Nevada
Environmental
Restoration
Project

DOE/NV--556

Corrective Action Investigation Plan
for Corrective Action Unit 25.2:
Area 25 Engine Test Stand 1
Decontamination Pad,
Nevada Test Site, Nevada

Controlled Copy No.: ____

Revision No.: 0

August 1999

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**CORRECTIVE ACTION INVESTIGATION PLAN
FOR CORRECTIVE ACTION UNIT 252:
AREA 25 ENGINE TEST STAND 1
DECONTAMINATION PAD,
NEVADA TEST SITE, NEVADA**

DOE Nevada Operations Office
Las Vegas, Nevada

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**CORRECTIVE ACTION INVESTIGATION PLAN
FOR CORRECTIVE ACTION UNIT 252:
AREA 25 ENGINE TEST STAND 1
DECONTAMINATION PAD,
NEVADA TEST SITE, NEVADA**

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List of Acronyms and Abbreviations

ALARA	As low as reasonably achievable
bgs	Below ground surface
CADD	Corrective Action Decision Document
CAIP	Corrective Action Investigation Plan
CAS	Corrective Action Site(s)
CAU	Corrective Action Unit(s)
CFR	<i>Code of Federal Regulations</i>
COPC	Contaminant(s) of potential concern
CR	Closure Report
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy, Nevada Operations Office
DOT	U.S. Department of Transportation
DQO	Data Quality Objective(s)
EPA	U.S. Environmental Protection Agency
ETS-1	Engine Test Stand-1
FFACO	<i>Federal Facility Agreement and Consent Order</i>
FSL	Field-screening level(s)
ft	Foot (feet)
HWAA	Hazardous Waste Accumulation Area
IDW	Investigation-derived waste
in.	Inch(es)
LLW	Low-level radioactive waste
mi	Mile(s)
MS/MSD	Matrix spike/matrix spike duplicate
NAC	<i>Nevada Administrative Code</i>
NaI	Sodium iodide

List of Acronyms and Abbreviations (Continued)

NDEP	Nevada Division of Environmental Protection
NEPA	<i>National Environmental Policy Act</i>
NRDS	Nuclear Rocket Development Station
NTS	Nevada Test Site
NTSWAC	Nevada Test Site Waste Acceptance Criteria
PAL	Preliminary action level(s)
PCB	Polychlorinated biphenyl(s)
PID	Photoionization detector
PPE	Personal protective equipment
ppm	Part(s) per million
PRG	Preliminary Remediation Goal(s)
QAPP	<i>Quality Assurance Project Plan</i>
QA/QC	Quality assurance/quality control
QC	Quality control
RCRA	<i>Resource Conservation and Recovery Act</i>
SVOC	Semivolatile organic compound(s)
TCLP	Toxicity characteristic leaching procedure
TID	Tamper-indicating device(s)
TPH	Total petroleum hydrocarbons
VOC	Volatile organic compound(s)

Executive Summary

This Corrective Action Investigation Plan contains the environmental sample collection objectives and the criteria for conducting site investigation activities for Corrective Action Unit 252, Corrective Action Site 25-07-04, Area 25 Engine Test Stand-1 Decontamination Pad, at the Nevada Test Site. The Corrective Action Investigation Plan has been developed in accordance with the *Federal Facility Agreement and Consent Order* agreed to by the U.S. Department of Energy, Nevada Operations Office; the State of Nevada Division of Environmental Protection; and the U.S. Department of Defense.

The Engine Test Stand-1 Decontamination Pad is located in Area 25 at the intersection of Road H and Road K and was designed for use as a mobile radiation checkpoint and for vehicle decontamination. The corrective action site consists of a concrete decontamination pad with a drain, a gravel-filled sump, two concrete trailer pads, and utility boxes. Contaminants of potential concern for the site include radionuclides, total volatile organic compounds, total semivolatile compounds, total petroleum hydrocarbons-as diesel range organics, *Resource Conservation and Recovery Act* metals, total pesticides, and polychlorinated biphenyls. Additional samples may also be collected at the discretion of the Site Supervisor. The formulation of a conceptual site model was used as an aid for the development of Data Quality Objectives for the site. The technical approach for investigating the site was discussed during the Data Quality Objective meeting held on April 28, 1999. The investigative strategy includes the following activities:

- Conduct a utility survey prior to excavation activities.
- Determine radiological field-screening levels using an Electra alpha/beta scintillator, a sodium iodide detector, or intrinsic germanium detector (or equivalent) by taking 20 background sample readings and calculating the mean plus two standard deviations.
- Remove the gravel-fill from test pit locations in the sump with a backhoe prior to sampling soil in the sump.
- Excavate three test pits with a backhoe. Samples will be collected at approximately 2-foot intervals to a maximum depth of about 12 feet below the ground surface (or the maximum reach of the backhoe). The planned locations for the test pits are as follows:
 - At the sump where the decontamination pad drain pipe discharged

- At the sump where the sewer pipe discharged
- The soil near the northeast corner of the decontamination pad where runoff from decontamination effluent would have most likely ponded
- Collect soil samples for laboratory analysis as follows:
 - Soil samples will be collected at the gravel-soil interface in each of the sump test pits. Soil samples will be collected from each test pit, at approximately 2-foot depth intervals until a sample has been collected below field-screening levels or to the maximum reach of the backhoe (about 12 feet below the ground surface or about 6 feet below the gravel/soil interface). At a minimum two depth intervals will be sampled.
 - At the test pit near the northeast corner of the decontamination pad, soil sampling will begin at ground surface and continue at approximately 2-foot depth intervals until a sample has been collected below field-screening levels or to the maximum reach of the backhoe (about 12 feet below ground surface). At a minimum two depth intervals will be sampled.
 - If field-screening results exceed field-screening levels at 12 feet below ground surface (or the maximum reach of the backhoe), then sampling will stop and the investigation will be rescoped.
 - If contaminants of potential concern are not detected above preliminary action levels, a Corrective Action Decision Document/Closure Report will be prepared.
- Field screen for VOCs using a headspace technique with a photoionization detector.
- Field survey for radioactivity using an Electra alpha/beta scintillator, a sodium iodide detector, or intrinsic germanium detector (or equivalent).
- Conduct a geophysical survey to locate the piping, as necessary.
- Conduct a video survey to locate breaches in piping, as necessary.
- Conduct laboratory analysis for gamma emitters, total volatile organic compounds, total semivolatile organic compounds, total petroleum hydrocarbons-diesel range organics, *Resource Conservation and Recovery Act* metals, total pesticides, and polychlorinated biphenyls.
- Collect and submit quality control samples as prescribed in the *Quality Assurance Project Plan*.

- Collect additional samples should the following occur:
 - Field-screening levels or preliminary actions levels are exceeded and contamination needs to be further delineated.
 - Data are insufficient for a corrective action decision document evaluation.
 - More data are needed for waste management purposes.
 - Site Supervisor determines it to be necessary.

Under the *Federal Facility Agreement and Consent Order*, the Corrective Action Investigation Plan will be submitted to the Nevada Division of Environmental Protection for approval. Field work will be conducted following approval of the plan. The results of the field investigation will support a defensible evaluation of corrective action alternatives in the Corrective Action Decision Document.

1.0 Introduction

This Corrective Action Investigation Plan (CAIP) has been developed in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) that was agreed to by the U.S. Department of Energy, Nevada Operations Office (DOE/NV); the State of Nevada Division of Environmental Protection (NDEP); and the U.S. Department of Defense (FFACO, 1996). The CAIP is a document that provides or references all of the specific information for investigation activities associated with Corrective Action Units (CAUs) or Corrective Action Sites (CASs). According to the FFACO, CASs are sites potentially requiring corrective action(s) and may include solid waste management units or individual disposal or release sites (FFACO, 1996). Corrective Action Units consist of one or more CASs grouped together based on geography, technical similarity, or agency responsibility for the purpose of determining corrective action(s).

This CAIP contains the environmental sample collection objectives and the criteria for conducting site investigation activities at the CAU 252, CAS 25-07-02, Area 25 Engine Test Stand-1 (ETS-1) Decontamination Pad at the Nevada Test Site (NTS). For purposes of this discussion, this site will be referred to as either CAU 252 or the ETS-1 Decontamination Pad. The NTS is approximately 65 miles (mi) northwest of Las Vegas, Nevada ([Figure 1-1](#)). The ETS-1 Decontamination Pad was designed as a mobile radiation checkpoint and for vehicle decontamination ([Figure 1-2](#)). The ETS-1 Decontamination Pad is located at the intersection of Road H and Road K south of the ETS-1 facility (Pan Am, 1966; Pan Am, 1968). The CAU 252 site includes a concrete decontamination pad with a drain, a gravel filled sump, two concrete trailer pads, and utility boxes.

1.1 Purpose

The purpose for the corrective action investigation of the ETS-1 Decontamination Pad is to determine the nature and extent of contaminants of potential concern (COPCs). This investigation needs to provide sufficient information and data to develop appropriate corrective action alternatives for CAU 252, including closure in place and clean closure, which will be evaluated in the Corrective Action Decision Document (CADD). The resulting data will permit DOE/NV to make informed decisions about the future disposition of CAU 252.

Figure 1-1
Nevada Test Site and CAU 252 Engine Test Stand -1
Decontamination Pad Location Map, Nevada

Figure 1-2
 CAU 252, Area 25, Engine Test Stand-1 Decontamination Pad Location,
 Nevada Test Site

This CAIP was developed using the U.S. Environmental Protection Agency (EPA) Data Quality Objectives (DQOs) (EPA, 1994) process to clearly define the goals, establish the DQOs for collecting environmental data, and to design a data collection program that will satisfy these goals. A DQO scoping meeting was held on April 28, 1999. A brief summary of the DQOs is presented in [Section 3.4](#) of this CAIP, a detailed summary of the DQO process and results is included in [Appendix A](#).

1.2 Scope

The scope of this CAIP is to resolve the problem statement identified during the DQO process (see [Appendix A](#)) which states that radioactive and potentially hazardous wastes may have been released at CAU 252. The existing information about the nature and extent of contamination is insufficient to evaluate and select a preferred corrective action. Therefore, the scope of the corrective action investigation for the ETS-1 Decontamination Pad includes the following tasks:

- Determine if COPCs are present
 - Collect soil samples from biased, worst-case locations using a backhoe.
 - Utilize headspace field-screening methods to determine the presence of volatiles and assist in guiding the sampling investigation.
 - Utilize field-survey techniques to determine the presence of radionuclides and assist in guiding the sampling investigation.
 - Identify the types and concentrations of COPCs through laboratory analytical methods and techniques.
 - If COPCs are above field-screening levels (FSLs) and/or preliminary action levels (PALs), additional sampling (i.e., step-outs) may be required to delineate vertical and/or lateral extent. Additional sampling may be conducted with direct-push technology (or other approved sampling method) if the backhoe is inadequate for sampling needs.

1.3 CAIP Contents

[Section 1.0](#) of this CAIP provides an introduction to this project, including the purpose and scope for this corrective action investigation. The remainder of the document details the investigation strategy. The FFACO (1996) requires that CAIPs address the following elements:

- Management
- Technical aspects
- Quality assurance
- Health and safety
- Public involvement
- Field sampling
- Waste management

The managerial aspects of this project are discussed in the DOE/NV *Project Management Plan* (DOE/NV, 1994) and the site-specific Field Management Plan that will be developed prior to field activities. A facility description is presented in [Section 2.0](#). The technical aspects of this CAIP are contained in [Section 3.0](#) and [Section 4.0](#) of this document and in the DQO summary presented in [Appendix A](#). General field and laboratory quality assurance and quality control (QA/QC) issues, including collection of quality control (QC) samples are presented in the *Industrial Sites Quality Assurance Project Plan* (QAPP) (DOE/NV, 1996b), as well as in this CAIP.

The generic health and safety protocol to be followed for this project is documented in applicable sections of the *Environmental Restoration Project Health and Safety Plan* (DOE/NV, 1998) and will also be supplemented with a site-specific health and safety plan which will be written prior to commencement of field activities. In addition, as required by the U.S. Department of Energy (DOE) Integrated Safety Management System, these documents outline the requirements for protecting the health and safety of the workers and the public, and some procedures for protection of the environment. Site personnel will take every reasonable step to reduce or eliminate the possibility of injury, illness, or accident, and to protect the environment during all project activities. The following will be taken into consideration when evaluating the hazards and associated control procedures for the field activities:

- Potential hazards to site personnel and the public include, but are not limited to, radionuclides, chemicals (such as *Resource Conservation and Recovery Act* [RCRA] metals, volatile organic compounds [VOCs], and semivolatile organic compounds [SVOCs]), adverse and rapidly

changing weather, remote location, motor vehicle and heavy equipment operation, and excavations.

- Proper training of all site personnel to recognize and mitigate the anticipated hazards.
- Work controls to reduce or eliminate the hazards including engineering controls, substitution of less hazardous materials, and personal protective equipment (PPE).
- Occupational exposure monitoring to prevent overexposure to hazards, including chemical and/or physical agents.
- Use of the “as low as reasonably achievable” (ALARA) principle when dealing with radiological hazards.
- Emergency and contingency planning and communication to include medical care and evacuation, decontamination and spill control measures, and appropriate notification of project management.

No CAU-specific public involvement activities are planned at this time; however, an overview of the public involvement process is documented in the *Public Involvement Plan* in Appendix V of the FFACO (1996). Waste management issues are discussed in [Section 5.0](#). The project schedule and records availability information are discussed in [Section 6.0](#), and project references are provided in [Section 7.0](#).

2.0 Facility Description

Corrective Action Unit 252 (ETS-1 Decontamination Pad) is comprised of one CAS, the Decontamination Pad (25-07-04). The ETS-1 facility was used as a test stand for nuclear rocket tests (SNPO, 1970). The ETS-1 facility is included as part of the Nuclear Rocket Development Station (NRDS) in Area 25 of the NTS, which was operational primarily between 1959 and 1973 (Bernhardt et al., 1974; DOE/NV, 1984). The NRDS complex consisted of several buildings, test facilities, and support systems used for the development and testing of nuclear rocket engines. The ETS-1 Decontamination Pad is located south of the ETS-1 facility and was designed to be used as a mobile radiation check point and for vehicle decontamination ([Figure 2-1](#)) (Pan Am, 1966; Pan Am, 1968).

General background information pertaining to the history of the NTS and Area 25, a geologic assessment, and an overview of the area hydrogeology including depths to groundwater are provided in the *Site Characterization Plan, Yucca Mountain Site* (DOE, 1988).

2.1 Physical Setting

Topographically, Area 25 is an intermontane valley bordered by highlands on all sides, except for a large drainage outlet to the southwest. Elevations range from 3,400 to 5,600 feet (ft). The dominant plant community is *Larrea-Ambrosia* associated with a transition zone between the Mojave and Great Basin Deserts (DRI, 1988).

The NRDS area is located in Jackass Flats which is underlain by alluvium, colluvium, and volcanic rocks of Cenozoic age and, at greater depth, by sedimentary rocks of Paleozoic age. The alluvium and the colluvium lie above the saturated zone throughout nearly all of Jackass Flats. The Paleozoic sedimentary rocks contain limestone and dolomite units that are excellent water producers elsewhere; however, these units are too deep in Jackass Flats to be economic water sources. The only important water producing unit known in the vicinity of the NRDS is a welded-tuff aquifer, the Topopah Spring Member of the Paintbrush tuff (DRI, 1988; SNPO, 1970).

Three water supply wells are within the NRDS, Wells J-11, J-12, and J-13. Yucca Flat, Frenchman Flat, and Jackass Flats are believed to be hydraulically connected, with groundwater moving along

Figure 2-1
CAU 252, Area 25 Engine Test Stand-1 Decontamination Pad Layout

fracture zones in the carbonates. It is thought that the present groundwater is a result of rainfall in the past, and that no significant recharge of groundwater is occurring now (SNPO, 1970).

Surface water is ephemeral and is a function of variations in annual climate patterns. Climate in this area is affected by the rain shadow of the Sierra Nevada. The average annual rainfall for Jackass Flats is approximately 4 inches (in.) (DOE, 1988). Approximately 65 percent of the precipitation for the area occurs between October and April as a result of Pacific Coast storms (DOE, 1988). Summer showers are generally isolated and precipitation is variable. Occasionally, storms move directly from the Gulf of California, resulting in wide-spread heavy rain (DOE, 1988).

2.2 Operational History

The ETS-1 facility, constructed in 1966, was part of the NRDS complex and used to test nuclear rockets. The ETS-1 Decontamination Pad and mobile radiation check point was built in 1968. The NRDS complex ceased primary operations in 1973. The CAU 252 investigation area, which measures approximately 115 ft by 60 ft, includes the following:

- A concrete decontamination pad that measures approximately 35 ft long by 15 ft wide with a small grated drain (1.5 ft by 0.5 ft); the decontamination pad slopes downward to the northeast
- A gravel-filled sump that measures approximately 31 ft long by 35 ft wide; the surface of the sump is below the general area topography
- A pair of concrete trailer pads that measure approximately 55 ft by 3 ft and a smaller concrete pad for the trailer tongue; this trailer had a sewer drain that connected to the sump ([Figure 2-1](#))
- A pair concrete trailer pads that measure approximately 18 ft by 3 ft and a smaller concrete pad for the trailer tongue ([Figure 2-1](#))
- Several utility boxes

2.3 Waste Inventory

The DQO process evaluated available information, and a list of potential contaminants was developed ([Appendix A](#)). Based on its intended use as a mobile radiation checkpoint and for vehicle decontamination, the potential contaminants are radionuclides, VOCs, SVOCs, total petroleum hydrocarbons (TPH) - diesel range organics, RCRA metals, pesticides, and polychlorinated biphenyls

(PCBs). The radiological contamination, if present, would result from the decontamination of vehicles at the site. Volatile organic compounds, SVOCs, and TPH-diesel may be present from the potential use of decontamination solvents and/or vehicle fuel. RCRA metals may result due to the potential to accumulate from the vehicles themselves. Pesticides were added to the COPC list because they were identified at similar sites in the Area 25 NRDS complex (i.e., CAU 240 Area 25 Vehicle Washdown Stations). Any pesticide occurrence may be the result of pesticide application around the pads. Polychlorinated biphenyls are also included because they were identified in small concentrations in the preliminary sample analytical results (see [Section 2.5](#)).

2.4 Release Information

Vehicle decontamination effluent is the source of potential contamination in the soil near the northeast corner of the decontamination pad and within the sump. The decontamination pad slopes downward to the northeast and decontamination effluent could have runoff the pad and ponded on the soil near the northeast corner of the pad. Additionally, there are two pipes that were designed to discharge to the sump. The decontamination pad drain pipe consists of vitrified clay and perforated pipe (orangeburg pipe) that discharged along the center of the sump ([Figure 2-1](#)). The perforated pipe is about 2 ft below the gravel-fill surface. Liquid that was discharged to the pipe would percolate out of the pipe and into the gravel fill and subsequently into the subsurface soil. The larger trailer pad has a vitrified clay sewer pipe that discharged to the northeast corner of the sump ([Figure 2-1](#)).

The primary driving force for any vertical migration of COPCs would be the liquid discharged to the sump. No odor or surface staining on the decontamination pad was observed by the field personnel (Forsgren, 1998). Bechtel Nevada (BN) conducted a radiological survey with an Electra scintillator at the ETS-1 site on June 29, 1999 (BN, 1999). During the survey, pieces of an old yellow and magenta rope were found on the ground north and south of the sump, and an old radiological sign was found west of the sump. The radiological survey results did not exceed or meet RADCON requirements (DOE/NV, 1996c) for posting (BN, 1999).

No documentation has been located at this time that describes the usage of the ETS-1 Decontamination Pad. Therefore, the quantities of liquids that could have been generated from decontamination activities or discharged to the sump for this site are unknown.

2.5 Investigative Background

A preliminary surface-soil sample (ERS00044) was collected by IT Corporation on August 15, 1997, from the soil near the northeast corner of the decontamination pad (Forsgren, 1998). The intent of the preliminary sample was to collect soil considered most likely to be contaminated to determine the COPCs. The sample was analyzed by an off-site laboratory for VOCs, SVOCs, TPH-diesel range organics, RCRA metals, PCBs, gross alpha/beta, and gamma emitters (Forsgren, 1998). Although the analytical results for the sample identified both chemical and radioactive constituents above detection limits, the results did not indicate the presence of any COPCs above EPA Region IX Industrial Soil Preliminary Remediation Goals (PRGs) (EPA, 1998). These analytical results were used to identify COPCs for this corrective action investigation.

In accordance with the DOE/NV *National Environmental Policy Act* (NEPA) compliance program, a NEPA checklist shall be completed prior to commencement of site investigation activities at CAU 252. This checklist requires DOE/NV projects to evaluate their proposed project against a list of several potential environmental impacts. These include, but are not limited to, air quality, chemical use, waste generation, noise level, and land use. Completion of the checklist results in a determination of the appropriate level of NEPA documentation by the DOE/NV NEPA Compliance Officer.

3.0 Objectives

The DQOs (see [Appendix A](#)) are qualitative and quantitative statements (EPA, 1994) that specify the quality of the data required to support potential corrective action alternatives for the ETS-1 Decontamination Pad investigation. The DQOs were developed to clearly define the purpose(s) for which environmental data will be used and to design a data collection program that will satisfy these uses ([Section 4.1](#)). The formulation of a conceptual site model was used as an aid for the development of DQOs for the site. The conceptual site model for the ETS-1 Decontamination Pad sampling activities is presented in [Section 3.1](#).

3.1 Conceptual Site Model

The conceptual site model defines the expected nature and extent of contamination within CAU 252. The conceptual site model for this CAU is based on assumptions formulated on information presented in [Section 2.0](#) and discussed during the DQO process. The model is used to identify an appropriate sampling strategy and data collection methods. The conceptual site model and assumptions developed in the DQO process are presented in [Appendix A](#) and are summarized as follows:

- Contaminants of potential concern, if present, could have been released into the soil near the northeast corner of the decontamination pad and/or into the sump during the decontamination of vehicles at the site.
- Vertical extent of COPCs is expected to be less than 12 ft below ground surface (bgs). The assumed vertical extent is based in part on investigative and analytical results of CAU 240, Area 25 Vehicle Washdown Pads which show contamination to be within 3 ft to 5 ft bgs (Bordelois, 1999). Also, the vertical extent of contamination would be affected by the arid environment, high evaporation, soil type, low annual precipitation, and the physical nature of the COPCs that are not conducive to the downward migration of contaminants.
- Lateral extent of COPCs is expected to be limited to the sump area or near the northeast corner of the decontamination pad. The decontamination pad slopes downward to the northeast. Runoff from decontamination activities would have most likely ponded on the soil near the northeast corner of the pad. The sump area and the soil near the northeast corner of the decontamination pad are considered to be the worst-case locations for contamination, if present.

- Groundwater is unlikely to be impacted from potential contaminant releases because the depth-to-water near the ETS-1 site for three NTS wells, J-11, J-12, and J-13, is approximately 1,040 ft, 740 ft, and 928 ft, respectively (La Camera et al., 1999).

3.2 Contaminants of Potential Concern

A list of COPCs for the ETS-1 Decontamination Pad was determined based on a review of site history documentation, subjective process knowledge, preliminary analytical results, and inferred activities associated with the CAU. Based on this information, the following COPCs have been identified:

- Gamma emitters
- Total VOCs
- Total SVOCs
- RCRA metals
- TPH-diesel range organics
- Total pesticides
- PCBs

All soil samples collected from the test pits will be submitted for laboratory analyses for the specified COPCs. Additional samples may also be collected for waste management purposes. If additional sampling needs to be conducted at the site, the COPC list may be reduced or expanded based on analytical results from the test pit samples. The COPC field-screening methods and levels, analytical methods, and PALs are shown in [Table A.3-1](#) and [Table A.3-2](#) in [Appendix A](#).

3.3 Preliminary Action Levels

The following subsections describe the FSLs for on-site field-screening methods and PALs for analytical methods that will be used to determine the presence of contamination and guide the collection of environmental samples.

3.3.1 Field-Screening Levels

The following FSLs will be used during the ETS-1 Decontamination Pad corrective action investigation:

- The VOC headspace (e.g., photoionization detector [PID]) FSL is established at 20 parts per million (ppm) or 2.5 times background, whichever is greater.

- Radiation FSLs are established as the mean background activity level plus two times the standard deviation of the mean background activity level (to be determined prior to start of field activities and monitored during sampling).

Field screening will provide on-site measurement of VOCs and field surveys will be conducted for on-site measurement of radionuclides. The COPC concentrations that exceed FSLs indicate potential contamination at that sample location. Field-screening results will be used as an initial indicator of potential contamination and will be used assist in guiding the sampling investigation.

3.3.2 Chemical Preliminary Action Levels

Laboratory analysis will provide quantitative measurement of the chemical COPCs. The data obtained from laboratory analysis will be used to support corrective action decision recommendations for CAU 252 in the CADD. The analytical methods and minimum reporting limits for each COPC are presented in [Appendix C](#). Analytical results will be compared to the following PALs to evaluate the need for possible corrective actions:

- NDEP Corrective Action Regulations (NAC, 1998b); for purposes of this investigation, the risk-based industrial soil PRGs for EPA Region IX (EPA, 1998) will be used as the PALs.
- TPH concentrations above the TPH limit of 100 mg/kg per the *Nevada Administrative Code* (NAC) 445A.2272 (NAC, 1998b)

The comparison of laboratory results to PALs will be discussed in the CADD. Laboratory results above PALs would indicate the presence of COPCs at levels that may require corrective action. The evaluation of potential corrective actions and the justification for a preferred corrective action will be included in the CADD based on the results of this field investigation.

3.3.3 Radiological Preliminary Action Levels

The PALs for radionuclides are isotopic specific and are defined as the maximum concentration for that isotope found in environmental samples taken from undisturbed background locations. Environmental samples will be taken within the vicinity of CAU 252. These samples will be analyzed and compared with the results for environmental samples taken from other undisturbed background locations in Area 25. In addition, the radionuclide concentrations in the CAU 252 and

Area 25 background samples will be compared with the radionuclide concentrations found in environmental samples taken from undisturbed background locations in the vicinity of the NTS, presented in McArthur and Miller (1989) and Atlan-Tech (1992). The PAL for each isotope will be the maximum concentration of that isotope found in any of the samples taken from the undisturbed background locations described above. For soil matrix, the minimum reporting limit for Cobalt-60, Cesium-137, and Niobium-94 is 0.4 picocuries per gram (Adams, 1999). For water matrix, the minimum reporting limit for Cobalt-60 is 50 picocuries per liter, Cesium-137 is 10 picocuries per liter, and for Niobium-94 is 20 picocuries per liter (Adams, 1999).

3.4 DQO Process Discussion

During the DQO discussions for CAU 252, a biased sampling approach was identified for this site. Near-surface and subsurface sampling will be conducted at the suspected worst-case areas: the sump and to soil near the northeast corner of the decontamination pad (see [Section 4.1](#) and [Appendix A](#)). Details about the COPC analytical methods prescribed through the DQO process are provided in [Table A.3-1](#) of [Appendix A](#). The precision and accuracy requirements and reporting limits for these analytical methods are presented in [Appendix C](#).

4.0 Field Investigation

This section of the CAIP contains the sampling approach for investigation of the CAU 252, Area 25 ETS-1 Decontamination Pad. All sampling activities will be conducted following the guidelines specified in the Industrial Sites QAPP (DOE/NV, 1996b) and other applicable, approved procedures. Quality assurance and quality control requirements for field and laboratory environmental sampling are also contained in the Industrial Sites QAPP (DOE/NV, 1996b). The general sampling strategy will focus on answering the problem question: “Is the site contaminated?” The planned sampling locations are biased to the potential worst-case contamination areas. Field screening, field surveys, and laboratory analyses are the primary investigation tools for determining the presence and nature of COPCs.

4.1 Technical Approach

The following main activities will be conducted during the site investigation:

- Conduct a utility survey prior to excavation activities.
- Determine radiological field-screening levels using an Electra alpha/beta scintillator, a sodium iodide detector, or intrinsic germanium detector (or equivalent) by taking 20 background sample readings and calculating the mean plus two standard deviations.
- Remove the gravel-fill from test pit locations in the sump with a backhoe prior to sampling soil in the sump.
- Excavate three test pits with a backhoe. Samples will be collected at approximately 2-ft intervals to a maximum depth of about 12 ft below the ground surface (or the maximum reach of the backhoe). The planned locations for the test pits are as follows:
 - At the sump where the decontamination pad drain pipe discharged
 - At the sump where the sewer pipe discharged
 - The soil near the northeast corner of the decontamination pad where runoff from decontamination effluent would have most likely ponded

- Collect soil samples for laboratory analysis as follows:
 - Soil samples will be collected at the gravel-soil interface in each of the sump test pits. Soil samples will be collected from each test pit, at approximate 2-ft sample depth intervals until a sample has been collected below field-screening levels or to the maximum reach of the backhoe (about 12 ft bgs or about 6 ft below the gravel/soil interface). At a minimum two depth intervals will be sampled.
 - At the test pit near the northeast corner of the decontamination pad soil sampling at this location will begin at ground surface and continue at approximate 2-ft sample depth intervals until a sample has been collected below field-screening levels or to the maximum reach of the backhoe (about 12 ft bgs). At a minimum two depth intervals will be sampled.
 - If field-screening results exceed field-screening levels at 12 ft bgs (or the maximum reach of the backhoe), then sampling will stop and the investigation will be rescoped.
 - If COPCs are not detected above PALs, then prepare a CADD/Closure Report (CR).
- Field screen for VOCs using the headspace technique with a photoionization detector.
- Field survey for radioactivity using an Electra alpha/beta scintillator, a sodium iodide detector, or intrinsic germanium detector (or equivalent).
- Conduct a geophysical survey to locate the piping, as necessary.
- Conduct a video survey to locate breaches in piping, as necessary.
- Conduct laboratory analysis for gamma emitters, total VOCs, total SVOCs, TPH-diesel, RCRA metals, total pesticides, and PCBs.
- Collect and submit quality control samples as prescribed in the QAPP.
- Collect additional samples should the following occur:
 - Field-screening levels or preliminary actions levels are exceeded and contamination needs to be further delineated.
 - Data are insufficient for a corrective action decision document evaluation.
 - Needed for waste management purposes.
 - Site Supervisor determines it to be necessary.

In the following sections, the components of the field investigation are described in greater detail.

4.2 Field Activities

Sampling associated with CAU 252 will be focused within the sump area (west of the ETS-1 Decontamination Pad) and in the soil near the northeast corner of the decontamination pad. The gravel-fill within the sump area will be removed from the location of the planned test pits. All equipment which contacts soil to be sampled will be decontaminated in accordance with approved procedures. The environmental soil samples collected for laboratory analysis will be from fresh media. Samples will be collected with highest priority given to those that will be analyzed for VOCs. When volatilization of COPCs is not a concern, samples will be collected with priority given to those with the shortest hold times prior to analysis.

Records will be maintained of the general physical characteristics of the soil, field-screening measurements, and all other relevant data. Pertinent and required sampling information (e.g., date, time, sample interval) will be documented in accordance with the Industrial Sites QAPP (DOE/NV, 1996b). Approved chain-of-custody procedures will be followed to ensure data defensibility.

4.2.1 Test Pit Excavation and Soil Sampling

A backhoe will be used to remove the gravel from the sump and to excavate three test pits at the site. Two test pits will be excavated in the sump where the trailer sewage pipe and decontamination pad drain pipe discharged into the sump ([Figure A.1-1 of Appendix A](#)). The third test pit will be excavated near the northeast corner of the decontamination pad. Soil sampling in the sump test pits will begin at the gravel/soil interface and continue at approximately 2-ft depth intervals until a sample has been collected below FSLs. The maximum sampling depth will be 12 ft bgs (about 6 ft below the gravel/soil interface for the sump test pits) or to the maximum reach of the backhoe. Soil sampling for the test pit near the northeast corner of the decontamination pad will begin at the ground surface and continue at approximately 2-ft depth intervals until a sample has been collected below FSLs or to the maximum reach of the backhoe (about 12 ft bgs). At a minimum, two depth intervals will be sampled at each test pit.

If COPCs (i.e., VOCs or radionuclides) are detected above the FSLs at the maximum sample depth, the investigation will stop and be rescoped. The soil samples collected from each sample interval in

the test pits will be submitted for laboratory analysis. The soil samples will be analyzed for gamma emitters, total VOCs, total SVOCs, TPH-diesel range organics, RCRA metals, total pesticides, and PCBs.

If FSLs or PALs are exceeded at the test pits, additional (step-out) sampling may be conducted to further delineate the lateral and vertical extent of COPCs. The location and depth of the samples will be based on the results of the FSLs, PALs, and/or at the discretion of the Site Supervisor. Additional sampling, if necessary, will be conducted with a backhoe, direct-push, or other approved sampling method. Direct-push technology may be also used to collect soil samples should the backhoe be inadequate for sample collection. Additional sampling may be conducted should the following occur:

- Lateral and vertical extent of contamination is not adequately delineated.
- Laboratory analytical results are inadequate for evaluation in the CADD.
- Data is not sufficient to make a waste determination.

4.2.2 Video/Geophysical Survey

Based on the existing information and a preliminary site evaluation, a video/geophysical survey of the drains and pipelines does not appear to be necessary at this time. However, video/geophysical survey equipment will be available during the excavation of the test pits in case the drains and pipelines warrant this type of assessment. Should a video survey be deemed necessary, the Site Supervisor will determine if the survey should be performed from the drain to the sump or in the reverse direction. An optional radiation detector may be included with the camera and cable system for the video survey to further assess the drainage system, if necessary. Any decisions regarding the video/geophysical survey will be made at the discretion of the Site Supervisor, Project Manager, and DOE/NV representative.

4.2.3 Field Screening and Field Surveys

Field screening for VOCs and field surveys for radiological activity will be performed for all samples. The field-screening results will be used as follows:

- Guiding the sampling investigation by providing semiquantitative measurements of the soil conditions

- Provide information to establish the maximum depth of COPCs and the need for additional (step-out) sampling
- Monitoring the health and safety of personnel
- Waste management decisions

Field screening for TPH will not be conducted because of the potential for radionuclides to be present thereby possibly generating mixed waste. Field screening for VOCs will be performed using a PID and headspace techniques. Field surveying for radioactivity will be performed using an Electra alpha/beta scintillator, sodium iodide detector, and/or intrinsic germanium detector (or equivalent).

4.2.4 Quality Control Samples

Quality control samples will be collected as required by the Industrial Sites QAPP (DOE/NV, 1996b). These samples will include trip blanks, equipment blanks, field blanks, field duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples. Except for trip blanks, all QC samples will be analyzed for applicable parameters, trip blanks will only be analyzed for VOCs. The following quality control samples will be collected:

- Field Blanks - one per 20 samples submitted to the laboratory
- Equipment Blanks - an equipment rinsate blank will be submitted to the laboratory for each different type of sampling activity and/or decontamination process.
- Field Duplicates - one per 20 samples per matrix submitted to the laboratory
- MS/MSD - one per 20 samples per matrix submitted to the laboratory
- Trip Blanks - one per shipping container (cooler) if analyzing for VOCs

5.0 Waste Management

Management of investigation-derived waste (IDW) will be based on regulatory requirements, field observations, process knowledge, and the results of laboratory analysis of ETS-1 Decontamination Pad investigation samples. Additional analyses may be requested for waste management purposes. Administrative controls (decontamination procedures and the characterization strategy) will minimize waste generated during the investigation.

Solid materials other than soil wastes are potentially contaminated waste only by virtue of contact with potentially contaminated media. The same is true for the decontamination rinsate. Therefore, sampling and analysis of the IDW, separate from analyses of site characterization samples, will generally not be required. In some cases rinsate may need to be analyzed separately to determine final disposition. The data generated as a result of site characterization will be used to assign the appropriate waste type (i.e., sanitary, hazardous, low-level radioactive [LLW], or mixed) to the IDW with the exception noted in [Section 5.3](#).

Sanitary, hazardous, LLW, and/or mixed waste, if generated, will be managed and disposed of in accordance with DOE Orders, U.S. Department of Transportation (DOT) regulations, RCRA regulations, *Nevada Revised Statutes* (NRS, 1998), and agreements and permits between the DOE and the NDEP.

In the following sections, operational requirements are provided for managing sanitary, hazardous, LLW, and mixed wastes. However, when the waste is initially generated, it will be managed according to mixed waste requirements until laboratory analyses are received and a final waste determination is made.

5.1 Waste Minimization

Corrective action investigation activities have been planned to minimize the amount of IDW generated. Decontamination activities are planned to minimize the use of rinsate; decontamination materials will consist of detergent, water, and wipes. Disposable sampling equipment and PPE, will be segregated to the greatest extent possible to avoid generation of hazardous, radioactive, and/or mixed waste.

5.2 Potential Waste Streams

Historical records and process knowledge indicate that potentially hazardous materials and/or radioactive materials may have been generated at the site. There is a potential that sanitary, LLW, hazardous, mixed, and/or hydrocarbon wastes will be generated at the site. Wastes generated during the investigation activities may include, but are not limited to, the following:

- Contaminated disposable or reusable sampling equipment (such as plastic, paper, sample containers, aluminum foil, spoons, scoops, and bowls)
- Decontamination rinsate
- Spent PPE which was contaminated during excavation and sampling activities
- Contaminated soil

For administrative purposes, this waste will be managed in three waste streams: soil, contaminated solid trash, and liquid wastes (such as decontamination rinsate). Segregation will occur within each waste stream based on sample location. For example, the soil waste and decontamination rinsate will be segregated. Waste will be traceable to its source and to individual samples.

5.3 Investigation-Derived Waste Management

All waste generated through the performance of the field activities at the ETS-1 Decontamination Pad will be managed in accordance with the requirements outlined in this CAIP, waste minimization and pollution prevention objectives, and waste management programs.

To allow for the segregation of radioactive and nonradioactive waste and materials, radiological swipe surveys or screening for fixed radiation may be conducted on reusable sampling equipment, the PPE, and disposable sampling equipment waste streams exiting from within the controlled area. Contamination limits, as defined in Table 2-2 of the *NV/YMP Radiological Control Manual* (DOE/NV, 1996c), shall be used to determine if such materials may be declared nonradioactive. Once a radiological or nonradiological determination has been made for a particular waste stream, a sanitary or hazardous waste determination will be made. The final disposition of such wastes will be determined by evaluating the analytical results of acquired soil samples. Management requirements for sanitary, LLW, hazardous, or mixed wastes are discussed further in the following sections.

5.3.1 Sanitary Waste

Sanitary waste, generated outside the controlled area, will be contained in plastic bags, dumpsters, or packages and transported to an NTS-managed sanitary waste landfill.

5.3.2 Low-Level Radioactive Waste

Low-level radioactive waste, if generated, will be managed in accordance with DOE Orders, the contractor-specific waste certification program plan and the *Nevada Test Site Waste Acceptance Criteria* (NTSWAC) (DOE/NV, 1997). Packages containing soil, PPE and disposable sampling equipment, and rinsate (when full) shall be staged at a designated Radioactive Materials Area or a Radioactive Control Area pending certification and disposal under NTSWAC requirements (DOE/NV, 1997). The PPE and disposable sampling equipment shall be placed in clear plastic bags marked with the date and an associated sample location number. The bags will be tagged with a contractor-specific waste tracking tag and logged in the contractor-specific waste management logbook. The DOE-compliant packages shall be labeled “Hazardous Waste Pending Analysis” and “Radioactive Material Pending Analysis,” and will be locked or fitted with tamper-indicating devices (TIDs). Traceability shall be maintained by assigning unique waste tracking numbers to each container and by maintaining records that trace the IDW back to the original sampling locations.

Rinsate shall be collected in DOT-compliant packages (49 *Code of Federal Regulations* [CFR] 172) (CFR, 1998d). Rinsate may be analyzed separately to determine final disposition. If rinsate is characterized as low-level waste on the basis of container-specific sampling or other methods, it may be solidified prior to NTSWAC certification activities.

5.3.3 Hazardous Waste

Suspected hazardous wastes will be managed in accordance with RCRA and State of Nevada hazardous waste management regulations, interpreted as follows. Suspected hazardous waste will be placed in DOT-compliant packages (49 CFR 172) (CFR, 1998d) which will be locked or fitted with TIDs. The IDW shall be containerized in a manner to comply with Subpart CC of 40 CFR 265 (CFR, 1998c) and the requirements of 40 CFR 265.172 (CFR, 1998c). Drums shall be handled and inspected in accordance with the requirements of 40 CFR 265.173 and 174, respectively (CFR, 1998c). No incompatible wastes are expected to be generated; however, if incompatible waste

is encountered in the field, it will be managed in accordance with 40 CFR 265.177 (CFR, 1998c) (i.e., shall not be placed in the same container) and shall be separated so that in the event of a spill, leak, or release, incompatible wastes shall not contact one another.

Hazardous wastes shall be characterized in accordance with the requirements of 40 CFR 261 (CFR, 1998a). Characterization will be based on laboratory results and process knowledge. Packages containing IDW pending characterization will be marked with the words "Hazardous Waste Pending Analysis" until its regulatory status can be determined through interpretation and evaluation of laboratory results. Waste shall be traceable to its source and/or samples considered analogous to the waste (such as PPE associated with a sample). Traceability shall be maintained by assigning unique waste tracking numbers to each container and by maintaining records that trace the IDW back to the original samples. After receipt of analytical results, hazardous wastes (if identified) will be labeled and marked in accordance with the requirements of 40 CFR 262.32 (CFR, 1998b) and State of Nevada requirements, such as writing the EPA Waste Code number on the hazardous waste label.

Hazardous waste management methods to include the establishment of Satellite Accumulation Areas or a 90-day Hazardous Waste Accumulation Area (HWAA) will be employed to temporarily accumulate IDW pending characterization. These methods will be appropriate for the amount of waste being accumulated and in compliance with applicable State of Nevada and federal requirements.

If a HWAA is established, suspected hazardous waste will be accumulated at the HWAA for up to 90 days in accordance with 40 CFR 262.34 (CFR, 1998b). Prior to or on the ninetieth day of accumulation as specified in 40 CFR 262.34 (a) (CFR, 1998b), hazardous waste will be shipped by a licensed/permitted hazardous waste transporter to a permitted treatment, storage, and disposal facility. If hazardous waste must remain on-site for longer than 90 days due to unforeseen, temporary, and uncontrollable circumstances, a letter requesting an extension for up to 30 days will be sent to the NDEP in accordance with 40 CFR Part 262.11(b) (CFR, 1998b). A copy of the uniform hazardous waste manifest shall be provided to the State of Nevada.

5.3.4 Mixed Wastes

Mixed waste, if generated, shall be managed in accordance with RCRA (40 CFR 262) (CFR, 1998b) and NAC 444 (NAC, 1998a). These regulations, as well as DOE requirements for radioactive waste are interpreted as follows. Where there is a conflict in regulations or requirements, the most stringent shall apply. For example, the 90-day accumulation time limit and weekly inspections per RCRA regulations will be applied to mixed waste even though it is not required for radioactive waste. Conversely, while RCRA does not require documented traceability, the waste acceptance program for LLW does; therefore, traceability shall be documented as described in [Section 5.3.2](#).

In general, mixed waste shall be managed in the same manner as hazardous waste, with added mandatory radioactive waste management program requirements. Suspected mixed waste will be managed in accordance with applicable regulations and requirements and will be marked with the words “Hazardous Waste Pending Analysis” pending characterization and confirmation of its regulatory status. However, once the waste determination is made, or the RCRA 90-day time requirement draws to an end, mixed waste shall be transported via a permitted hazardous waste hauler to the NTS transuranic waste storage pad for storage pending treatment or disposal. Mixed waste with hazardous waste constituents below land disposal restrictions may be disposed of at the Area 5 Radioactive Waste Management Site.

Mixed waste not meeting land disposal restrictions will remain in Area 5 and require development of a treatment plan under the requirements of the Mutual Consent Agreement between DOE and the State of Nevada (NDEP, 1995)

5.3.5 Hydrocarbon Waste

Hydrocarbon waste, such as contaminated soil containing more than 100 milligrams per kilogram (mg/kg) TPH, will be properly containerized in bags or packages and will be transported to an appropriately permitted hydrocarbon waste management facility after the waste is fully characterized. Hydrocarbon waste which has come in contact with or has the potential to contact radiologically contaminated media is to be considered radiological waste and managed in accordance with the handling procedures for LLW.

6.0 Duration and Records Availability

6.1 Duration

Following NDEP approval of this CAIP, the tentative schedule of activities (in calendar days) to occur after October 1, 1999:

- Day 0: Preparation for field work will begin.
- Day 55: Notify NDEP of upcoming field activities.
- Day 60: Field work, including field screening and sampling, will begin. Samples will be shipped to meet laboratory holding times.
- Day 70: Field work is complete.
- Day 185: The quality-assured laboratory analytical sample data will be available for review.
- The FFACO date for the CADD is currently October 31, 2000.

6.2 Records Availability

Historic information and documents referenced in this plan are retained in the DOE/NV project files in Las Vegas, Nevada, and can be obtained through written request to the DOE/NV Project Manager. This document is available in the DOE public reading rooms located in Las Vegas and Carson City, Nevada, or by contacting the DOE/NV Project Manager. The NDEP maintains the official Administrative Record for all activities conducted under the auspices of the FFACO.

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Appendix A

Data Quality Objectives Worksheets

A.1.0 Introduction

A.1.1 Problem Statement

Potentially hazardous wastes were discharged to the CAU 252, CAS 25-07-04, Area 25 ETS-1 Decontamination Pad (ETS-1 Decontamination Pad) at the NTS. Effluent from vehicle decontamination at the ETS-1 Decontamination Pad could have been discharged to sump. Two pipes discharged to the sump ([Figure A.1-1](#)): one pipe from the decontamination pad drain and the other was a sewer pipe for a trailer. Soil near the northeast corner of the decontamination pad could also be contaminated. The decontamination pad slopes downward to the northeast and effluent from vehicle decontamination could have flowed northeast across the pad and ponded on the soil near the pad. Existing information about the nature and extent of contamination or about the decontamination activities that may have occurred at the site is insufficient to evaluate and select a preferred corrective action.

This CAU will be investigated based on DQOs developed by representatives of NDEP and DOE/NV. This investigation will determine if COPCs are present in soils at the site (i.e., the sump and the soil near the northeast corner of the decontamination pad). If COPCs are detected above PALs, the lateral and vertical extent of contamination will be delineated (e.g., step-out sampling may be conducted). Data adequate to close the site under NDEP, RCRA, and DOE requirements will be collected.

A.1.2 DQO Kickoff Meeting

[Table A.1-1](#) lists the DQO participants present at the FFACO-required DQO Kickoff Meeting. These participants or additional pertinent personnel may be consulted as necessary for any subsequent meetings that may be required prior to submittal of the CAIP. The goal of the DQO process is to establish the quantity and quality of environmental data required to support corrective action decisions for the CAUs. The process ensures that the information collected will provide sufficient and reliable information to identify, evaluate, and technically defend the chosen corrective action. Unless otherwise required by the results of this DQO and stated in the CAIP, this investigation will adhere to the Industrial Sites QAPP (DOE/NV, 1996b).

Figure A.1-1
CAU 252, Area 25 Engine Test Stand - 1 Decontamination Pad
and Planned Test Pit Locations

Table A.1-1
DQO Kickoff Meeting Participants
April 28, 1999

Participant	Affiliation
Mike McKinnon	NDEP
Sabine Curtis	DOE/NV
Matt Klainer	IT
Syl Hersh	IT
Juliana Herrington	SAIC
Lydia Coleman	SAIC
Carrye Putz	IT
Shannon Parsons - DePry	BN
Robert Curiale	IT
Jeff Johnson	IT
Steve Adams	IT
Milinka Watson-Garrett	IT
Don Cox	BN
Mary Todd	SAIC
Jeanne Wightman	MACTEC

BN - Bechtel Nevada
DOE/NV - U.S. Department of Energy, Nevada Operations Office
IT - IT Corporation
MACTEC - Management Analysis Company Technologies
NDEP - Nevada Division of Environmental Protection
SAIC - Science Applications International Corporation

A.2.0 Conceptual Model

The NRDS in Area 25 of the Nevada Test Site was operational primarily between 1958 and 1973 (Bernhardt et al., 1974; DOE/NV, 1984). The NRDS complex consisted of several buildings, test facilities, and support systems used for the development and testing of nuclear rocket engines. The NRDS complex included the ETS-1 facility which was constructed in 1966 for use as a test stand for testing nuclear rockets (SNPO, 1970). The ETS-1 Decontamination Pad was constructed in 1968 for use as a mobile radiation checkpoint and for vehicle decontamination. The site is located in Area 25 at the intersection of Road H and Road K (Pan Am, 1966; Pan Am, 1968). The conceptual site model for the ETS-1 Decontamination Pad is provided in [Table A.2-1](#).

Table A.2-1
CAU 252 Conceptual Model Element Descriptions
(Page 1 of 2)

Conceptual Model Element	Description	Source
ETS-1 Decontamination Pad (CAS 25-07-04)	The ETS-1 Decontamination Pad is located at the northwest corner of the intersection of Road H and Road K in Area 25 of the NTS.	Engineering drawings (Pan Am, 1966; Pan Am, 1968)
	<p>The CAU 252 site includes:</p> <ul style="list-style-type: none"> A concrete decontamination pad that measures about 35 ft by 15 ft with a grated drain (18 in. by 6 in.). There are two light poles on either side of the pad. The decontamination pad slopes to the northeast. A gravel-filled sump measures 31 ft by 35 ft. The surface of the sump is below the general topography of the nearby area. Concrete trailer pads: Two parallel concrete pads that measure 3 ft by 55 ft and two parallel concrete pads that measure 3 ft by 18 ft. Two small concrete pads for the trailer tongues. Several utility boxes. Dimensions for the entire CAU 252 site are 115 ft by 60 ft. 	Engineering drawings (Pan Am, 1966; Pan Am, 1968) Site observation (ITLV, 1994)
	The ETS-1 test stand constructed in 1966 is part of the NRDS facility. The CAU 252 ETS-1 Decontamination Pad and mobile radiation check point was built in 1968. The NRDS complex ceased primary operations in 1973.	Process knowledge (Bernhardt et al., 1974; DOE/NV, 1984; Pan Am, 1966; Pan Am, 1968)
Evidence for COPCs	The CAU 252 site was designed for use as a mobile radiation check point and for vehicle decontamination. If COPCs are present, they would most likely be associated with radiological decontamination processes.	Engineering drawings (Pan Am, 1966; Pan Am, 1968)
	There are no visible stains or odors at the site.	Site observation (ITLV, 1994; ITLV, 1997)
	A preliminary sample (ERS00044) was collected on August 15, 1997. The sample was collected from the soil near the northeast corner of the decontamination pad. The sample was analyzed for VOCs, SVOCs, TPH-diesel range organics, RCRA metals, PCBs, gross alpha/beta, and gamma emitters. The results of these analyses did not indicate any COPCs above EPA Region IX Industrial Soil PRGs. These data were used to assist in developing the COPC list for the CAU 252 investigation.	Process knowledge (Forsgren, 1998)

Table A.2-1
CAU 252 Conceptual Model Element Descriptions
(Page 2 of 2)

Conceptual Model Element	Description	Source
Extent of COPCs	If COPCs were released at the site, assume relatively low contaminant concentrations. Process knowledge from other decontamination pads within Area 25 also show little to no contamination (CAU 240 Area 25 Vehicle Washdown Pads).	Process knowledge (Pan Am, 1966; Pan Am, 1968)
	The extent of lateral contamination, if present, is not expected beyond the CAU 252 area. Any COPC releases at the site are due to decontamination processes and not from deliberate waste disposal.	Process knowledge (CAU 240)
	COPCs are of relatively minor vertical extent. The site, if used, would have been used intermittently. There is no evidence the sump had a sufficient and/or sustained hydraulic head to act as a significant driving force to mobilize contaminants to large depths. Annual precipitation, soil type, and the arid environment are not adequate to support appreciable downward contaminant movement.	Process Knowledge (NTS and Yucca Mountain climate data, various reports; CAU 240 project)
	The CAU 252 site was designed for use as mobile radiation checkpoint and for vehicle decontamination. Currently the site is abandoned.	Process knowledge (Bernhardt et al., 1974; DOE/NV, 1984; Pan Am, 1966; Pan Am, 1968)
Future use of the site	Future site use is restricted per the NTS Environmental Impact Statement.	Environmental Impact Statement (DOE/NV, 1996a)
Potential receptors	Potential for exposure is mainly to field personnel and workers performing investigations at this site.	NTS excavation activities

A.3.0 Potential Contaminants

The gravel sump for the ETS-1 Decontamination Pad was designed to receive decontamination effluent from the decontamination pad and sewage from the larger trailer pad. The decontamination pad slopes downward to the northeast. If the decontamination pad was used, the effluent would have most likely drained toward the northeast corner of the pad and not necessarily down the drain. The COPCs for CAU 252 include the following:

- Radiological emitters associated with decontamination activities are the indicator parameter or primary COPC. Radiological emitters will be evaluated through field surveys and laboratory analyses.
- Other COPCs for this site include total VOCs, total SVOCs, TPH-diesel, RCRA metals, total pesticides, and PCBs. These COPCs will be evaluated through field screening and/or laboratory analyses for one or more of the following reasons:
 - Potential for being associated with solvents and/or vehicles potentially decontaminated used during the decontamination process
 - Evaluated for as a precautionary measure because of operations associated with a nuclear facility
- Additional samples may also be collected for waste management purposes.

[Section 3.0](#) of the CAIP provides additional information on the COPCs for CAU 252, including PALs and QA/QC requirements ([Table A.3-1](#)). The precision, accuracy, and practical quantitation limits are contained in [Appendix C](#).

Table A.3-1
CAU 252 ETS-1 Decontamination Pad
Contaminants of Potential Concern

Analyte	Comments	Field Screening Method	Field Screening Level	Conduct Analytical?	Analytical Method	Preliminary Action Level	Source ^c
Volatile Organic Compounds	Unlikely	Headspace	20 ppm or 2.5X background (use greater value)	Yes*	8260B ^a	PRGs ^b	NAC 445A
Semivolatile Organic Compounds	Unlikely	NA	NA	Yes*	8270C ^a	PRGs ^b	NAC 445A
Total Petroleum Hydrocarbons (diesel)	Unlikely	NA	NA	Yes*	8015B modified ^a	100 mg/kg ^c	NAC 445A
Total RCRA Metals	Unlikely	NA	NA	Yes*	6010B/7470A ^a 6010B/7471A ^a	PRGs ^b	NAC 445A
Total Pesticides	Unlikely	NA	NA	Yes*	8081A ^c	PRGs ^b	NAC 445A
Polychlorinated Biphenyls	Unlikely, detected in a very low concentration in preliminary sample	NA	NA	Yes*	8082 ^c	PRGs ^b	NAC 445A
Radionuclides	Potential for radionuclides because the site was designed for use as a mobile radiological check point and for vehicle decontamination	Electra alpha/beta scintillator, sodium iodide detector, and/or intrinsic germanium detector (or equivalent)	Mean background activity plus 2 times standard deviations of background readings	Yes*	Gamma Spectroscopy ^d	Isotopic-specific value based on maximum isotopic background data	NA

^aTest Methods for Evaluating Solid Waste, Third Edition, Parts 1-4, SW-846 (EPA, 1996)

^bRegion IX Industrial Soil Preliminary Remediation Goals (PRGs) (EPA, 1998)

^cNevada Administrative Code (NAC, 1998)

^dSee Table C.1-1 for specific analyses

NA = Not applicable for this project

*As specified in text Section 3.0 of the CAIP

A.3.1 Decisions

The primary decision to be made from the investigation is whether the sump or soil near the northeast corner of the pad have been adversely impacted by decontamination activities. Decisions to be resolved by the investigation include the following:

- Determine the presence or absence of COPCs.
- If COPCs are present, determine the type and concentrations of COPCs.
- If COPCs are present, determine whether the COPC concentrations exceed the PALs.
- Determine the nature and extent of contamination (or absence of contamination) with enough certainty to develop and evaluate a range of potential corrective actions, including closure in place and clean closure.

A.3.2 Inputs and Strategy

Inputs to the decisions are those elements of information used to support the decisions in addressing the identified problem. A list of information inputs, existing data, identified data gaps, and brief strategies are discussed in [Table A.3-2](#). A more detailed discussion of investigation strategies is found in [Section A.4.0](#).

Table A.3-2
CAU 252 Decisions, Inputs, and General Strategies
(Page 1 of 3)

Decision	Input	Existing Data	Data Gap	Strategy
Are COPCs present above PALs at site?	Potential contaminant identification	Process knowledge indicates the site was designed for use as a mobile radiation check point and for vehicle decontamination.	Exact COPCs	Conduct utility, video, and/or geophysical surveys, as necessary. Conduct radiological survey. Collect soil samples and analyze for COPCs.
	Potential contaminant concentration	A preliminary sample (ERS00044) was collected on August 15, 1997. The sample was analyzed for VOCs, SVOCs, TPH-diesel, RCRA metals, PCBs, gross alpha/beta, and gamma emitters. The results of these analyses did not indicate any COPCs above EPA Region IX Industrial Soil PRGs.	Identify COPCs and concentrations	Collect soil samples with a backhoe for field screening and laboratory analyses. Direct-push methods may be used as necessary for sample collection. Field survey for radiological emitters. The planned soil sample locations are biased to worst-case areas (i.e., sump and soil near the northeast corner of the decontamination pad); compare results to FSLs and/or to PALs. Conduct additional (step-out) sampling, as necessary.
	Potential contaminant distribution	Location of the ETS-1 Decontamination Pad. The vertical and lateral extent of COPCs is assumed to be limited to the sump and in the soil near the northeast corner of the decontamination pad. There is a lack of driving force due to arid environment and the COPCs are relatively immobile.	Identify vertical and lateral extent of COPCs	See strategy (above) for determining if COPCs are present above PALs at site.

Table A.3-2
CAU 252 Decisions, Inputs, and General Strategies
(Page 2 of 3)

Decision	Input	Existing Data	Data Gap	Strategy
Are potential contaminants migrating?	Relative mobility of potential contaminant	Process knowledge from similar decontamination pads (CAU 240 Area 25 Vehicle Washdown Pads) indicate COPCs primarily occur within 3 ft to 5 ft bgs.	Identify COPCs and concentrations	See strategy (above) for determining if COPCs are present above PALs at site.
	Potential contaminant distribution	Limited by COPC type, surficial geology, operational practices, and meteorological characteristics	Identify vertical and lateral extent of COPCs	See strategy (above) for determining if COPCs are present above PALs at site.
	Meteorologic data	NTS and Yucca Mountain Project data on annual precipitation, evaporation, evapotranspiration, and weather.	Sufficient information exists.	No site-specific meteorological data will be collected. General weather conditions (e.g., sunny, breezy, cool, hot) are noted on daily field notes.
	Geologic/hydrologic data	NTS and Yucca Mountain Project data describing general geologic and/or hydrologic characteristics of the NTS and surrounding area.	Sufficient information exists.	No specific geologic or hydrologic sample data will be collected for this site. Sampling for this investigation will not exceed 12 ft bgs. General soil characteristics will be noted on sample collection log.
	Biological degradation factors	Not applicable	None anticipated	There are no plans to collect microbial samples; however, if laboratory analytical results indicate higher than expected concentrations of TPH, then samples may be collected.
	Radiological data	Man-made radionuclides may be present at this site.	Conduct ground survey prior the field investigation. Conduct sample surveys during the field investigation.	Establish background; field survey for alpha/beta/gamma radiation; and collect samples for gamma spectroscopy.

Table A.3-2
CAU 252 Decisions, Inputs, and General Strategies
(Page 3 of 3)

Decision	Input	Existing Data	Data Gap	Strategy
Data sufficient to support closure options?	No further action	The ETS-1 Decontamination Pad site was designed for use as a mobile radiation checkpoint and for vehicle decontamination.	Presence, concentration, and extent of COPCs	Insufficient evidence to proceed without investigation. Collect field and laboratory samples; compare results to PALs. If no COPCs above PALs, prepare CADD/CR.
	Closure in place by administrative controls	Potential for COPCs; assume industrial soil PRGs per NAC 445A (NAC, 1998); assume 100 mg/kg for TPH per NAC 445A; assume use restrictions with signs and fencing as needed.	Presence of regulated COPCs; concentrations above PALs; groundwater protection	Collect field and laboratory samples; compare results to PALs. If no COPCs above PALs, prepare CADD/CR; otherwise prepare CADD.
	Clean closure by contaminant removal	Potential for COPCs; assume industrial soil PRGs per NAC 445A; assume 100 mg/kg for TPH per NAC 445A.	Presence, concentration, and extent of COPCs; volume of contaminated material above PALs	Collect field and laboratory samples; compare results to PALs. If no COPCs above PALs, prepare CADD/CR; otherwise prepare CADD.

PRGs - Preliminary Remediation Goal(s)

A.4.0 Investigation Strategy

The investigation strategy for the ETS-1 Decontamination Pad site includes the following activities:

- Conduct a utility survey prior to excavation activities.
- Determine radiological field-screening levels using an Electra alpha/beta scintillator, a sodium iodide detector, or intrinsic germanium detector (or equivalent) by taking 20 background sample readings and calculating the mean plus two standard deviations.
- A backhoe will be used to remove the gravel-fill from test pit locations in the sump prior to sampling soil in the sump.
- Excavate three test pits with a backhoe. Samples will be collected at approximately 2-ft intervals to a maximum depth of about 12 ft bgs (or the maximum reach of the backhoe). The planned locations for the test pits are as follows:
 - In the sump where the decontamination pad drain pipe discharged
 - In the sump where the sewer pipe discharged
 - The soil near the northeast corner of the decontamination pad where runoff from decontamination effluent would have most likely ponded
- Collect soil samples for laboratory analysis as follows:
 - Soil samples will be collected at the gravel-soil interface in each of the sump test pits. Soil samples will be collected from each test pit, at approximately 2-ft depth intervals until a sample has been collected below FSLs or to the maximum reach of the backhoe (about 12 ft bgs or about 6 ft below the gravel/soil interface). At a minimum two depth intervals will be sampled.
 - At the test pit near the northeast corner of the decontamination pad soil sampling at this location will begin at ground surface and continue at approximately 2-ft depth intervals until a sample has been collected below FSLs or to the maximum reach of the backhoe (about 12 ft bgs). At a minimum two depth intervals will be sampled.
 - If field-screening results exceed field-screening levels at 12 ft bgs (or the maximum reach of the backhoe), then sampling will stop and the investigation will be rescoped.
 - If COPCs are not detected above PALs, prepare CADD/CR.
- Field screen for VOCs using the headspace technique with a photoionization detector.

- Field survey for radioactivity using an Electra alpha/beta scintillator, a sodium iodide detector, or intrinsic germanium detector (or equivalent).
- Conduct a geophysical survey to locate the piping, as necessary.
- Conduct a video survey to locate breaches in piping, as necessary.
- Conduct laboratory analysis for gamma emitters, total VOCs, total SVOCs, TPH-diesel, RCRA metals, total pesticides, and PCBs.
- Collect and submit quality control samples as prescribed in the QAPP.
- Collect additional samples should the following occur:
 - Field-screening levels or preliminary actions levels are exceeded and contamination needs to be further delineated.
 - Data are insufficient for a corrective action decision document evaluation.
 - Needed for waste management purposes.
 - Site Supervisor determines it to be necessary.

A.5.0 Decision Rules

The following decision rules ([Table A.5-1](#)) are applicable to the ETS-1 Decontamination Pad site and will be used to guide the investigation and subsequent data evaluation.

- If, in the course of the investigation, either of the following occur, the investigation will be halted and rescoped as necessary:
 - The conceptual model fails to such a degree that rescoping is required.
 - Sufficient data are collected to support evaluation of corrective actions.
- If analytical results are not adequate for preparation of a CADD and/or for waste management purposes, additional (step-out) samples may be collected and submitted for analyses at the discretion of the Site Supervisor.
- If COPCs extend beyond 12 ft bgs (or maximum reach of the backhoe), the investigation will be stopped and rescoped.
- If laboratory results indicate the presence of COPCs above PALs, a CADD will be prepared.
- If no COPCs are identified above PALs, a CADD/CR will be prepared according to the outline agreed upon by NDEP and DOE/NV.

Table A.5-1
CAU 252 Site-Specific Decision Points and Rules

Investigation Activity	Decision Point	Decision Result	Decision Rule
Excavation and Soil Sample Collection in Sump	Can the piping discharge points be located?	Yes	Proceed with sampling and investigation.
		Yes, but in a different location	Adjust sampling location and proceed with investigation.
		No	Piping may have been removed; proceed with sampling and investigation; evaluate field data to determine if sampling location is correct; notify appropriate personnel; adjust sampling location; conduct a geophysical or video survey to locate piping discharge points as necessary.
	Are radiological survey results above FSLs Table A.3-1?	Yes	All soil samples collected at the test pits will be submitted to the laboratory analysis for gamma emitters, total VOCs, total SVOCs, TPH-diesel, RCRA metals, total pesticides, and PCBs. Any additional (step-out) samples collected will be submitted for laboratory analyses as specified by the Site Supervisor.
		No	All soil samples collected at the test pits will be submitted to the laboratory analysis for gamma emitters, total VOCs, total SVOCs, TPH-diesel, RCRA metals, total pesticides, and PCBs.
	Are VOC results above FSLs Table A.3-1?	Yes	All soil samples collected at the test pits will be submitted to the laboratory analysis for gamma emitters, total VOCs, total SVOCs, TPH-diesel, RCRA metals, total pesticides, and PCBs. Any additional (step-out) samples collected will be submitted for laboratory analyses as specified by the Site Supervisor.
		No	All soil samples collected at the test pits will be submitted to the laboratory analysis for gamma emitters, total VOCs, total SVOCs, TPH-diesel, RCRA metals, total pesticides, and PCBs.
Video Survey and Soil Sampling	Can discharge points of piping be found with backhoe or process knowledge?	Yes	Proceed with investigation and sampling.
		No	Conduct video survey to locate discharge points for piping, as necessary.
Geophysical Survey and Soil Sampling	Can discharge points of piping be found with backhoe or process knowledge?	Yes	Proceed with investigation and sampling.
		No	Conduct geophysical survey to locate piping, as necessary.

A.6.0 Decision Error

Biased sampling locations will be selected for soil sampling at the CAU 252 ETS-1 Decontamination Pad site as identified in Sections A.3.0, A.4.0, and A.5.0. The sampling strategy targets the worst-case contamination by directly sampling areas where contamination will most likely be present. Sampling areas include the sump and the soil near the northeast corner of the decontamination pad. The decontamination pad slopes downward to the northeast and effluent from decontamination activities could have runoff the pad and ponded in this location. Additional soil samples will be collected if laboratory results indicate significant contamination is present and the contamination needs to be further delineated. This sampling strategy will yield the highest confidence that the extent of contamination, if present, has been adequately bounded. Samples will be field screened and submitted to a laboratory for analyses using the rationale in [Section A.3.0](#) and [Section A.4.0](#).

A.7.0 References

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Appendix B

Project Organization

B.1.0 Project Organization

The DOE/NV Industrial Sites Project Manager is Janet Appenzeller-Wing and her telephone number is (702) 295-0461.

The names of the project Health and Safety Officer and the Quality Assurance Officer can be found in the appropriate DOE/NV plan. However, personnel are subject to change, and it is suggested that the Project Manager be contacted for further information. The Task Manager will be identified in the FFACO Biweekly Activity Report prior to the start of field activities.

Appendix C

Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and Radiochemistry Analytical Requirements for Industrial Sites

Table C.1-1
Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and
Radiochemistry Analytical Requirements for Industrial Sites
(Page 1 of 6)

Parameter or Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit	Regulatory Limit	Relative Percent Difference (RPD) ^a	Percent Recovery (%R) ^b
ORGANICS						
Total Volatile Organic Compounds (VOCs)	Water	8260B ^c	Analyte-specific estimated quantitation limits ^d	Not Applicable (NA)	14 ^e	61-145 ^e
	Soil				24 ^e	59-172 ^e
Toxicity Characteristic Leaching Procedure (TCLP) VOCs						
Benzene	Aqueous	1311/8260B ^c	0.050 mg/L ^d	0.5 mg/L ^d	14 ^e	61-145 ^e
Carbon Tetrachloride			0.050 mg/L ^d	0.5 mg/L ^d		
Chlorobenzene			0.050 mg/L ^d	100 mg/L ^d		
Chloroform			0.050 mg/L ^d	6 mg/L ^d		
1,2-Dichloroethane			0.050 mg/L ^d	0.5 mg/L ^d		
1,1-Dichloroethene			0.050 mg/L ^d	0.7 mg/L ^d		
Methyl Ethyl Ketone			0.050 mg/L ^d	200 mg/L ^d		
Tetrachloroethene			0.050 mg/L ^d	0.7 mg/L ^d		
Trichloroethene			0.050 mg/L ^d	0.5 mg/L ^d		
Vinyl Chloride			0.050 mg/L ^d	0.2 mg/L ^d		
Total Semivolatile Organic Compounds (SVOCs)	Water	8270C ^c	Analyte-specific estimated quantitation limits ^d	NA	50 ^e	9-127 ^e
	Soil				50 ^e	11-142 ^e
TCLP SVOCs						
o-Cresol	Aqueous	1311/8270C ^c	0.10 mg/L ^d	200 mg/L ^d	50 ^e	9-127 ^e
m-Cresol			0.10 mg/L ^d	200 mg/L ^d		
p-Cresol			0.10 mg/L ^d	200 mg/L ^d		
Cresol (total)			0.30 mg/L ^d	200 mg/L ^d		
1,4-Dichloro-benzene			0.10 mg/L ^d	7.5 mg/L ^d		
2,4-Dinitrotoluene			0.10 mg/L ^d	0.13 mg/L ^d		

Table C.1-1
Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and
Radiochemistry Analytical Requirements for Industrial Sites
(Page 2 of 6)

Parameter or Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit	Regulatory Limit	Relative Percent Difference (RPD) ^a	Percent Recovery (%R) ^b
Hexachloro-benzene	Aqueous	1311/8270C ^c	0.10 mg/L ^d	0.13 mg/L ^d	50 ^e	9-127 ^e
Hexachloro-butadiene			0.10 mg/L ^d	0.5 mg/L ^d		
Hexachloro-ethane			0.10 mg/L ^d	3 mg/L ^d		
Nitrobenzene			0.10 mg/L ^d	2 mg/L ^d		
Pentachloro-phenol			0.50 mg/L ^d	100 mg/L ^d		
Pyridine			0.10 mg/L ^d	5 mg/L ^d		
2,4,5-Trichloro-phenol			0.10 mg/L ^d	400 mg/L ^d		
2,4,6-Trichloro-phenol			0.10 mg/L ^d	2 mg/L ^d		
Total Pesticides	Water	8081A ^c	Analyte-specific (CRQL) ^e	NA	27 ^e	38-131 ^e
	Soil				50 ^e	23-139 ^e
TCLP Pesticides						
Chlordane	Aqueous	1311/8081A ^c	0.0005 mg/L ^e	0.03 mg/L ^d	27 ^e	38-131 ^e
Endrin			0.001 mg/L ^e	0.02 mg/L ^d		
Heptachlor			0.0005 mg/L ^e	0.008 mg/L ^d		
Heptachlor Epoxide			0.0005 mg/L ^e	0.008 mg/L ^d		
gamma-BHC (Lindane)			0.0005 mg/L ^e	0.4 mg/L ^d		
Methoxychlor			0.005 mg/L ^e	10 mg/L ^d		
Toxaphene			0.05 mg/L ^e	0.5 mg/L ^d		
Polychlorinated Biphenyls (PCBs)	Water	8082 ^c	Analyte-specific contract required quantitation limits (CRQL) ^e	NA	Lab-specific ^d	Lab-specific ^d
	Soil					
Total Herbicides	Water	8151A ^c	1.3 µg/L ^c	NA	Lab-specific ^d	Lab-specific ^d
	Soil		66 µg/kg ^c			
TCLP Herbicides						
2,4-D	Aqueous	1311/8151A ^c	0.002 mg/L ^d	10 mg/L ^d	Lab-specific ^d	Lab-specific ^d
2,4,5-TP			0.00075 mg/L ^d	1 mg/L ^d		

Table C.1-1
Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and
Radiochemistry Analytical Requirements for Industrial Sites
(Page 3 of 6)

Parameter or Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit	Regulatory Limit	Relative Percent Difference (RPD) ^a	Percent Recovery (%R) ^b
Total Petroleum Hydrocarbons (TPH)	Water Gasoline	8015B modified ^c	0.1 mg/L ^g	NA	Lab-specific ^d	Lab-specific ^d
	Soil Gasoline		0.5 mg/kg ^g			
	Water Diesel		0.5 mg/L ^g			
	Soil Diesel		25 mg/kg ^g			
Explosives	Water	8330 ^c	14 µg/L ^c	NA	Lab-specific ^d	Lab-specific ^d
	Soil		2.2 mg/kg ^c			
Polychlorinated Dioxins and Furans	Water	8280A/8290 ^c	0.05 µg/L ^c	NA	Lab-specific ^d	Lab-specific ^d
	Soil		5 µg/kg ^c			
INORGANICS						
Total Resource Conservation and Recovery Act (RCRA) Metals						
Arsenic	Water	6010B/7470A ^c	10 µg/L ^{g,h}	NA	20 ^h	75-125 ^h
	Soil	6010B/7471A ^c	1 mg/kg ^{g,h}			
Barium	Water	6010B/7470A ^c	200 µg/L ^{g,h}			
	Soil	6010B/7471A ^c	20 mg/kg ^{g,h}			
Cadmium	Water	6010B/7470A ^c	5 µg/L ^{g,h}			
	Soil	6010B/7471A ^c	0.5 mg/kg ^{g,h}			
Chromium	Water	6010B/7470A ^c	10 µg/L ^{g,h}			
	Soil	6010B/7471A ^c	1 mg/kg ^{g,h}			
Lead	Water	6010B/7470A ^c	3 µg/L ^{g,h}			
	Soil	6010B/7471A ^c	0.3 mg/kg ^{g,h}			
Mercury	Water	6010B/7470A ^c	0.2 µg/L ^{g,h}			
	Soil	6010B/7471A ^c	0.1 mg/kg ^{g,h}			
Selenium	Water	6010B/7470A ^c	5 µg/L ^{g,h}			
	Soil	6010B/7471A ^c	0.5 mg/kg ^{g,h}			
Silver	Water	6010B/7470A ^c	10 µg/L ^{g,h}			
	Soil	6010B/7471A ^c	1 mg/kg ^{g,h}			

Table C.1-1
Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and
Radiochemistry Analytical Requirements for Industrial Sites
(Page 4 of 6)

Parameter or Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit	Regulatory Limit	Relative Percent Difference (RPD) ^a	Percent Recovery (%R) ^b
TCLP RCRA Metals						
Arsenic	Aqueous	1311/6010B ^c 1311/7470A ^c	0.10 mg/L ^{g,h}	5 mg/L ^d	20 ^h	75-125 ^h
Barium			2 mg/L ^{g,h}	100 mg/L ^d		
Cadmium			0.05 mg/L ^{g,h}	1 mg/L ^d		
Chromium			0.10 mg/L ^{g,h}	5 mg/L ^d		
Lead			0.03 mg/L ^{g,h}	5 mg/L ^d		
Mercury			0.002 mg/L ^{g,h}	0.2 mg/L ^d		
Selenium			0.05 mg/L ^{g,h}	1 mg/L ^d		
Silver			0.10 mg/L ^{g,h}	5 mg/L ^d		
Cyanide	Water	9010B ^c	0.01 mg/L ^h	NA	20 ^h	75-125 ^h
	Soil		1.0 mg/kg ^h			
Sulfide	Water	9030B/9034 ^c	0.4 mg/L ^c	NA	Lab-specific ^d	Lab-specific ^d
	Soil or Sediment		10 mg/kg ^g			
pH/Corrosivity	Water	9040B ^c	NA	pH >2 ⁱ	Lab-specific ^d	Lab-specific ^d
	Soil	9045C ^c		pH<12.5 ⁱ		
Ignitability	Water	1010 ^c	NA	Flash Point <140° F ^d	NA	NA
	Soil	1030 ^c		Burn Rate ^c >2.2 mm/sec nonmetals; >0.17 mm/sec metals		
RADIOCHEMISTRY						
Gamma-emitting Radionuclides ^j	Water	EPA 901.1 ^k	Isotope-specific ^m	NA	20	Tracer Yield 30-105 Laboratory Control Sample Yield 80-120
	Soil	HASL 300 ^l			35	
Isotopic Plutonium ^j	Water	NAS-NS-3058 ^{n,o}	1 pCi/L	NA	20	
	Soil		0.1 pCi/g Pu-238 ^p 0.4 pCi/g Pu-239/240 ^p		35	
Isotopic Uranium ^j	Water	NAS-NS-3050 ^{q,r}	2 pCi/L	NA	20	
	Soil		1 pCi/g		35	
Strontium - 90 ^l	Water	SM 7500-Sr ^s	5 pCi/L	NA	20	
	Soil	Martin 79 ^t	1 pCi/g ^u		35	

Table C.1-1
Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and
Radiochemistry Analytical Requirements for Industrial Sites
(Page 5 of 6)

Parameter or Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit	Regulatory Limit	Relative Percent Difference (RPD) ^a	Percent Recovery (%R) ^b
Gross Alpha	Water	EPA 900.0 ^k	3 pCi/L ^v	NA	20	Tracer Yield 30-105 Laboratory Control Sample Yield 80-120
	Soil	SM 7110 ^s	3 pCi/g ^v		35	
Gross Beta	Water	EPA 900.0 ^k	4 pCi/L ^v	NA	20	Tracer Yield 30-105 Laboratory Control Sample Yield 80-120
	Soil	SM 7110 ^s	4 pCi/g ^v		35	

Table C.1-1 Laboratory Chemical, Toxicity Characteristic Leaching Procedure, and Radiochemistry Analytical Requirements for Industrial Sites (Page 6 of 6)

^aRPD is used to Calculate Precision

Precision is estimated from the relative percent difference of the concentrations measured for the matrix spike and matrix spike duplicate analyses of unspiked field samples, or field duplicates of unspiked samples. It is calculated by:

$RPD = 100 \times \{(|C_1 - C_2|) / [(C_1 + C_2) / 2]\}$, where C_1 = Concentration of the analyte in the first sample aliquot, C_2 = Concentration of the analyte in the second sample aliquot.

^b%R is used to Calculate Accuracy

Accuracy is assessed from the recovery of analytes spiked into a blank or sample matrix of interest, or from the recovery of surrogate compounds spiked into each sample. The recovery of each spiked analyte is calculated by: $\%R = 100 \times (C_s - C_u / C_n)$, where C_s = Concentration of the analyte in the spiked sample, C_u = Concentration of the analyte in the unspiked sample, C_n = Concentration increase that should result from spiking the sample

^cU.S. Environmental Protection Agency's (EPAs) *Test Methods for Evaluating Solid Waste*, 3rd Edition, Parts 1-4, SW-846 (EPA, 1996)

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

^eEPA *Contract Laboratory Program Statement of Work for Organic Analysis* (EPA, 1988b; 1990; 1991; and 1994b)

^fIn-House Generated RPD and %R Performance Criteria

It is necessary for laboratories to develop in-house performance criteria and compare them to those in the methods. The laboratory begins by analyzing 15-20 samples of each matrix and calculating the mean %R for each analyte. The standard deviation (SD) of each %R is then calculated, and the warning and control limits for each analyte are established at ± 2 SD and ± 3 SD from the mean, respectively. If the warning limit is exceeded during the analysis of any sample delivery group (SDG), the laboratory institutes corrective action to bring the analytical system back into control. If the control limit is exceeded, the sample results for that SDG are considered unacceptable. These limits are reviewed after every 20-30 field samples of the same matrix and are updated at least semiannually. The laboratory tracks trends in both performance and control limits by the use of control charts. The laboratory's compliance with these requirements is confirmed as part of an annual laboratory audit. Similar procedures are followed in order to generate acceptance criteria for precision measurements.

^g*Industrial Sites Quality Assurance Project Plan* (DOE/NV, 1996)

^hEPA *Contract Laboratory Program Statement of Work for Inorganic Analysis* (EPA, 1988a; 1993; and 1994a)

ⁱRCRA Regulations and Keyword Index, 1998 Edition

^jIsotopic minimum detectable concentrations are defined during the DQO process and specified in the CAIP as applicable

^k*Prescribed Procedures for Measurements of Radioactivity in Drinking Water* (EPA, 1980) or equivalent method

^l*Environmental Measurements Laboratory Procedures Manual* (DOE, 1997) or equivalent method

^mIsotope-Specific Minimum Reporting Limit to be specified in CAIP

ⁿ*The Radiochemistry of Plutonium* (Coleman, 1965) or equivalent method

^o*Separation and Preconcentration of Actinides from Acidic Media by Extraction Chromatography* (Horwitz, et al., 1993) or equivalent method

^pThe *Nevada Test Site Performance Objective Criteria* requirement for certifying that hazardous waste has no added radioactivity requires that the total plutonium (the sum of the Pu-238, 239, 240 concentrations) not exceed 0.5 pCi/g (BN, 1995)

^q*The Radiochemistry of Uranium* (Grindler, 1962) or equivalent method

^r*Separation and Preconcentration of Uranium from Acidic Media by Extraction Chromatography* (Horwitz, et al., 1992) or equivalent method

^s*Standard Methods for the Examination of Water and Waste Water* (APHA, 1995) or equivalent method

^tDetermination of Strontium-89 and -90 in soil with Total Sample Decomposition (Analytical Chemistry, 1979) or equivalent method

^uThe 1.0 pCi/g concentration is approximately twice the concentration of fallout Sr-90 in background surface soils reported in the *Environmental Monitoring Report for the Proposed Ward Valley California Low-Level Radioactive Waste Facility* (Atlan-Tech, 1992)

^vMinimum Reporting Limits (MRLs) for Radiological Contaminants of Potential Concern for the Area 25 Engine Test Stand 1 Decontamination Pad, Corrective Action Unit (CAU) 252 (Adams, 1999)

Definitions:

µg/kg = Microgram(s) per kilogram

mg/kg = Milligram(s) per kilogram

pCi/L = Picocurie(s) per liter

mg/L = Milligram(s) per liter

pCi/g = Picocurie(s) per gram

µg/L = Microgram(s) per liter

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Appendix D

NDEP Comment Responses

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number: Draft Corrective Action Investigation Plan for Corrective Action Unit 252: Area 25 Engine Test Stand-1 Decontamination Pad, Nevada Test Site, Nevada			2. Document Date: June 1999	
3. Revision Number: 0			4. Originator/Organization: IT Corporation	
5. Responsible DOE/NV ERP Project Mgr.: Janet Appenzeller-Wing			6. Date Comments Due:	
7. Review Criteria: Full				
8. Reviewer/Organization/Phone No.: Michael D. McKinnon, NDEP 486-2874			9. Reviewer's Signature:	
10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
1) Page ES-1, 3rd Para.		To be consistent with the rest of the document, add pesticides to the list of contaminants of potential concern (COPCs).	<p>The COPC lists throughout the document have been modified to include the following:</p> <ul style="list-style-type: none"> *Gamma emitters *Total VOCs *Total SVOCs *RCRA metals *TPH-diesel range organics *Total pesticides *Polychlorinated biphenyls (PCBs) <p>All soil samples collected from the test pits will be submitted for laboratory analyses for the specified COPCs. Additional samples may also be collected for waste management purposes.</p>	Yes
2) Section 2.4, Page 10, 1st Para., 6th Line		"vitrified" vice "virtified".	Correction has been made.	Yes

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
3) Section 4.2, Page 17, 1st Para., 2nd Line		<i>"...Sampling activities...will be focused...at the northwest corner of the decontamination pad..."</i> This statement conflicts with Section 3.0, 1 st bullet: <i>"...Characterize the surface and shallow subsurface soils near the northeast corner of the decontamination pad..."</i> , Section 2.5, <i>"...from the northeast corner of the decontamination pad..."</i> , and Page ES-2, 1 st bullet, <i>"...near the northeast corner of the decontamination pad..."</i> Ensure all sampling location references are consistent.	All references to the sampling locations have been checked for consistency. Section 4.2, Page 17, 1st Paragraph, 1st sentence text states: Sampling associated with CAU 252 will be focused within the sump area (west of the ETS-1 Decontamination Pad) and in the soil near the northeast corner of the decontamination pad.	Yes
4) Page 18, 1st Para.		For samples analyzed off-site for radionuclides, those which exceed the FSLs will be selected; however, it is not apparent how these samples (which should total 25%) will be selected in the event the FSLs are not exceeded.	All soil samples collected from the test pits will be submitted for laboratory analyses for the specified COPCs as follows: *Gamma emitters *Total VOCs *Total SVOCs *RCRA metals *TPH-diesel range organics *Total pesticides *Polychlorinated biphenyls (PCBs) Samples may also be collected for waste management purposes.	Yes
5) Section 5.0, Page 20, 2nd Para., 2nd Line		<i>"...The same is true for the contamination rinsate..."</i> Change to "decontamination" rinsate.	Correction has been made.	Yes
6) Section 5.3.4, Page 24, Last Para.		Change Mutual Consent Order to Mutual Consent Agreement.	Correction has been made.	Yes
7) Page A-3, 7th Line		End this sentence after <i>"Road K"</i> ; delete <i>"for the ETS-1 facility"</i> .	Correction has been made.	Yes

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