CAS 06-99-10.

2.1.3.1 Visual Inspection

Before sampling activities, visual inspections performed of the two tar spills determined that they were composed of the same material and that one sample would be collected instead of two samples (see Section A.5.1.4), as agreed upon in the CAIP (NNSA/NSO, 2008). No visible signs of biasing factors (e.g., staining) were noted during sampling activities, and additional biased sampling locations were not identified at this site.

2.1.3.2 Field Screening

Soil samples were screened in the field for VOCs and for gross alpha and beta/gamma radioactivity. A PID was used for screening VOCs by the headspace method, and a handheld survey instrument was used to screen the soil for gross alpha and beta/gamma radioactivity before soil samples were placed in sample jars. Both the VOC and radiological FSRs were below their respective FSLs, and no additional sampling at this site was performed.

2.1.3.3 Sample Collection

Environmental soil sampling activities included the collection of two surface soil samples (0 to 0.5 ft bgs) from directly beneath one of the hardened tar spills (samples 557C002 and FD 557C003) and one additional deeper subsurface soil sample (557C004) at a depth from 0.5 to 1.0 ft bgs to determine whether the tar had leached into the underlying soils. The sample location and ID number, types, and analyses are listed in Table A.5-1, and the locations are shown on Figure A.5-1.

Potential source material sampling activities included the collection of a tar material sample (557C001) to determine whether it exceeds the PSM criteria. The tar was also sampled for waste characterization purposes as presented in Section A.7.0.

2.1.3.4 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at the CAU 557 CASs. The CSM and associated discussion for CAS 06-99-10 are provided in the CAIP (NNSA/NSO, 2008).

Contaminant migration and the extent of the underlying soil impact at this CAS was minimal based on the composition of the tar material. The migration pathway and release mechanism information gathered during the CAI was consistent with the CSM, and all information gathered during the CAI supports and validates the CSM as presented in the CAIP.

2.1.4 Train Maintenance Bldg 3901 Spill Site (*CAS 25-25-18*)

The following sections summarize the field activities conducted at CAS 25-25-18.

2.1.4.1 Radiological Survey

A radiological survey was performed at CAS 25-25-18 as part of the CAI. Survey results did not identify areas of potential concern within the CAS boundary; therefore, no additional biased sampling locations were identified as a result of this survey.

2.1.4.2 Visual Inspection

Visual inspections included monitoring vertical soil profiles to identify stained soil boundaries and surveying the areas on either side of the railroad tracks to identify the locations exhibiting the highest degree of staining for biased sample locations. Additional surface sample locations were identified for collection of beryllium, and for pesticides and polychlorinated biphenyls (PCBs) based on their proximity to Bldg 3901. Sample locations were also identified outside of the visibly stained areas to define the lateral extent of contamination. No other features associated with the stained soil were identified within this CAS.

2.1.4.3 Field Screening

Soil samples were screened in the field for VOCs and for alpha and beta/gamma radioactivity. A PID was used for screening VOCs by the headspace method. A handheld survey instrument was used to screen for alpha and beta/gamma radioactivity before soil samples were placed in sample jars. The radiological FSRs were compared to FSLs to guide subsequent sampling decisions. The radiological FSLs exceeded the FSRs at surface sample locations D07 and D09; therefore, samples at deeper intervals continued to be collected until FSRs were below FSLs. No other additional biased sampling locations were identified as a result of field screening.

2.1.4.4 Sample Collection

Twenty-one surface and shallow subsurface environmental samples, including one FD, were collected from various areas within and surrounding visibly stained soil on the east and west sides of the railroad tracks that enter the north bay of the ETSM Bldg 3901. The CAU 557 CAIP planned for the collection of samples at six locations (one location from each of the two stained soil areas and four locations to define the lateral extent of potential contamination). During the CAI, a total of three sample locations were identified in stained soil areas, and a total of six sample locations were identified for defining the lateral extents of contamination. In addition to these sample locations, five additional surface (0 to 0.25 ft bgs) samples (557D001 through 557D005) were collected from locations D01 through D05 for the purposes of beryllium analysis only. The sample ID numbers, locations, types, and analyses are listed in Table A.6-1, and the sample locations are shown on Figure A.6-1.

Sample location D07 represents the area of darkest stained soil on the east side of the tracks. At D07, sample 557D008 was collected at 0.0 to 0.5 ft bgs using hand sampling methods and represents the darkest stained soil. A subsurface sample (557D014) was collected at 2.0 to 2.5 ft bgs using a backhoe for the purpose of defining the vertical extent of potential contamination at D07. Three sample locations (D06, D08, and D10) were collected for the purpose of defining the lateral extent of potential contamination on the east side of the tracks. Sample locations D06 and D08 were collected in close proximity to the stained soil and location D10 represents the lowest topographical point. Pesticides and PCBs were added to the list of analytes for one representative sample (location D06; sample 557D006) collected in close proximity to Bldg 3901 because these contaminants are commonly identified adjacent to NTS building pads.

Sample locations D09 and D11 represent the areas of darkest stained soil on the west side of the tracks, which is more extensive than the stained soil on the east side. At D09, samples 557D011

(0 to 1.0 ft bgs) and 557D012 (1.0 to 1.5 ft bgs) were collected within the horizon of stained soil using hand sampling and hand auger methods, and sample 557D015 was a subsurface sample collected at 5.5 to 6.0 ft bgs using a backhoe to define the vertical extent of potential contamination. At D11, sample 557D016 (0 to 0.5 ft bgs) was collected from the horizon of stained soil using hand sampling methods, and sample 557D017 (2.5 to 3.0 ft bgs) was a subsurface sample collected using a backhoe to define the vertical extent of potential contamination. Three sample locations (D12, D13, and D14) were collected for the purpose of defining the lateral extent of potential contamination on the west side of the tracks. Location D12 was collected in the middle of the slope west of the stained soil, and locations D13 and D14 were collected at the lowest topographical points (see Table A.6-1 for a list of all samples collected).

2.1.4.5 Conceptual Site Model Validation

A CSM was developed to represent the release mechanisms and potential migration pathways for contaminant releases at this CAS. The CSM and associated discussion for CAS 25-25-18 are provided in the CAU 557 CAIP (NNSA/NSO, 2008).

The extent of the underlying soil impacted at this CAS was minimal and dependent upon the volume of contaminants released from the surface staining.

The migration pathway and release mechanism information gathered during the CAI was 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 is provided in this section, and results were compared to action levels. This section also summarizes the data assessment made in Appendix B, which demonstrates that the investigation results satisfy the DQO data requirements for CAU 557.

2.2.1 Summary of Analytical Data

Chemical and radiological results for environmental and PSM samples collected from the CAU 557 CASs are summarized in the following subsections. Environmental soil sample results were compared against FALs to determine the absence or presence of COCs and the extent of COC contamination, if present. Potential source material sample results were also evaluated to determine whether a release of contaminants from these areas to the surrounding environmental media could potentially result in the presence of a COC in that environmental media.

The preliminary action levels (PALs) for the CAU 557 investigation were determined during the DQO process and are discussed in Section 3.3 of the CAU 557 CAIP (NNSA/NSO, 2008). The FALs used for determining the absence or presence of COCs and evaluating the need for corrective action are defined in Section 3.4 of the CAIP. Details about the analytical methods used during this CAI and a comparison of sample results to the FALs are presented in Appendix A.

2.2.1.1 Fuel Spill (*CAS 01-25-02*)

All concentrations of the reported parameters at this site were compared to and were less than the corresponding PALs. Therefore, the FALs were established at the corresponding PAL concentrations, and no COCs were identified in the soils at this site.

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

Table 2-1
Maximum Concentration of Detected Contaminants in Soil for CAS 01-25-02, Fuel Spill

Contaminant	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
Acetone	0.00303 (J)	557A001	14.0 - 14.5	A01	54,000	mg/kg
TPH-DRO	1.5 (J)	557A003	24.5 - 25.0	A01	100	mg/kg

DRO = Diesel-range organics
TPH = Total petroleum hydrocarbons

J = Estimated value

2.2.1.2 Area 3 Subdock UST (*CAS 03-02-02*)

With the exception of TPH-DRO detected in the soil within the casing, all soil concentrations of the reported constituents were compared to and were less than PALs. One sand/sediment sample (557B002) collected at location B01 within the casing showed a concentration of TPH-DRO at

270 mg/kg, which exceeded the PAL for TPH-DRO of 100 mg/kg (NNSA/NSO, 2006). The TPH-DRO result was moved on to a Tier 2 evaluation, which consisted of comparing the hazardous constituents of diesel to their respective FALs. The FALs were not exceeded for the individual hazardous constituents present at this site; therefore, TPH-DRO is not considered to be a COC. The calculation of the FALs is presented in Appendix C.

The maximum concentration of each detected contaminant at this CAS is shown on Table 2-2.

Table 2-2
Maximum Concentration of Detected Contaminants in Soil for CAS 03-02-02, Area 3 Subdock UST

Contaminant	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
Ac-228	2.164	557B006	17.5 - 18.0	B03	5	pCi/g
Am-241	0.894 (J)	557B002	8.0 - 9.0	B01	12.7	pCi/g
Arsenic	3.81	557B005	13.0 - 13.5	B02	23	mg/kg
Barium	249	557B001	3.0 - 4.0	B01	67,000	mg/kg
Beryllium	0.948	557B005	13.0 - 13.5	B02	1,900	mg/kg
Cadmium	0.925	557B002	8.0 - 9.0	B01	450	mg/kg
Cs-137	0.688	557B002	8.0 - 9.0	B01	12.2	pCi/g
Chromium	7.71	557B005	13.0 - 13.5	B02	450	mg/kg
TPH-DRO	270	557B002	8.0 - 9.0	B01	N/A	mg/kg
Eu-155	1.3 (J)	557B006	17.5 - 18.0	B03	135	pCi/g
Lead	26.9	557B003	9.0 - 9.5	B01	800	mg/kg
Pb-212	2.616 (J)	557B005	13.0 - 13.5	B02	5	pCi/g
Pb-214	1.657 (J)	557B005	13.0 - 13.5	B02	5	pCi/g
Pu-239/240	0.474	557B002	8.0 - 9.0	B01	12.7	pCi/g
Tl-208	0.699	557B002	8.0 - 9.0	B01	5	pCi/g
U-234	1.316	557B002	8.0 - 9.0	B01	143	pCi/g
U-238	1.135	557B005	13.0 - 13.5	B02	105	pCi/g

Ac = Actinium
Am = Americium
Cs = Cesium
Eu = Europium
N/A = Not applicable
Pb = Lead
pCi/g = Picocuries per gram
Pu = Plutonium
Tl = Thallium
U = Uranium

J = Estimated value

2.2.1.3 Tar Spills (CAS 06-99-10)

With the exception of TPH-DRO detected in one surface soil sample collected beneath the tar material, all soil concentrations of the reported constituents were compared to and were less than PALs. The FD sample (557C003) of the surface soil sample (557C002) collected beneath the tar material showed a concentration of TPH-DRO of 100 mg/kg, which is equal to the PAL of 100 mg/kg (NNSA/NSO, 2006). However, the parent sample (557C002) showed a concentration of TPH-DRO of 62 mg/kg. The tar material sample (557C001) collected at location C01 showed a concentration of TPH-DRO of 100,000 mg/kg.

The TPH-DRO results for the FD surface soil sample and the overlying tar material were moved on to a Tier 2 evaluation, which consisted of comparing the hazardous constituents of diesel to their respective FALs. The FALs were not exceeded for the individual hazardous constituents present in the soil; therefore, TPH-DRO is not considered to be a COC at this site. Also, the PSM criteria were not exceeded for the tar material; therefore, the tar material is not considered to be a PSM at this site. The calculation of the FALs is presented in Appendix C.

The maximum concentration of each detected contaminant in soil at this CAS is shown on Table 2-3. The maximum concentration of each detected contaminant in the tar material at this CAS is shown on Table 2-4.

Table 2-3
Maximum Concentration of Detected Contaminants in Soil for CAS 06-99-10, Tar Spills
(Page 1 of 2)

Contaminant	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
Ac-228	1.252	557C003	0.0 - 0.5	C01	5	pCi/g
Arsenic	4.02	557C003	0.0 - 0.5	C01	23	mg/kg
Barium	131	557C002	0.0 - 0.5	C01	67,000	mg/kg
Cadmium	0.483 (J)	557C003	0.0 - 0.5	C01	450	mg/kg
Chromium	7.97	557C003	0.0 - 0.5	C01	450	mg/kg
TPH-DRO	100	557C003	0.0 - 0.5	C01	N/A	mg/kg
Eu-155	0.271 (J)	557C002	0.0 - 0.5	C01	135	pCi/g
Lead	13.7	557C002	0.0 - 0.5	C01	800	mg/kg

Table 2-3
Maximum Concentration of Detected Contaminants in Soil for CAS 06-99-10, Tar Spills
(Page 2 of 2)

Contaminant	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
Pb-212	1.431 (J)	557C003	0.0 - 0.5	C01	5	pCi/g
Pb-214	0.993 (J)	557C003	0.0 - 0.5	C01	5	pCi/g
Mercury	0.0522 (J)	557C004	0.5 - 1.0	C01	310	mg/kg
Tl-208	0.765	557C004	0.5 - 1.0	C01	5	pCi/g

J = Estimated value

Table 2-4
Maximum Concentration of Detected Contaminants in Tar for CAS 06-99-10, Tar Spills

Contaminant	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
Lead	0.438	557C001	N/A	C01	800	mg/kg
Barium	2.1 (J)		N/A		67,000	mg/kg
TPH-DRO	100,000 (J)		N/A		100	mg/kg
1,2,4-Trimethylbenzene	0.44		N/A		170	mg/kg
1,3,5-Trimethylbenzene	0.16 (J)		N/A		70	mg/kg
2-Butanone	0.43 (J)		N/A		110,000	mg/kg
4-Isopropyltoluene	0.12 (J)		N/A		2,000	mg/kg
Acetone	0.84 (J)		N/A		54,000	mg/kg
N-Butylbenzene	0.11 (J)		N/A		240	mg/kg
Sec-Butylbenzene	0.23 (J)		N/A		220	mg/kg
Total Xylenes	0.23 (J)		N/A		420	mg/kg
Benzoic Acid	98 (J)		N/A		100,000	mg/kg

J = Estimated value

2.2.1.4 Train Maintenance Bldg 3901 Spill Site (*CAS 25-25-18*)

With the exception of TPH-DRO detected in several soil samples at this site, all soil concentrations of the reported constituents were compared to and were less than their corresponding PALs. The maximum concentration of TPH-DRO in the stained soil was estimated at 8,700 mg/kg, which exceeded the PAL of 100 mg/kg (NNSA/NSO, 2006). This soil sample was collected at location D11 from a surface area showing heavy staining. The TPH-DRO results were moved on to a Tier 2 evaluation, which consisted of comparing the hazardous constituents of diesel to their respective FALs. The FALs were not exceeded for the individual hazardous constituents; therefore, TPH-DRO is not considered to be a COC at this site. The calculation of the FALs is presented in Appendix C.

The maximum concentration of each detected contaminant at this CAS is shown on Table 2-5.

Table 2-5
Maximum Concentration of Detected Contaminants in Soil for CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site
(Page 1 of 2)

Contaminant	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
2-Methylphenol	0.86	557D016	0.0 - 0.5	D11	31,000	mg/kg
4,4'-DDT	0.015	557D006	0.0 - 0.5	D06	7	mg/kg
Acetone	0.017 (J)	557D016	0.0 - 0.5	D11	54,000	mg/kg
Ac-228	2.287	557D009	0.0 - 0.5	D08	5	pCi/g
Am-241	4.261	557D018	0.0 - 0.5	D12	12.7	pCi/g
Aroclor 1260	0.12	557D006	0.0 - 0.5	D06	0.74	mg/kg
Arsenic	7.82	557D019	0.0 - 0.5	D13	23	mg/kg
Barium	288	557D016	0.0 - 0.5	D11	67,000	mg/kg
Benzoic acid	0.97 (J)	557D016	0.0 - 0.5	D11	100,000	mg/kg
Beryllium	0.363 (J)	557D007	1.0 - 2.0	D06	1,900	mg/kg
Bis(2-ethylhexyl)phthalate	1.3	557D016	0.0 - 0.5	D11	120	mg/kg
Cadmium	1.86	557D001	0.0 - 0.25	D01	450	mg/kg
Chromium	15.4	557D008	0.0 - 0.5	D07	450	mg/kg
Dieldrin	0.0062 (J)	557D006	0.0 - 0.5	D06	0.11	mg/kg
TPH-DRO	8,700 (J)	557D016	0.0 - 0.5	D11	N/A	mg/kg
Endosulfan II	0.0052 (J)	557D006	0.0 - 0.5	D06	3,700	mg/kg
Endrin	0.014 (J)	557D006	0.0 - 0.5	D06	180	mg/kg
Eu-155	0.65 (J)	557D009	0.0 - 0.5	D08	135	pCi/g
Heptachlor epoxide	0.0026	557D006	0.0 - 0.5	D06	0.19	mg/kg

Table 2-5
Maximum Concentration of Detected Contaminants in Soil for CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site
(Page 2 of 2)

Contaminant	Maximum Result	Sample Number	Depth (ft bgs)	Location	FAL	Units
Lead	440	557D016	0.0 - 0.5	D11	800	mg/kg
Pb-212	2.323 (J)	557D009	0.0 - 0.5	D08	5	pCi/g
Pb-214	1.312 (J)	557D009	0.0 - 0.5	D08	5	pCi/g
Phenol	0.51 (J)	557D016	0.0 - 0.5	D11	100,000	mg/kg
Pu-239/240	0.288	557D021	0.0 - 0.5	D14	12.7	pCi/g
Selenium	2.95	557D019	0.0 - 0.5	D13	5,100	mg/kg
Silver	2.59	557D002	0.0 - 0.25	D02	5,100	mg/kg
Tl-208	0.733	557D009	0.0 - 0.5	D08	5	pCi/g
U-234	1.042	557D010	1.0 - 1.5	D08	143	pCi/g
U-235	0.153	557D008	0.0 - 0.5	D07	17.6	pCi/g
U-238	0.965	557D010	1.0 - 1.5	D08	105	pCi/g

J = Estimated value

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 DQO decisions are sound and defensible.

The DQA process as presented in Appendix B comprises the following steps:

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

Sample locations that support the presence and/or extent of contamination at each CAS are shown in Appendix B. Based on the results of the DQA presented in Appendix B, the DQO requirements for CAU 557 have been met. The DQA also determined that information generated during the CAI support the CSM assumptions and that the data collected support their intended use in the decision-making process.

2.3 Justification for No Further Action

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

The only contaminant identified at concentrations exceeding PALs was TPH-DRO. This was identified at three of the four CASs (CASs 03-02-02, 06-99-10, and 25-25-18); however, because the individual hazardous constituents of diesel did not exceed their corresponding FALs, TPH-DRO is not considered to be a COC at these sites.

As no COCs were identified, no corrective action is required for CAU 557. Appendix C presents the justification for no further action based on risk.

As a best management practice (BMP) at CAS 03-02-02, the vertical casing will be removed and properly disposed, and the resulting excavation will be backfilled to grade with inert material. As a BMP at CAS 06-99-10, the tar material will be removed and properly disposed.

2.3.1 Final Action Levels

The CAU 557 FALs are risk-based cleanup goals that, if met, will ensure that each release site will not pose an unacceptable risk to human health and the environment, and that conditions at each site are in compliance with all applicable laws and regulations. The risk-based corrective action (RBCA) process used to establish FALs is described in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006). This process conforms with NAC Section 445A.227, which lists the requirements for sites with soil contamination (NAC, 2006b). For the evaluation of corrective actions, NAC Section 445A.22705 (NAC, 2006c) requires the use of American Society for Testing and Materials (ASTM) Method E 1739-95 (ASTM, 1995) to "conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards (i.e., FALs) or to establish that corrective action is not necessary."

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

- Tier 1 Evaluation – Sample results from source areas (highest concentrations) are compared to action levels based on generic (non-site-specific) conditions (i.e., the PALs established in the CAIP [NNSA/NSO, 2008]). The FALs may then be established as the Tier 1 action levels, or the FALs may be calculated using a Tier 2 evaluation.

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

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

A Tier 1 evaluation was conducted for all COPCs to determine whether contaminant levels satisfy the criteria for a quick regulatory closure or warrant a more site-specific assessment. This was accomplished by comparing individual source area contaminant concentration results to the Tier 1 action levels (the PALs established in the CAIP [NNSA/NSO, 2008]).

The constituents detected at the CAU 557 CASs that exceeded Tier 1 action levels were:

- TPH-DRO at CASs 03-02-02, 06-99-10, and 25-25-18

The concentrations of all constituents and CASs not listed above were below Tier 1 action levels, and the corresponding FALs were established as the Tier 1 action levels.

The TPH-DRO results that exceeded Tier 1 action levels at CAS 03-02-02, 06-99-10, and 25-25-18 were passed on to a Tier 2 evaluation, which consisted of evaluating the hazardous constituents of diesel to their respective Tier 2 SSTLs. The Tier 2 SSTLs for the hazardous constituents of diesel were established at the corresponding PAL concentrations. None of the individual hazardous constituents of diesel exceeded their Tier 2 SSTLs. Therefore, the FALs were established at the corresponding PAL concentrations, and neither TPH-DRO nor any of the individual hazardous constituents of diesel are considered to be COCs at these sites. Additional details for the calculation of the Tier 2 FALs are presented in Appendix C.

The FALs for all CAU 557 COPCs are shown in Table 2-6.

Table 2-6
Definition of FALs for CAU 557 COPCs

COPCs	Tier 1 Based FALs	Tier 2 Based FALs	Tier 3 Based FALs
VOCs	PALs	None	N/A
SVOCs	PALs	None	N/A
PCBs	PALs	None	N/A
Pesticides	PALs	None	N/A
RCRA Metals	PALs[a]	None	N/A
TPH-DRO	PALs	Region 9 PRGs for individual hazardous constituents of diesel[b]	N/A
Radionuclides	PALs	None	N/A

[a]Based on the background concentrations for metals. Background is considered the average 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 *Region 9 Preliminary Remediation Goals (PRGs)* (EPA, 2004).

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

3.0 Recommendations

No further corrective action is required at CAU 557 based on the implementation of the following corrective actions:

- Close CASs 01-25-02, 03-02-02, 06-99-10, and 25-25-18 under a corrective action of no further action as no contaminants were present at concentrations exceeding FALs.

Selection of this corrective action is consistent with past practices for CASs that do not contain COCs.

The DOE, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) requests that NDEP issue a Notice of Completion for CAU 557 and approval to move the CAU from Appendix III to Appendix IV of the FFACO.

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Appendix A

Corrective Action Investigation Results

A.1.0 Introduction

This appendix presents the CAI activities and analytical results for CAU 557: Spills and Tank Sites. The following four CASs comprise CAU 557 and are located in Areas 1, 3, 6, and 25 of the NTS (see Figure 1-1). Additional information regarding the history of each site, scope of the investigation, and planning of activities, is presented in the CAU 557 CAIP (NNSA/NSO, 2008).

- CAS 01-25-02, Fuel Spill
- CAS 03-02-02, Area 3 Subdock UST
- CAS 06-99-10, Tar Spills
- CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site

Corrective Action Site 01-25-02, Fuel Spill, consists of residual diesel contamination in soil remaining at the bottom of a backfilled excavation at the Area 1 Batch Plant. The diesel is associated with a historical diesel fuel release that was remediated through excavation in late 1993 and early 1994 at which time the excavation was backfilled to grade with clean native soil (REECo, 1994a and b). However, it was reported that the diesel contamination was not completely removed, as a diesel concentration of 1,740 mg/kg remained at the bottom of the excavation (REECo, 1994c). The CAS location and site layout is shown on Figure A.3-1.

Corrective Action Site 03-02-02, Area 3 Subdock UST, was investigated due to a potential release of contaminants into the surrounding media from an undocumented flush-mounted subsurface steel feature having an unknown purpose or design configuration. The feature was discovered in 2004 during a site visit to CAS 03-20-04 under CAU 145 (Fahringer, 2004). The CAS location and site layout is shown on Figure A.4-1.

Corrective Action Site 06-99-10, Tar Spills, is located approximately 500 ft south of CP-72, just west of a utility access road that parallels Mercury Highway, and consists of potential soil contamination from two surface spills of a tar-like material released from an unknown source. The CAS location and site layout is shown on Figure A.5-1.

Correction Action Site 25-25-18, Train Maintenance Bldg 3901 Spill Site, is located just north of the ETSM Building within the EMAD facility in Area 25. This CAS consists of potential soil contamination from a historic surface spill reported to be released on both sides of the railroad tracks leading into the north bay of the ETSM Building. The ETSM Building (Bldg 3901) was used for servicing train engines and other equipment. The CAS location and site layout is shown on Figure A.6-1.

A.1.1 Project Objective

The primary objective of the CAI is to provide sufficient information to document completion of appropriate corrective actions for each CAS within CAU 557 and to support recommendations for closure of the CAU 557 CASs. This objective was achieved by confirming the absence of COCs at all four CASs within CAU 557.

The selection of soil and/or waste characterization sample locations for CAU 557 was based on a combination of past and present site conditions and the sampling strategies developed for each site during the DQO process, as outlined in Appendix A of the CAU 557 CAIP (NNSA/NSO, 2008). The sampling strategy for CAU 557 implemented a judgemental sampling approach which involved the collection of samples from biased locations at each CAS. Sampling locations were selected as the most likely locations to find contamination, if present.

A.1.2 Contents

This appendix describes the investigation activities performed at CAU 557 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 overview of the investigation.
- Sections A.3.0 through A.6.0 provide CAS-specific information regarding the field activities, sampling methods, and laboratory analytical results from investigation sampling.
- Section A.7.0 summarizes waste management activities.
- Section A.8.0 discusses the QA and QC processes followed, and results of QA/QC activities.
- Section A.9.0 provides a summary of the investigation results.
- Section A.10.0 lists the cited references.

The complete field documentation and laboratory data — including field activity daily logs, sample collection logs (SCLs), analysis request/chain-of-custody forms, sample descriptions, laboratory certificates of analyses, analytical results, and surveillance results — are retained in the CAU 557 project files as hard copy or as electronic media.

A.2.0 Investigation Overview

Field investigation and sampling activities for the CAU 557 CAI were conducted from May 5 through November 24, 2008. Table A.2-1 lists the CAI activities that were conducted at each CAS.

Table A.2-1
Corrective Active Investigation Activities Conducted at CAU 557 To Meet CAIP Requirements

CAI Activities	CAS			
	01-25-02	03-02-02	06-99-10	25-25-18
Inspected CAS and potential CAS system components identified in the CAIP.	X	X	X	X
Reviewed previous site geophysical survey results.	--	X	--	--
Reviewed previous site radiological walkover survey results and conducted a radiological surface soil walkover survey.	--	X	--	X
Performed general site walkovers to identify biased sampling locations.	X	X	X	X
Drilled a borehole, observed lithology changes, logged soil types, and collected soil samples.	X	--	--	--
Conducted video surveys using a video-mole survey instrument to identify system configurations.	--	X	--	--
Field screened selected soil samples for VOCs using an air headspace method and handheld PID.	X	X	X	X
Field screened samples for alpha and beta/gamma radiation using a handheld survey instrument.	X	X	X	X
Collected sand/sediment, solid material, and stained soil for waste characterization in support of potential disposal recommendations.	--	X	X	X
Collected surface, near subsurface and/or subsurface soil samples.	X	X	X	X
Collected swipes of sample jars and shipping coolers for removable radioactivity for shipping samples to offsite laboratories.	X	X	X	X
Submitted select samples for offsite laboratory analysis.	X	X	X	X
Collected site marker and sample coordinates for reference.	X	X	X	X

-- = Not applicable

The investigation and sampling program was managed in accordance with the requirements set forth in the CAU 557 CAIP (NNSA/NSO, 2008). Samples were collected and documented following the

CAIP and approved protocols and procedures. Quality control samples (e.g., field blanks, equipment rinsate blanks, trip blanks, and FD samples) were collected as required by the Industrial Sites QAPP (NNSA/NV, 2002) and the CAU 557 CAIP. During field activities, waste minimization practices were followed according to approved procedures, including segregation of the wastes according to their waste stream.

The CASs were investigated by conducting radiological surveys, sampling potential contaminant sources, and sampling surface and shallow subsurface soils. At CAS 01-25-02, subsurface soils were collected using a drill rig. At all other CASs, surface soil samples were collected through excavation using hand tools and subsurface soil samples were collected using a hand auger or via excavation using a backhoe when sampling depths were greater than 4 ft bgs. The soil samples were field screened at specific locations for VOCs using the headspace method, and for total (gross) alpha and beta/gamma radiation using handheld instruments. The FSRs were compared against FSLs to select samples to be submitted for offsite laboratory analyses. Samples of tar at CAS 06-99-10 were collected to support both environmental and waste characterization decisions.

The planned sampling locations were accessible, and sampling activities were not restricted and remained within anticipated spatial boundaries at each CAS.

Based on analytical sampling results, Decision II step-out samples were not necessary at any of the CAU 557 CASs. Sections A.2.1 through A.2.4 provide the investigation methodology, site geology and hydrology, and laboratory analytical information.

A.2.1 Boring and Sample Locations

Investigation locations selected for sampling were based on interpretation of existing engineering drawings, aerial and land photographs, interviews with former and current site employees, information obtained during site visits, and site conditions as provided in the CAU 557 CAIP (NNSA/NSO, 2008). 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 provided in the CAIP. Actual environmental sample locations are shown on the figures included in Sections A.3.0 through A.6.0 of this document. Some locations at CAS 03-02-02 were modified slightly from planned positions due to field conditions and/or observations made during inspections.

Sample locations were staked and labeled for reference, and Appendix D presents the coordinates in tabular format for sample locations at each CAS.

A.2.2 Investigation Activities

The investigation activities performed at each CAS within CAU 557 were based on field investigation activities discussed in the CAU 557 CAIP (NNSA/NSO, 2008). The technical approach consisted of the activities listed in Table A.2-1. The CAS-specific investigation strategy allowed for the establishment of the nature and extent of potential contamination associated with each CAS. The following sections describe the specific investigation activities that took place at the CAU 557 CASs.

A.2.2.1 Radiological Walkover Surveys

Before the CAI at CAS 03-02-02 and during the CAI at CAS 25-25-18, surface radiological walkover surveys were performed to identify the presence of potential radiological contaminants at activities that are distinguishable from background activities at these sites. The surveys were performed using a handheld plastic scintillation detector in conjunction with a global positioning receiver and data logger.

A.2.2.2 Geophysical Surveys

No geophysical surveys were performed at any of the CASs during this investigation; however, at CAS 03-02-02, previous geophysical survey results were reviewed, and investigation areas and proposed sampling points were identified in the CAIP (NNSA/NSO, 2008).

A.2.2.3 Field Screening

Field-screening activities for VOCs, gross alpha and beta/gamma radiation, and gamma-emitting radionuclides were performed at each CAS as specified in the CAU 557 CAIP (NNSA/NSO, 2008). Field screening for VOCs was conducted using a PID. Gross alpha and beta/gamma radioactivities were determined by using a handheld radiation detection instrument that was held within an inch over the sample for one minute. The radiological field screening was performed using an NE Technology Electra fitted with a DP6 dual-alpha and beta/gamma radiation scintillation probe.

Before the start of sampling activities at each CAS, the background activity for gross alpha and beta/gamma radiation was established for the site. The site-specific FSLs for radiation were defined as the mean background activity level plus two times the standard deviation of readings taken from 10 background locations that were selected near each CAS. In addition, the radiation FSLs are instrument-specific and were established for each instrument and CAS before use. At each specific sampling location, the sample material was field screened for gross alpha and beta/gamma radiation, before sample collection. The FSRs were compared against daily FSLs to guide in the selection of samples from specific intervals and/or locations. Field screening was also performed for health and safety controls and to meet transportation requirements.

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

A.2.2.4 Video Surveys

A video survey was conducted at CAS 03-02-02 using a video-mole surveying instrument to inspect the interior of the vertical casing, to determine the integrity of the steel casing and the presence of any pipe tie-ins, and to determine whether contents were present within the casing itself. Video-mole surveys were not required at any of the other CAU 557 CASs.

A.2.2.5 Surface and Subsurface Soil Sampling

Surface soil samples were collected using hand sampling methods (scoop and trowel), while subsurface soil samples were collected using hand augering, backhoe excavation, and drill rig methods. All samples were field screened for alpha and beta/gamma radiation before the start of sampling, as well as for VOC headspace screening during sample collection to guide in the sample collection decisions during the CAI and to serve as a health and safety control for protection of the sampling team. Sample containers were filled according to the following sequence:

1. Volatile organic compound sample containers were filled with soil directly from the sample location for both laboratory analysis and headspace field screening.

2. Additional soil was transferred into a stainless-steel bowl, homogenized, and field screened for alpha and beta/gamma radiation. Radiological isotope and gamma radiation sample containers were then filled for laboratory analyses.

3. Sample containers for TPH-DRO analyses were then filled with the homogenized soil followed by all remaining sample containers for laboratory analyses.

4. Excess soil was returned to its original location and the sample containers used for field screening were appropriately disposed (based on FSRs and/or analytical results).

Surface soil samples were collected from biased locations focusing on aboveground features, stained soil, and radiological measurements. Shallow subsurface soil samples were collected from beneath the surface locations where continuation of soil staining was noted.

No surface soil samples were collected at CAS 01-25-02 or 03-02-02 because the samples of the source of the releases were known to be below the surface. Subsurface samples were collected from locations exhibiting a biasing factor or at depth intervals surrounding system components.

For additional investigation details, refer to the Sections A.3.0 through A.6.0.

A.2.2.6 Waste Characterization Sampling

Characterization of CAS-specific wastes were performed to support recommendations/decisions for potential disposal of these items during closure activities, and to determine whether the waste in question at these CASs could be acting as a source of potential soil contamination.

Table A.2-2
Laboratory Analyses and Methods, CAU 557 Investigation Samples[a]
(Page 1 of 2)

Analysis	Analytical Method[b]
VOCs	Aqueous/Non-aqueous - EPA SW-846[c] 8260
TCLP VOCs	EPA SW-846[c] 1311/8260
SVOCs	Aqueous/Non-aqueous - EPA SW-846[c] 8270
TCLP SVOCs	EPA SW-846[c] 1311/8270
PCBs	Aqueous/Non-aqueous - EPA SW-846[c] 8082
TPH-DRO	Aqueous/Non-aqueous - EPA SW-846[c] 8015 Modified

Table A.2-2
Laboratory Analyses and Methods, CAU 557 Investigation Samples[a]
(Page 2 of 2)

Analysis	Analytical Method[b]
Pesticides	Aqueous/Non-aqueous - EPA SW-846[c] 8081
RCRA Metals and Beryllium	Aqueous - EPA SW-846[c] 6010/7470 Non-aqueous - EPA SW-846[c] 6010/6020/7471
TCLP RCRA Metals	EPA SW-846[c] 1311/6010/7470
Isotopic U	Aqueous/Non-aqueous - DOE EML HASL-300[d] U-02-RC
Isotopic Pu	Aqueous - DOE EML HASL-300[d] Pu-10-RC Non-aqueous - DOE EML HASL-300[d] Pu-02-RC
Sr-90	Aqueous - EPA 905.0[e] Non-aqueous - DOE EML HASL-300[d] Sr-02-RC
Gamma Spectroscopy	Aqueous - EPA 901.1[e] Non-aqueous - DOE EML HASL-300[d] Ga-01-R

[a]Investigation samples include confirmation, environmental, waste characterization and associated QC samples.
[b]The most current EPA, DOE, ASTM, or equivalent accepted analytical method may be used, including Laboratory Standard Operating Procedures approved by SNJV in accordance with industry standards and Statement of Work requirements.
[c]*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 2008).
[d]*The Procedures Manual of the Environmental Measurements Laboratory* (DOE, 1997).
[e]*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 SNJV’s Analytical Services Department.

EML = Environmental Measurements Laboratory
EPA = Environmental Protection Agency
HASL = Health and Safety Laboratory
SNJV = Stoller-Navarro Joint Venture
TCLP = Toxicity Characteristic Leaching Procedure

Samples were analyzed in accordance with the CAU 557 CAIP (NNSA/NSO, 2008). The analytical suites and laboratory methods used to analyze potential waste samples are listed in Table A.2-2. The analytical results were compared to the federal action limits for hazardous waste, the NDEP hydrocarbon action limit, landfill acceptance criteria, and to the limits presented in the NTS performance objective criteria (POC) (BN, 1995). The POC limits have been established for NTS hazardous waste generators to ensure that all hazardous waste being shipped offsite does not contain “added radioactivity.”

Specific waste characterization sampling and analysis was conducted on the tar material on the ground surface at CAS 06-99-10. In addition, to assist in potential waste decisions for

CASs 03-02-02 and 25-25-18, waste characterization sampling and analysis was also conducted on the sediment within the steel casing at CAS 03-02-02 and on the stained soil at CAS 25-25-18. Additional detail regarding waste characterization activities, analyses, and sample results are provided in the applicable CAS-specific subsections and in Section A.7.0.

A.2.3 Laboratory Analytical Information

The analytical parameters are CAS-specific and were selected through the application of site process knowledge according to the DQOs presented in the CAU 557 CAIP (NNSA/NSO, 2008). Chemical analyses were performed by EMAX Laboratories, Inc., of Torrance, California, while the radiological analyses were performed by Eberline Services of Oakridge, Tennessee. The analytical suites and laboratory analytical methods used to analyze investigation samples are listed in Table A.2-2. Analytical results are reported in the following CAS-specific subsections only if they were detected above the laboratory minimum detectable concentrations (MDCs). The complete laboratory data packages are available in the project files.

Validated analytical data for CAU 557 investigation samples have been compiled and evaluated to confirm the absence of COC contamination at each of the four sites. The analytical results for each CAS are presented in Sections A.3.0 through A.6.0.

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 C.

If a COC is present in the environmental media, a corrective action must be considered for the CAS. The FALs for the CAU 557 investigation have been defined for each CAS as shown in Appendix C. Analytical results that are equal to or greater than FALs are identified by bold text in the CAS-specific results tables present in Sections A.3.0 through A.6.0.

A corrective action may also be necessary if there is a potential for waste material that is present at a site to release a COC to the site environmental media (i.e., PSM). To evaluate a waste for such a scenario, 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.
- For non-liquid wastes, the concentration of the contaminants in the surrounding soil would be equal to the concentration of contaminants in the waste.
- For liquid wastes, the resulting concentration of contaminants in the surrounding soil would be calculated based on the concentration of contaminants in the wastes and the liquid holding capacity of the soil.

A.3.0 CAS 01-25-02, Fuel Spill, Investigation Results

Corrective Action Site 01-25-02 is located at the Area 1 Batch Plant and was investigated to confirm the absence or presence of diesel fuel at the bottom of a former excavation. It was reported in late 1993 that stained soil was discovered while excavating for the construction of a concrete pad (REECo, 1994a). The CAS location and site layout is shown on Figure A.3-1.

The hydrocarbon-impacted soil was removed in late 1993 and early 1994, and the excavation was backfilled to grade. Soil verification samples were collected from the sidewalls and bottom of the excavation before backfilling (REECo, 1994b). Review of the analytical results determined sufficient soil had been removed in the horizontal direction; however, diesel fuel still remained at the excavation bottom at a concentration of greater than regulatory levels (REECo, 1994c).

During the DQO process in preparation for the CAU 557 CAIP (NNSA/NSO, 2008), review of analytical results from the 1993-1994 soil removal and sampling activities was inconclusive with respect to the detection and removal of the hazardous constituents of diesel fuel at the base of the former excavation.

A.3.1 Corrective Action Investigation

A total of three confirmation soil samples (including one FD) were collected during CAI activities at CAS 01-25-02. The sample IDs, locations, matrix types, and analyses are listed in Table A.3-1, while the sampling locations are shown on Figure A.3-1. The specific CAI activities conducted to satisfy the CAIP requirements at this CAS (NNSA/NSO, 2008) are described in the following sections.

A.3.1.1 Visual Inspections

Subsurface soils were visually inspected during drilling activities at CAS 01-25-02 to identify biasing factors (i.e., staining, soil discoloration) and to identify the boundary between excavation backfill material and the underlying native soil. Backfill material consisting of light brown gravelly sand was observed from 0 ft bgs to approximately 13 ft bgs. At 13 ft bgs, a distinct color change to orange-brown moist sand was observed that may represent the native soil interface; however, a distinct boundary between backfill material and native soil was not identified. This is attributed to the

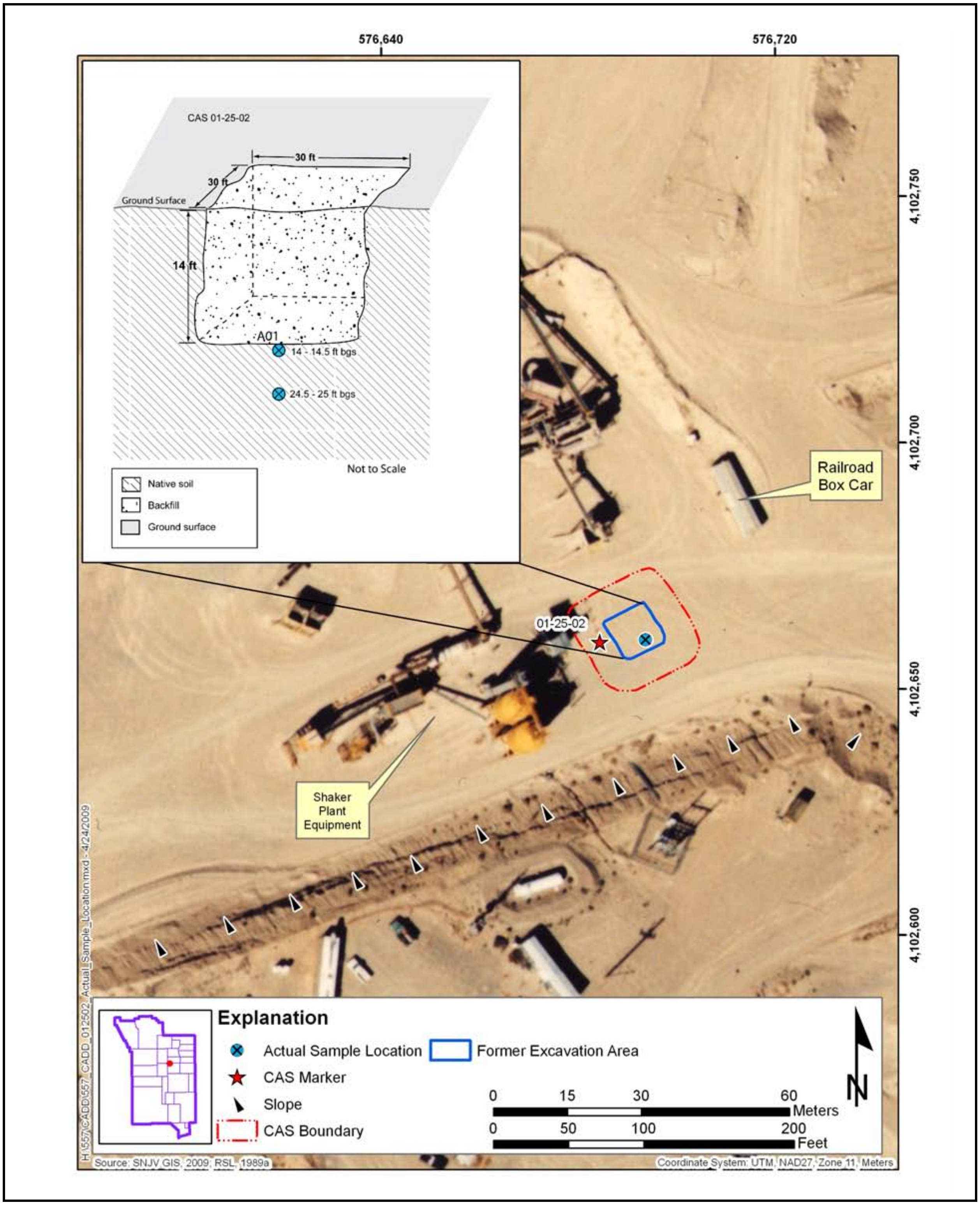

Figure A.3-1
Corrective Action Investigation Site Map for CAS 01-25-02, Fuel Spill

Table A.3-1
Samples Collected at CAS 01-25-02, Fuel Spill

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	TPH-DRO	SVOCs	VOCs
A01	557A001	14.0 - 14.5	Soil	Environmental	X	X	X
	557A002	14.0 - 14.5	Soil	FD of #557A001	X	X	X
	557A003	24.5 - 25.0	Soil	Environmental	X	X	X
N/A	557A301	N/A	Water	Trip Blank	--	--	X

-- = Not required

backfill material, consisting of gravelly sands, being similar in composition to the geology of the Area 1 Batch Plant (accumulations of well to poorly sorted sandy wash sediments). Therefore, FSRs and other biasing factors were used to identify the soil interval most likely to contain contamination. No additional biased samples were collected other than those proposed in the CAU 557 CAIP (NNSA/NSO, 2008).

A.3.1.2 Field Screening

Investigation samples were field screened for VOCs using a PID and for gross alpha and beta/gamma radiation using handheld radiological survey instruments. The FSRs were compared to FSLs to guide subsequent sampling decisions. Core material retrieved during drilling was field screened for VOCs at 5-ft intervals (or more often based on biasing factors). Screening began at 12 ft bgs (a depth slightly shallower than the expected bottom of the former excavation) and continued into native soil to a depth of 25 ft bgs. All VOC FSRs were below 20 ppm, with the highest recorded FSR of 5.5 ppm at a depth of 14.0 to 14.5 ft bgs (sample 557A001 and FD 557A002). The FSRs decreased with depth from this interval to 3.5 ppm at 20 ft bgs and to 3.0 ppm at 25 ft bgs. No samples exceeded alpha or beta/gamma FSLs.

A.3.1.3 Sample Collection

Three environmental soil samples were collected at this CAS to determine whether residual diesel contamination beneath the previously removed contaminated soil exceeds FALs. Soil samples were collected using drilling methods at a location in the middle of the former excavation at depths where the greatest concentration of contaminants were expected to be found, based on the 1993-1994 sampling results. Because the exact depth of the former excavation was not known, screening for VOCs began at a depth of 12 ft bgs during this CAI to approximate the bottom of the former excavation. Sample 557A001 (and FD 557A002) was collected from the 14.0 to 14.5 ft bgs interval because the FSR for VOC headspace was the highest (5.5 ppm) at this interval. This was also the interval of a distinct soil change from light brown gravelly sand to orange brown sand with more moisture. Additional deeper soil intervals were field screened for VOCs to verify that contamination decreases with depth. One soil sample (557A003) was collected from 24.5 to 25.0 ft bgs, which is the interval in native soil with the lowest FSR of 3.0 ppm. The CAIP for CAU 557 planned for an optional second boring to be drilled if contamination in the first boring was shown to increase with depth. Because this was not the case, only one boring was drilled, and the lateral extent has been established by the former excavation sidewalls (NNSA/NSO, 2008).

A.3.1.4 Deviations

There were no deviations to the CAIP requirements at this CAS. Investigation samples were collected as outlined in the CAU 557 CAIP (NNSA/NSO, 2008). Samples were submitted for laboratory analysis, as specified in 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, 2008). 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 01-25-02 is listed on Table A.3-1. An assessment of the analytical results is provided in Appendix B.

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 results against the corresponding PALs. The FALs were established as the corresponding PAL concentrations if the contaminant concentrations were below their respective PALs. Establishment of the FALs is presented in Appendix C.

A.3.2.1 Volatile Organic Compounds

Analytical results for VOCs in soil samples collected at this CAS that were detected above MDCs are 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.

Table A.3-2
Soil Sample Results for VOCs Detected above MDCs at CAS 01-25-02, Fuel Spill

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)
			Acetone
FAL			54,000
A01	557A001	14.0 - 14.5	0.00303 (J)
	557A003	24.5 - 25.0	0.003 (J)

J = Estimated value

A.3.2.2 Semivolatile Organic Compounds

No analytical results for SVOCs in soil samples collected at this CAS were detected above MDCs.

A.3.2.3 Total Petroleum Hydrocarbons

Analytical results for TPH-DRO in soil samples collected at this CAS that were detected above MDCs are presented in Table A.3-3. Because TPH-DRO was not detected at a concentration exceeding the PAL, the FAL was established at the corresponding PAL concentration.

Table A.3-3
Soil Sample Results for TPH-DRO Detected above MDCs at CAS 01-25-02, Fuel Spill

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)
			TPH-DRO
FAL			100
A01	557A001	14.0 - 14.5	1.47 (J)
	557A002	14.0 - 14.5	1.21 (J)
	557A003	24.5 - 25.0	1.5 (J)

J = Estimated value

A.3.3 Nature and Extent of Contamination

Based on the analytical results in the environmental soil samples collected within CAS 01-25-02, no COCs are present, and the initial 1993-1994 cleanup was confirmed. Therefore, no further action is required at this CAS.

A.3.4 Conceptual Site Model

The CAIP requirements were met at this CAS, and no revisions were necessary to the original CSM.

A.4.0 CAS 03-02-02, Area 3 Subdock UST, Investigation Results

Corrective Action Site 03-02-02 is located at the Area 3 Subdock and consists of an undocumented buried steel casing used for unknown purposes. The system components consist of a flush-mounted 5-ft diameter perforated steel casing, which is set vertically. The casing is fitted with a steel lid that is welded to the top and has side flaps overlapping the first 2 ft of the casing. No other features associated with the casing were identified during the CAI. The CAS location and site layout is shown on Figure A.4-1.

Before the CAI, geophysical walkover surveys were conducted at this CAS that indicated a possible second feature, suggesting shallow piping connecting to the main feature (Weston, 2006). In addition, a radiological walkover survey was conducted at CAS 03-02-02 which indicated the general CAS area to be similar to the site background readings and no radiological concern was identified.

A.4.1 Corrective Action Investigation

A total of six environmental soil samples were collected during CAI activities at CAS 03-02-02. The sample IDs, locations, matrix types, and analyses performed are listed in Table A.4-1, while the sample locations are shown on Figure A.4-1. The specific CAI activities conducted to satisfy the CAIP requirements at this CAS (NNSA/NSO, 2008) are described in the following sections.

A.4.1.1 Geophysical Survey

Before the CAI, a preliminary geophysical survey was performed at CAS 03-02-02 that identified two large anomalies and several linear anomalies (Weston, 2006). The first anomaly corresponds to the main feature of the CAS, a vertical steel casing with a lid that is flush with the ground surface and mostly covered with soil. The second large anomaly is located approximately 5 ft northeast of the steel casing and was interpreted to be a second feature connected to the steel casing by subsurface piping at a depth of 1 m or less.

A.4.1.2 Visual Inspections

Visual inspections were conducted during excavation activities to determine the configuration of the CAS feature(s) and to identify any biasing factors that would warrant sample collection. Initial

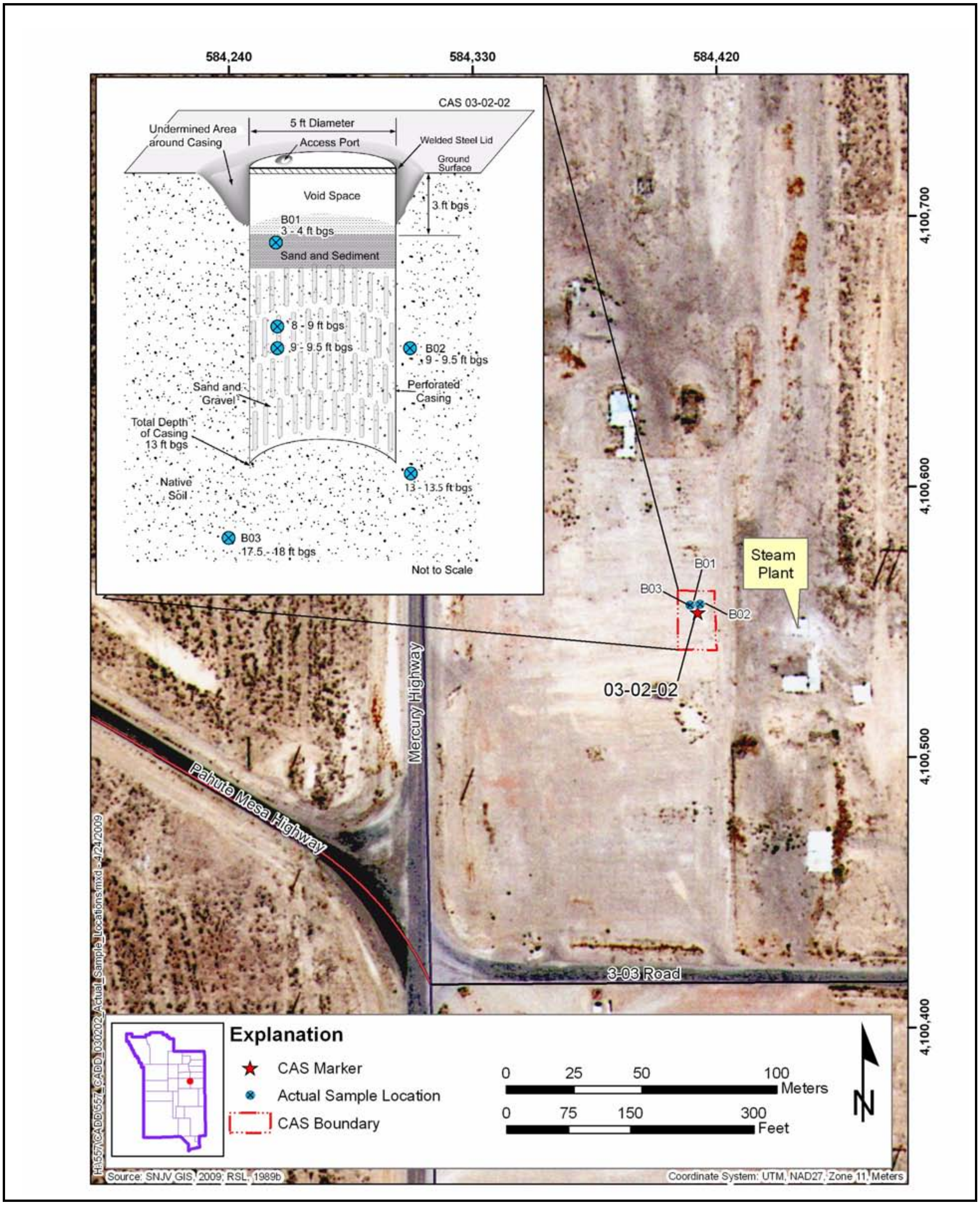

Figure A.4-1
Corrective Action Investigation Site Map for CAS 03-02-02, Area 3 Subdock UST

Table A.4-1
Samples Collected at CAS 03-02-02, Area 3 Subdock UST

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	TPH-DRO	Gamma Spectroscopy	RCRA Metals	PCBs	VOCs	SVOCs	Plutonium	Sr-90	TCLP Metals	TCLP SVOCs	TCLP VOCs	Uranium
B01	557B001	3.0 - 4.0[a]	Sediment	Environmental	X	X	X	X	X	X	X	X	--	--	--	X
	557B002	8.0 - 9.0[b]	Sediment	Environmental	X	X	X	X	X	X	X	X	--	--	--	X
	557B003	9.0 - 9.5[c]	Sediment	Environmental	X	X	X	X	X	X	X	X	X	X	X	X
B02	557B004	9.0 - 9.5	Soil	Environmental	X	X	X	X	X	X	X	X	--	--	--	X
	557B005	13.0 - 13.5	Soil	Environmental	X	X	X	X	X	X	X	X	--	--	--	X
B03	557B006	17.5 - 18.0	Soil	Environmental	X	X	X	X	X	X	X	X	--	--	--	X
N/A	557B301	N/A	Water	Trip Blank	--	--	--	--	X	--	--	--	--	--	--	--
N/A	557B302	N/A	Water	Trip Blank, QC	--	--	--	--	X	--	--	--	--	--	--	--
Sample Table	557B303	N/A	Water	Field Blank	X	X	X	X	--	X	X	X	--	--	--	X
N/A	557B304	N/A	Water	Equipment Rinsate	X	X	X	X	--	X	X	X	--	--	--	X
N/A	557B305	N/A	Water	Equipment Rinsate	X	X	X	X	--	X	X	X	--	--	--	X

[a]Casing contents start at 3 ft bgs (i.e., sample was taken from 0 to 1 ft below top of sand/sediment layer).
[b]Casing contents start at 3 ft bgs (i.e., sample was taken from 5 to 6 ft below top of sand/sediment layer).
[c]Casing contents start at 3 ft bgs (i.e., sample was taken from 6 to 6.5 ft below top of sand/sediment layer).

Sr = Strontium
-- = Not required

inspection identified an 8-in. diameter access portal as part of the steel casing lid; however, no pipe tie-ins to the casing were observed. Further excavation identified abundant 2- to 4-in. diameter perforations throughout the length of the 13-ft steel casing. The perforations allowed the liquid to directly discharge to the surrounding soils. To uncover the possible origins of the geophysical anomalies, a series of three parallel trenches were excavated (within the limits of two nearby underground utility lines) to a total depth of 6 ft bgs in the area northeast of the steel casing. No subsurface features, debris, or other biasing factors were identified in the area of the anomaly that would warrant the collection of environmental samples. Also, soil was excavated along the east-northeast side of the steel casing and confirmed that there are no subsurface connections to other features. Two additional trenches were excavated on the south side of the steel casing to investigate the smaller linear anomalies. It was determined that the anomalies south of the steel casing corresponded to inactive telecommunication lines (typical of the NTS) that were uncovered at a depth of 1.0 to 1.5 ft bgs.

Soil intervals were continuously monitored during hand augering and excavation activities to identify biasing factors. Biased samples were collected from dark-stained, rust-stained, and debris-containing soils that were identified in soil sample intervals during hand augering within the steel casing. Trenches that were excavated to uncover geophysical anomalies were also inspected during excavation activities (see Section 2.1.2.1).

A.4.1.3 Video Surveys

The interior of the vertical casing was inspected with a video-mole camera by accessing an 8-in. diameter portal present on the welded steel lid. A video survey was performed to determine the design configuration of the system, evaluate the integrity of the CAS components, identify possible component pipe tie-ins, and identify whether contents were present. No additional feature components were identified, and no pipe tie-ins to the casing were observed. The casing contained approximately 3 ft of void space above a mixture of sandy sediment; however, no liquid influent was present in the casing.

A.4.1.4 Field Screening

Investigation samples were field screened for VOCs, and alpha and beta/gamma radiation. The FSRs were compared to respective FSLs to guide subsequent sampling decisions where appropriate. The VOC headspace FSRs were not exceeded in samples collected at this CAS. Gross alpha or beta/gamma radiation FSLs were not exceeded in any samples.

A.4.1.5 Sample Collection

Intrusive investigation activities were conducted to support Decision I environmental sampling and included the collection of six subsurface soil samples. Because the perforated vertical casing was designed to release effluent directly into the surrounding soils, three samples were collected adjacent to, at the base of, and below the casing to determine whether contamination had been released from the system. Three samples (557B001, 557B002, and 557B003) were collected via hand auger from the sand/sediment that had accumulated inside the casing as a result of the surface runoff to determine whether contamination had adhered or adsorbed to the soil particles and remained inside the casing. All three intervals sampled had biasing factors present, including slightly moist and discolored soil that contained bits of paper debris and scraps of rusted metal. Auger refusal was at 9.5 ft bgs when a soil and gravel mixture was encountered. Sampling (557B004) continued via backhoe at 9.5 ft bgs from the native soil outside the casing adjacent to a perforation in the steel at the same depth as the auger refusal. A deeper sample (557B005) was collected in the native soil adjacent to a perforation from the casing bottom depth at 13 to 13.5 ft bgs due to maximum reach of the backhoe. An additional soil sample (557B006) was collected beneath the bottom of the casing, in native soil, at a depth from 17.5 to 18 ft bgs using sloping excavation methods. No additional biased sample locations were identified at this CAS.

A.4.1.6 Deviations

There were no deviations to the CAIP requirements at this CAS. Investigation samples were collected as outlined in the CAU 557 CAIP (NNSA/NSO, 2008). Samples were submitted for laboratory analysis, as indicated in the CAIP.

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, 2008). Investigation samples were analyzed for the CAIP-specified COPCs. The parameters and laboratory methods used to analyze the investigation samples are listed in Table A.2-2. The sample-specific analytical suite for CAS 03-02-02 is listed on Table A.4-1. An assessment of the analytical results is provided in Appendix B.

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 their respective FALs. Establishment of the FALs is presented in Appendix C.

Additional results (i.e., TCLP results) to support potential waste disposal of the soil within the casing are presented in Section A.7.3.

A.4.2.1 Volatile Organic Compounds

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

A.4.2.2 Semivolatile Organic Compounds

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

A.4.2.3 Total Petroleum Hydrocarbons

Analytical results for TPH-DRO concentrations in soil samples collected at this CAS that were detected above MDCs are presented in Table A.4-2. One sand/sediment sample collected from within the casing exceeded the PAL of 100 mg/kg for TPH-DRO. The TPH-DRO was moved on to a Tier 2 evaluation, and FALs were established for the hazardous constituents of diesel. Concentrations of the hazardous constituents of diesel did not exceed FALs. Therefore, TPH-DRO is not considered a

COC at this CAS. The calculation of FALs for the hazardous constituents of TPH-DRO is presented in Appendix C.

Table A.4-2
Soil Sample Results for TPH-DRO Detected above MDCs at CAS 03-02-02, Area 3 Subdock UST

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)
			TPH-DRO
PAL			100
B01	557B001	3.0 - 4.0	9.9 (J)
	557B002	8.0 - 9.0	**270**
	557B003	9.0 - 9.5	75

Bold indicates the results meet or exceed the PAL.

J = Estimated value

A.4.2.4 Total RCRA Metals and Beryllium

Analytical results for RCRA metals and beryllium detected in soil samples above MDCs are presented in Table A.4-3. No metals were detected at concentrations exceeding their PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

Table A.4-3
Soil Sample Results for RCRA Metals and Beryllium Detected above MDCs at CAS 03-02-02, Area 3 Subdock UST
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)					
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead
FALs			23	67,000	1,900	450	450	800
B01	557B001	3.0 - 4.0	3.01	249	0.281 (J)	0.376 (J)	6.6	17.6
	557B002	8.0 - 9.0	2.93	237	0.405 (J)	0.925	6.35	25
	557B003	9.0 - 9.5	2.81	196	0.451 (J)	0.471 (J)	7.33	26.9

Table A.4-3
Soil Sample Results for RCRA Metals and Beryllium Detected above MDCs at CAS 03-02-02, Area 3 Subdock UST
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)					
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead
FALs			**23**	**67,000**	**1,900**	**450**	**450**	**800**
B02	557B004	9.0 - 9.5	2.54	232	0.253 (J)	0.121 (J)	4.04	11.1
	557B005	13.0 - 13.5	3.81	219	0.948	0.208 (J)	7.71	21.5
B03	557B006	17.5 - 18.0	3.1	165	0.658	0.198 (J)	5.08	13

J = Estimated value

A.4.2.5 Polychlorinated Biphenyls

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

A.4.2.6 Pesticides

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

A.4.2.7 Gamma-Emitting Radionuclides

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

Table A.4-4
Soil Sample Results for Gamma-Emitting Radionuclides Detected above MDCs at CAS 03-02-02, Area 3 Subdock UST

Sample Location	Sample Number	Depth (ft bgs)	COPCs (pCi/g)						
			Ac-228	Am-241	Cs-137	Eu-155	Pb-212	Pb-214	Tl-208
FALs			5	12.7	12.2	135	5	5	5
B01	557B001	3.0 - 4.0	1.768	--	--	--	1.622 (J)	1.363 (J)	0.49
	557B002	8.0 - 9.0	2.109	0.894 (J)	0.688	0.484 (J)	2.298 (J)	1.461 (J)	0.699
	557B003	9.0 - 9.5	--	--	0.433	--	2.13 (J)	1.318 (J)	0.638
B02	557B004	9.0 - 9.5	1.302	--	--	0.291 (J)	1.491 (J)	1.104 (J)	0.456
	557B005	13.0 - 13.5	2.1	--	--	--	2.616 (J)	1.657 (J)	0.69
B03	557B006	17.5 - 18.0	2.164	--	--	1.3 (J)	1.992 (J)	1.314 (J)	0.592

J = Estimated value
-- = Not detected above MDCs.

A.4.2.8 Uranium, Plutonium, and Strontium-90 Isotopes

Analytical results for uranium, plutonium, or Sr-90 isotopes detected in soil samples above MDCs are presented in Table A.4-5. No isotopes were detected at concentrations exceeding their PALs. Therefore, the FALs were established at the corresponding PAL concentrations.

A.4.3 Nature and Extent of Contamination

Based on the analytical results, no COCs were identified in the environmental soil samples collected within CAS 03-02-02.

A.4.4 Conceptual Site Model

The CAIP requirements were met at this CAS, and no revisions were necessary to the CSM.

Table A.4-5
Soil Sample Results for Isotopes Detected above MDCs at CAS 03-02-02, Area 3 Subdock UST

Sample Location	Sample Number	Depth (ft bgs)	COPCs (pCi/g)		
			Pu-239/240	U-234	U-238
FALs			12.7	143	105
B01	557B001	3.0 - 4.0	--	0.95	0.96
	557B002	8.0 - 9.0	0.474	1.316	1.121
	557B003	9.0 - 9.5	--	0.942 (J)	0.828 (J)
B02	557B004	9.0 - 9.5	--	0.898 (J)	0.931 (J)
	557B005	13.0 - 13.5	--	1.161	1.135
B03	557B006	17.5 - 18.0	--	0.95	1.022

-- = Not detected above MDCs.
J = Estimated value

A.5.0 CAS 06-99-10, Tar Spills, Investigation Results

Corrective Action Site 06-99-10 is located in Area 6 approximately 500 ft south of Building CP-72 off a utility access road running parallel to Mercury Highway and consists of potential soil contamination resulting from historical tar material spills. The larger of the two main spills measures approximately 20 by 15 ft while the smaller spill measures 5 by 2 ft. The hardened tar material varies between less than 1 in. in thickness to several inches thick. Additional detail is provided in the CAIP. The CAS location and site layout is shown on Figure A.5-1.

A.5.1 Corrective Action Investigation

A total of three environmental soil samples (including one FD) and one PSM tar sample were collected during CAI activities at CAS 06-99-10. The sample IDs, locations, matrix types, and analyses are listed in Table A.5-1 while the sample locations are shown on Figure A.5-1. The specific CAI activities conducted to satisfy the CAIP requirements at this CAS (NNSA/NSO, 2008) are described in the following sections.

A.5.1.1 Visual Inspections

The area of the spill was visually inspected during sampling activities at CAS 06-99-10 and no other features were identified to be associated with this CAS. The two tar material spills were observed to be of the same material. The asphalt and gravel composition within the tar appeared to be of the same amount and degree.

A.5.1.2 Field Screening

Investigation samples were field screened for VOCs, and alpha and beta/gamma radiation. The FSRs were compared to respective FSLs to select samples to be submitted to the laboratory for analyses. The VOC headspace FSRs were not exceeded in any sample collected at this CAS. Gross alpha and beta/gamma radiation FSLs were not exceeded in any samples. Therefore, samples were not collected at additional locations or depths.

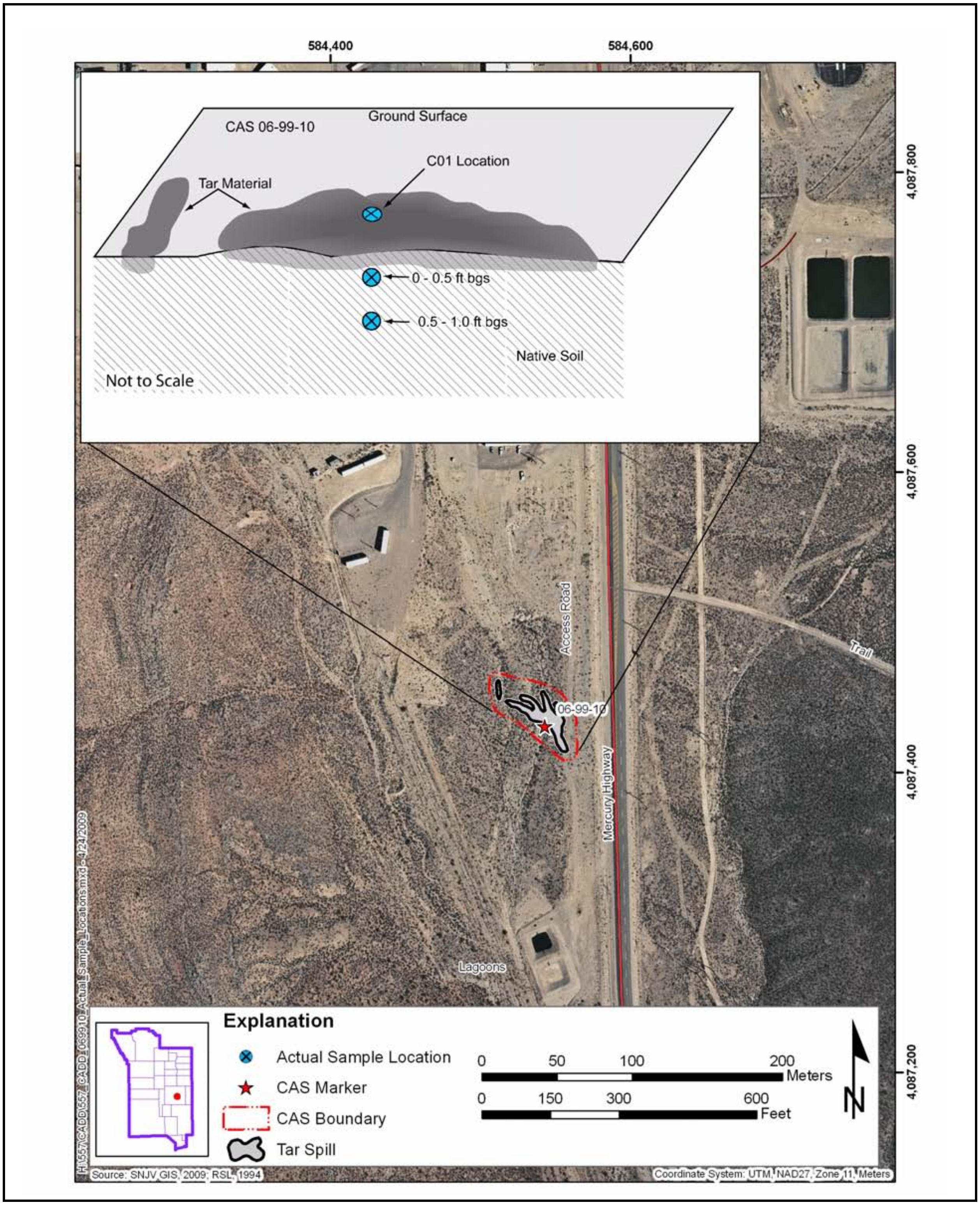

Figure A.5-1
Corrective Action Investigation Site Map for CAS 06-99-10, Tar Spills

Table A.5-1
Samples Collected at CAS 06-99-10, Tar Spills

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	TPH-DRO	SVOCs	TCLP SVOCs	VOCs	TCLP VOCs	Total RCRA Metals	TCLP RCRA Metals	PCBs	Gamma Spectroscopy
C01	557C001	N/A	Solid (tar)	PSM	X	X	X	X	X	X	X	X	X
	557C002	0.0 - 0.5	Soil	Environmental	X	X	--	X	--	X	--	X	X
	557C003	0.0 - 0.5	Soil	FD of 557C002	X	X	--	X	--	X	--	X	X
	557C004	0.5 - 1.0	Soil	Environmental	X	X	--	X	--	X	--	X	X
N/A	557C301	N/A	Water	Trip Blank	--	--	--	X	--	--	--	--	--

-- = Not required

A.5.1.3 Sample Collection

Environmental soil sampling activities included the collection of two surface soil samples (0 to 0.5 ft bgs) from directly beneath one of the hardened tar spills (samples 557C002 and FD 557C003) and one additional deeper subsurface soil sample (557C004) at a depth from 0.5 to 1.0 ft bgs to determine whether the tar had leached into the underlying soils.

Waste characterization sampling activities included the collection of a tar material sample (557C001) to determine the appropriate waste management and potential future disposal actions of the tar. The TCLP results are discussed in Section A.7.3 and presented on Table A.7-2.

A.5.1.4 Deviations

One minor sampling modification was made in the field during the CAI. It was determined (after a visual survey of the tar material) that the two spills were of the same material. Therefore, one representative tar sample was collected and analyzed from the largest spill, instead of one sample from each of the two spills. In addition, underlying soil was collected under the same single tar spill. The samples were submitted for laboratory analysis, as indicated in the CAU 557 CAIP (NNSA/NSO, 2008). Because the tar material did not meet the criteria for being a PSM, and no COCs were identified in the soil, this deviation is considered minor and did not affect the investigation outcome.

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, 2008). Investigation samples were analyzed for the CAIP-specified COPCs. The 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 06-99-10.

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

Analytical results to determine whether the tar is a PSM are discussed in Section A.5.2.9. Waste characterization (TCLP) results to support the recommended BMP for tar removal are discussed in Section A.7.3.

A.5.2.1 Volatile Organic Compounds

No analytical results for VOCs in environmental samples collected at this CAS exceeded the MDCs. Therefore, the FALs were established at the corresponding PAL concentrations.

A.5.2.2 Semivolatile Organic Compounds

No analytical results for SVOCs in environmental samples collected at this CAS exceeded the MDCs. Therefore, the FALs were established at the corresponding PAL concentrations.

A.5.2.3 Total Petroleum Hydrocarbons

Analytical results for TPH-DRO in environmental soil samples collected at this CAS that were detected above MDCs are presented in Table A.5-2. One FD surface soil sample had a concentration at the PAL of 100 mg/kg for TPH-DRO. The parent soil sample only had a concentration of 62 mg/kg. The TPH-DRO results were moved on to a Tier 2 evaluation, and FALs were established for the hazardous constituents of diesel. Because concentrations of the hazardous constituents of diesel did not exceed FALs, TPH-DRO is not considered a COC at this CAS. The calculation of FALs for the hazardous constituents of diesel is presented in Appendix C.

Table A.5-2
Soil Sample Results for TPH-DRO Detected above MDCs
at CAS 06-99-10, Tar Spills

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)
			TPH-DRO
PAL			100
C01	557C002	0.0 - 0.5	62
	557C003	0.0 - 0.5	**100**
	557C004	0.5 - 1.0	32

Bold indicates the results meet or exceed the PAL.

A.5.2.4 Total RCRA Metals

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

Table A.5-3
Soil Sample Results for Total RCRA Metals Detected above MDCs at CAS 06-99-10, Tar Spills

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)					
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury
FALs			**23**	**67,000**	**450**	**450**	**800**	**310**
C01	557C002	0.0 - 0.5	3.58	131	0.469 (J)	7.93	13.7	--
	557C003	0.0 - 0.5	4.02	125	0.483 (J)	7.97	13.6	0.041 (J)
	557C004	0.5 - 1.0	3.91	117	0.464 (J)	6.42	11.9	0.0522 (J)

-- = Not detected above MDCs.
J = Estimated value

A.5.2.5 Polychlorinated Biphenyls

No analytical results for PCBs in environmental samples collected at this CAS exceeded the MDCs. Therefore, the FALs were established at the corresponding PAL concentrations.

A.5.2.6 Total Pesticides

No analytical results for pesticides in environmental samples collected at this CAS exceeded the MDCs. Therefore, the FALs were established at the corresponding PAL concentrations.

A.5.2.7 Gamma-Emitting Radionuclides

Analytical results for gamma-emitting radionuclides detected in soil samples above MDCs are presented in Table A.5-4. No results exceeded their respective PALs. The FALs were established at the corresponding PAL concentrations.

Table A.5-4
Soil Sample Results for Gamma-Emitting Radionuclides Detected above MDCs at CAS 06-99-10, Tar Spills

Sample Location	Sample Number	Depth (ft bgs)	COPCs (pCi/g)				
			Ac-228	Eu-155	Pb-212	Pb-214	Tl-208
PALs			5	135	5	5	5
C01	557C002	0.0 - 0.5	0.914	0.271 (J)	1.173 (J)	0.892 (J)	0.363
	557C003	0.0 - 0.5	1.252	--	1.431 (J)	0.993 (J)	0.302
	557C004	0.5 - 1.0	0.899	--	0.702	0.49	0.765

-- = Not detected above MDCs.
J = Estimated value

A.5.2.8 Uranium, Plutonium, and Strontium-90 Isotopes

No analytical results for uranium, plutonium, and Sr-90 isotopes in environmental samples collected at this CAS exceeded the MDCs. Therefore, the FALs were established at the corresponding PAL concentrations.

A.5.2.9 Potential Source Material

Analytical results from the analyses listed in Table A.5-1 for the tar material that were detected above MDCs are presented in Table A.5-5. The sample of the tar material has a concentration of 100,000 mg/kg TPH-DRO. These results were moved on to a Tier 2 evaluation, and the FALs were established for the hazardous constituents of TPH-DRO. Because concentrations of these hazardous constituents did not exceed FALs, TPH-DRO is not considered a COC, and the tar material is not considered to be a PSM. The calculation of FALs for the hazardous constituents of TPH-DRO is presented in Appendix C.

A.5.3 Nature and Extent of Contamination

Based on the analytical results for soil samples collected within CAS 06-99-10, no COCs were identified in the soil.

Table A.5-5
Tar Sample Results Detected
above MDCs at CAS 06-99-10, Tar Spills

Sample Location	Sample Number	Sample Matrix	Parameter	Results	Units	FAL Exceeded[a]
C01	557C001	Solid	Lead	0.438	mg/kg	No
			Barium	2.1 (J)	mg/kg	No
			TPH-DRO	100,000 (J)	mg/kg	No[a]
			1,2,4-Trimethylbenzene	0.44	mg/kg	No
			1,3,5-Trimethylbenzene	0.16 (J)	mg/kg	No
			2-Butanone	0.43 (J)	mg/kg	No
			4-Isopropyltoluene	0.12 (J)	mg/kg	No
			Acetone	0.84 (J)	mg/kg	No
			N-Butylbenzene	0.11 (J)	mg/kg	No
			Sec-Butylbenzene	0.23 (J)	mg/kg	No
			Total Xylenes	0.23 (J)	mg/kg	No
			Benzoic Acid	98 (J)	mg/kg	No

[a]FAL is not exceeded for individual hazardous constituents of diesel in tar; therefore, TPH-DRO is not considered a COC (i.e., PSM) in tar at this location. Refer to Section 2.2.1.3.

J = Estimated value

A.5.4 Conceptual Site Model

The CAIP requirements were met at this CAS, and no revisions were necessary to the CSM.

A.6.0 CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site, Investigation Results

Corrective Action Site 25-25-18 is located just north of the ETSM Building (i.e., Bldg 3901), which is within the EMAD Complex. The CAS consists of two areas of hydrocarbon-impacted soil situated on both sides of the railroad tracks that lead into Bldg 3901 and were reported to be from the discharge of used engine oil from the north end of Bldg 3901. The ETSM Building was used to perform maintenance of trains and equipment and was operational from 1965 to 1985. Additional detail is provided in the CAIP. The CAS location and site layout is shown on Figure A.6-1.

A.6.1 Corrective Action Investigation

A total of 21 environmental soil samples (including one FD) and one QC water sample were collected during CAI activities at CAS 25-25-18. The sample IDs, locations, matrix types, and analyses are listed in Table A.6-1, while the sample locations are shown on Figure A.6-1. The specific CAI activities conducted to satisfy the DQO requirements outlined in the CAIP (NNSA/NSO, 2008) for this CAS are described in the following sections.

A.6.1.1 Field Screening

Investigation samples were field screened for VOCs, and alpha and beta/gamma radiation. The FSRs were compared to the respective FSLs to guide selections of samples to be submitted for analyses. The VOC headspace FSRs were not exceeded in any samples collected at this CAS. Gross alpha and beta/gamma radiation FSLs were slightly exceeded in two shallow subsurface (1 to 1.5 ft bgs) soil samples collected from areas of heavy staining located on each side of the railroad tracks (D07 from the east stain and D09 from the west stain). The FSLs were below the FSRs in the deeper subsurface soil collected in these locations.

A.6.1.2 Radiological Surveys

A radiological walkover survey was performed at this CAS. Survey results were not distinguishable from background activities and no additional samples were collected based on this survey.

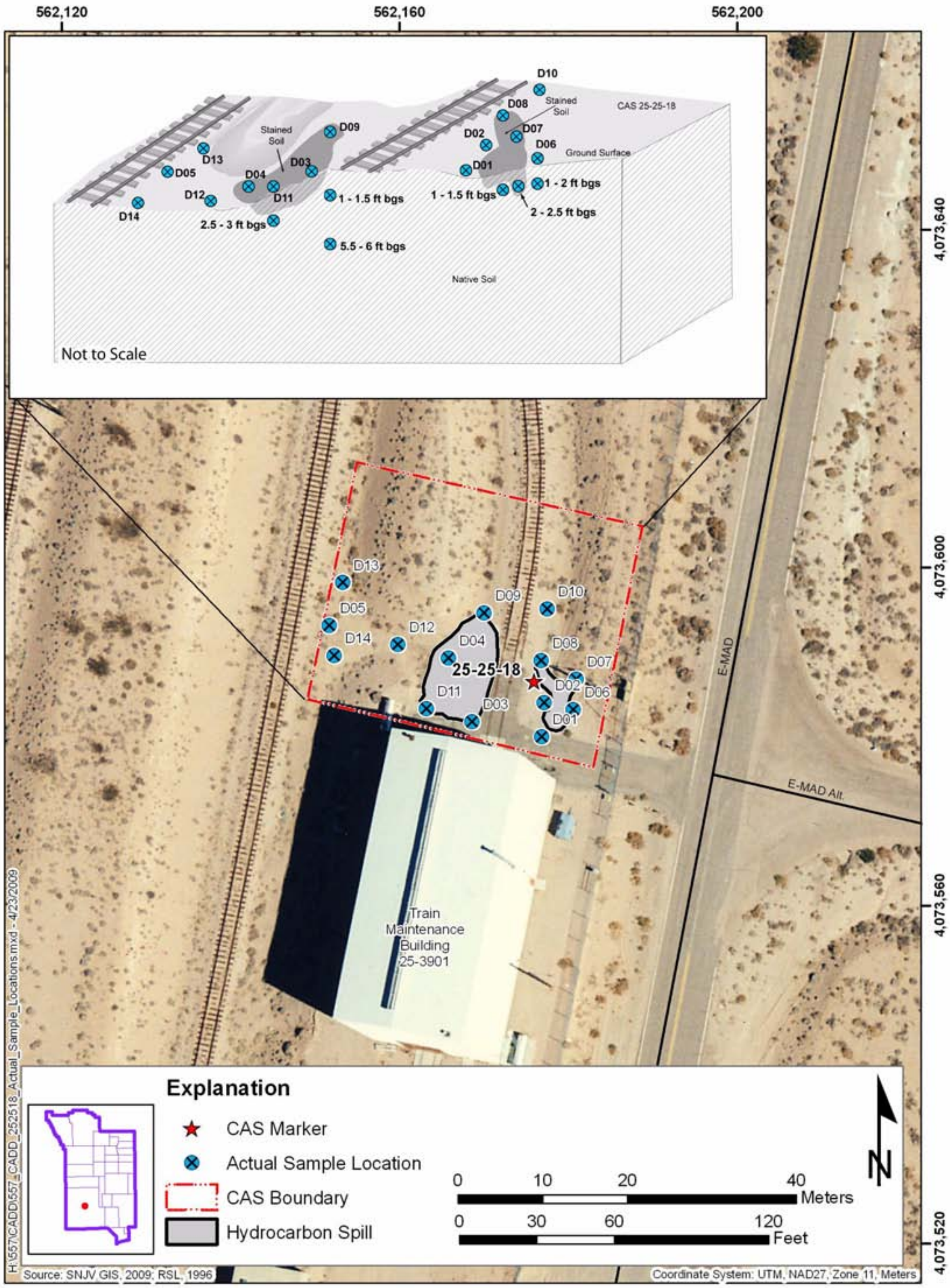

Figure A.6-1
Corrective Action Investigation Site Map for CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site

Table A.6-1
Samples Collected at CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	TPH-DRO	Beryllium	Gamma Spectroscopy	Total RCRA Metals	PCBs	Pesticides	Plutonium	Sr-90	SVOCs	TCLP RCRA Metals	TCLP SVOCs	TCLP VOCs	Uranium	VOCs
D01	557D001	0.0 - 0.25	Soil	Environmental	--	X	--	X	--	--	--	--	--	--	--	--	--	--
D02	557D002	0.0 - 0.25	Soil	Environmental	--	X	--	X	--	--	--	--	--	--	--	--	--	--
D03	557D003	0.0 - 0.25	Soil	Environmental	--	X	--	X	--	--	--	--	--	--	--	--	--	--
D04	557D004	0.0 - 0.25	Soil	Environmental	--	X	--	X	--	--	--	--	--	--	--	--	--	--
D05	557D005	0.0 - 0.25	Soil	Environmental	--	X	--	X	--	--	--	--	--	--	--	--	--	--
D06	557D006	0.0 - 0.5	Soil	Environmental	X	--	X	X	X	X	X	X	X	--	--	--	X	X
	557D007	1.0 - 2.0	Soil	Environmental	X	--	X	X	--	--	X	X	X	--	--	--	X	X
D07	557D008	0.0 - 0.5	Soil	Environmental	X	--	X	X	--	--	X	X	X	X	X	X	X	X
	557D014	2.0 - 2.5	Soil	Environmental	X	--	X	X	--	--	X	X	X	--	--	--	X	X
D08	557D009	0.0 - 0.5	Soil	Environmental	X	--	X	X	--	--	X	X	X	--	--	--	X	X
	557D010	1.0 - 1.5	Soil	Environmental	X	--	X	X	--	--	X	X	X	--	--	--	X	X
D09	557D011	0.0 - 1.0	Soil	Environmental	X	--	X	X	--	--	X	X	X	X	X	X	X	X
	557D012	1.0 - 1.5	Soil	Environmental	X	--	X	X	--	--	X	X	X	--	--	--	X	X
	557D015	5.5 - 6.0	Soil	Environmental	X	--	X	X	--	--	X	X	X	--	--	--	X	X
D10	557D013	0.0 - 0.5	Soil	Environmental	X	--	X	X	--	--	X	X	X	--	--	--	X	X

Table A.6-1
Samples Collected at CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Purpose	TPH-DRO	Beryllium	Gamma Spectroscopy	Total RCRA Metals	PCBs	Pesticides	Plutonium	Sr-90	SVOCs	TCLP RCRA Metals	TCLP SVOCs	TCLP VOCs	Uranium	VOCs
D11	557D016	0.0 - 0.5	Soil	Environmental	X	--	X	X	--	--	X	X	X	--	--	--	X	X
	557D017	2.5 - 3.0	Soil	Environmental	X	--	X	X	--	--	X	X	X	--	--	--	X	X
D12	557D018	0.0 - 0.5	Soil	Environmental	X	--	X	X	--	--	X	X	X	--	--	--	X	X
D13	557D019	0.0 - 0.5	Soil	Environmental	X	--	X	X	--	--	X	X	X	--	--	--	X	X
D14	557D020	0.0 - 0.5	Soil	Environmental	X	--	X	X	--	--	X	X	X	--	--	--	X	X
	557D021	0.0 - 0.5	Soil	FD of #537D020	X	--	X	X	--	--	X	X	X	--	--	--	X	X
N/A	557D301	N/A	Water	Trip Blank, QC	--	--	--	--	--	--	--	--	--	--	--	--	--	X
N/A	557D302	N/A	Water	Trip Blank, QC	--	--	--	--	--	--	--	--	--	--	--	--	--	X
N/A	557D303	N/A	Water	Source Blank, QC	X	--	X	X	X	X	X	X	X	--	--	--	X	X

-- = Not required

A.6.1.3 Visual Inspections

Visual inspections included monitoring vertical soil profiles to identify stained soil boundaries, and surveying the areas on either side of the railroad tracks to identify the locations exhibiting the highest degree of staining for biased sample locations. Additional surface sample locations were identified for collection of beryllium, and for pesticides and PCBs based on their proximity to Bldg 3901. Sample locations were also identified outside of the visibly stained areas to define the lateral extent of contamination. No other features associated with the stained soil were identified within this CAS.

A.6.1.4 Sample Collection

Twenty-one surface and shallow subsurface environmental samples, including one FD, were collected from various areas within and surrounding visibly stained soil on the east and west sides of the railroad tracks that enter the north bay of the ETSM Bldg 3901. The CAU 557 CAIP planned for the collection of six sample locations (one location from each of the two stained soil areas and four locations to define the lateral extent of potential contamination). During the CAI, a total of three sample locations were identified in stained soil areas, and a total of six sample locations were identified for defining the lateral extents of contamination. In addition to these sample locations, five additional surface samples (557D001 through 557D005) were collected at 0.0 to 0.25 ft bgs using hand sampling methods from locations D01 through D05 for the purposes of total RCRA metals and beryllium analysis.

Sample location D07 represents the area of darkest stained soil on the east side of the tracks. At D07, sample 557D008 was collected at 0.0 to 0.5 ft bgs using hand sampling methods. A subsurface sample (557D014) was collected at 2.0 to 2.5 ft bgs using a backhoe for the purpose of defining the vertical extent of potential contamination at D07. Three sample locations (D06, D08, and D10) were collected for the purpose of defining the lateral extent of potential contamination on the east side of the tracks. Sample locations D06 and D08 were collected in close proximity to the stained soil and location D10 represents the lowest topographical point. Pesticides and PCBs were added to the list of analytes for one representative sample (location D06; sample 557D006) collected in close proximity to Bldg 3901 because these contaminants are commonly identified adjacent to NTS building pads.

Sample locations D09 and D11 represent the areas of darkest stained soil on the west side of the tracks, which is more extensive than the stained soil on the east side. At D09, samples 557 D011 (0 to 1.0 ft bgs) and 557D012 (1.0 to 1.5 ft bgs) were collected within the horizon of stained soil using hand sampling and hand auger methods, and sample 557 D015 was a subsurface sample collected at 5.5 to 6.0 ft bgs using a backhoe to define the vertical extent of potential contamination. At D11, sample 557D016 (0 to 0.5 ft bgs) was collected from the horizon of stained soil using hand sampling methods, and sample 557D017 (2.5 to 3.0 ft bgs) was a sample collected using a backhoe to define the vertical extent of potential contamination. Three sample locations (D12, D13, and D14) were collected for the purpose of defining the lateral extent of potential contamination on the west side of the tracks. Location D12 was collected in the middle of the slope west of the stained soil, and locations D13 and D14 were collected at the lowest topographical points.

A.6.1.5 Deviations

There were no deviations to the CAIP requirements at this CAS. Investigation samples were collected and submitted for laboratory analysis as outlined in the CAU 557 CAIP (NNSA/NSO, 2008).

A.6.2 Investigation Results

The following sections provide analytical results from the samples collected to complete investigation activities as outlined in the CAIP (NNSA/NSO, 2008). Investigation samples were analyzed for the CAIP-specified COPCs. The parameters and laboratory methods used to analyze the investigation samples are listed in Table A.2-2. Table A.6-1 lists the sample-specific analytical suite for CAS 25-25-18.

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 their respective FALs. Establishment of the FALs is presented in Appendix C.

To assist in potential waste decisions at this CAS, samples were collected of the stained soil and submitted for TCLP analyses. The TCLP sample results are presented in Section A.7.3.

A.6.2.1 Volatile Organic Compounds

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

Table A.6-2
Sample Results for Total VOCs Detected
above MDCs at CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)
			Acetone
FAL			**54,000**
D11	557D016	0.0 - 0.5	0.017 (J)

J = Estimated value

A.6.2.2 Semivolatile Organic Compounds

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

A.6.2.3 Total Petroleum Hydrocarbons

Analytical results for TPH-DRO in soil samples collected at this CAS that were detected above MDCs are presented in Table A.6-4. Four surface samples exceeded the PAL of 100 mg/kg for TPH-DRO while one surface sample showed a concentration equal to the PAL. One continuation subsurface sample had a concentration of 140 mg/kg. The TPH-DRO was moved on to a Tier 2 evaluation, and FALs were established for the hazardous constituents of TPH-DRO. Because the concentrations of the hazardous constituents of TPH-DRO did not exceed FALs, TPH-DRO is not considered a COC. The calculation of FALs for the hazardous constituents of TPH-DRO is presented in Appendix C.

Table A.6-3
Sample Results for Total SVOCs Detected above MDCs at CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)			
			2-Methylphenol	Benzoic Acid	Bis(2-ethylhexyl)phthalate	Phenol
FALs			**31,000**	**100,000**	**120**	**100,000**
D09	557D011	0.0 - 1.0	--	0.49 (J)	0.82	--
D11	557D016	0.0 - 0.5	0.86	0.97 (J)	1.3	0.51 (J)

-- = Not detected above MDCs.
J = Estimated value

Table A.6-4
Soil Sample Results for TPH-DRO Detected above MDCs at CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)
			TPH-DRO
PAL			**100**
D06	557D006	0.0 - 0.5	9 (J)
D07	557D008	0.0 - 0.5	**3,000** (J)
	557D014	2.0 - 2.5	57
D08	557D010	1.0 - 1.5	7.5 (J)
D09	557D011	0.0 - 1.0	**1,700**
	557D012	1.0 - 1.5	**140**
D10	557D013	0.0 - 0.5	**100**
D11	557D016	0.0 - 0.5	**8,700** (J)
D12	557D018	0.0 - 0.5	**3,000** (J)

Table A.6-4
Soil Sample Results for TPH-DRO Detected
above MDCs at CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)
			TPH-DRO
PAL			**100**
D14	557D020	0.0 - 0.5	6.5 (J)
	557D021	0.0 - 0.5	8.2 (J)

Bold indicates the results meet or exceed the PAL.

J = Estimated value

A.6.2.4 Total RCRA Metals and Beryllium

Analytical results for RCRA metals and beryllium detected in soil samples above MDCs are presented in Table A.6-5. No metals were detected at concentrations exceeding their PALs. The FALs were established at the corresponding PAL concentrations.

Table A.6-5
Sample Results for Total RCRA Metals and Beryllium Detected
above MDCs at CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site
(Page 1 of 2)

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)							
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Selenium	Silver
FALs			**23**	**67,000**	**1,900**	**450**	**450**	**800**	**5,100**	**5,100**
D01	557D001	0.0 - 0.25	3.59	80.2	--	1.86	13.6	117	--	--
D02	557D002	0.0 - 0.25	4.46	101	--	1.74	9.21	152	--	2.59
D03	557D003	0.0 - 0.25	4.4	130	0.204 (J)	1.7	10.5	316	--	--
D04	557D004	0.0 - 0.25	3.56	155	0.298 (J)	0.422 (J)	5.73	106	--	--
D05	557D005	0.0 - 0.25	2.63	73.2	0.213 (J)	0.217 (J)	4.93	15	--	--
D06	557D006	0.0 - 0.5	3.15	104	--	0.557	5.5	54.3	--	--
	557D007	1.0 - 2.0	2.55	74.1	0.363 (J)	0.343 (J)	3.97	9.78	--	--

Table A.6-5
Sample Results for Total RCRA Metals and Beryllium Detected above MDCs at CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site
(Page 2 of 2)

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)							
			Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Selenium	Silver
FALs			**23**	**67,000**	**1,900**	**450**	**450**	**800**	**5,100**	**5,100**
D07	557D008	0.0 - 0.5	2.77	147	--	0.829	15.4	47.7	--	--
	557D014	2.0 - 2.5	1.83	58.4	--	--	2.78	6.25	--	--
D08	557D009	0.0 - 0.5	6.33	101	--	0.421 (J)	7.6	17.5	--	--
	557D010	1.0 - 1.5	3.89	74.6	--	0.51 (J)	7.19	22	--	--
D09	557D011	0.0 - 1.0	3.07	69.6	--	0.129 (J)	2.71	12.8	--	--
	557D012	1.0 - 1.5	3.78	78.2	--	--	4.94	9.46	--	--
	557D015	5.5 - 6.0	1.3	77.8	--	--	1.33	4.39	--	--
D10	557D013	0.0 - 0.5	1.89	58.1	--	0.324 (J)	3.6	19.9	--	--
D11	557D016	0.0 - 0.5	2.77	288	--	1.38	8.14	440	--	0.308 (J)
	557D017	2.5 - 3.0	1.95	82.7	--	--	3.13	5.86	--	--
D12	557D018	0.0 - 0.5	1.91	68.8	--	0.117 (J)	2.83	64.9	--	--
D13	557D019	0.0 - 0.5	7.82	65.9	--	--	3.86	11.1	2.95	--
D14	557D020	0.0 - 0.5	1.84	64.1	--	0.13 (J)	2.57	20.8	--	--
	557D021	0.0 - 0.5	1.71	66.2	--	0.133 (J)	2.76	242	--	--

-- = Not detected above MDCs.
J = Estimated value

A.6.2.5 Polychlorinated Biphenyls

Analytical results for PCBs in soil samples detected above MDCs are shown in Table A.6-6. No concentrations exceeded their PALs; therefore, the FALs were established at the corresponding PAL concentrations.

Table A.6-6
Sample Results for PCBs Detected
above MDCs at CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)
			Aroclor 1260
FAL			0.74
D06	557D006	0.0 - 0.5	0.12

A.6.2.6 Pesticides

Analytical results for pesticides detected in soil samples above MDCs are presented in Table A.6-7. No concentrations exceeded their PALs; therefore, the FALs were established at the corresponding PAL concentrations.

Table A.6-7
Sample Results for Pesticides Detected
above MDCs at CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site

Sample Location	Sample Number	Depth (ft bgs)	COPCs (mg/kg)				
			4,4'-DDT	Dieldrin	Endosulfan II	Endrin	Heptachlor Epoxide
FALs			7	0.11	3,700	180	0.19
D06	557D006	0.0 - 0.5	0.015	0.0062 (J)	0.0052 (J)	0.014 (J)	0.0026

J = Estimated value

A.6.2.7 Gamma-Emitting Radionuclides

Analytical results for gamma-emitting radionuclides detected in soil samples above MDCs are presented in Table A.6-8. No concentrations exceeded their PALs; therefore, the FALs were established at the corresponding PAL concentrations.

Table A.6-8
Sample Results for Gamma-Emitting Radionuclides Detected above MDCs at CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site

Sample Location	Sample Number	Depth (ft bgs)	COPCs (pCi/g)					
			Ac-228	Am-241	Eu-155	Pb-212	Pb-214	Tl-208
FALs			5	12.7	135	5	5	5
D06	557D006	0.0 - 0.5	1.866	--	--	1.651	1.088	0.553
	557D007	1.0 - 2.0	1.661	--	--	1.615 (J)	0.893 (J)	0.481
D07	557D008	0.0 - 0.5	1.734	--	--	1.887 (J)	0.97 (J)	0.64
	557D014	2.0 - 2.5	1.286	--	--	1.579	0.869	0.487
D08	557D009	0.0 - 0.5	2.287	--	0.65 (J)	2.323 (J)	1.312 (J)	0.733
	557D010	1.0 - 1.5	1.81	--	--	2.237	1.117	0.654
D09	557D011	0.0 - 1.0	1.735	--	0.48 (J)	2.024 (J)	0.866 (J)	0.653
	557D012	1.0 - 1.5	1.772	--	--	1.895 (J)	1.014 (J)	0.662
	557D015	5.5 - 6.0	1.586	--	0.396 (J)	1.966 (J)	0.971 (J)	0.661
D10	557D013	0.0 - 0.5	--	--	--	1.473	0.547	0.422
D11	557D016	0.0 - 0.5	1.506	--	--	1.687	0.904	0.513
	557D017	2.5 - 3.0	1.663	--	--	1.901 (J)	0.949 (J)	0.66
D12	557D018	0.0 - 0.5	1.686	4.261	--	1.917	0.823	0.485
D13	557D019	0.0 - 0.5	1.51	--	--	--	0.942	0.513
D14	557D020	0.0 - 0.5	1.235	2.306	0.399	1.593	0.904	0.456
	557D021	0.0 - 0.5	1.435	0.768	--	1.493	0.892	0.442

-- = Not detected above MDCs.
J = Estimated value

A.6.2.8 Uranium, Plutonium, and Strontium-90 Isotopes

Analytical results for uranium and plutonium isotopes detected in soil samples above MDCs are presented in Table A.6-9. No uranium or plutonium isotopic results exceeded the PALs. The FALs were established at the corresponding PAL concentrations.

Table A.6-9
Sample Results for Isotopes Detected
above MDCs at CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site

Sample Location	Sample Number	Depth (ft bgs)	COPCs (pCi/g)			
			Pu-239/240	U-234	U-235	U-238
FALs			12.7	143	17.6	105
D06	557D006	0.0 - 0.5	--	0.953	0.102	0.894
	557D007	1.0 - 2.0	--	0.757	--	0.812
D07	557D008	0.0 - 0.5	--	0.722	0.153	0.846
	557D014	2.0 - 2.5	--	0.809	--	0.826
D08	557D009	0.0 - 0.5	--	0.801	--	0.724
	557D010	1.0 - 1.5	--	1.042	--	0.965
D09	557D011	0.0 - 1.0	--	0.599 (J)	--	0.681 (J)
	557D012	1.0 - 1.5	--	0.698	0.15	0.715
	557D015	5.5 - 6.0	--	0.788	--	0.86
D10	557D013	0.0 - 0.5	--	0.702	--	0.649
D11	557D016	0.0 - 0.5	--	0.792	--	0.662
	557D017	2.5 - 3.0	--	0.792 (J)	--	0.706 (J)
D12	557D018	0.0 - 0.5	--	0.719	--	0.698
D13	557D019	0.0 - 0.5	--	0.794 (J)	--	0.744
D14	557D020	0.0 - 0.5	0.161	0.688	--	0.682
	557D021	0.0 - 0.5	0.288	0.672	--	0.592

-- = Not detected above MDCs.
J = Estimated value

A.6.3 Nature and Extent of Contamination

Based on the analytical results for soil samples collected within CAS 25-25-18, no COCs were identified in the soil.

A.6.4 Conceptual Site Model

The CAIP requirements were met at this CAS, and no revisions were necessary to the CSM.

A.7.0 Waste Management

Wastes generated during the CAI were characterized based on associated soil samples, direct samples of the waste, and/or process knowledge. The characterization and disposition of the waste was based on federal and state regulations, permit limitations, and acceptance criteria. The types, volumes, and disposal of the wastes are addressed in the following subsections. Section A.7.1 addresses investigation-derived waste (IDW), and Section A.7.2 addresses wastes generated as part of the best management practices at the CAU 557 CASs. Results from TCLP analyses run on samples collected from CASs 03-02-02, 06-99-10, and 25-25-18 for potential waste decisions are presented in Section A.7.3.

A.7.1 Investigation-Derived Waste

Investigation-derived waste generated during the field activities for CAU 557 included disposable personal protective equipment (PPE), disposable sampling equipment, plastic sheeting, and empty sample jars. The IDW, which are collected daily, is field screened as generated to comply with the radiological release limits of Table 4-2 of the *NV/YMP Radiological Control Manual* (NNSA/NSO, 2004). The wastes are visually inspected as generated and packaged for evidence of staining or other evidence of hazardous/chemical contamination. The IDW streams for CAU 557 met all of the release criteria and were characterized as industrial waste based on process knowledge, site environmental samples, and radiological surveys of the waste. The waste was bagged, marked, and placed in a roll-off container at Building 23-153 for disposition at the NTS Area 9 U10c Industrial Landfill.

A.7.2 Best Management Practices Waste

The following subsections describe the potential wastes that will be generated from the recommended BMPs. Table A.7-1 presents the volumes, waste characterizations, and disposition of these waste streams for each CAS within CAU 557.

Table A.7-1
Waste Summary

CAS	Container Number	Waste Description	Volume Capacity	Process Knowledge	Analytical Data	Landfill Limits	NTS POC	Lagoon Criteria	Disposal Pathway	Volume	Disposal Date	Disposal Document
01-25-02	No waste was generated or managed at CAS 01-25-02.											
03-02-02	557B01	Debris (Pipe Casing)	13 ft x 5 ft Diameter Pipe Casing	Carbon Steel Pipe	Industrial Waste	Meets	N/A	N/A	Area 9 U10c Industrial Landfill	5 - 6 yd^3	TBD	LLVF
06-99-10	557C01	Tar Material	~ 3 yd^3	N/A	Industrial Waste	N/A	N/A	N/A	Area 6 Hydrocarbon Landfill	~ 3 yd^3	TBD	LLVF
25-25-18	No waste was generated or managed at CAS 25-25-18.											

LLVF = Landfill Load Verification Form
TBD = To be determined
yd^3 = Cubic yard

A.7.2.1 Waste Characterization and Disposition

The following waste streams were identified for CAU 557:

- Steel casing from CAS 03-02-02
- Tar from CAS 06-99-10

All preliminary estimates of these waste streams are based on process knowledge, radiological surveys, sites samples, and/or direct samples of the waste. These estimated characterizations and disposition pathways are shown on Table A.7-1 and are based on current federal and state regulations, permit limitations, and acceptance criteria.

A.7.2.1.1 Steel Casing

A waste stream of one empty perforated steel casing will be generated as part of the BMP recommendation for CAS 03-02-02. The steel casing measures approximately 13 ft long and 5 ft in diameter. A preliminary evaluation of the steel casing resulting from the BMP to be conducted at CAS 03-02-02 determined this waste will be characterized as industrial waste and meets the waste acceptance criteria for the NTS Area 9 U10c Industrial Landfill.

A.7.2.1.2 Tar

The BMP recommended at CAS 06-99-10 is the removal of the tar. This volume of the tar is estimated at approximately 3.0 yd^3. Analytical results for TCLP run on the tar samples are presented in Table A.7-2. A preliminary evaluation of the tar resulting from the BMP to be conducted at CAS 06-99-10 determined this waste will be characterized as hydrocarbon-impacted industrial waste and meets the waste acceptance criteria for disposal at the NTS Area 6 Hydrocarbon Landfill.

A.7.3 Toxicity Characteristic Leaching Procedure Results

To assist in potential waste decisions, samples were submitted for TCLP analyses of the soil within the steel casing at CAS 03-02-02, the tar material at CAS 06-99-10, and the worst-case stained soil at CAS 25-25-18. Analytical results of MDCs from these samples are shown on Table A.7-2.

Table A.7-2
TCLP Sample Results for CAU 557

Sample Location	Sample Number	Depth (ft bgs)	Matrix	Parameter	Result	Criteria[a] (TC Levels)	Units
CAS 03-02-02							
B01	557B003	9.0 - 9.5	Sediment	Barium	1.22	100	mg/L
CAS 06-99-10							
C01	557C001	N/A	Solid	Barium	0.589	100	mg/L
CAS 25-25-18							
D07	557D008	0.0 - 0.5	Soil	Barium	1.17	100	mg/L
				Cadmium	0.016 (J)	1.0	mg/L
				Lead	0.0549	5.0	mg/L
D09	557D011	0.0 - 1.0	Soil	Barium	1.1	100	mg/L
				Lead	0.0169	5.0	mg/L

[a]Based on 40 *Code of Federal Regulations* Part 261, “Identification and Listing of Hazardous Waste” (CFR, 2006).

mg/L = Milligrams per liter
TC = Toxicity characteristic

J = Estimated value

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 557 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 557 were evaluated for data quality in a tiered process described 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

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 packages.
- Completeness of signatures, dates, and times on chain of custody.
- Condition-upon-receipt variance form included.
- Requested analyses performed on all samples.
- Date received/analyzed given for each sample.
- Correct concentration units indicated.
- Electronic data transfer supplied.
- Results reported for field and laboratory QC samples.
- Whether or not the deliverable met the overall objectives of the project.

A.8.1.2 Tier II Evaluation

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

- Correct detection limits achieved.
- Sample date, preparation date, and analysis date for each sample.
- Holding time criteria met.
- Quality control batch association for each sample.
- Cooler temperature upon receipt.
- Sample pH for aqueous samples, as required.
- Detection limits properly adjusted for dilution, as required.
- Blank contamination evaluated and applied to sample results/qualifiers.
- Matrix spike (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 %R evaluated and qualifiers applied to laboratory results, as necessary.
- Initial and continuing calibration evaluated and qualifiers applied to laboratory results, as necessary.
- Internal standard evaluation.
- Mass spectrometer tuning criteria.
- Organic compound quantitation.

- Inductively coupled plasma interference check sample evaluation.
- Graphite furnace atomic absorption QC.
- Inductively coupled plasma serial dilution effects.
- Recalculation of 10 percent of laboratory results from raw data.

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

- Correct detection limits achieved.
- Blank contamination evaluated and, if significant, qualifiers are applied to sample results.
- Certificate of Analysis consistent with data package documentation.
- Quality control sample results (duplicates, laboratory control samples [LCSs], laboratory blanks) evaluated and used to determine laboratory result qualifiers.
- Sample results, uncertainty, and MDC evaluated.
- Detector system calibrated with National Institute of Standards and Technology (NIST)-traceable sources.
- Calibration sources preparation was documented, demonstrating proper preparation and appropriateness for sample matrix, emission energies, and concentrations.
- Detector system response to daily or weekly background and calibration checks for peak energy, peak centroid, peak full-width half-maximum, and peak efficiency, depending on the detection system.
- Tracers NIST-traceable, appropriate for the analysis performed, and recoveries that met QC requirements.
- Documentation of all QC sample preparation complete and properly performed.
- Spectra lines, photon emissions, particle energies, peak areas, and background peak areas support the identified radionuclide and its concentration.

A.8.1.3 Tier III Evaluation

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

- Review:
  - 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

- Perform calculation checks of:
  - At least one analyte per QC sample and 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.8.1.4 Field QC Samples

Field QC samples consisted of trip blanks, equipment rinsate blanks, field blanks, source blanks, laboratory QC samples, and FD samples that were collected and submitted for analysis by the laboratory using the analytical methods shown in Table A.2-2. The QC samples were assigned individual sample numbers and sent to the laboratory "blind."

The FD samples were also sent as blind samples to the laboratory and were analyzed for the investigation parameters listed in Table A.2-2. For these samples, the precision results were evaluated between the duplicate and the parent sample (i.e., RPDs between the environmental sample results and their corresponding FD sample results). Additional samples were selected by the laboratory to be analyzed as laboratory duplicates.

A.8.1.5 Laboratory QC Samples

Analysis of QC preparation blanks (PBs) was performed on each sample delivery group (SDG) for inorganics. Analysis for surrogate spikes and method blanks was 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 when appropriate. Documentation of data qualifications resulting from the application of these guidelines is retained in project files as both hard copy and electronic media.

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

A.8.2 Field Nonconformances

There were no field nonconformances identified for the CAI.

A.8.3 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.

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 557. Assessment of the data generated from investigation activities indicates that FALs were not exceeded for any parameters at any of the CAU 557 CASs. The following summarizes the investigation results for each CAS.

CAS 01-25-02, Fuel Spill

Based on field observations and analytical results for soil samples collected at this CAS, no COCs are present, and the initial 1993-1994 cleanup was confirmed. Therefore, no further action is required at this CAS.

CAS 03-02-02, Area 3 Subdock UST

Based on the analytical results of the environmental samples collected at this CAS, no COC contamination has been released to the soil at this CAS. Therefore, no further action is required at this CAS. However, as a BMP at this CAS, removal and disposal of the vertical steel casing will be performed.

CAS 06-99-10, Tar Spills

Based on analytical results of the environmental samples collected at this CAS, no COC contamination has been released to the soil at this CAS. Therefore, no further action is required at this CAS. However, as a BMP, the tar material will be removed and properly disposed.

CAS 25-25-18, Train Maintenance Bldg 3901 Spill Site

Based on the analytical results of the environmental samples collected at this CAS, no COC contamination has been released to the soil at this CAS. Therefore, no further action is required at this CAS.

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Appendix B

Data Assessment

B.1.0 Data Assessment

The DQA process is the scientific evaluation of the actual CAI results to determine whether the DQO criteria established in the CAU 557 CAIP (NNSA/NSO, 2008) were met and whether DQO decisions can be resolved at the desired level of confidence. The DQO process ensures that the right type, quality, and quantity of data will be available to support the resolution of those decisions at an appropriate level of confidence. Using both the DQO and DQA processes help to ensure that DQO decisions are sound and defensible.

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

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

Step 2: Conduct a Preliminary Data Review – Perform a preliminary data review by reviewing QA reports and inspecting the data both numerically and graphically, validating and verifying the data to ensure that the measurement systems performed 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 this has on DQO decision error.

Step 5: Draw Conclusions from the Data – Perform the calculations required for the selected 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 557 CAIP (NNSA/NSO, 2008). The DQO decisions are presented with the DQO provisions to limit false negative or false positive decision errors. Special features, potential problems, or any deviations to the sampling design are also presented.

B.1.1.1 Decision I

The Decision I statement as presented in the CAU 557 CAIP is: "Is any COPC associated with the CAS present in environmental media at a concentration exceeding its corresponding FAL?" (NNSA/NSO, 2008).

Decision I Rules:

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

B.1.1.1.1 DQO Provisions To Limit False Negative Decision Error

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

1. Having a high degree of confidence that locations selected will identify COCs if present anywhere within the CAS.
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 field-screening techniques, methods, and biasing factors (stipulated in the CAU 557 DQOs [NNSA/NSO, 2008]) were used in selecting judgmental sample locations:

- Screening samples for VOCs using a PID
- Screening samples for alpha- and beta/gamma-emitting radionuclides using an NE Technology Electra
- Conducting visual inspections of soil profiles surrounding CAS-component(s) during sampling and excavation activities and core material during drilling operations to identify staining and the presence of debris
- Preselecting areas based on process knowledge of the site (e.g., known stained areas at CAS 25-25-18, presence of tar at CAS 06-99-10) for source and location of a release

Criterion 2:

Samples were analyzed using the analytical methods outlined in Section A.2.3 and shown on Tables 3-4 and 3-5 of the CAU 557 CAIP (NNSA/NSO, 2008). Table B.1-1 provides a reconciliation of the planned analytical program for CAU 557 to the actual samples analyzed to ensure that adequate samples were collected and analyzed from Decision I locations. The tar sample from CAS 06-99-10 was also submitted and analyzed for RCRA metal analysis.

Sensitivity

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 is that the analytical detection limit will be less than the corresponding action level for the sample result. This criterion was not achieved for analytical results from the samples at CAS 25-25-18 that are listed in Table B.1-2. Three chemical COPCs failed the sensitivity criteria: benzo(a)pyrene, dibenzo(a,h)anthracene, and n-nitro-di-n-propylamine. These results were not used in making DQO decisions and are considered as rejected data. The impact of these failed sensitivity results on DQO decisions is addressed in the assessment of completeness.

Table B.1-1
CAU 557 Analyses Performed

CAS	VOCs	SVOCs	RCRA Metals	Beryllium	PCBs	TPH-DRO	Pesticides	Gamma Spectroscopy	Isotopic U	Isotopic Pu	Sr-90
01-25-02	RS	RS	--	--	--	RS	--	--	--	--	--
03-02-02	RS	RS	RS	--	RS	RS	--	RS	RS	RS	RS
06-99-10	RS	RS	RS	--	RS	RS	--	RS	--	--	--
25-25-18	RS	RS	RS	RS[a]	RS[b]	RS	RS[c]	RS	RS	RS	RS

[a]Surface soil samples at locations D01 through D05 were also submitted and analyzed for beryllium.
[b]Surface soil sample at location D06 were submitted and analyzed for PCBs.
[c]Surface soil sample at location D06 were submitted and analyzed for pesticides.

RS = Required and submitted
-- = Not required and not submitted

Table B.1-2
Analytes Failing Sensitivity Criteria

Sample Number	COPCs	MDC (mg/kg)	FAL (mg/kg)
557D008	Benzo(a)pyrene	0.86	0.21
	Dibenzo(a,h)anthracene	0.86	0.21
	N-Nitroso-di-n-propylamine	0.86	0.25
557D016	Benzo(a)pyrene	0.34	0.21
	Dibenzo(a,h)anthracene	0.34	0.21
	N-Nitroso-di-n-propylamine	0.34	0.25
557D018	Benzo(a)pyrene	0.35	0.21
	Dibenzo(a,h)anthracene	0.35	0.21
	N-Nitroso-di-n-propylamine	0.35	0.25

mg/kg = Milligrams per kilogram

Criterion 3:

To satisfy the third criterion, the entire dataset, as well as individual sample results, was assessed against the acceptance criteria for the DQIs of precision, accuracy, representativeness, completeness, and comparability, as defined in the Industrial Sites QAPP (NNSA/NV, 2002). The DQI goals are presented in Table 6-1 of the CAU 557 CAIP (NNSA/NSO, 2008). As presented in the following sections, these goals were met for each of the DQIs.

Precision

Precision was evaluated as described in Section 6.2.3 of the CAU 557 CAIP (NNSA/NSO, 2008). Precision is a measure of the repeatability of the analysis process from sample collection through analysis results that is used to access the variability between two equal samples. There were no chemical or radiological data qualified for precision, therefore, the DQI for precision was 100 percent. As all contaminants exceed the precision goal for CAU 557 of 80 percent, the datasest is determined to be acceptable for the DQI of precision.

Accuracy

Accuracy was evaluated as described in Section 6.2.4 of the CAU 557 CAIP (NNSA/NSO, 2008). Accuracy is a measure of the closeness of an individual measurement to the true value and is used to assess the performance of laboratory measurement processes. There were no chemical or radiological data qualified for accuracy; therefore, the DQI for accuracy was 100 percent. As all contaminants exceed the accuracy goal for CAU 557 of 80 percent, the datasest is determined to be acceptable for the DQI of accuracy.

Representativeness

The DQO process, as identified in Section 6.2.5 of the CAU 557 CAIP (NNSA/NSO, 2008), was used to address sampling and analytical requirements for CAU 557. 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 the most likely locations that bound COCs). The sampling locations identified in the Criterion 1 discussion meet this criterion. Therefore, the analytical data acquired during the CAU 557 CAI are considered representative of the population parameters.

Completeness

Section 6.2.6 of the CAU 557 CAIP (NNSA/NSO, 2008) defines acceptable criteria for completeness to be that the dataset is sufficiently complete to be able to make the DQO decisions. As shown on Table 6-1 in the CAIP, this is initially evaluated as 80 percent of CAS-specific COPCs (non-critical analytes) that are identified on Table 3-3 in the CAIP as having usable results, and 100 percent of CAS-specific targeted contaminants (critical analytes) as having usable results. For CAU 557, there were no data qualified as rejected, and all contaminants met the 80 percent completeness criteria.

The targeted contaminants identified for the CAU 557 CASs were TPH-DRO and the hazardous constituents of TPH-DRO. Results for the targeted contaminants of TPH-DRO and the hazardous constituents of TPH-DRO were 100 percent complete with the exception of benzo(a)pyrene, which did not meet the criteria for sensitivity and is considered to be rejected data (and therefore did not meet the 100 percent completeness criterion for targeted contaminants). Dibenzo(a,h)anthracene and n-nitroso-di-n-propylamine also did not meet the sensitivity criteria in 3 of the 16 samples, resulting in a completeness rate of 81 percent (and therefore met the completeness criterion of 80 percent). These rejected 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.

Benzo(a)pyrene failed the initial completeness criterion of 100 percent in three samples analyzed from CAS 25-25-18 (557D008, 560D016, and 560D018). These samples were diluted and/or prepared at reduced volume resulting in elevated detection limits that were greater than their corresponding FAL concentrations. However, valid results were obtained for benzo(a)pyrene contaminants in 14 other samples from this CAS for a completeness rate of 82 percent. As benzo(a)pyrene was not detected in any sample for this CAS, there is no evidence to suspect that benzo(a)pyrene is present at CAS 25-25-18. Therefore, there is sufficient information to make the DQO decisions at each of the CASs, and the dataset was determined to meet the criteria for completeness.

Comparability

Field sampling, as described in the CAU 557 CAIP (NNSA/NSO, 2008), was performed and documented in accordance with approved procedures that are comparable to standard industry practices. Approved analytical methods and procedures per DOE were used to analyze, report, and validate the data. These are comparable to other methods used not only in industry and government practices, but most importantly are comparable to other investigations conducted for the NTS. Therefore, project datasets are considered comparable to other datasets generated using these same standardized DOE procedures, thereby meeting DQO requirements.

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

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 to the data results when applicable.

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

B.1.1.2 Decision II

Decision II was not assessed because no COCs were present at the CAU 557 CASs and it was not necessary to determine the extent of contamination.

B.1.1.3 Sampling Design

The CAU 557 CAIP (NNSA/NSO, 2008) made the following commitments for sampling:

1. Judgmental sampling will be conducted at all CASs based on the CAS features and biasing factors present. Soil samples will be collected beneath and/or adjacent to collection and release points to identify releases of contaminants.

   Result: At CAS 01-25-02, the soil most likely to be contaminated was successfully sampled based on visual observations of soil discoloration, VOC headspace FSRs, and process knowledge regarding the former excavation (e.g., approximate depth to interface between backfill material and native soil). At CAS 03-02-02, the soils most likely to be contaminated were successfully sampled based on the presence and known release points from the CAS feature (steel casing with perforations), visual observations of stained and debris containing soil within the casing, and investigation of subsurface geophysical anomalies. At CAS 06-99-10, the soil most likely to be contaminated was successfully sampled based on the presence of two tar spills of the same material and collecting a representative soil sample directly underneath tar material. At CAS 25-25-18, the soils most likely to be contaminated were successfully sampled based on a visual survey to identify the darkest areas of stained soil.

2. Waste present that has the potential to cause a future release will be sampled.

   Result: At CAS 06-99-10, a representative sample of the tar material was sampled and submitted for laboratory analysis.

B.1.2 Conduct a Preliminary Data Review

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

B.1.3 Select the Test and Identify Key Assumptions

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

The key assumptions that could impact a DQO decision are listed in Table B.1-3.

B.1.4 Verify the Assumptions

The results of the CAI support the key assumptions identified in the CAU 557 DQOs and Table B.1-3. All data collected during the CAI supported CSMs.

B.1.5 Draw Conclusions from the Data

This section resolves the two DQO decisions for each of the CAU 557 CASs.

Table B.1-3
Key Assumptions

Exposure Scenario	Site workers are only exposed to COCs through oral ingestion, inhalation, external exposure to radiation, or dermal contact (by absorption) of COCs absorbed onto the soils. Exposure to contamination is limited to industrial site workers, construction/remediation workers, and military personnel conducting training. The investigation results did not reveal any potential exposures other than those identified in the CSM.
Affected Media	Surface soil, shallow subsurface soil, and potentially perched (shallow) groundwater. Deep groundwater contamination is not a concern. Contaminants migrating to regional aquifers are not considered. The investigation results did not reveal any affected media other than those identified in the CSM. Because no COCs were present at any CAS, shallow groundwater is not an affected media.
Location of Contamination/Release Points	The area of contamination is contiguous (except at CAS 06-99-10). The extent of COC concentration decreases away from the area of contamination. No COCs were identified as a result of the CAI.
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. The investigation results did not reveal any transport mechanisms other than those identified in the CSM.
Preferential Pathways	None. The investigation results did not reveal any pathways other than those identified in the CSM.
Lateral and Vertical Extent of Contamination	Subsurface contamination, if present, is contiguous and decreases with distance and depth from the source. Surface contamination may occur laterally as a result of a spill or storm water runoff. No surface or subsurface contamination is present, as no COCs were identified.
Groundwater Impacts	None. The investigation results did not identify any impacts to groundwater.
Future Land Use	Nonresidential. The investigation results did not reveal any future land uses other than those identified in the CSM.
Other DQO Assumptions	Contamination may be present in the soils adjacent to a feature due to surface water runoff or intended use (e.g., casing). The investigation results did not identify any contamination associated with the steel casing of CAS 03-02-02.

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: Because no COPCs were identified in any on a target population exceeding their FALs, no COCs were identified, and no Decision II sampling was conducted at any of the CAU 557 CASs.

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

Result: Because all COPC concentrations were less than their corresponding FALs, the decision of no further action was identified as the corrective action for all the CAU 557 CASs.

B.1.5.2 Decision Rules for Decision II

Decision II was not assessed because no COCs were present at the CAU 557 CASs, and it was not necessary to determine the extent of contamination.

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.

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Appendix C

Risk Assessment

C.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, which lists the requirements for sites with soil contamination (NAC, 2006a). For the evaluation of corrective actions, NAC Section 445A.22705 (NAC, 2006b) requires the use of ASTM Method E 1739-95 (ASTM, 1995) to "conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards (i.e., FALs) or to establish that corrective action is not necessary."

The presence of a COC would require a corrective action. A corrective action may also be necessary if there is a potential for waste that is present at a site to release a COC to the site environmental media (i.e., PSM). To evaluate a waste for such a scenario, 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.
- For non-liquid wastes, the concentration of the contaminants in the surrounding soil would be equal to the concentration of contaminants in the waste.
- For liquid wastes, the resulting concentration of contaminants in the surrounding soil would be calculated based on the concentration of contaminants in the wastes and the liquid holding capacity of the soil.

This section contains documentation of the RBCA process used to establish FALs described in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 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 Final Action Levels* (NNSA/NSO, 2006) is summarized in Figure C.1-1.

C.1.1 A. Scenario

Corrective Action Unit 557 is comprised of the following four CASs:

- 01-25-02, Fuel Spill
- 03-02-02, Area 3 Subdock UST
- 06-99-10, Tar Spills
- 25-25-18, Train Maintenance Bldg 3901 Spill Site

Corrective Action Site 01-25-02, Fuel Spill, is located at the Area 1 Batch Plant and consists of a 1994 cleanup of an historical diesel fuel release from an unknown source that was discovered in late 1993. The hydrocarbon-impacted soils were removed, and the excavation was backfilled to grade. The Area 1 Batch Plant operated between 1965 and 1985 and functioned as a screening facility for recovered desert soil and rock from a nearby strip mine. Parts of the Shaker Plant are currently active.

Corrective Action Site 03-02-02, Area 3 Subdock UST, consists of a flush-mounted subsurface steel feature that was reportedly used for the diversion and drainage of surface water runoff and the subsequent dispersion and release of the effluent into the surrounding soils. The Area 3 Subdock was used for degreasing, cleaning, and repairing worn drill bits and realigning bent drill rods from the 1970s through 1985, when it was relocated to Area 1.

Corrective Action Site 06-99-10, Tar Spills, is located approximately 500 ft south of the CP-72 Building in Area 6, just west of an utility access road that runs parallel to Mercury Highway, and consists of a tar material spill released from an unknown source. The spill site is not associated with any known activities; however, it is suspected to be a release of unused tar that was allocated for road paving material.

Correction Action Site 25-25-18, Train Maintenance Bldg 3901 Spill Site, is located just north of the ETSM Building (i.e., Bldg 3901), which is part of the EMAD facility in Area 25. The CAS consists of two areas of hydrocarbon-impacted soil situated on both sides of the railroad tracks that lead into Bldg 3901 and were reported to be from the discharge of used engine oil from the north end of

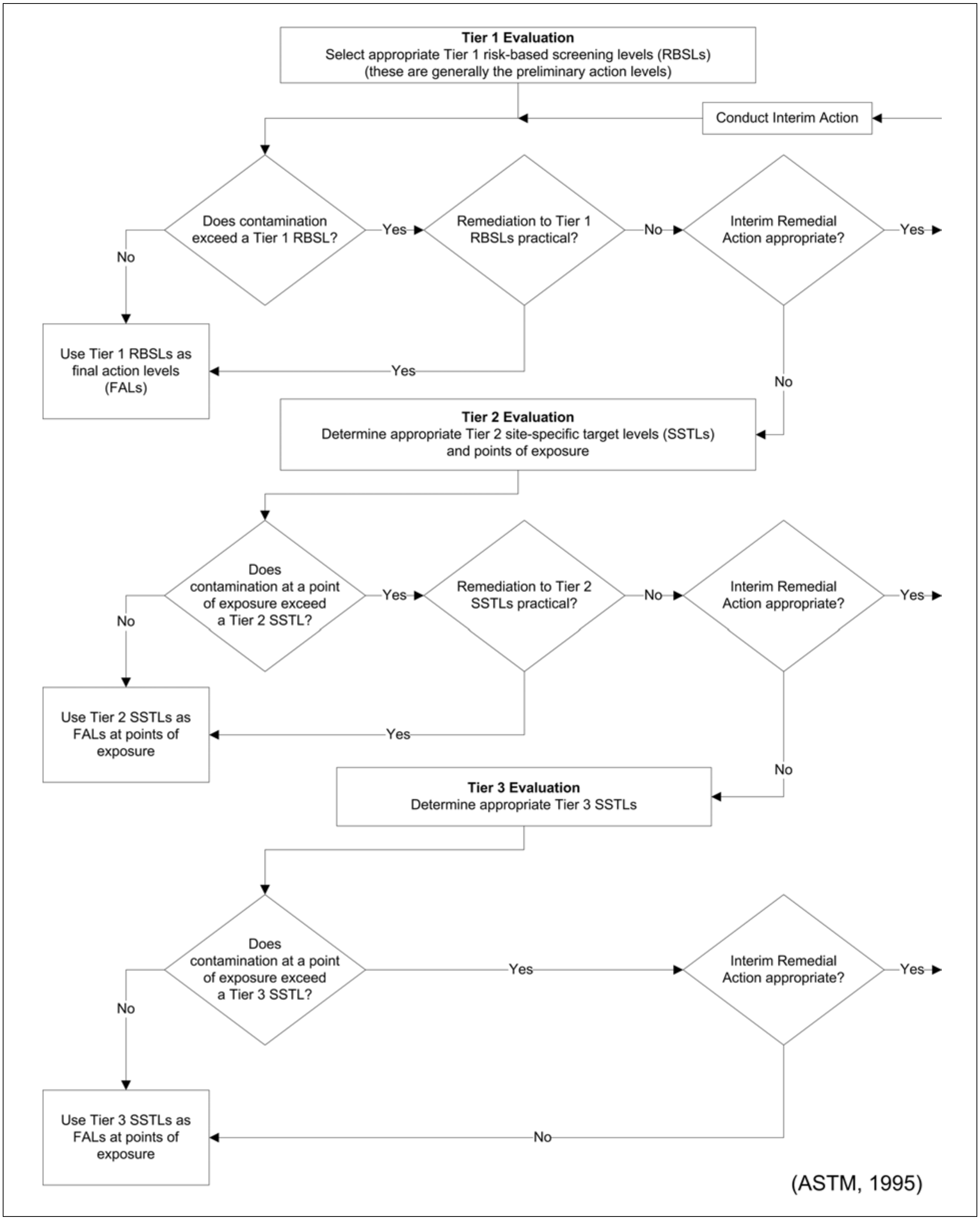

Figure C.1-1
Risk-Based Corrective Action Decision Process

Bldg 3901. The ETSM Building was used to perform maintenance of trains and equipment and was operational from 1965 to 1985. The EMAD facility remains inactive.

C.1.2 B. Site Assessment

The CAI at the CAU 557 CASs involved visual inspections through video survey and/or excavation, and soil sampling adjacent to and/or beneath structural components identified as potential sources for contaminant releases. The CAI results indicate that no residual COC contamination is present within or beneath the former excavation at CAS 01-25-02 and vertical casing at CAS 03-02-02; therefore, no COC contamination is being released to the surrounding environment. In addition, no COCs are present in the spill materials at CAS 06-99-10 or 25-25-18, nor are they being released to the surrounding or underlying soils.

The only contaminant identified at any of the CAU 557 CASs was TPH-DRO at CASs 03-02-02, 06-99-10 and 25-25-18. The maximum concentration of TPH-DRO identified at these CASs, and the corresponding PAL, is presented in Table C.1-1.

Table C.1-1
Maximum Reported Value of TPH-DRO for Tier 1 Comparison

Parameter	PAL	Units	Maximum Reported Value of TPH-DRO					
			CAS 03-02-02		CAS 06-99-10		CAS 25-25-18	
			Sand/ Sediment inside Casing	Soil outside Casing	Tar Material	Underlying Soil	Stained Soils	Underlying Soils
TPH-DRO	100	mg/kg	270	--	100,000	100	8,700	140

-- = No analytical results were above PALs

C.1.3 C. Site Classification and Initial Response Action

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

Based on the CAI, none of the CASs present an immediate threat to human health, safety, and the environment; therefore, no interim response actions are necessary at these sites. Based on this information, all four CASs are determined to be Classification 4 sites as defined by ASTM Method E 1739-95 and pose no demonstrated near- or long-term threats.

C.1.4 D. Development of Tier 1 Lookup Table of RBSLs

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 FAL is practical. The PALs are defined as:

- EPA Region 9 Risk-Based PRGs for Industrial Soils (EPA, 2004).
- Background concentrations for RCRA metals will be evaluated when natural background exceeds the PAL, as is often the case with arsenic. Background is considered the mean plus two times the standard deviation of the mean based on data published in Mineral and Energy Resource Assessment of the Nellis Air Force Range (NBMG, 1998; Moore, 1999).
- 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 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 557 CASs in Areas 1, 3, 6, and 25 are not assigned work stations and are considered to be in remote or occasional use areas, the use of the industrial scenario-based PALs is conservative. The Tier 1 lookup table is defined as these PAL concentrations or activities as defined in the CAIP (NNSA/NSO, 2008).

C.1.5 E. Exposure Pathway Evaluation

The DQOs stated that site workers would only be exposed to COCs through oral ingestion, inhalation, or dermal contact (absorption) due to exposure to potentially contaminated media (i.e., soil) at the CASs. The results of the CAI showed that no COCs have been identified at any of the CASs within CAU 557. The limited migration of TPH-DRO demonstrated by the analytical results, elapsed time since the suspected release, and depth to groundwater supports the selection and evaluation only surface and shallow subsurface contact as the complete exposure pathways. Groundwater is not considered to be a significant exposure pathway.

C.1.6 F. Comparison of Site Conditions with Tier 1 RBSLs

All analytical results from CAU 557 samples were less than corresponding Tier 1 action levels (i.e., PALs) except for those listed in Table C.1-2.

Table C.1-2
Contaminants of Potential Concern Detected above PALs

CAS	TPH-DRO
03-02-02	X
06-99-10	X
25-25-18	X

Analysis of the tar material at CAS 06-99-10 also exceeded the PSM criteria for TPH-DRO, as discussed in Section 3.4 of the CAIP (NNSA/NSO, 2008).

C.1.7 G. Evaluation of Tier 1 Results

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

C.1.8 H. Tier 1 Remedial Action Evaluation

TPH-DRO Evaluation

No actions to remediate any of the sites to Tier 1 action levels for TPH-DRO are proposed, and TPH-DRO was moved to a Tier 2 evaluation.

C.1.9 I. Tier 2 Evaluation

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

C.1.10 J. Development of Tier 2 SSTLs

Evaluation 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 diesel. 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 diesel were compared to corresponding Tier 2 SSTLs based on PAL concentrations to evaluate the need for corrective action at each individual CAS at CAU 557. These SSTLs and the maximum reported level for each diesel constituent per CAS are presented in Table C.1-3.

C.1.11 K. Comparison of Site Conditions with Tier 2 SSTLs

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 557, the Tier 2 action levels were compared to maximum contaminant concentrations from each sample location. No potentially hazardous constituents of diesel exceeded their corresponding Tier 2 SSTLs. The FALs for the potentially hazardous constituents of diesel were established at the corresponding Tier 2 SSTLs (i.e., PALs),

Table C.1-3
Tier 2 SSTLs and CAU 557 Results for Hazardous Constituents of Diesel in Soil and Tar

Constituent	SSTL (mg/kg)	Maximum Reported Value (mg/kg)			
		03-02-02 (soil)	06-99-10 (soil)	06-99-10 (tar)	25-25-18 (soil)
Benzo(a)pyrene	0.21	ND	ND	ND	ND
Benzene	1.4	ND	ND	ND	ND
Benzo(a)anthracene	2.1	ND	ND	ND	ND
Benzo(b)fluoranthene	2.1	ND	ND	ND	ND
Benzo(k)fluoranthene	21	ND	ND	ND	ND
1,3,5-Trimethylbenzene	70	ND	ND	0.16 (J)	ND
Naphthalene	190	ND	ND	ND	ND
2-Methylnaphthalene	190	ND	ND	ND	ND
Chrysene	210	ND	ND	ND	ND
n-Propylbenzene	240	ND	ND	ND	ND
n-Butylbenzene	240	ND	ND	0.11 (J)	ND
Ethylbenzene	400	ND	ND	ND	ND
Total Xylenes[a]	420	ND	ND	0.23 (J)	ND
Toluene	520	ND	ND	ND	ND
Fluoranthene	22,000	ND	ND	ND	ND
Fluorene	26,000	ND	ND	ND	ND
Benzo(ghi)perylene	29,000	ND	ND	ND	ND
Pyrene	29,000	ND	ND	ND	ND
Anthracene	100,000	ND	ND	ND	ND
Phenanthrene	100,000	ND	ND	ND	ND

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

ND = Nondetect
J = Estimated value

C.1.12 L. Tier 2 Remedial Action Evaluation

Based on the Tier 2 evaluation of the potentially hazardous constituents of diesel, the TPH-DRO does not pose an unacceptable risk to human health and the environment. Therefore, no further action concerning TPH-DRO required at the CASs within CAU 557.

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

C.2.0 Recommendations

All of the hazardous constituents of diesel concentrations in soil and tar identified from the analysis of CAU 557 samples are less than the corresponding FALs at all locations. Therefore, it has been determined that TPH-DRO is not a COC at these locations and does not pose a significant risk to human health or the environment. Based on this determination, these sites do not warrant corrective actions. However, this does not preclude the consideration of these sites for additional protective measures that are recommended as BMPs (i.e., removal of the perforated vertical steel casing at CAS 03-02-02 and removal of the tar material at CAS 06-99-10).

C.3.0 References

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NAC, see *Nevada Administrative Code*

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Appendix D

Borehole and Sample Location Coordinates

D.1.0 Sample Location Coordinates

Sample locations and pertinent locations of interest are shown on Figures A.3-1 through A.6-1. The corresponding coordinates for the four CAU 557 CASs are listed Table D.1-1.

Table D.1-1
Sample Location Coordinates and Locations of Interest for CAU 557
(Page 1 of 2)

Location	Northing	Easting	Latitude	Longitude
CAS 01-25-02				
Site Marker	4102659.5	576684.4	37.06885	-116.13827
A01	4102660.0	576693.8	37.06885	-116.13816
CAS 03-02-02				
Site Marker	4100553.4	584413.3	37.04920	-116.05157
B01	4100556.0	584411.1	37.04922	-116.05159
B02	4100556.3	584414.1	37.04923	-116.05156
B03	4100556.0	584410.4	37.04923	-116.05160
CAS 06-99-10				
Site Marker	4087430.6	584543.0	36.93091	-116.05158
C01	4087431.1	584545.4	36.93091	-116.05155
CAS 25-25-18				
Site Marker	4073586.6	562176.0	36.80786	-116.30385
D01	4073580.0	562176.8	36.80780	-116.30384
D02	4073584.0	562177.1	36.80784	-116.30383
D03	4073581.8	562168.6	36.80782	-116.30393
D04	4073589.3	562165.8	36.80789	-116.30396
D05	4073593.1	562151.7	36.80792	-116.30412
D06	4073583.2	562180.6	36.80783	-116.30380
D07	4073586.8	562180.9	36.80786	-116.30379
D08	4073589.0	562176.8	36.80788	-116.30384
D09	4073594.6	562170.1	36.80793	-116.30391

Table D.1-1
Sample Location Coordinates and Locations of Interest for CAU 557
(Page 2 of 2)

Location	Northing	Easting	Latitude	Longitude
CAS 25-25-18 (continued)				
D10	4073595.1	562177.5	36.80794	-116.30383
D11	4073583.3	562163.2	36.80783	-116.30399
D12	4073590.9	562159.8	36.80790	-116.30403
D13	4073598.2	562153.3	36.80797	-116.30410
D14	4073589.6	562152.3	36.80789	-116.30411

Appendix E

Nevada Division of Environmental Protection Comments

(2 Pages)

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

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

March 23, 2009

Robert F. Boehlecke
Federal Project Director
Environmental Restoration Project
National Nuclear Security Administration
Nevada Site Office
P. O. Box 98518
Las Vegas, NV 89193-8518

RE: Review of the Draft Corrective Action Decision Document/Closure Report for Corrective Action Unit (CAU) 557: Spills and Tank Sites, Nevada Test Site, Nevada
Federal Facility Agreement and Consent Order

Dear Mr. Boehlecke:

The Nevada Division of Environmental Protection, Bureau of Federal Facilities (NDEP) staff has received and reviewed the draft Corrective Action Decision Document/Closure Report for Corrective Action Unit (CAU) 557: Spills and Tank Sites, Nevada Test Site, Nevada. NDEP's review of this document did not indicate any deficiencies.

If you have any questions regarding this matter contact Ted Zaferatos at ext. 234 or me at (702) 486-2850 ext. 233.

Sincerely,

Jeff MacDougall, Ph.D.
Supervisor
Bureau of Federal Facilities

JM/TZ:tz

cc: K. J. Cabble, ERP, NNSA/NSO, Las Vegas, NV
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