Environmental
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DOE/EMNV--0042

Streamlined Approach for Environmental Restoration (SAFER) Plan for Corrective Action Unit 578: Miscellaneous Inactive Sites Nevada National Security Site, Nevada

Controlled Copy No.: UNCONTROLLED
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June 2023

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STREAMLINED APPROACH FOR ENVIRONMENTAL RESTORATION (SAFER) PLAN FOR CORRECTIVE ACTION UNIT 578: MISCELLANEOUS INACTIVE SITES NEVADA NATIONAL SECURITY SITE, NEVADA

U.S. Department of Energy,
Environmental Management Nevada Program
Las Vegas, Nevada

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Approved by: TIFFANY GAMERO Digitally signed by TIFFANY GAMERO Date: 2023.06.12 12:27:51 -07'00' Date: ______________

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List of Acronyms and Abbreviations

amsl	Above mean sea level
ASTM	ASTM International
bgs	Below ground surface
CA	Corrective action
CAA	Corrective action alternative
CAI	Corrective action investigation
CAS	Corrective action site
CAU	Corrective action unit
CFR	*Code of Federal Regulations*
COC	Contaminant of concern
COPC	Contaminant of potential concern
CR	Closure report
CSM	Conceptual site model
day/yr	Days per year
DOE	U.S. Department of Energy
DQA	Data quality assessment
DQI	Data quality indicator
DQO	Data quality objective
DRO	Diesel-range organics
EM	Environmental Management
EPA	U.S. Environmental Protection Agency
FAL	Final action level
FFACO	*Federal Facility Agreement and Consent Order*
FSR	Field-screening result
ft	Foot
hr/day	Hours per day

List of Acronyms and Abbreviations *(Continued)*

hr/yr	Hours per year
IDW	Investigation-derived waste
in.	Inch
in./yr	Inches per year
m	Meter
mg/kg	Milligrams per kilogram
NAC	*Nevada Administrative Code*
NAD	North American Datum
NDEP	Nevada Division of Environmental Protection
NHPA	*National Historic Preservation Act*
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NTTR	Nevada Test and Training Range
PA	Preliminary assessment
PAL	Preliminary action level
PCB	Polychlorinated biphenyl
PET	Potential evapotranspiration
PIRDY	Public Involvement Resource Database
PPE	Personal protective equipment
PSM	Potential source material
QA	Quality assurance
QAP	Quality Assurance Plan
QC	Quality control
RBCA	Risk-based corrective action
RCRA	*Resource Conservation and Recovery Act*
REECo	Reynolds Electrical & Engineering Co., Inc.

List of Acronyms and Abbreviations *(Continued)*

REOP	Real Estate/Operations Permit
RMA	Radioactive material area
RSL	Regional Screening Level
SAFER	Streamlined Approach for Environmental Restoration
SVOC	Semivolatile organic compound
TLD	Thermoluminescent dosimeter
TPH	Total petroleum hydrocarbons
TSCA	*Toxic Substances Control Act*
UGTA	Underground Test Area
UR	Use restriction
UST	Underground storage tank
UTM	Universal Transverse Mercator
VOC	Volatile organic compound
yd^3	Cubic yard

Executive Summary

This Streamlined Approach for Environmental Restoration (SAFER) Plan addresses the actions needed to achieve closure for Corrective Action Unit (CAU) 578, Miscellaneous Inactive Sites, identified in the *Federal Facility Agreement and Consent Order* (FFACO). CAU 578 comprises the following 11 corrective action sites (CASs) located in Areas 2, 3, 4, 6, 7, 12, and 23 of the Nevada National Security Site:

- 02-26-01, Lead (Concrete Box w/Lining)
- 02-26-07, Gun Turret w/Lead in Barrel
- 03-16-01, U-3auS Disposal Site
- 04-26-02, Lead on Instrument Bunker
- 06-99-07, Sump
- 07-99-01, Miscellaneous Debris
- 12-02-11, UST-P-2
- 12-06-01, Muckpile
- 12-06-04, Muckpile
- 23-12-01, Boiler (2)
- 23-99-04, Salvage Yard

This plan provides the methodology for field activities needed to gather the necessary information for closing each CAS. There is sufficient information and process knowledge from historical documentation and investigations of similar sites regarding the expected nature and extent of potential contaminants to recommend closure of CAU 578 using the SAFER process. Additional information will be obtained by conducting a field investigation before selecting the appropriate corrective action for each CAS. The results of the field investigation will support a defensible recommendation that no further corrective action is necessary. This will be presented in a closure report that will be prepared and submitted to the Nevada Division of Environmental Protection (NDEP) for review and approval.

Each CAS was grouped into one of three categories based on their pathway to closure. Sites that have a use restriction (UR) but have not been closed under an FFACO closure document were placed into Category I, Document Use Restriction. Sites that are assumed to require corrective action because they are landfills with a presumed corrective action of closure in place were placed into Category II, Create Use Restriction. Sites where sufficient information is not available to determine whether corrective actions are needed were placed into Category III, Determine Corrective Action.

The sites in Category III will be investigated based on the data quality objectives (DQOs) developed on December 15, 2022, by representatives of NDEP and the U.S. Department of Energy (DOE), Environmental Management Nevada Program. The DQO process was used to identify and define the type, amount, and quality of data needed to determine and implement appropriate corrective actions for each CAS in Category III.

The DQO process developed for these CASs identified the following expected closure options:

- investigation and confirmation that no contamination exists above the final action levels (FALs) leading to a no further action declaration,
- characterization of the nature and extent of contamination leading to closure in place with URs, or
- clean closure by remediation and verification.

The following text summarizes the SAFER activities that will support the closure of Category III CASs:

- Perform site preparation activities (e.g., utilities clearances, geophysical surveys).
- Move or remove and dispose of potential source material (PSM), as required.
- Collect environmental samples from designated target populations (e.g., stained soil) to confirm or disprove the presence of contaminants of concern (COCs) as necessary to supplement existing information.
- If no COCs are present at a CAS, establish no further action as the corrective action.
- If a COC or PSM is present either
    - establish clean closure as the corrective action. The material to be remediated will be removed, disposed of as waste, and verification samples will be collected from remaining soil, or
    - establish closure in place as the corrective action and implement the appropriate use restrictions.

- If closure in place is the selected corrective action, either
  - collect environmental samples from designated target populations to define the extent of COC contamination, or
  - define the entire physical dimensions of the unit as the extent of contamination.
- Confirm the preferred closure option is sufficient to protect human health and the environment.

This SAFER Plan has been developed in accordance with the FFACO that was agreed to by the State of Nevada, DOE, and the U.S. Department of Defense. Under the FFACO, this SAFER Plan will be submitted to NDEP for approval.

1.0 Introduction

This Streamlined Approach for Environmental Restoration (SAFER) Plan contains activity-specific information, including facility descriptions, environmental sample collection objectives, and criteria for conducting site investigation activities at Corrective Action Unit (CAU) 578: Miscellaneous Inactive Sites, Nevada National Security Site (NNSS), Nevada. It has been developed in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) (1996, as amended) that was agreed to by the State of Nevada, U.S. Department of Energy (DOE), and the U.S. Department of Defense.

A SAFER may be performed when the following criteria are met:

- Conceptual corrective actions are clearly identified (although some degree of investigation may be necessary to select a specific corrective action before completion of the corrective action investigation [CAI]).
- Uncertainty of the nature, extent, and corrective action is limited to an acceptable level of risk.
- Decision points and criteria for making data quality objective (DQO) decisions are defined.

The purpose of the investigation will be to document and verify the adequacy of existing information; to affirm the decision for either clean closure, closure in place, or no further action; and to provide sufficient data to implement the corrective action. The actual corrective action selected will be based on characterization activities implemented under this SAFER Plan. This SAFER Plan identifies decision points developed in cooperation with the Nevada Division of Environmental Protection (NDEP), where the DOE Environmental Management (EM) Nevada Program will reach consensus with NDEP before beginning the next phase of work.

CAU 578 is located in Areas 2, 3, 4, 6, 7, 12, and 23 of the NNSS, which is approximately 65 miles northwest of Las Vegas, Nevada. CAU 578 consists of 11 corrective action sites (CASs) listed in Table 1-1 and shown on Figure 1-1.

There is sufficient information and process knowledge from historical documentation and investigations of similar sites (i.e., the expected nature and extent of contaminants) to recommend closure of CAU 578 using the SAFER process.

Table 1-1
CAU 578 CAS Information

CAS Number	CAS Name
02-26-01	Lead (Concrete Box w/Lining)
02-26-07	Gun Turret w/Lead in Barrel
03-16-01	U-3auS Disposal Site
04-26-02	Lead on Instrument Bunker
06-99-07	Sump
07-99-01	Miscellaneous Debris
12-02-11	UST-P-2
12-06-01	Muckpile
12-06-04	Muckpile
23-12-01	Boiler (2)
23-99-04	Salvage Yard

UST = Underground storage tank

1.1 SAFER Process Description

CAUs that may be closed using the SAFER process have conceptual corrective actions that are clearly identified. Consequently, corrective action alternatives (CAAs) can be chosen before completing a CAI, given anticipated investigation results.

For the CASs that require investigation, the SAFER process combines elements of the DQO process and the observational approach to plan and conduct closure activities. The DQOs specific to these CASs are presented in Appendix B, and are used to identify the problem and define the type and quality of data needed to complete closure of each CAS. The purpose of the investigation phase is to verify the adequacy of existing information used to determine the chosen corrective action and to confirm that closure objectives were met.

Use of the SAFER process allows for technical decisions to be made based on incomplete but sufficient information, and the experience of the decision-maker. Based on a detailed review of historical documentation, there is sufficient process knowledge to close CAU 578 using the SAFER process. Any uncertainties are addressed by documented assumptions that are verified by sampling

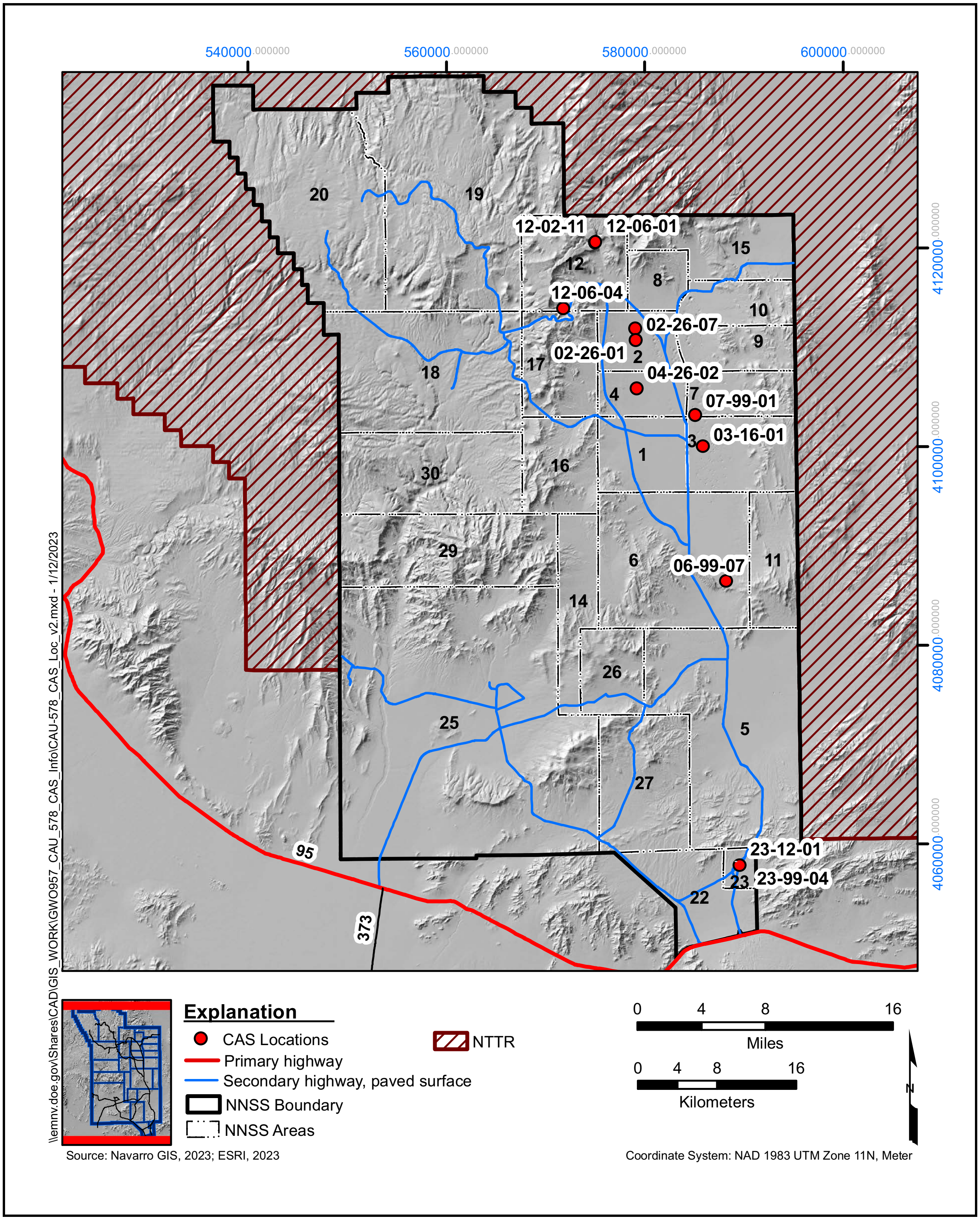

Figure 1-1
CAU 578 CAS Location Map

and analysis, data evaluation, and onsite observations, as necessary. Closure activities may proceed simultaneously with site characterization as sufficient data are gathered to confirm or disprove the assumptions made during selection of the corrective action. If, at any time during the closure process, new information is discovered that indicates that closure activities should be revised, closure activities will be reevaluated as appropriate.

1.2 Summary of Corrective Actions and Closures

The decision flow for closure of each CAS in CAU 578 is summarized in Figure 1-2. This starts with the initial categorization of CASs into three categories based on their pathway to closure as shown in Table 1-2.

Table 1-2
CAU 578 CAS Categorization

CAS Number	CAS Name	Concern	Category
02-26-01	Lead (Concrete Box w/Lining)	UR not in closure document	Document UR
02-26-07	Gun Turret w/Lead in Barrel	UR not in closure document	Document UR
04-26-02	Lead on Instrument Bunker	UR not in closure document	Document UR
12-06-01	Muckpile	Environmental Concern	Create UR
12-06-04	Muckpile	Environmental Concern	Create UR
03-16-01	U-3auS Disposal Site	Inspections but no UR	Determine CA
06-99-07	Sump	Potential Environmental Concern	Determine CA
12-02-11	UST-P-2	Potential Environmental Concern	Determine CA
23-12-01	Boiler (2)	Potential Environmental Concern	Determine CA
23-99-04	Salvage Yard	Potential Environmental Concern	Determine CA
07-99-01	Miscellaneous Debris	Potential Environmental Concern	Determine CA

CA = Corrective action
UR = Use restriction

Category I, Document Use Restriction

Sites in this category have a UR but have not been closed under an FFACO closure document. The SAFER process for CASs in this category will be to document the URs in the FFACO closure report (CR). These CASs will not require a CAI.

Category II, Create Use Restriction

Sites in this category are assumed to require corrective action because they are landfills that cannot be sufficiently characterized to demonstrate that they do not contain hazardous wastes. The presumed corrective action is closure in place with a UR. The SAFER process for CASs in this category will be to create, implement, and document the URs in the FFACO CR. These CASs will not require a CAI.

Category III, Determine Corrective Action

There is not sufficient information available about the releases from sites in this category to determine whether corrective actions are needed. Additional information needs to be generated and documented to justify the path forward to closure for these sites. The SAFER process for CASs in this category will be to generate the additional information needed to justify the selection of a corrective action and to implement the selected corrective action.

The investigation of CAS 03-16-01, U-3auS Disposal Site will be to review and evaluate available documents and correspondence to determine whether sufficient information is available to justify that no corrective action is required. If this corrective action cannot be justified, the corrective action for this CAS will be closure in place with a UR.

For the remaining CASs in the Determine Corrective Action category, a CAI will be conducted in which the appropriate target population(s) within each CAS (defined in the DQO process, Appendix B) will be sampled. The selection of a corrective action for the CASs undergoing a CAI will be documented using the data quality assessment (DQA) process.

If contaminants are detected at concentrations that are above the final action levels (FALs) and remediation is feasible, the nature and extent of contamination will be delineated by additional sampling. However, contingencies are built into the process if new information is identified which indicates that the selected closure option should be revised. The process ends with closure of the site based on laboratory analytical results of the environmental samples and the preparation of a CR. CAAs of closure in place and clean closure will be evaluated for each CAS with contaminants above FALs.

Decision points that require a consensus between DOE EM Nevada Program and NDEP before continuing are indicated in Figure 1-2.

In addition to the previously discussed hold/decision points, work may be temporarily suspended until the issue can be satisfactorily resolved if any of the following unexpected conditions occur:

- Conditions outside the scope of work are encountered.
- Elevated levels of additional contaminants of concern (COCs) are found that were not originally identified as being present at the sites.
- Unexpected conditions, including unexpected waste and/or contamination, are encountered.
- Out-of-scope work activities are required due to the detection of other COCs that would require reevaluating a disposal pathway, such as with hazardous or low-level waste.

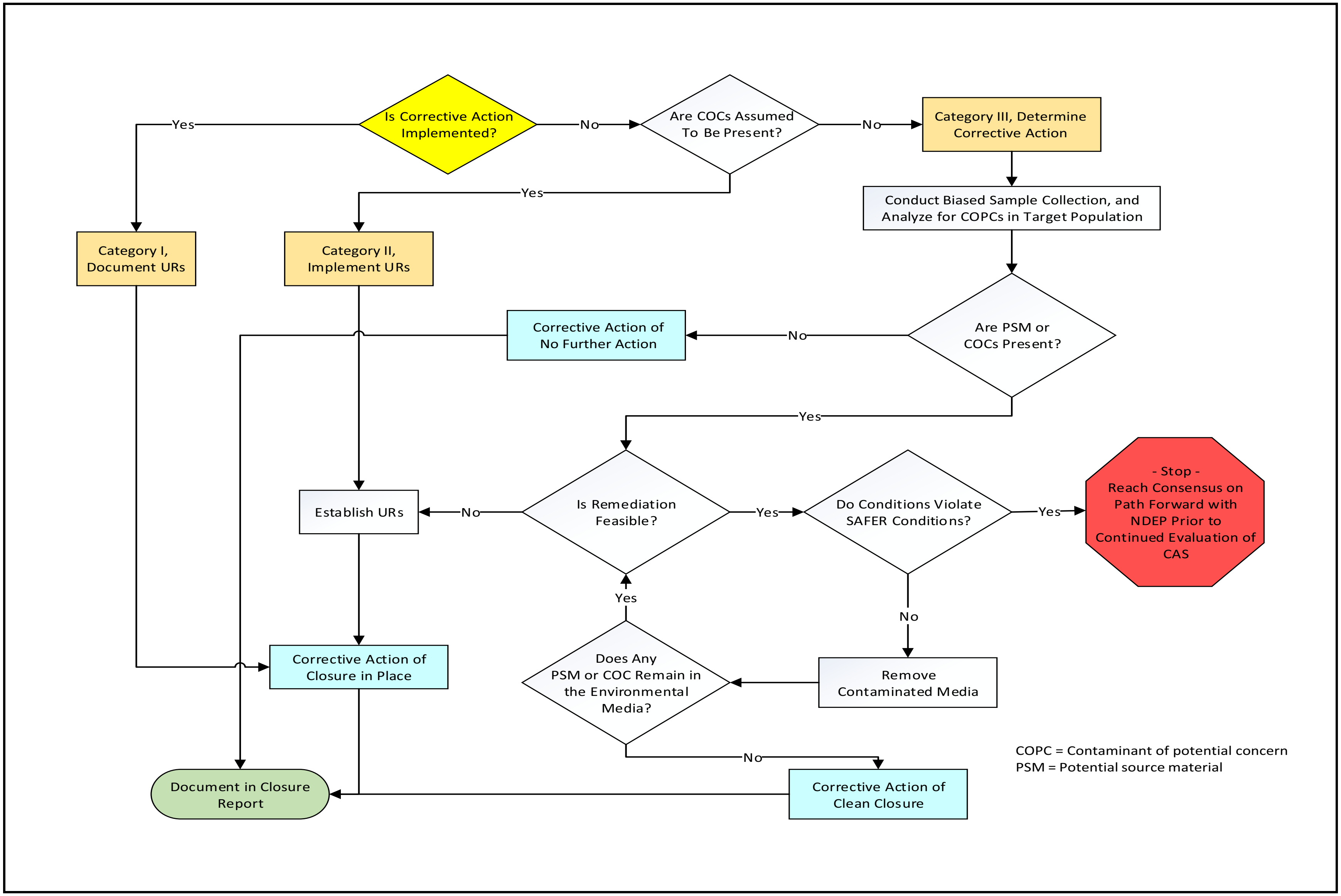

Figure 1-2
CAU 578 Closure Decision Process

2.0 Unit Description

The CASs within CAU 578 are located within Areas 2, 3, 4, 6, 7, 12, and 23 of the NNSS (Figure 1-1). There are 11 CASs in CAU 578 and they have been placed into three categories as described in the following sections.

The operational history, process knowledge, and existing information for each CAS is summarized in this section. Process knowledge for the CASs in CAU 578 has been obtained through historical document reviews, engineering drawing and map reviews, and interviews with past and present NNSS employees. In some cases, site-specific historical documentation pertaining to each CAS is limited. For the CASs that will be sampled under a CAI, assumptions were made to formulate a conceptual site model (CSM) that describes the most probable scenario for the current conditions at each CAS. Appendix B provides additional information on the CSM developed for the CASs undergoing a CAI.

2.1 Category I Sites: Document Use Restriction

Sites in this category have a UR but have not been closed under an FFACO closure document.

2.1.1 Description and History

The following sections provide descriptions of the release sites and a historical summary of FFACO administrative actions.

2.1.1.1 CAS 02-26-01, Lead (Concrete Box w/Lining)

CAS 02-26-01 is the potential release of lead into the soil from the lead metal sheet that lines the bottom of a trough-shaped, concrete box structure. The box is approximately 4 feet (ft) wide and 8 ft in length, and is 2 ft above ground surface (Bangerter, 2004a). The concrete box is labeled as an archaeological find, as this type of atmospheric testing remnants is rare, especially on Yucca Flat. In 2004, a request to transfer CAS 02-26-01 from CAU 286 to CAU 5000 was approved by NDEP (Bangerter, 2004c; Murphy, 2004b) because it was deemed historic and is protected under the *National Historic Preservation Act* (NHPA) (USC, 2018). The environmental impact of lead and lead structures was not addressed until a UR was created in 2017 for potential lead exposure (Boehlecke, 2017). The transfer of CAS 02-26-01 from CAU 5000 to CAU 578 was approved by NDEP in 2023 (Andres, 2023) and allows for this CAS to be formally closed under the FFACO in the CAU 578 CR. Figure 2-1 shows the CAS location with respect to the surrounding roads, any buildings, and other physical features; and Figure 2-2 is a photograph of CAS 02-26-01. It is located within Area 2 of the NNSS near the Diablo ground zero within a radioactive material area (RMA) and is currently encompassed by the administrative UR associated with CAS 02-23-06, Atmospheric Test Site T-2B.

2.1.1.2 CAS 02-26-07, Gun Turret w/Lead in Barrel

CAS 02-26-07 is the potential release of lead into the soil from a lead plug inside the barrel of an artillery type gun from a naval ship. When the gun was installed in Area 2 of the NNSS and the lead was inserted into the barrel, it was used as a collimator for instrumentation on atmospheric events conducted from towers and balloons in the area. In 2004, a request to transfer CAS 02-26-07 from CAU 286 to CAU 5000 was approved (Appenzeller-Wing, 2004; Maize, 2004) because the gun turret was deemed historic and is protected under the NHPA (USC, 2018). The environmental impact of lead and lead structures was not addressed until a UR was created in 2017 for potential lead exposure (Boehlecke, 2017). The transfer of CAS 02-26-07 from CAU 5000 to CAU 578 was approved by NDEP in 2023 (Andres, 2023) and allows for this CAS to be formally closed under the FFACO in the CAU 578 CR. Figure 2-3 shows the CAS location with respect to the surrounding roads, buildings, and other physical features; and Figure 2-4 is a photograph of CAS 02-26-07.

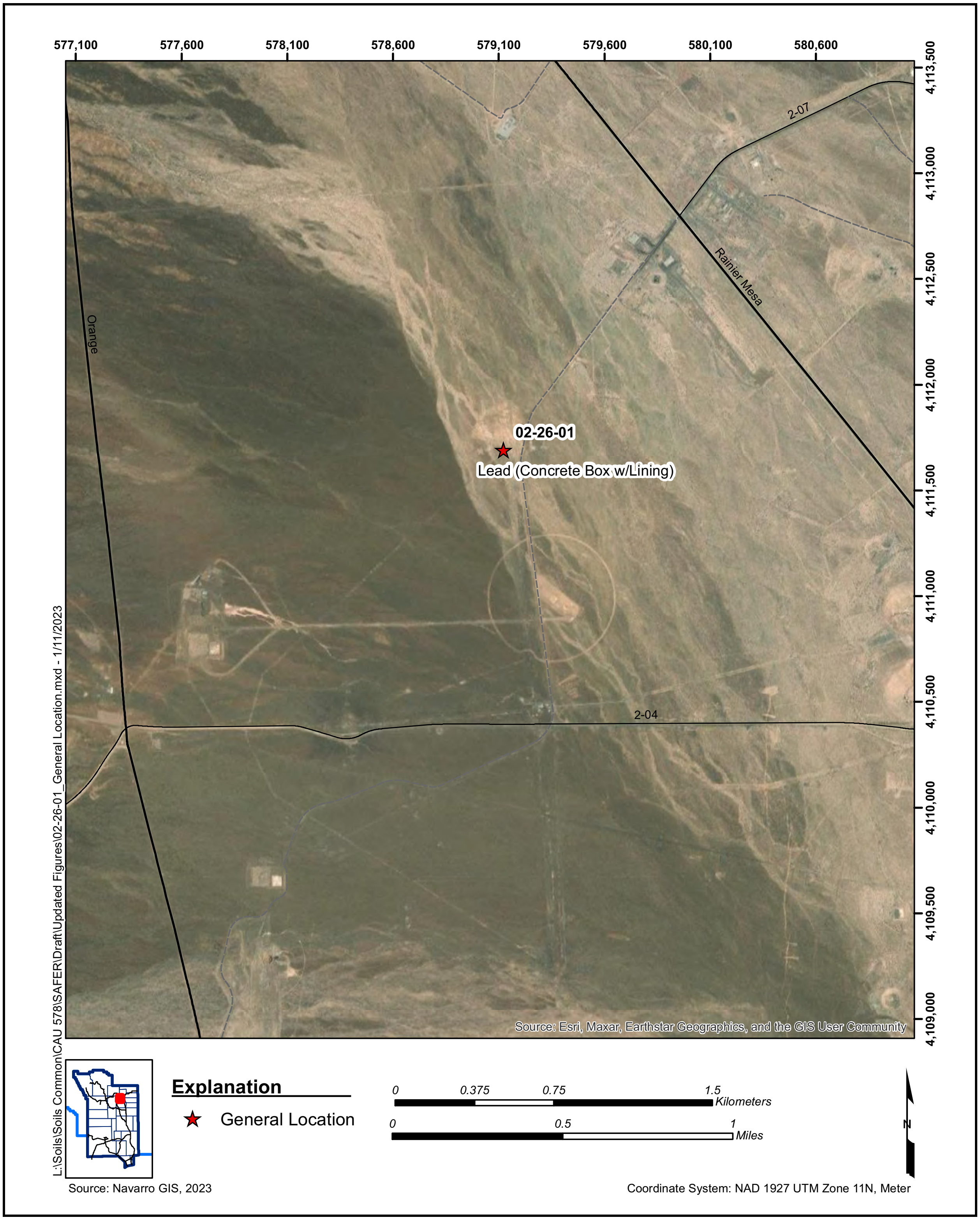

Figure 2-1
CAS 02-26-01, Lead (Concrete Box w/Lining), CAS Location

07/21/2015 (PIRDY-57-206849)

Figure 2-2
CAS 02-26-01, Lead (Concrete Box w/Lining)

2.1.1.3 CAS 04-26-02, Lead on Instrument Bunker

CAS 04-26-02 is the potential release of lead into the soil from a large piece of mangled lead that forms part of the roof of an instrument bunker. The bunker has atmospheric blast damage which includes a large piece of mangled lead that forms part of the roof of the bunker (Bangerter, 2004a). It was proposed to remove the twisted metal from the top of the bunker, but it was determined that removal of the lead would affect the integrity of the bunker and likely cause deterioration of this historic property. In 2004, a request to transfer CAS 04-26-02 from CAU 286 to CAU 5000 was approved by NDEP (Bangerter, 2004c; Murphy, 2004b) because the bunker was deemed historic and protected under the NHPA (USC, 2018). The environmental impact of lead and lead structures was not addressed until a UR was created in 2017 for potential lead exposure (Boehlecke, 2017). The

Figure 2-3
CAS 02-26-07, Gun Turret w/Lead in Barrel, CAS Location

07/21/2015 (PIRDY-57-206852)

Figure 2-4
CAS 02-26-07, Gun Turret w/Lead in Barrel

transfer of CAS 04-26-02 from CAU 5000 to CAU 578 was approved by NDEP in 2023 (Andres, 2023) and allows for this CAS to be formally closed under the FFACO in the CAU 578 CR. The instrument bunker is located within Area 4 of the NNSS within the fenced RMA of the T-4 Atmospheric Test Site. Figure 2-5 shows the CAS location with respect to the surrounding roads, buildings, and other physical features; and Figure 2-6 is a photograph of CAS 04-26-02.

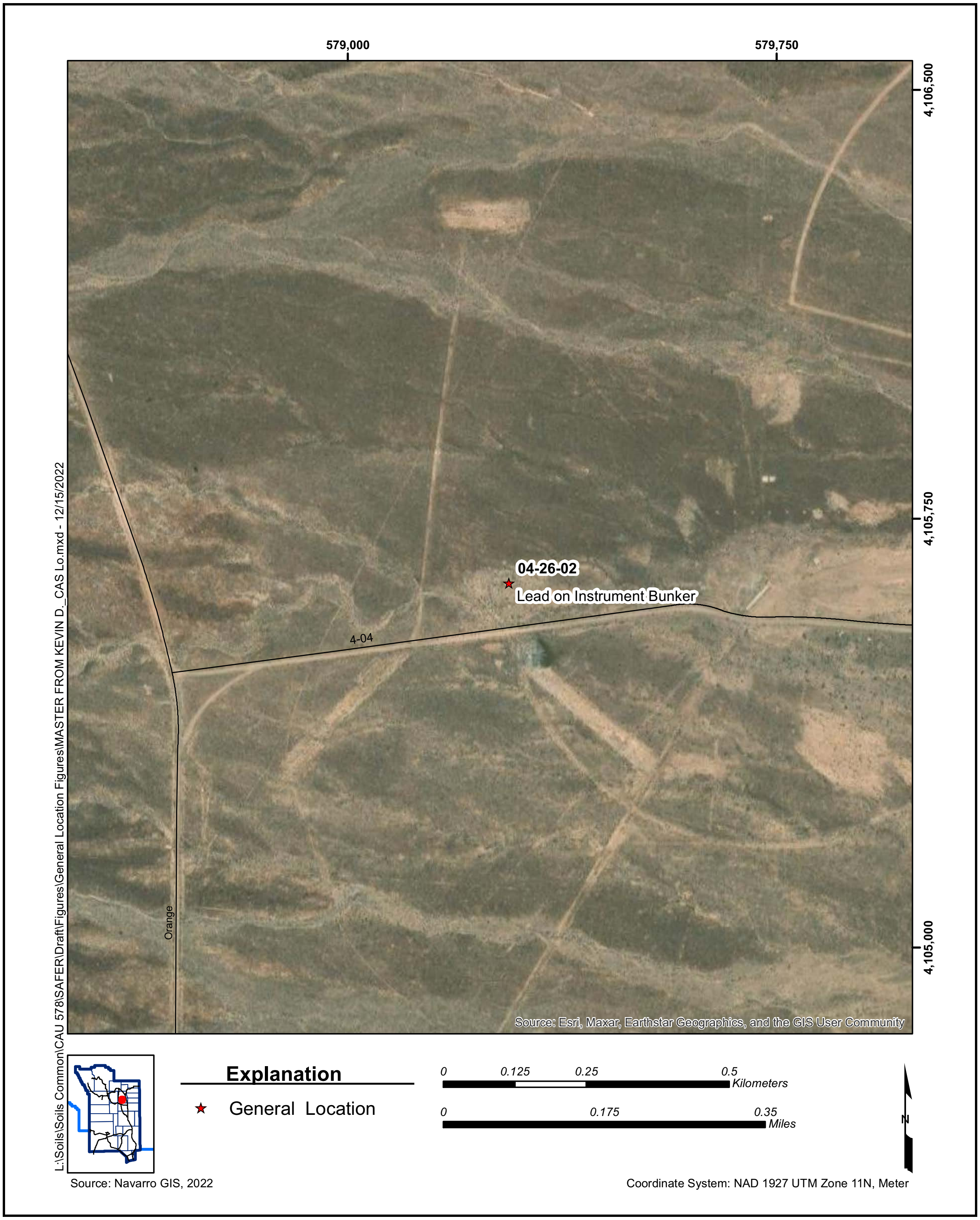

Figure 2-5
CAS 04-26-02, Lead on Instrument Bunker, CAS Location

07/21/2015 (PIRDY-57-206840)

Figure 2-6
CAS 04-26-02, Lead on Instrument Bunker

2.1.2 Available Characterization Information

2.1.2.1 CAS 02-26-01, Lead (Concrete Box w/Lining)

There is no characterization information for CAS 02-26-01. The metal sheet in the box was identified as elemental lead, which is a *Resource Conservation and Recovery Act* (RCRA) hazardous constituent when released to the soil. In its current configuration, the lead is exposed to the environment and is degrading by oxidation. As it degrades, it may become susceptible to leaching lead particles into the soil. Therefore, it is assumed that at some time in the future, the concentration of lead in the soil beneath the box will exceed the FAL for lead.

2.1.2.2 CAS 02-26-07, Gun Turret w/Lead in Barrel

There is no characterization information for CAS 02-26-07. The collimator in the gun turret was identified as elemental lead, which is a RCRA hazardous constituent when released to the soil. In its current configuration, the lead is exposed to the environment and is degrading by oxidation. As it degrades, it may become susceptible to leaching lead particles into the soil. Therefore, it is assumed that at some time in the future, the concentration of lead in the soil beneath the gun turret will exceed the FAL for lead.

2.1.2.3 CAS 04-26-02, Lead on Instrument Bunker

There is no characterization information for CAS 04-26-02. The metal sheet on the instrument bunker was identified as elemental lead, which is a RCRA hazardous constituent when released to the soil. In its current configuration, the lead is exposed to the environment and is degrading by oxidation. As it degrades, it may become susceptible to leaching lead particles into the soil. Therefore, it is assumed that at some time in the future, the concentration of lead in the soil beneath the instrument bunker will exceed the FAL for lead.

2.2 Category II Sites: Create Use Restriction

Sites in this category are assumed to require corrective action because they are landfills that cannot be sufficiently characterized to demonstrate that they do not contain hazardous wastes. The presumed corrective action is closure in place with a UR.

2.2.1 Description and History

The following sections provide descriptions of the release sites and a historical summary of FFACO administrative actions.

2.2.1.1 CAS 12-06-01, Muckpile

CAS 12-06-01 is the potential release of hazardous constituents from the muck deposited on the slope in front of P-Tunnel located within Area 12 of the NNSS. The P-Tunnel muckpile and underlying soil consists of mining debris (rock) generated during tunnel excavation and construction of P-Tunnel that was mined horizontally into the Rainier Mesa tuff in support of nuclear weapon effects testing between 1987 and 1992. The surface elevation at the top of the muckpile is approximately 5,490 ft above mean sea level (amsl). The muckpile is approximately 533 ft across at its widest point and 1,160 ft long in a northeast–southwest direction. The muckpile has an approximate thickness of 5 ft at the northwest end and 70 ft at the southeast end (DTRA, 2003).

In 2005, P-Tunnel was identified as a "readiness facility" to be used in the event that underground nuclear weapons effects testing is resumed (Lantow, 2005). The facility is also used periodically to conduct non-nuclear tests and training. Therefore, a request to transfer CAS 12-06-01 from CAU 475 to CAU 5000 was approved (Lantow, 2005; Murphy, 2005a). However, based on an evaluation of EM closeout responsibilities, CAS 12-06-01 has been identified with potential environmental liabilities (DOE/EMNV, 2022). As potentially hazardous waste is no longer being added to the muckpile, a request to transfer from CAU 5000 to CAU 578 was approved, allowing CAS 12-06-01 to be closed and documented in the CAU 578 CR (DOE/EMNV, 2022; Andres, 2023). Figure 2-7 shows the CAS location with respect to the surrounding roads, buildings, and other physical features; and Figure 2-8 is a photograph of CAS 12-06-01.

2.2.1.2 CAS 12-06-04, Muckpile

CAS 12-06-04 is the potential release of hazardous constituents from the muck deposited on the slope in front of G-Tunnel located within Area 12 of the NNSS. The muckpile is on a steep slope, and the muck consists of rock debris that is distinctly different from the surrounding natural soil. The surface elevation at the top of the muckpile is approximately 6,100 ft amsl. The muckpile is approximately 100 ft across, 7,178 ft long, and 50 ft high (NNSA/NSO, 2003).

In 2004, the G-Tunnel muckpile was in an active area and was being used by a National Nuclear Security Administration (NNSA) National Security Program. It was expected that activities at the site would continue for many years. A 2004 letter stated that "NNSA will resume responsibility for closure of the muckpile upon completion of their activities," and CAS 12-06-04 was transferred from CAU 552 to CAU 5000 (Bangerter, 2004b; Murphy, 2004a). However, based on an evaluation of EM closeout responsibilities CAS 12-06-04 has been identified with potential environmental liabilities (DOE/EMNV, 2022). As potentially hazardous waste is no longer being added to the muckpile, a request to transfer from CAU 5000 to CAU 578 was approved, allowing CAS 12-06-04 to be closed and documented in the CAU 578 CR (DOE/EMNV, 2022; Andres, 2023).

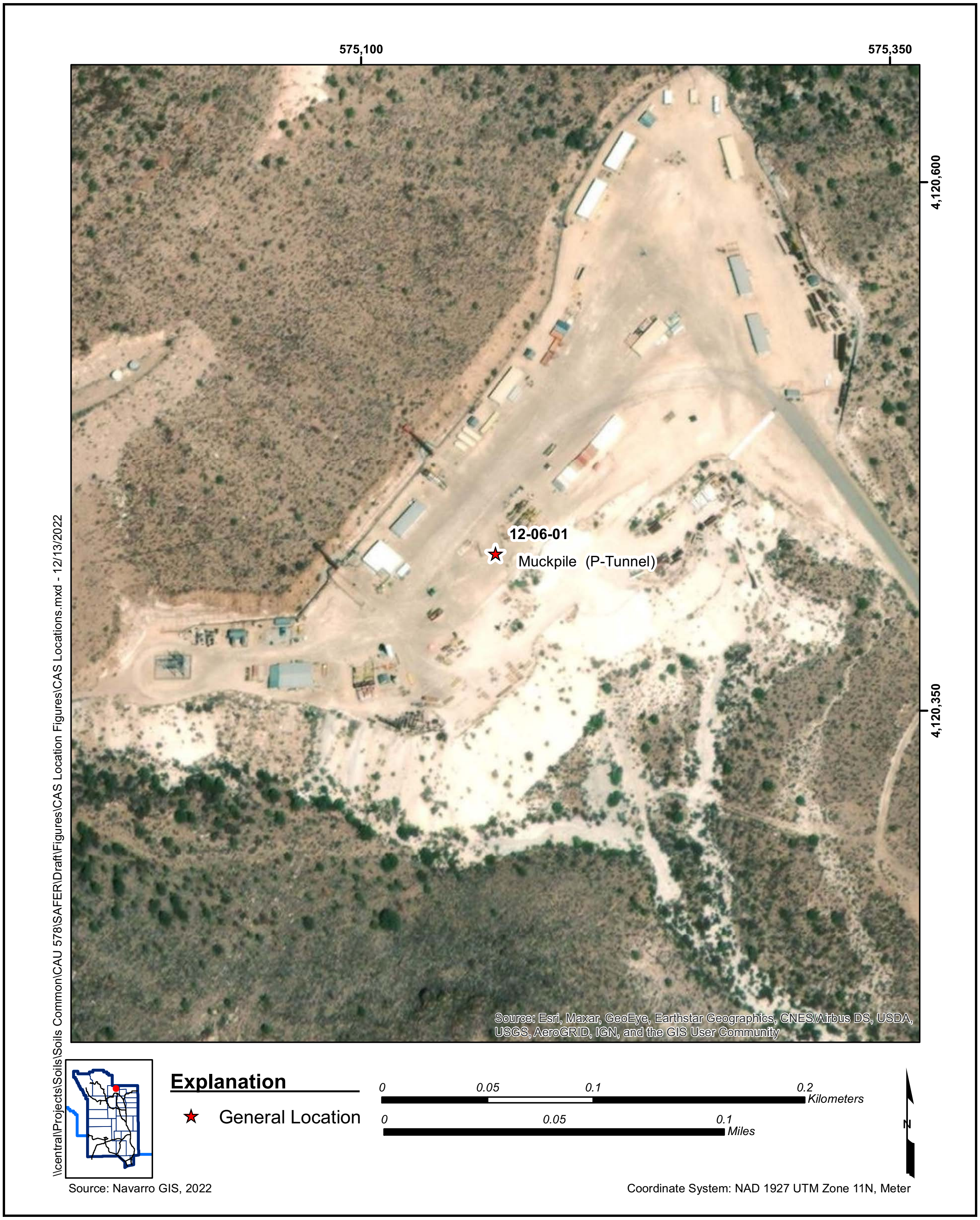

Figure 2-7
CAS 12-06-01, Muckpile, CAS Location

05/11/2022 (PIRDY-57-237325)

Figure 2-8
CAS 12-06-01, Muckpile

The G-Tunnel muckpile is located within Area 12 of the NNSS to the east of Rainer Mesa. Five documented nuclear tests (one weapons and four weapons effects tests) were conducted inside G-Tunnel between 1962 and 1971. Figure 2-9 shows the CAS location with respect to the surrounding roads, buildings, and other physical features; and Figure 2-10 is a photograph of CAS 12-06-04.

Figure 2-9
CAS 12-06-04, Muckpile, CAS Location

Navarro GIS, 2022

Figure 2-10
CAS 12-06-04, Muckpile

2.2.2 Available Characterization Information

2.2.2.1 CAS 12-06-01, Muckpile

A CAI was performed at the P-Tunnel muckpile from April 7 though April 29, 2003, as reported in the CAU 475 corrective action decision document (DTRA, 2004). Diesel-range organics (DRO) was the analyte found to be above action levels as outlined in the 2003 corrective action investigation plan (CAIP) (DTRA, 2003). Although DRO is no longer a criterion for corrective action, it is possible that other contaminated wastes were deposited into the muckpile. Due to the heterogeneous nature of the muckpile and the difficulty of characterizing a muckpile, it is assumed that the muckpile contains hazardous constituents exceeding FALs and requires corrective action.

2.2.2.2 CAS 12-06-04, Muckpile

There is no previous characterization for CAS 12-06-04. It is possible that contaminated wastes were deposited into the muckpile. Due to the heterogeneous nature of the muckpile and the difficulty of characterizing a muckpile, it is assumed that the muckpile contains hazardous constituents exceeding FALs and requires corrective action.

2.3 Category III Sites: Determine Corrective Action

There is not sufficient information available about the releases from sites in this category to determine whether corrective actions are needed. Additional information needs to be generated and documented to justify the path forward to closure for these sites.

2.3.1 Description and History

The following sections provide descriptions of the release sites and a historical summary of FFACO administrative actions.

2.3.1.1 CAS 03-16-01, U-3auS Disposal Site

CAS 03-16-01, U-3auS Disposal Site is the potential release of hazardous constituents from a construction disposal site that is located in the subsidence crater from the Haymaker underground test. It is located within Area 3 of the NNSS, north of Area 3 Camp. It is a subsidence crater that was used for disposal of inert construction and demolition debris. The landfill was used from 1971 to 1991 and closed under standards at the time (Liebendorfer, 1996).

Correspondence between DOE and NDEP resulted in required post-closure inspections, but no UR was formally implemented (Friedman, 1999). The transfer of CAS 03-16-01 from CAU 333 to CAU 578 was requested in 2022 and approved in 2023 to provide formal FFACO closure of the site (DOE/EMNV, 2022; Andres, 2023). Figure 2-11 shows the CAS location with respect to the surrounding roads, any buildings, and other physical features; and Figure 2-12 is a photograph of CAS 03-16-01.

Figure 2-11
CAS 03-16-01, U-3auS Disposal Site, CAS Location

08/30/2021 (PIRDY-57-234610)

Figure 2-12
CAS 03-16-01, U-3auS Disposal Site

2.3.1.2 CAS 06-99-07, Sump

CAS 06-99-07, Sump is the potential release of hazardous constituents to a bermed sump constructed and used to manage water pumped from Water Well C-1. It may have also been used to manage other waste waters. It is located in Area 6 of the NNSS at the southern tip of Yucca Lake. It is described as a sump or evaporation pond used to receive water discharge from Water Well C-1. Water Well C-1 is currently offline. The sump (evaporative pond) accepts periodic discharge from Water Well C-1 from sampling activities at Water Well C-1 under an approved discharge plan (Wycoff, 2001; Andres, 2018).

In 2001, a request to transfer CAS 06-99-07 from CAU 516 to CAU 5000 was approved by NDEP because the sump was deemed active (Wycoff, 2001; Liebendorfer, 2001). However, based on an evaluation of EM closeout responsibilities, CAS 06-99-07 has been identified with potential environmental liabilities and was approved for transfer to CAU 578 to be closed and documented in the CAU 578 CR (DOE/EMNV, 2022; Andres, 2023).

The construction period for the sump (evaporation pond) is unknown; however, an as-built engineering drawing indicates the presence of the pump station, piping, and the evaporation pond (H&N, 1965). Figure 2-13 shows the CAS location with respect to the surrounding roads, any buildings, and other physical features; and Figure 2-14 is a photograph of CAS 06-99-07.

2.3.1.3 CAS 07-99-01, Miscellaneous Debris

CAS 07-99-01, Miscellaneous Debris is the potential release of hazardous constituents from debris associated with a collapsed bunker. It is located in Area 7 of the NNSS, near Gate 7-1C. As described in the initial site identification documentation in the REECo Inventory Form (REECo, 1991). The CAS consists of miscellaneous debris in a pit (e.g., air filters, mufflers, oil filters, lumber).
CAS 07-99-01 was originally placed in CAU 344. In 1997, debris was removed from the site under housekeeping cleanup activities. However, large sections of lumber, many of which are attached and are approximately 25 yards in length, remained at the site. Several pieces of wood are partially buried in the banks of the pit. There are also some partially buried sections of steel cable that could not be easily retrieved for disposal. In a 1997 letter (BN, 1997), it was stated that CAS 07-99-01 requires cuttings tools and heavy equipment to remove large sections of wood debris and cable. It was then determined that this site did not meed the criteria for a housekeeping site. Therefore, it was requested to be transferred to another CAU in the CAU 344 housekeeping report (DOE/NV, 1997a).

In 2022, a request was made to transfer CAS 07-99-01 from CAU 344 to CAU 578 to be closed under the FFACO in the CAU 578 CR (DOE/EMNV, 2022). In 2023, the transfer to CAU 578 was approved by NDEP (Andres, 2023). Figure 2-15 shows the CAS location with respect to the surrounding roads, any buildings, and other physical features; and Figure 2-16 is a photograph of CAS 07-99-01, reflecting the remaining debris.

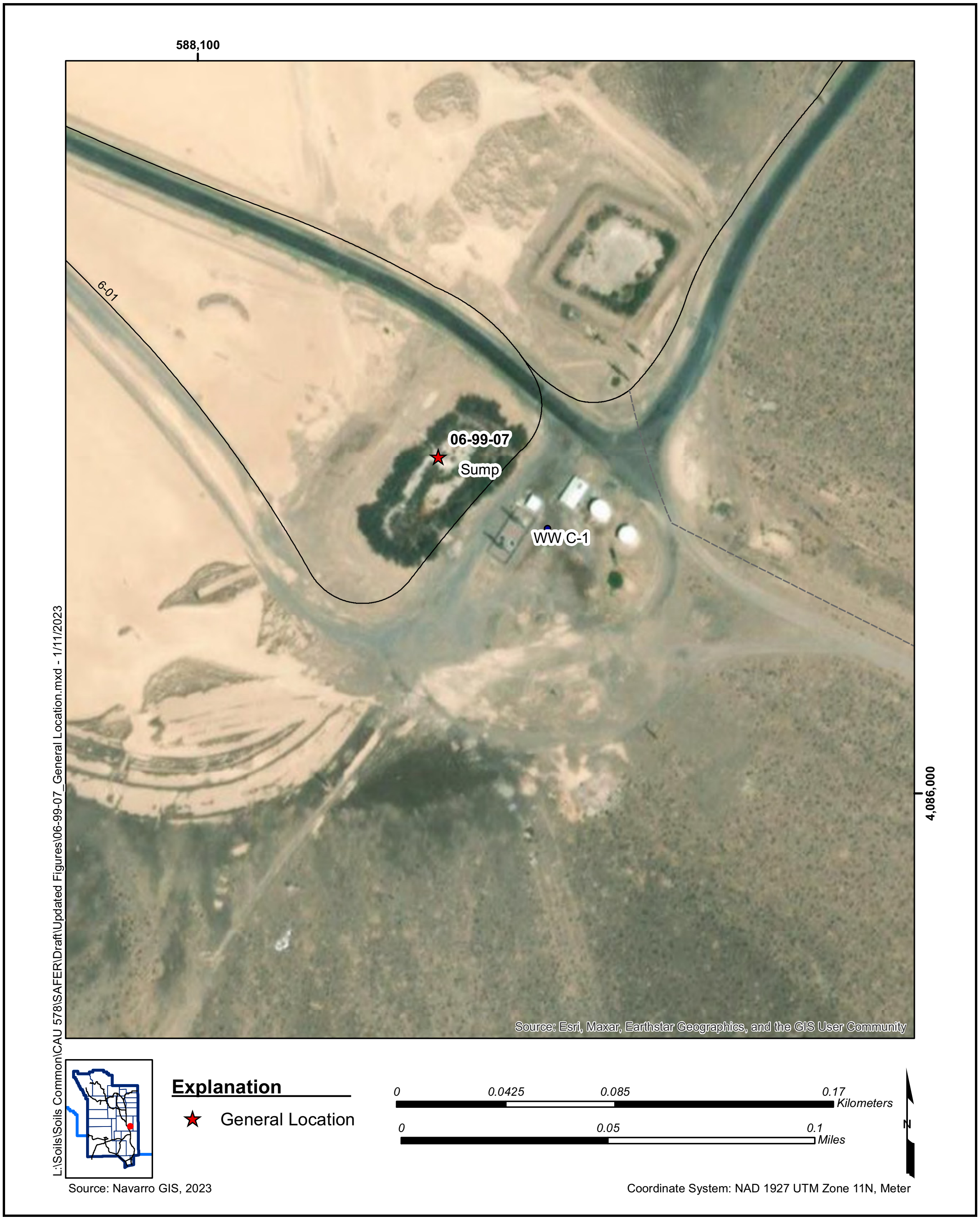

Figure 2-13
CAS 06-99-07, Sump, CAS Location

03/19/2015 (PIRDY-57-205222)

Figure 2-14
CAS 06-99-07, Sump

2.3.1.4 CAS 12-02-11, UST-P-2

CAS 12-02-11, UST-P-2 is the potential release of hazardous constituents from a diesel spill resulting from overfilling a subsurface diesel storage tank. It is located in Area 12 of the NNSS. The 550-gallon tank was installed in 1984 and stored diesel fuel for operation of an emergency generator at P-Tunnel. A hydrocarbon release was observed on September 26, 1990, during excavation around the tank in preparation for its removal. Approximately 146 cubic yards (yd^3) of soil was excavated and removed. Of this amount, it is estimated that 30 to 40 yd^3 contained hydrocarbons. According to available records (REECo, 1990), limited removal of soil beside the generator stand was accomplished using a hand shovel. The depth to bedrock in this area is approximately 12 inches (in.) to 18 in. The area of the excavation is approximately 5 by 5 ft. Electrical conduits run under the

Figure 2-15
CAS 07-99-01, Miscellaneous Debris, CAS Location

07/20/2022 (PIRDY-57-238120)

Figure 2-16
CAS 07-99-01, Miscellaneous Debris

surface in trenches excavated into the bedrock. Samples from the remaining material showed that hydrocarbons exceeding 100 milligrams per kilogram (mg/kg) remained following the removals. Because P-Tunnel was used periodically for non-nuclear tests and training, it was deemed a "readiness facility" (active) (Lantow, 2005), and CAS 12-02-11 was transferred to CAU 5000 (Appenzeller-Wing, 2005; Murphy, 2005b). However, based on an evaluation of EM closeout responsibilities, CAS 12-02-11 has been identified with potential environmental liabilities (DOE/EMNV, 2022). As the source of the release has been removed, the transfer of CAS 12-02-11 from CAU 5000 to CAU 578 was approved by NDEP in 2023 (Andres, 2023) and allows for this CAS to be formally closed under the FFACO in the CAU 578 CR.

The area of the generator stand currently contains a vapor extraction well and two guard posts. The area of the former tank currently contains two vapor extraction wells (one at each end of the former tank) and six guard posts. Figure 2-17 shows the CAS location with respect to the surrounding roads, any buildings, and other physical features; and Figure 2-18 is a photograph of CAS 12-02-11.

2.3.1.5 CAS 23-12-01, Boiler (2)

CAS 23-12-01, Boiler (2) is the potential release of hazardous constituents associated with stained soil that may be from a diesel spill. It is located in Area 23 of the NNSS, and the CAS is defined as the potential release of hazardous constituents to the soils from two stained areas. CAS 23-12-01 was originally identified as two Area 23 boilers used at the Mercury Cafeteria. It was later determined that the boilers were permitted (701038 & 701037); therefore, a request was made to remove CAS 23-12-01 from the FFACO (DOE/NV, 1998). NDEP approved the transfer of CAS 23-12-01 from CAU 317 to CAU 5000 (Liebendorfer, 1998).

In 1998, a preliminary assessment (PA) field visit identified a soil stain at the northeast corner of the boiler building (Building 23-754), a lesser stain along the base of the building, and a large area of stained soil between the boiler building and two USTs north of the boiler building. The February 2, 1998, field paperwork reflects a large soil stained area that is covered by gravel (IT, 1998).

However, based on an evaluation of EM closeout responsibilities, CAS 23-12-01 has been identified with potential environmental liabilities (DOE/EMNV, 2022). As the source of the release has been removed, the site was transferred from CAU 5000 to CAU 578, allowing CAS 23-12-01 to be closed and documented in the CAU 578 CR (DOE/EMNV, 2022). In 2023, the request to transfer to CAU 578 was approved by NDEP (Andres, 2023).

These three soil stained areas will be investigated under CAU 578. Figure 2-19 shows the CAS location with respect to the surrounding roads, buildings, and other physical features; and Figure 2-20 is a photograph of CAS 23-12-01.

Figure 2-17
CAS 12-02-11, UST-P-2, CAS Location

09/05/2018 (PIRDY-57-221899)

Figure 2-18
CAS 12-02-11, UST-P-2

2.3.1.6 CAS 23-99-04, Salvage Yard

CAS 23-99-04, Salvage Yard is the potential release of hazardous constituents from materials or equipment that were stored in this area. It is located in Area 23 of the NNSS near the Mercury bypass and Jackass Flats Rd, off the access road to the WMD Sanitary Landfill. The yard currently appears to be inactive with a lot of debris around the sides of the yard. Visual inspections identified debris piles, soil staining, and possibly lead objects.

In 1997, it was discovered that CAS 23-99-04 was located in an active area and was subsequently requested to be deleted from the FFACO (DOE/NV, 1997b). As part of the closure verification process, an evaluation of EM responsibilities was conducted under the FFACO, and CAS 23-99-04

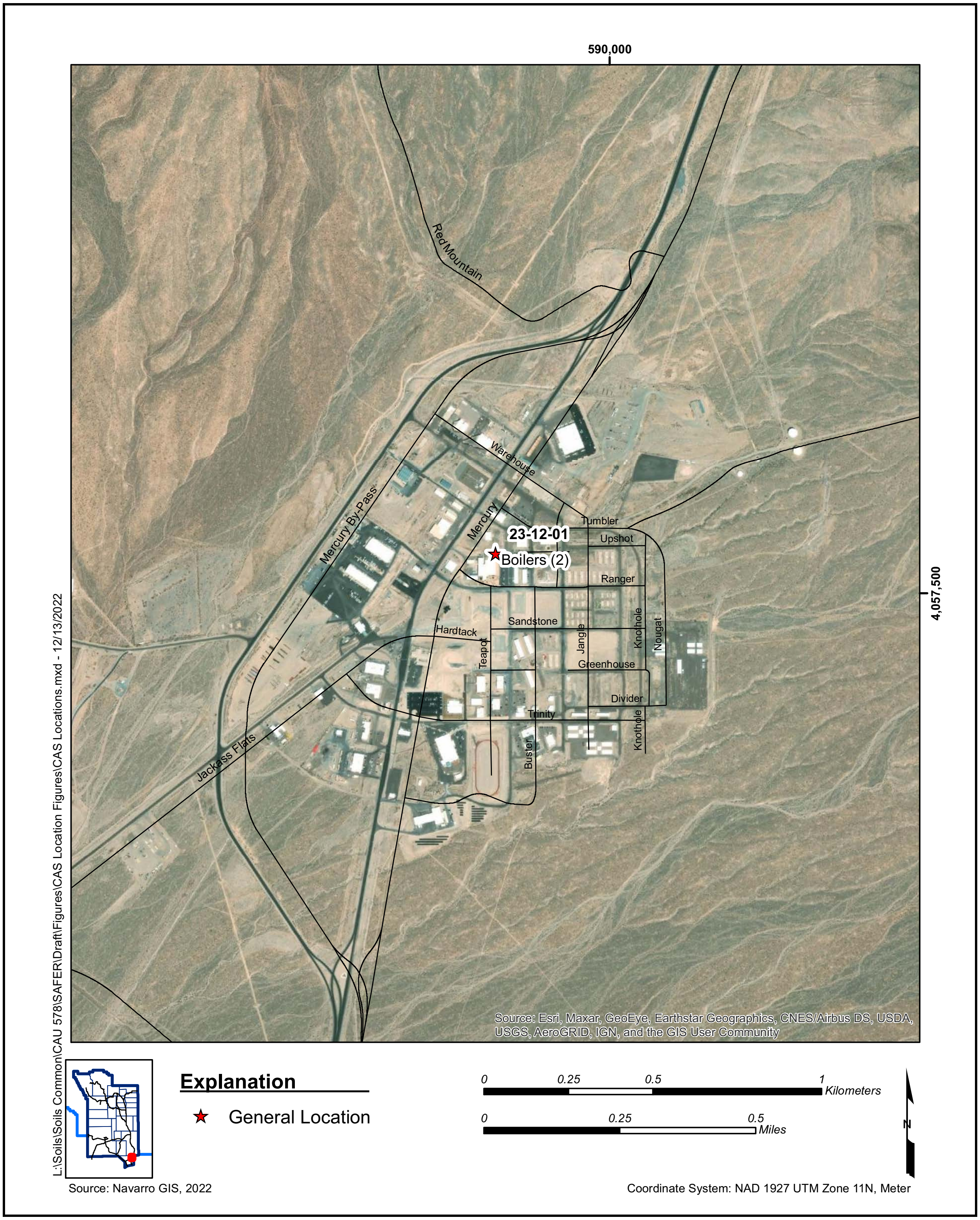

Figure 2-19
CAS 23-12-01, Boiler (2), CAS Location

Author Unknown, 1998

Figure 2-20
CAS 23-12-01, Boiler (2)

was identified with potential environmental liabilities (DOE/EMNV, 2022). In 2022, a request to transfer CAS 23-99-04 from CAU 5000 to CAU 578 was submitted to NDEP for approval (DOE/EMNV, 2022). In 2023, NDEP approved the request to transfer CAS 23-99-04 from CAU 5000 to CAU 578 (Andres, 2023). Figure 2-21 shows the CAS location with respect to the surrounding roads, any buildings, and other physical features; and Figure 2-22 comprises several photographs of CAS 23-99-04.

Figure 2-21
CAS 23-99-04, Salvage Yard, CAS Location

Author Unknown, 2002

06/23/2015 (PIRDY-57-206336)

06/23/2015 (PIRDY-57-206352)

05/11/2022 (PIRDY-57-237308)

05/11/2022 (PIRDY-57-237318)

05/11/2022 (PIRDY-57-237307)

Figure 2-22
CAS 23-99-04, Salvage Yard

2.3.2 Available Characterization Information

2.3.2.1 CAS 03-16-01, U-3auS Disposal Site

No samples have been collected and analyzed from CAS 03-16-01, U-3auS Disposal Site. However, there is good process history through many documents and correspondence detailing that all of the wastes that were disposed of in the landfill were uncontaminated (Elle, 1996; Friedman, 1999).

2.3.2.2 CAS 06-99-07, Sump

No samples have been collected and analyzed from CAS 06-99-07, Sump. Historical documentation indicates that three water softeners were originally used to treat water in the pump station, and the system was taken offline sometime between 1993 and 1994 (Wycoff, 2001). When the system was operational, discharge occurred for periods of time sufficient to maintain a specified water level in the evaporation pond. Water is discharged when the pump station was undergoing wash-down procedures or the pump was leaking water. Reportedly, chlorinated water (approximately 0.3 parts per million), brine from backwash, and possibly some resins from water-softening activities may have been discharged into the evaporation pond over this time period.

2.3.2.3 CAS 07-99-01, Miscellaneous Debris

No samples have been collected and analyzed from CAS 07-99-01, Miscellaneous Debris. Undated historical file photos showed that some materials had been removed from this location, but most of the nonhazardous materials were left behind. Recoverable surface debris, including empty aerosol cans, were disposed at the Ul0c Landfill on February 4, 1997. Remaining at this location are large sections of lumber, many of which are attached and are approximately 25 yards in length. Several pieces of wood are partially buried in the banks of the pit. There are also some partially buried sections of steel cable that could not be easily retrieved for disposal (BN, 1997).

2.3.2.4 CAS 12-02-11, UST-P-2

At the time of the removal of the fuel tank adjacent to the electrical substation at P-Tunnel, hydrocarbon releases (diesel) were observed around the fuel tank and around the generator stand (see Figure 2-18). After the excavations, the following total petroleum hydrocarbon (TPH) concentrations were observed (REECo, 1990):

- North end of tank sample - 92 mg/kg
- South end of tank sample - 803 mg/kg
- Generator stand sample - 4,026 mg/kg

2.3.2.5 CAS 23-12-01, Boiler (2)

No samples have been collected and analyzed from the stained soils at CAS 23-12-01, Boiler (2).

2.3.2.6 CAS 23-99-04, Salvage Yard

No samples have been collected and analyzed from CAS 23-99-04, Salvage Yard.

3.0 Data Quality Objectives

3.1 Summary of the DQO Analysis

This section contains a summary of the DQO process that is presented in Appendix B. Five of the CAU 578 CASs require the collection of additional information through a CAI. Therefore, the DQO process will be used to resolve corrective action decisions for the following CASs:

- CAS 06-99-07, Sump
- CAS 12-02-11, UST-P-2
- CAS 23-12-01, Boiler (2)
- CAS 23-99-04, Salvage Yard
- CAS 07-99-01, Miscellaneous Debris

The DQO process is a strategic planning approach based on the scientific method that is designed to ensure that the data collected will provide sufficient and reliable information to identify, evaluate, and technically defend the recommendation of viable corrective actions (e.g., no further action, clean closure, or closure in place).

The DQO strategy for the CASs that require a CAI in CAU 578 was developed at a meeting on December 15, 2022. The DQOs were developed to identify data needs, clearly define the intended use of the environmental data, and design a data collection program that will satisfy these purposes. During the DQO discussions, the informational inputs or data needs to resolve problem statements and decision statements were documented.

The problem statement is as follows: "Existing information on the nature and extent of potential contamination is insufficient to verify that closure objectives were met for the CASs that require a CAI in CAU 578."

The SAFER closure objectives for the corrective action of clean closure are defined as follows:

- No contamination remains at the site at concentrations exceeding FALs.
- All wastes have been properly disposed of.
- Site has been returned to a safe configuration.

The SAFER closure objectives for the corrective action of close in place are defined as follows:

- The nature and extent of contamination exceeding FALs has been defined.
- Appropriate controls have been put in place to prevent inadvertent contact with COCs.
- All wastes have been properly disposed of.
- Site has been returned to a safe configuration.

To address the problem statements, the resolution of two decisions statements is required:

- **Decision I**. "Is any COC associated with a CAU 578 release present in environmental media?" Any contaminant that is present (or is assumed to be present) at concentrations exceeding its corresponding FAL will be defined as a COC. A COC may also be defined as a contaminant that, in combination with other like contaminants, is determined to jointly pose an unacceptable risk based on a multiple constituent analysis.

- **Decision II.** "Is sufficient information available to meet the closure objectives?" Sufficient information is defined to include to following:

  - The lateral and vertical extent of COC contamination
  - The information needed to predict potential remediation waste types and volumes
  - Any other information needed to evaluate the feasibility of remediation alternatives

The presence of a COC would require a corrective action. A corrective action will also be necessary if there is a potential for wastes that are present at the site to contain contaminants that, if released, could cause the surrounding environmental media to contain COCs. Such a waste will be evaluated using the PSM criteria listed in the *Soils Risk-Based Corrective Action* (RBCA) *Evaluation Process* (DOE/EMNV, 2018) to determine the need for corrective action.

3.2 Results of the DQO Analysis

3.2.1 Action Level Determination and Basis

The preliminary action levels (PALs) presented in this section are to be used for site screening purposes. They are not necessarily intended to be used as cleanup action levels or FALs. However, they are useful in screening out contaminants that are not present in sufficient concentrations to warrant further evaluation, thereby streamlining the consideration of remedial alternatives. The RBCA process used to establish FALs is described in the Soils RBCA document (DOE/EMNV, 2018). This process conforms with *Nevada Administrative Code* (NAC) 445A.227, which lists the requirements for sites with soil contamination (NAC, 2018a). For the evaluation of corrective actions, NAC 445A.22705 (NAC, 2018b) requires the use of ASTM International (ASTM) Method E1739 (ASTM, 1995), or an equivalent method approved by NDEP to "conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards or to establish that corrective action is not necessary." For the evaluation of corrective actions, the FALs are established as the necessary remedial standard.

This RBCA process, summarized in Figure 3-1, defines three tiers (or levels) of evaluation involving increasingly sophisticated analyses:

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

- **Tier 2 evaluation.** Conducted by calculating Tier 2 action levels using site-specific information as inputs to the same or similar methodology used to calculate Tier 1 action levels. The Tier 2 action levels are then compared to individual sample results from reasonable points of exposure (as opposed to the source areas as is done in Tier 1) on a point-by-point basis. Results from TPH analyses will not be used for risk-based decisions under Tier 2 or Tier 3. Rather, the individual chemical constituents of TPH reported from volatile organic compound (VOC) and semivolatile organic compound (SVOC) analyses will be compared to the action levels.

- **Tier 3 evaluation.** Conducted by calculating Tier 3 action levels on the basis of more sophisticated risk analyses using methodologies described in ASTM Method E1739 that consider site-, pathway-, and receptor-specific parameters.

This RBCA process includes a provision for conducting an interim remedial action if necessary and appropriate. The decision to conduct an interim action may be made at any time during the investigation and at any level (tier) of analysis. Evaluation of DQO decisions will be based on conditions at the site after any interim actions are completed. Any interim actions conducted will be reported in the investigation report.

If, after implementation of corrective actions, contamination remains in place that is less than the site-specific exposure scenario based FAL but exceeds the Industrial Area exposure scenario PAL, an administrative UR will be implemented to prevent future industrial use of the area. For this reason, contamination at all sites will be evaluated against industrial exposure scenario based PALs and site-specific exposure scenario based FALs. The FALs (along with the basis for their selection) will

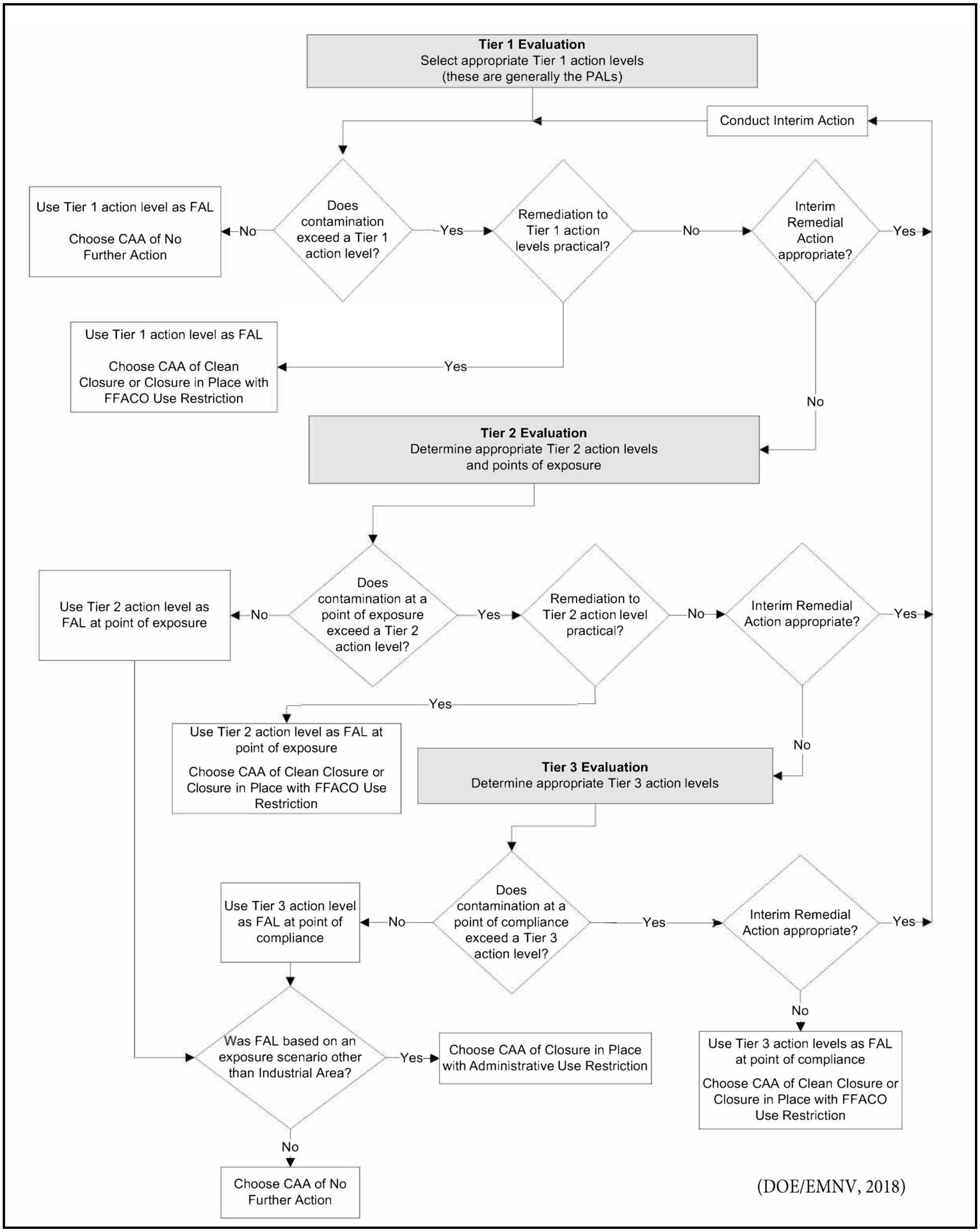

Figure 3-1
RBCA Decision Process

be proposed in the investigation report, where they will be compared to laboratory results in the evaluation of potential corrective actions.

3.2.2 Preliminary Action Levels

Except as noted herein, the chemical PALs are defined as the U.S. Environmental Protection Agency (EPA) Regional Screening Levels (RSLs) for chemical contaminants in industrial soils (EPA, 2022). Background concentrations for RCRA metals will be used instead of screening levels when natural background concentrations exceed the screening level, as is often the case with arsenic on the NNSS. Background is considered the mean plus two standard deviations of the mean for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (formerly the Nellis Air Force Range) (NBMG, 1998; Moore, 1999). For detected chemical COPCs without established screening levels, the protocol used by EPA in establishing screening levels (or similar) will be used to establish PALs. If used, this process will be documented in the investigation report.

3.2.3 Hypothesis Test

The baseline condition (i.e., null hypothesis) and alternative condition are as follows:

- **Baseline condition.** Closure objectives have not been met.
- **Alternative condition.** Closure objectives have been met.

Sufficient evidence to reject the null hypothesis is as follows:

- The identification of the lateral and vertical extent of COC contamination in media, if present.
- Sufficient information to properly dispose of investigation-derived waste (IDW) and remediation waste.

3.2.4 Judgmental Sampling

The presence and nature of contamination decision (Decision I) will be a judgmental decision determined using sample results from biased locations under a judgmental sampling design. Each sample will generate a value for the judgmental decision that will be directly compared to action levels.

Because individual sample results, rather than an average concentration, will be compared to FALs at the CASs undergoing judgmental sampling, statistical methods to generate site characteristics will not be used. Adequate representativeness of the entire target population may not be a requirement to developing a sampling design. If good prior information is available on the target site of interest, then the sampling may be designed to collect samples only from areas known to have the highest concentration levels on the target site. If the observed concentrations from these samples are below the action level, then a decision can be made that the site contains safe levels of the contaminant without the samples being truly representative of the entire area (EPA, 2006).

All sample locations will be selected to satisfy the data quality indicator (DQI) of representativeness in that samples collected from selected locations will best represent the populations of interest as defined in Section B.5.1. To meet this criterion for judgmentally sampled sites, a biased sampling strategy will be used for Decision I samples to target areas with the highest potential for contamination, if it is present anywhere in the CAS. Sample locations will be determined based on process knowledge, previously acquired data, or the field-screening and biasing factors listed in Section B.8.3. If biasing factors are present in soils below locations where Decision I samples were removed, additional Decision I soil samples will be collected at depth intervals selected by the Site Supervisor based on biasing factors to a depth where the biasing factors are no longer present. The Site Supervisor has the discretion to modify the judgmental sample locations, but only if the modified locations meet the decision needs and criteria stipulated in this DQO.

3.2.5 CSM and Drawing

The CSM describes the most probable scenario for current conditions at each site and defines the assumptions that are the basis for identifying the future land use, contaminant sources, release mechanisms, migration pathways, exposure points, and exposure routes. The CSMs were used to develop appropriate sampling strategies and data collection methods. A CSM was developed for each CAU 578 CAS undergoing a CAI using information from the physical setting, potential contaminant sources, release information, historical background information, knowledge from similar sites, and physical and chemical properties of the potentially affected media and COPCs. Figure B.2-1 depicts a tabular representation of the conceptual pathways to receptors from CAU 578 sources. Figures B.2-2 through B.2-6 depict graphical representations of the CSM for each of the five CASs included in the

CAI. If evidence of contamination that is not consistent with the presented CSM is identified during investigation activities, the situation will be reviewed, the CSM will be revised, the DQOs will be reassessed, and a recommendation will be made as to how best to proceed. In such cases, decision-makers will be notified and given the opportunity to comment on and/or concur with the recommendation. A detailed discussion of the CSM is presented in Appendix B.

4.0 Field Activities and Closure Objectives

This section of the SAFER Plan provides a description of the field activities and closure objectives for the CAI. The objectives for the field activities are to determine whether COCs exist.
If remediation is determined to be feasible, then the extent of COCs will be determined so that a closure alternative may be implemented. All sampling activities will be conducted in compliance with the *Soils Activity Quality Assurance Plan* (QAP) (Navarro, 2022) and other applicable, approved procedures and instructions.

4.1 Contaminants of Potential Concern

The COPCs for the CASs that require a CAI in CAU 578 are defined as the contaminants reasonably expected at the site that could contribute to a dose or risk exceeding FALs. Based on the nature of the releases and the previous investigation results presented in Section 2.0, the contaminants that could reasonably be suspected to be present at CAU 578 are listed in Section B.2.2.2.

These COPCs were identified during the planning process through the review of site history, process knowledge, personal interviews, past investigation efforts (where available), and inferred activities associated with the CASs and other releases (including those that may be discovered during the investigation). Other specific COPCs (and subsequently the analyses requested) will be determined for discovered potential releases based on the nature of the potential release (e.g., hydrocarbon stain, lead bricks).

These COPCs will be reported by the analytical methods identified in Section B.2-3 for environmental samples taken at each of the sites. The analytes reported for each analytical method are listed in Section B.2-4.

Decision II samples will be submitted for the analysis of all unbounded COCs. In addition, samples will be submitted for analyses as needed to support waste management or health and safety decisions.

4.2 Remediation

The DQOs developed for the CASs that require a CAI in CAU 578 identified data gaps that require additional data collection before the preferred closure alternative for each CAS can be identified and implemented. A decision point approach, based on the DQOs, for making remediation decisions is summarized in Figure 1-2. The presence of contamination, if any, is assumed to be confined to the spatial boundaries of the sites as defined in the DQO process and CSM.

If COCs are identified within a CAS based on the initial investigation results, that CAS will be further assessed before implementing closure activities. If COPCs are not present at concentrations exceeding FALs, the CAS will be recommended for no further action. The objective of the initial investigation strategy is to determine whether COCs are present. Laboratory analytical results will be used to confirm the presence or absence of COCs.

If COCs are present, or it is decided that COCs may be present based on the presence of biasing factors, a corrective action of removal for disposal may be implemented and additional verification samples taken from biased locations within the excavation.

The judgmental sampling strategy is presented in Appendix B. Predetermined biased sample locations may be justified by the Site Supervisor, based on the criteria for satisfying DQO data needs listed in Appendix B. Additional samples may be collected for waste management characterization and disposal purposes.

4.3 Verification

The information necessary to satisfy the closure criteria will be generated for each CAI CAS by collecting and analyzing samples generated during a field investigation. If a COC is present and removal of the COC is feasible, verification sampling of remaining environmental media will be required. The verification samples will be collected from the approximate center of the bottom of the excavation below the stained area and at lateral boundaries. The final locations and numbers of verification samples to be collected will be determined in the field based on the presence of any biasing factors as listed in Section B.8.3, the size of the excavation, site conditions, and the professional judgment of the Site Supervisor. All verification sample locations must meet the DQO decision needs and criteria stipulated in Appendix B. The number and location of verification samples will be justified in the CR.

If a COC is present and removal of the COC is not feasible, information on the extent of COC contamination will be obtained by collecting step-out (Decision II) samples. Decision II sampling will consist of further defining the extent of contamination where COCs have been confirmed. Step-out (Decision II) sampling locations at each CAS will be selected based on the CSM, biasing factors, field-survey results, existing data, and the outer boundary sample locations where COCs were detected. In general, step-out sample locations will be arranged in a triangular pattern around areas containing a COC at distances based on site conditions, COC concentrations, process knowledge, and other biasing factors. If COCs extend beyond step-out locations, additional Decision II samples will be collected from locations farther from the source. If a spatial boundary is reached, the CSM is shown to be inadequate, or the Site Supervisor determines that extent sampling needs to be reevaluated, work will be temporarily suspended, NDEP will be notified, and the investigation strategy will be reevaluated.

Because this SAFER Plan only addresses contamination originating from the CAU, it may be necessary to distinguish overlapping contamination originating from other sources. For example, contamination originating from other sources will not be addressed in the CAU 578 CAI. To determine whether contamination is from the CAU or from other sources, soil samples may be collected from background locations at selected CASs.

Modifications to the investigation strategy may be required should unexpected field conditions be encountered at any CAS. Significant modifications must be justified and documented in a Record of Technical Change before implementation. If an unexpected condition indicates that conditions are significantly different than the corresponding CSM, the activity will be rescoped and the decision-makers will be notified. Field activities at CAU 578 include site preparation, sample location selection, sample collection activities, waste characterization, photodocumentation, and collection of geocoordinates.

4.3.1 CAS 06-99-07, Sump

Site preparation activities to be completed before sampling activities for CAS 06-99-07 include the following:

- Brief workers on potential site hazards.
- Establish control of the site where intrusive sampling will be conducted.
- Prepare site for safe entry and exit.

A visual survey will be performed within the spatial boundaries of the sump to determine the configuration of the sump such that the lowest locations are identified. These locations will be selected as biased sample locations,

The sump will be sampled at a minimum of two biased locations within the defined spatial boundaries. Each sample location will consist of two discrete samples unless the configuration and depth of mud at a given location precludes two separate depths (i.e., less than 12 in.), in which case only one sample will be collected at that particular location. One sample will be collected at the surface (0 to 6 in.) within the mud/soil cuttings matrix, while the second sample will consist of an approximate 6-in. interval composed of mud and native soil at or below the textural discontinuity. Collecting both mud and native soil at this discontinuity ensures that contamination, if present, will be captured whether it is bound in the mud matrix or leached into the native soil. Additional material adjacent to the initial sample location may be collected to ensure sufficient volume is submitted to satisfy analytical requirements.

Each sample will be submitted for laboratory analysis using the RCRA metals, VOC, and SVOC methods. If a COC is identified, the entire sump will be defined as the corrective action boundary.

4.3.2 CAS 12-02-11, UST-P-2

Site preparation activities to be completed before sampling activities for CAS 12-02-11 include the following:

- Brief workers on potential site hazards.
- Establish control of the site where intrusive sampling will be conducted.
- Prepare site for safe entry and exit.

Sample locations based on the highest TPH concentration from previous sample results from remaining material. The targeted location of interest for confirming that no further action is needed for these releases of diesel is the location of the highest TPH results at the generator stand. If it can be shown that no hazardous constituents of diesel are present at levels exceeding the EPA RSLs (EPA, 2022) in the location of the highest TPH concentrations, it will be assumed that they are also not present at the other release locations.

The area of the generator stand currently contains a vapor extraction well and two guard posts. The surface of the area consists of material similar to road base. A soil sample will be collected from each of two locations around the vapor extraction well as indicated on Figure B.8-1. At each location, the surface road base will be removed using hand tools. The sample locations will be as close to the extraction well as possible but beyond the emplacement cement collar of the extraction well as shown in Figure B.8-1. At each location, soil samples will collected immediately under the road base and at approximately 12 in. below ground surface (bgs). Each of these samples will be screened using a headspace technique, and the samples with the two highest readings will be submitted for laboratory analysis using the VOC and SVOC methods. Each sampled location will then be returned to pre-sampling conditions.

4.3.3 CAS 23-12-01, Boiler (2)

Site preparation activities to be completed before sampling activities for CAS 23-12-01 include the following:

- Brief workers on potential site hazards.
- Establish control of the site where intrusive sampling will be conducted.
- Prepare site for safe entry and exit.

A visual survey will be performed within the spatial boundaries of the release to determine whether any areas of staining are identified. Sample locations will be determined based upon the locations of two soil stains in the PA report (IT, 1998). The first stain is shown in a photo on the northeast corner of the building. This will be used to bias Decision I sample location(s). The second stain is shown along the base of the building, and a third is shown in the site sketch as a larger stain with a center line 9 ft to the west of the center of the building extending approximately 13 ft to the north. Decision I samples will be collected at each stain location. Each sample will be submitted for laboratory analysis using the VOC and SVOC methods.

Each sample location will consist of two discrete samples unless the configuration and depth of soil at a given location precludes two separate depths, in which case only one sample will be collected at that particular location. One sample will be collected at the surface (0 to 6 in.), while the second sample will be collected at a depth of approximately 6 in bgs.

4.3.4 CAS 23-99-04, Salvage Yard and CAS 07-99-01, Miscellaneous Debris

Site preparation activities to be completed before sampling activities include the following:

- Brief workers on potential site hazards.
- Establish control of the site where intrusive sampling will be conducted.Prepare site for safe entry and exit.

A visual survey will be performed within the spatial boundaries of the release to determine whether any biasing factors listed in Section B.8.3 are present. If a biasing factor is identified, sample locations will be determined based upon the maximum presentation of that biasing factor. If PSM is identified as defined in the Soils RBCA document (DOE/EMNV, 2018) and it can be readily removed, it will be collected, disposed of appropriately, and documented in the CR. A sample location will be defined at the center of the area removed.

Each sample location will consist of two discrete samples unless the configuration and depth of soil at a given location precludes two separate depths, in which case only one sample will be collected at that particular location. One sample will be collected at the surface (0 to 6 in.) while the second sample will be collected at a depth of approximately 6 in. bgs. Each sample will be submitted for laboratory analysis using the RCRA metals, VOC, and SVOC methods.

4.4 Closure

The following activities, at a minimum, have been identified for closure of these CASs. The decision logic behind the activities is provided in Figure 1-2:

- If no COCs are detected, the CAS will be closed with no further action.

- If COCs are present and removal of the COCs is not feasible, closure in place will be the preferred CAA. The appropriate URs will be implemented and documented in the SAFER CR.

- If COCs are present and removal of the COCs is feasible, clean closure will be the preferred CAA. The material to be remediated will be removed and disposed as waste, and verification samples will be collected in remaining soil. Verification analytical results will be documented in the SAFER CR.

After completion of CAI and waste management activities, the following actions will be implemented before closure of the site Real Estate/Operations Permit (REOP):

- Remove all equipment, wastes, debris, and materials associated with the CAI.

- Remove all signage and fencing (unless part of a corrective action).

- Grade site to pre-investigation condition (unless changed condition is necessary under a corrective action).

- Inspect site, and certify that restoration activities have been completed.

4.5 Duration

It is anticipated that the duration of the field investigation effort will be 60 days.

5.0 Reports and Records Availability

Historical information and documents referenced in this plan are retained in the DOE EM Nevada Program activity files in Las Vegas, Nevada, and can be obtained through written request to the DOE EM Nevada Program Technical Lead. This document is available in the DOE public reading facilities located in Las Vegas and Carson City, Nevada, or by contacting the DOE EM Program Technical Lead.

6.0 Investigation/Remediation Waste Management

Waste generated during the CAI will be managed in accordance with all applicable DOE orders, federal and state regulations, and agreements and permits between DOE and NDEP. Wastes will be characterized based on these regulations using process knowledge, field-screening results (FSRs), and analytical results from investigation and waste samples. Waste types that may be generated during the CAI include industrial, hazardous, hydrocarbon, *Toxic Substances Control Act* (TSCA) regulated (e.g., polychlorinated biphenyls [PCBs], asbestos), low-level radioactive, or mixed wastes.

Disposable sampling equipment, personal protective equipment (PPE), and rinsate are considered potentially contaminated waste only by virtue of contact with potentially contaminated soil or potentially contaminated debris (e.g., lead). These wastes may be characterized based on associated environmental sample results, waste characterization results, FSRs, or process knowledge.

No chemicals were suspected to be used or present at this CAU in a manner that would generate listed hazardous waste; therefore, wastes will be characterized based on their chemical characteristics. The waste will be managed and disposed of accordingly.

Conservative estimates of total waste contaminant concentrations may be made based on the mass of the waste, the amount of contaminated media contained in the waste, and the maximum concentration of contamination found in the soil.

The following subsections discuss how the field investigation will be conducted to minimize the generation of waste, what waste streams are expected to be generated, and how IDW will be managed.

6.1 Waste Minimization

The CAI will be conducted in a manner that will minimize the generation of wastes using process knowledge, segregation, visual examination, and/or field screening (e.g., radiological survey and swipe results) to avoid cross-contaminating uncontaminated soil or uncontaminated IDW that would otherwise be characterized and disposed of as industrial waste. As appropriate, soil and debris will be returned to their original location. To limit unnecessary generation of hazardous or mixed waste, hazardous materials will not be used during the CAI unless required and approved by Environmental Compliance and Safety and Health. Other waste minimization practices will include, as appropriate, avoiding contact with contaminated materials, performing dry decontamination or wet decontamination over source locations, and carefully segregating waste streams.

6.2 Potential Waste Streams

The following is a list of common waste streams that may be generated during the field investigation and that may require management and disposal:

- Disposable sampling equipment and field-screening waste
- PPE
- Soil
- Surface debris (e.g., discarded chemicals, batteries, scrap metal)

The onsite management and ultimate disposition of wastes will be determined based on a determination of the waste type (e.g., industrial, low-level, hazardous, hydrocarbon, mixed), or the combination of waste types. A determination of the waste type will be guided by several factors, including, but not limited to, the analytical results of samples either directly or indirectly associated with the waste, historical site knowledge, knowledge of the waste generation process, field observations, field-monitoring results/FSRs, and/or radiological survey/swipe results.

6.2.1 Industrial Waste

Industrial solid waste, if generated, will be collected, managed, and disposed of in accordance with the solid waste regulations and the permits for operation of the NNSS Solid Waste Disposal Sites. The most commonly generated industrial solid waste includes disposable sampling equipment and PPE that will be collected in plastic bags, and marked in accordance with requirements. This waste, and other waste generated such as debris or soil that is characterized as industrial waste, may be placed in the roll-off box located adjacent to Building 23-310 in Mercury or in another approved container (e.g., drum).

6.2.2 Low-Level Radioactive Waste

Low-level radioactive waste, if generated, will be managed in accordance with the contractor-specific waste certification program plan, DOE orders, and the requirements of the current version of the *Nevada National Security Site Waste Acceptance Criteria* (DOE/EMNV and NNSA/NFO, 2022). Potential radioactive waste containers will be staged and managed at a designated RMA.

6.2.3 Hazardous Waste

Suspected hazardous waste, if generated, will be containerized and managed in waste accumulation areas in accordance with 40 *Code of Federal Regulations* (CFR) 262.34 (CFR, 2022a).

6.2.4 Hydrocarbon Waste

Suspected hydrocarbon solid waste, if generated, will be managed on site in a drum or other appropriate container until fully characterized and in accordance with the State of Nevada regulations (NDEP, 2006).

6.2.5 Mixed Low-Level Waste

Mixed waste, if generated, will be managed in accordance with the RCRA requirements (CFR, 2022b), agreements between DOE EM Nevada Program and the State of Nevada, and DOE requirements for radioactive waste. Waste characterized as mixed will not be stored for a period of time that exceeds the RCRA requirements unless subject to agreements between DOE EM Nevada Program and the State of Nevada. The mixed waste must be transported via an approved hazardous waste/radioactive waste transporter to the NNSS transuranic waste storage pad for storage pending treatment or disposal.

6.2.6 Polychlorinated Biphenyls

The management of PCBs is governed by TSCA and its implementing regulations at 40 CFR 761 (CFR, 2022b), and agreements between EPA and NDEP. PCB contamination may be found as a sole contaminant or in combination with any of the types of waste discussed in this document. For example, PCBs may be a co-contaminant in soil that contains a RCRA “characteristic” waste (PCB/hazardous waste), or in soil that contains radioactive wastes (PCB/radioactive waste), or even in mixed waste (PCB/radioactive/hazardous waste). IDW will initially be evaluated using analytical results for soil samples from the CAI. If any type of PCB waste is generated, it will be managed in accordance with 40 CFR 761 (CFR, 2022b) as well as State of Nevada requirements (NDEP, 2006), guidance, and agreements with DOE EM Nevada Program.

7.0 Quality Assurance/Quality Control

The overall objective of the characterization activities described in this SAFER Plan is to collect accurate and defensible data to support the selection and implementation of a closure alternative for each CAS that requires a CAI. All characterization activities, including those related to thermoluminescent dosimeter (TLD) measurements, will be conducted in accordance with the Soils QAP (Navarro, 2022) and the Soils RBCA document (DOE/EMNV, 2018), which define rigorous data quality requirements. Sections 7.1 and 7.2 discuss the collection of required quality control (QC) samples in the field and quality assurance (QA) requirements for the laboratory analysis of soil samples.

7.1 Sample Collection Activities

Field QC samples will be collected in accordance with established procedures. Field QC samples are collected and analyzed to aid in determining the validity of environmental sample results. The number of required QC samples depends on the types and number of environmental samples collected. As determined in the DQO process, the minimum frequency of collecting and analyzing QC samples for this investigation is as follows:

- Field duplicates for grab samples (1 per 20 environmental samples)
- Trip blanks (1 per sample cooler containing VOC environmental samples)

Additional QC samples may be submitted based on site conditions at the discretion of the Task Manager or Site Supervisor. Field QC samples must be analyzed using the same analytical procedures implemented for associated environmental samples. Additional details regarding field QC samples are available in the Soils QAP (Navarro, 2022).

7.2 Applicable Laboratory/Analytical DQIs

As stated in the DQOs (see Appendix B) and in the Soils QAP (Navarro, 2022), data used for making DQO decisions will be evaluated for data quality. The Soils QAP defines and establishes data quality criteria that are evaluated in three defined steps:

1. Data Verification
2. Data Validation
3. DQA

Data verification will include an evaluation of all chemical and radiological laboratory data for data quality in accordance with company-specific procedures. The data will be reviewed to evaluate the completeness, correctness, and conformance of each dataset. This verification will include a review of sample collection, handling and transfer, and documentation associated with sampling activities

Data validation must be performed on a portion of the environmental sample results to determine the analytical quality of a dataset. Data validation criteria must be based upon the DQOs and the intended use of the data. Validation should include an evaluation of method and contract compliance, data calculations, QC and calibration verifications, raw data, and data generation methods. Validation can include qualifying data that may restrict or limit data use. The data validation includes an evaluation of the DQI criteria for the following:

- Precision
- Accuracy/bias
- Representativeness
- Comparability
- Completeness
- Sensitivity

Data that do not meet the DQI criteria must be evaluated for usability in the investigation report.

A DQA must be performed to determine whether the data meet the DQO requirements of the investigation and the performance criteria for the DQIs as defined in the Soils QAP (Navarro, 2022). The DQA considers how the data relate to decisions to be made, the intended use of the data, and whether data are suitable for making those decisions. The results of this assessment will be documented in the investigation report. If the DQOs were not met, corrective actions will be evaluated, selected, and implemented (e.g., refine CSM or resample to fill data gaps).

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Appendix A

Activity Organization

A.1.0 Organization

The DOE EM Nevada Program Technical Lead is Tiffany Gamero. She can be reached at 702-724-0826.

The identification of the activity Health and Safety Officer and the QA Officer can be found in the appropriate plan. However, personnel are subject to change, and it is suggested that the DOE EM Nevada Program Technical Lead be contacted for further information. The Task Manager will be identified in the FFACO Monthly Activity Report prior to the start of field activities.

Appendix B

Data Quality Objectives

B.1.0 Introduction

Five of the CAU 578 CASs require the collection of additional information through a CAI. Therefore, the DQO process will be used to resolve corrective action decisions for the following CASs:

- CAS 06-99-07, Sump
- CAS 12-02-11, UST-P-2
- CAS 23-12-01, Boiler (2)
- CAS 23-99-04, Salvage Yard
- CAS 07-99-01, Miscellaneous Debris

The DQO process described in this appendix is a seven-step strategic systematic planning method used to plan data collection activities and define performance criteria for the CAU 578, Miscellaneous Inactive Sites, field investigation. DQOs are designed to ensure that the data collected will provide sufficient and reliable information to identify, evaluate, and technically defend recommended corrective actions (i.e., no further action, closure in place, or clean closure). Existing information about the nature and extent of contamination at the CASs that require a CAI in CAU 578 is insufficient to evaluate and select preferred corrective actions; therefore, a CAI will be conducted.

The CAU 578 CAI will be based on the DQOs presented in this appendix as developed by NDEP and NNSA/NFO representatives. The seven steps of the DQO process presented in Sections B.2.0 through B.8.0 were developed in accordance with *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA, 2006).

In general, the procedures used in the DQO process provide the following:

- A method to establish performance or acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of a study.

- Criteria that will be used to establish the final data collection design, such as

  - the nature of the problem that has initiated the study and a conceptual model of the environmental hazard to be investigated;

  - the decisions or estimates that need to be made, and the order of priority for resolving them;

  - the type of data needed; and

  - an analytic approach or decision rule that defines the logic for how the data will be used to draw conclusions from the study findings.

- Acceptable quantitative criteria on the quality and quantity of the data to be collected, relative to the ultimate use of the data.

- A data collection design that will generate data meeting the quantitative and qualitative criteria specified. A data collection design specifies the type, number, location, and physical quantity of samples and data, as well as the QA and QC activities that will ensure that sampling design and measurement errors are managed sufficiently to meet the performance or acceptance criteria specified in the DQOs.

B.2.0 Step 1 - State the Problem

Step 1 of the DQO process defines the problem that requires study, identifies the planning team, and develops a conceptual model of the environmental hazard to be investigated.

The problem statement for the CASs that require a CAI in CAU 578 is as follows: "Existing information on the nature and extent of potential contamination is insufficient to verify that closure objectives were met for the CASs that require a CAI in CAU 578."

B.2.1 Planning Team Members

The DQO planning team consists of representatives from NDEP and DOE EM Nevada Program. The DQO planning team met on December 15, 2022, for the DQO meeting.

B.2.2 Conceptual Site Model

The CSM is used to organize and communicate information about site characteristics. It reflects the best interpretation of available information at a point in time. The CSM is a primary vehicle for communicating assumptions about release mechanisms, potential migration pathways, or specific constraints. It provides a summary of how and where contaminants are expected to move and what impacts such movement may have. It is the basis for assessing how contaminants could reach receptors both in the present and future. The CSM describes the most probable scenario for current conditions at each site and defines the assumptions that are the basis for identifying appropriate sampling strategy and data collection methods. An accurate CSM is important, as it serves as the basis for all subsequent inputs and decisions throughout the DQO process.

The releases in the CASs that require a CAI in CAU 578 have individual CSMs that were developed using information from the physical setting, potential contaminant sources, release information, historical background information, knowledge from similar sites, and physical and chemical properties of the potentially affected soil and COPCs.

The CSMs consists of the following:

- Potential contaminant releases, including soil subsequently affected

- Release mechanisms (the conditions associated with the release)
- Potential contaminant source characteristics, including contaminants suspected to be present and contaminant-specific properties
- Site characteristics, including physical, topographical, and meteorological information
- Migration pathways and transport mechanisms that describe the potential for migration and where the contamination may be transported
- The locations of points of exposure where individuals or populations may come in contact with a COC associated with a release
- Routes of exposure where contaminants may enter the receptor.

If additional elements are identified during the CAI that are outside the scope of the CSM, the situation will be reviewed and a recommendation will be made as to how to proceed. In such cases, NDEP will be notified and given the opportunity to comment on, or concur with, the recommendation.

The applicability of the CSM to each release source is summarized in Table B.2-1 and discussed below. Table B.2-1 provides information on CSM elements that will be used throughout the remaining steps of the DQO process. Figure B.2-1 depicts a representation of the conceptual pathways to receptors from CAU 578 sources. Figures B.2-2 though B.2-6 depict graphical representations of the CSM for each of the five CASs included in the CAI.

Table B.2-1
CSM Description of Elements for Each Release

Release Identifier	06-99-07	07-99-01	12-02-11	23-12-01	23-99-04
Release Description	Sump	Miscellaneous Debris	UST-P-2	Boiler (2)	Salvage Yard
Site Status	Sites are inactive and/or abandoned				
Exposure Scenario	Remote Work	Remote Work	Occasional Use	Industrial	Industrial
Sources of Potential Soil Contamination	Discharged Water	Construction Debris	Diesel Spill	Diesel Spill	Spills/Stored Materials
Location of Contamination/Release Point	Surface and near subsurface of sump	Surface of former location of bunker	Soils around former location of tank	Surface soils	Surface soil at or near location(s) of stored waste/materials
Amount Released	Unknown				
Affected Media	Surface and shallow subsurface soil				
Potential Contaminants	Chemical only				
Transport Mechanisms	Percolation of precipitation through subsurface media serves as the major driving force for migration of contaminants. Surface water runoff may provide for the transportation of some contaminants within or outside the footprints of the releases. Include any surface liquids (e.g., ponds, drainages) or liquid released over time (e.g., leaks from tanks) that may also have provided a hydraulic driver for percolation and migration of contaminants.				
Migration Pathways	Vertical transport expected to dominate over lateral transport due to small surface gradients. Lateral transport expected to dominate over vertical due to large potential evapotranspiration (PET) demands and low precipitation amounts. The large depth to the uppermost aquifer precludes groundwater as a significant pathway.				
Lateral and Vertical Extent of Contamination	Contamination, if present, is expected to be contiguous to the release points. Concentrations are expected to decrease with distance and depth from the source. Lateral and vertical extent of contamination exceeding FALs is assumed to be within the spatial boundaries.				
Exposure Pathways	The potential for contamination exposure is limited to industrial and construction workers, and military personnel conducting training. These human receptors may be exposed to COPCs through oral ingestion or inhalation of, or dermal contact (absorption) with soil and/or debris due to inadvertent disturbance of these materials, or irradiation by radioactive materials.				

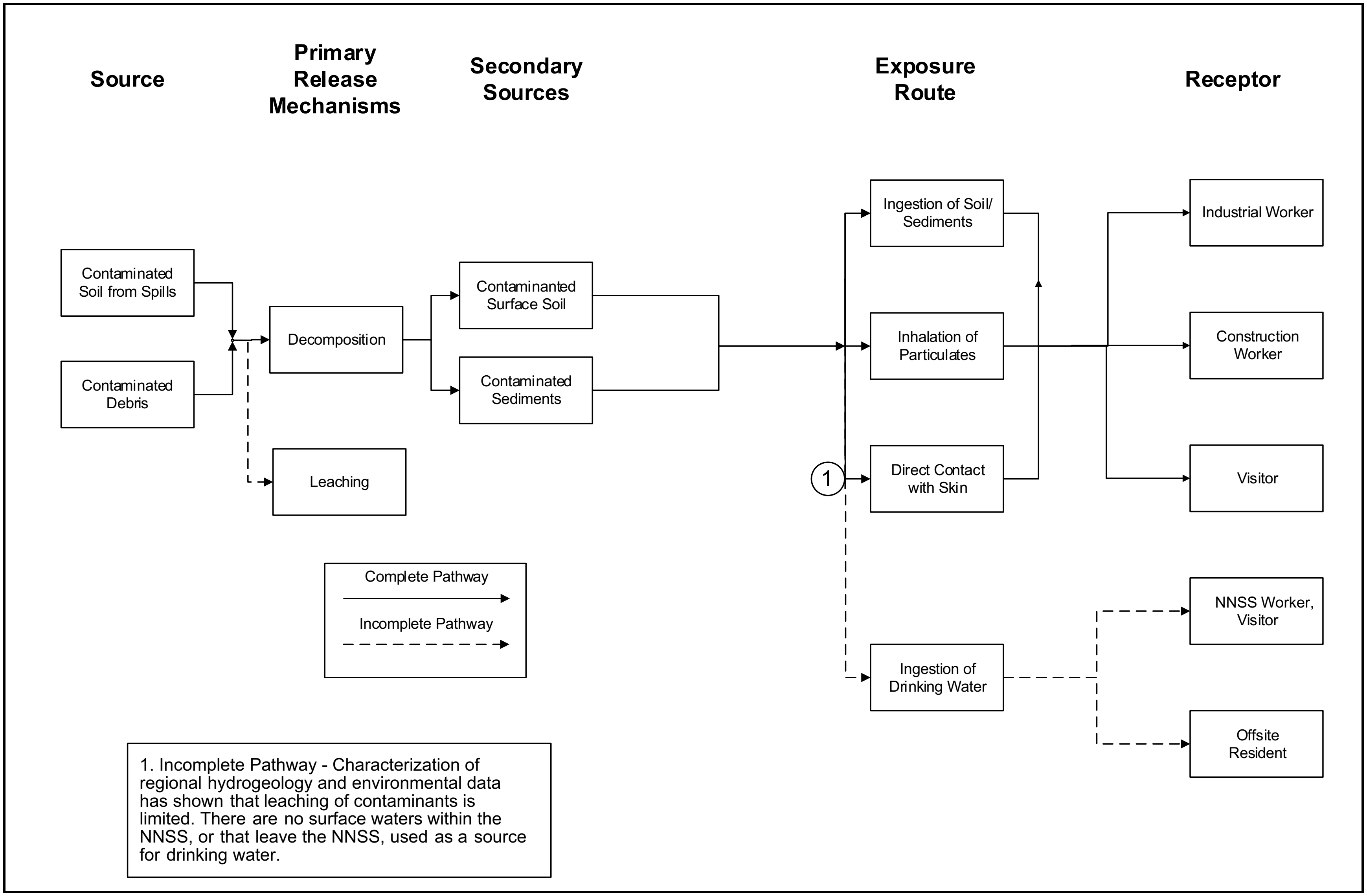

Figure B.2-1
CAU 578 CSM Pathways to Receptors

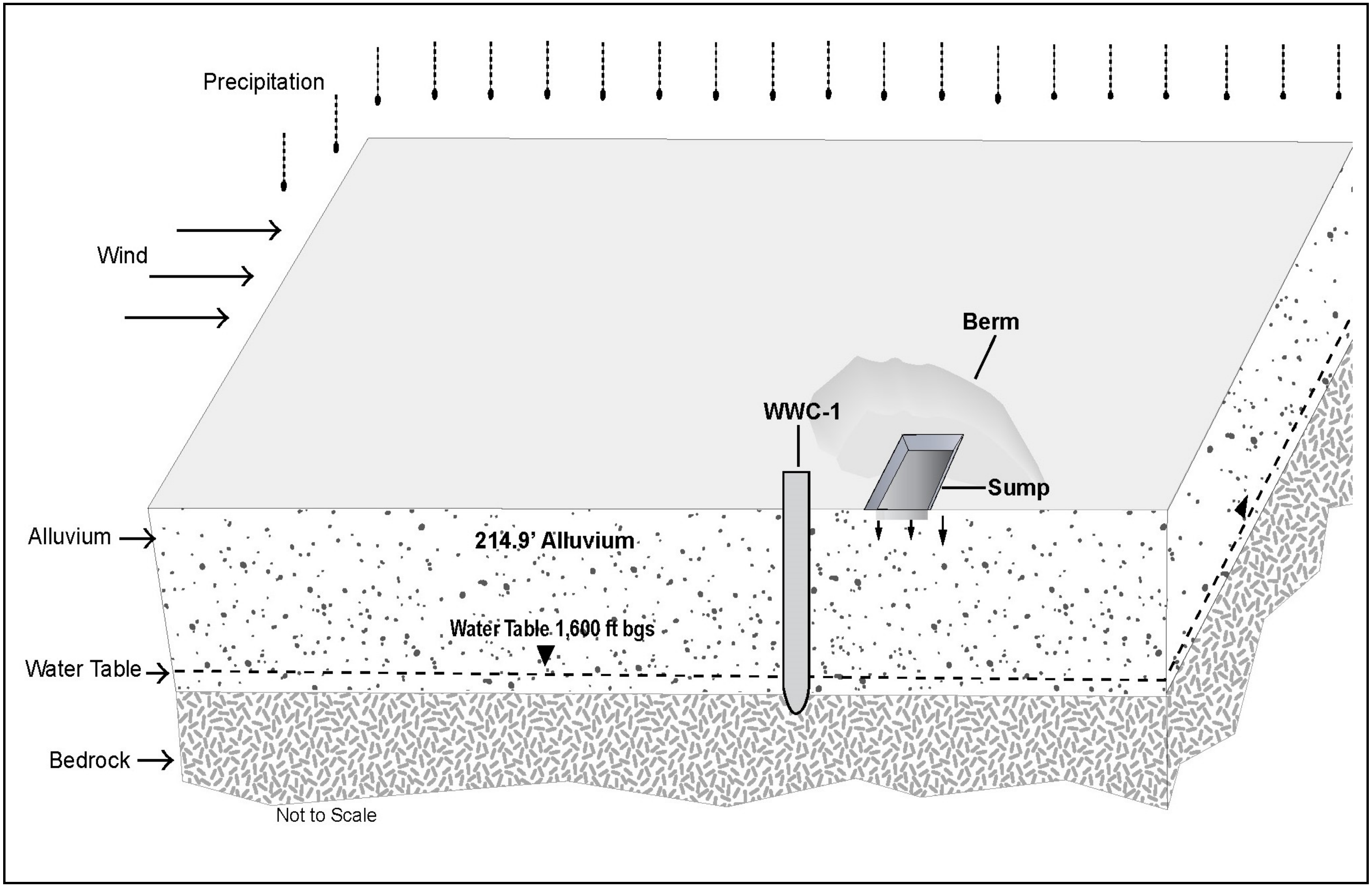

Figure B.2-2
CSM for CAS 06-99-07, Sump

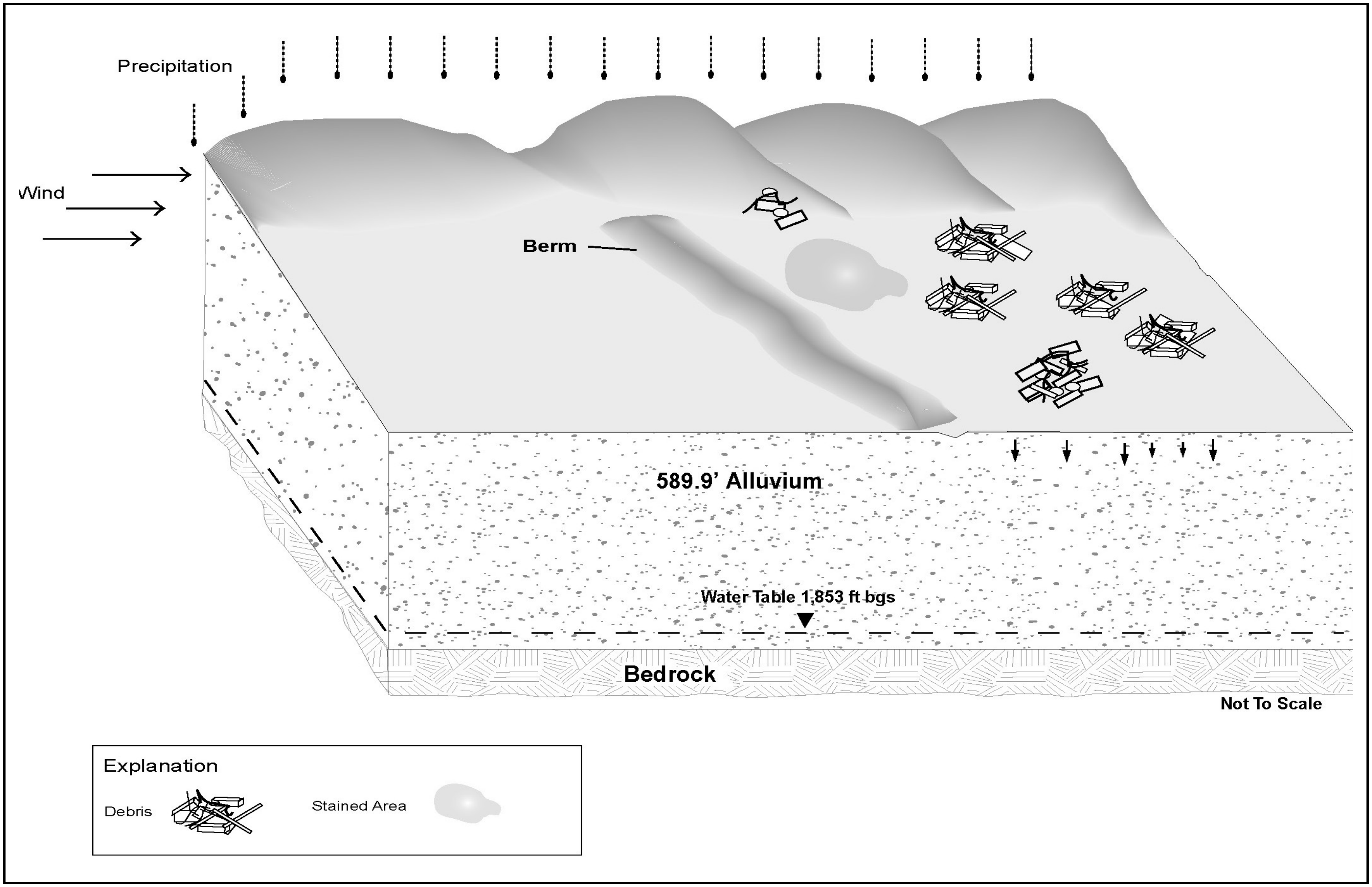

Figure B.2-3
CSM for CAS 07-99-01, Miscellaneous Debris

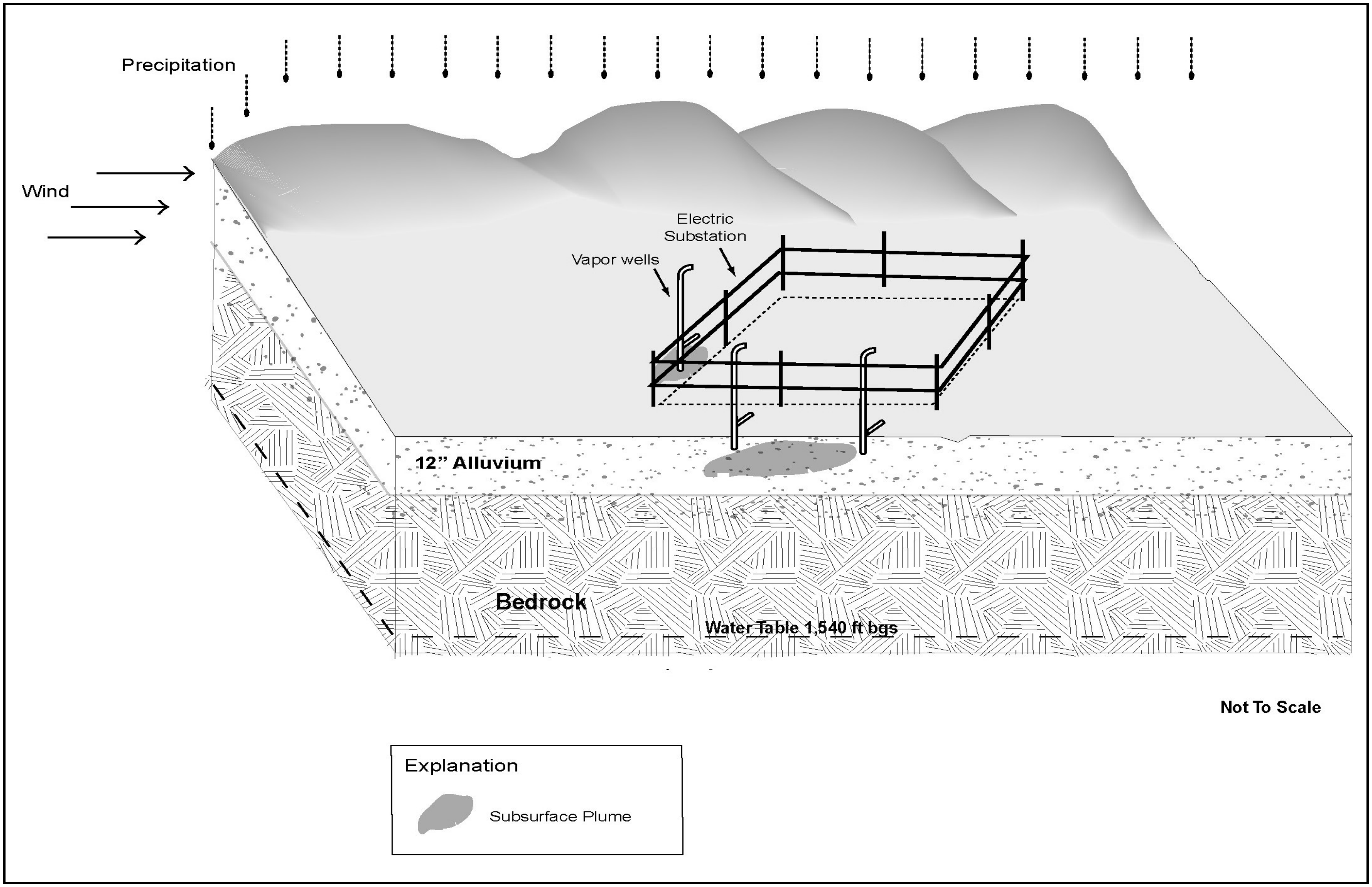

Figure B.2-4
CSM for CAS 12-02-11, UST-P-2

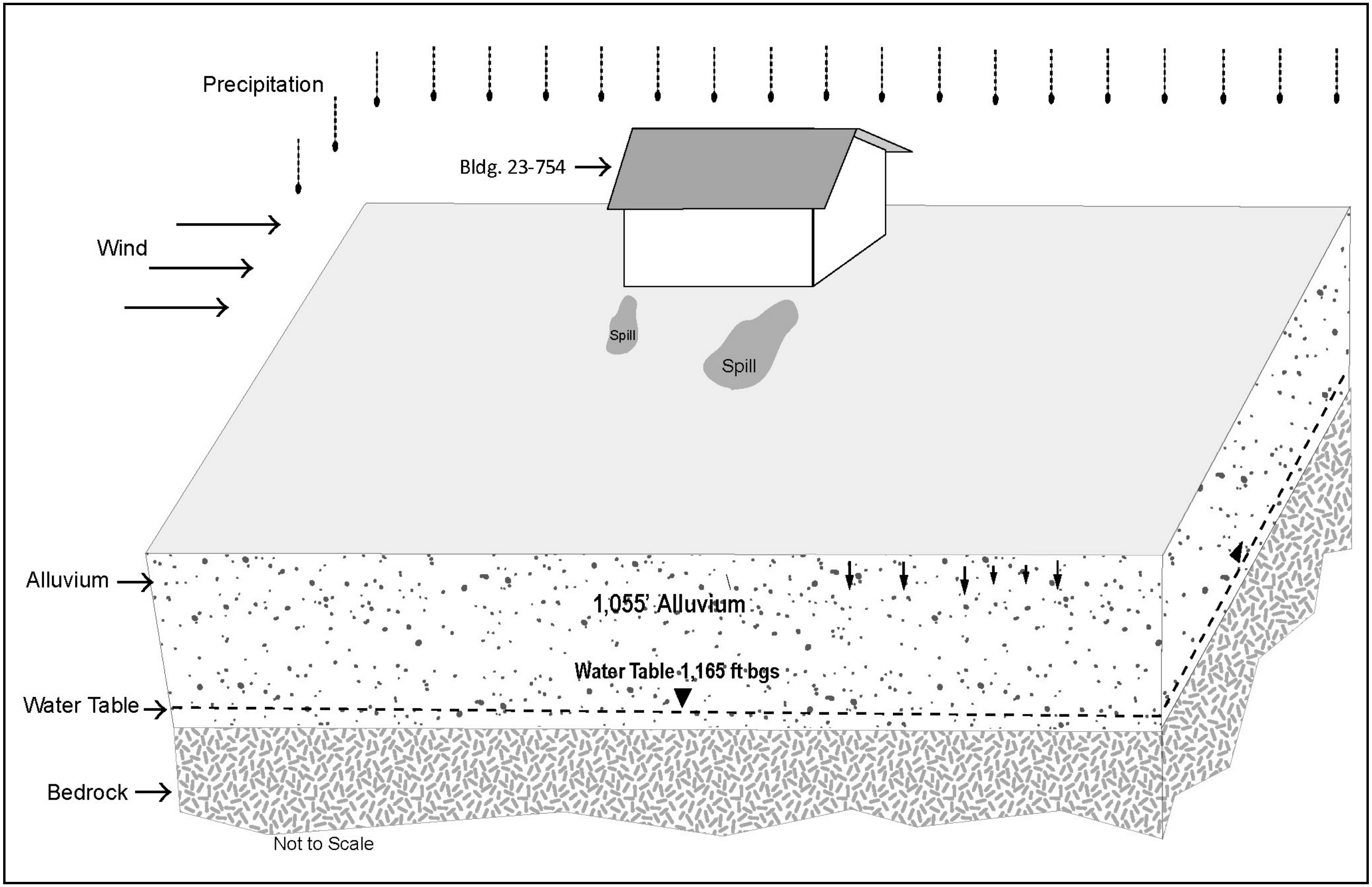

Figure B.2-5
CSM for CAS 23-12-01, Boiler (2)

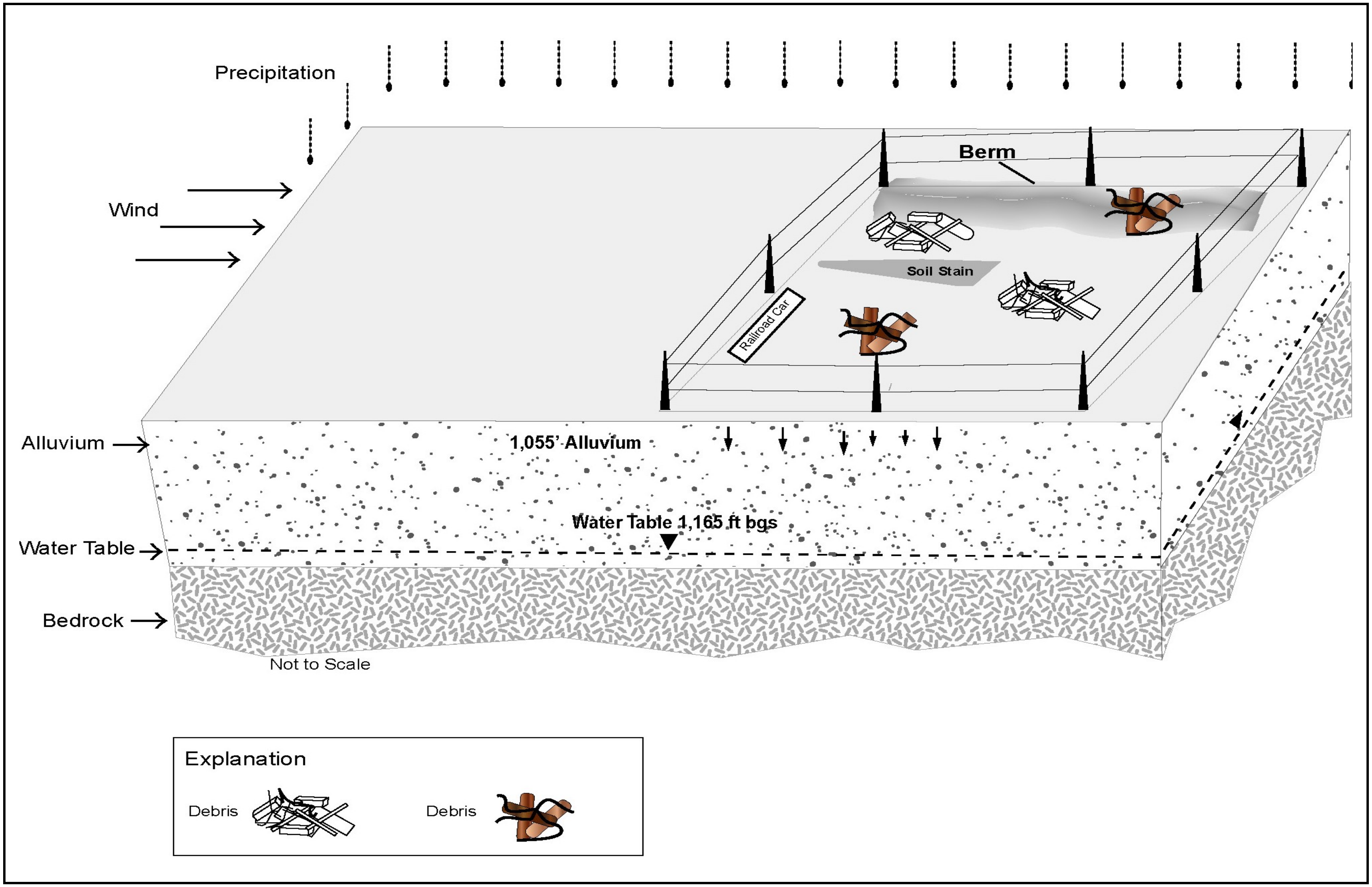

Figure B.2-6
CSM for CAS 23-99-04, Salvage Yard

B.2.2.1 Release Sources

The following identifies the release sources specific to the CAU 578 CAI:

- 06-99-07, Sump is the potential release of hazardous constituents to a bermed sump constructed and used to manage water pumped from Water Well C-1. It may have also been used to manage other waste waters.
- 12-02-11, UST-P-2 is the potential release of hazardous constituents from a diesel spill resulting from overfilling a subsurface diesel storage tank.
- 23-12-01, Boiler (2) is the potential release of hazardous constituents associated with stained soil that may be from a diesel spill.
- 23-99-04, Salvage Yard is the potential release of hazardous constituents from materials or equipment that were stored in this area.
- 07-99-01, Miscellaneous Debris is the potential release of hazardous constituents from debris associated with a collapsed bunker.

The most likely locations of the contamination and releases to the environment are the soils directly below or adjacent to the CSMs surface and subsurface components.

B.2.2.2 Potential Contaminants

The release-specific COPCs are defined as the contaminants reasonably expected at the site that could contribute to a dose or risk exceeding FALs. Based on the nature of the releases identified in Section 2.3.1 and previous investigation results presented in Section 2.3.2, the contaminants listed in Table B.2-2 could reasonably be suspected to be present at the CASs that require a CAI in CAU 578. These COPCs were identified during the planning process through the review of site history, process knowledge, personal interviews, past investigation efforts (where available), and inferred activities associated with the releases (including those that may be discovered during the investigation). The COPCs identified in Table B.2-2 will be detected by the analyses listed in Table B.2-3, as these analyses report the constituents listed in Table B.2-4.

Additional COPCs may be discovered during the investigation. Specific COPCs (and the analyses requested) will be determined for newly discovered releases based on the nature of the release (e.g., hydrocarbon stain, lead bricks).

Table B.2-2
Contaminants of Potential Concern [a]

Release	Description	Unknown Chemicals	Hazardous Constituents of Diesel
06-99-07	Sump	X	--
12-02-11	UST-P-2	--	X
23-12-01	Boiler (2)	--	X
23-99-04	Salvage Yard	X	--
07-99-01	Miscellaneous Debris	X	--

[a] The COPCs are the constituents that, based on process knowledge and historical documentation, are likely to be present.

X = COPC associated with this release
-- = COPC not associated with this release

Table B.2-3
Analyses Required by Group [a]

Release	Description	RCRA Metals	VOCs	SVOCs
06-99-07	Sump	X	X	X
12-02-11	UST-P-2	--	X	X
23-12-01	Boiler (2)	--	X	X
23-99-04	Salvage Yard	X	X	X
07-99-01	Miscellaneous Debris	X	X	X

[a] The analytical method has been determined based on the site-specific COPCs. Analytical methods numbers are shown in Table B.2-4.

X = Required analytical method as described in the Soils QAP (Navarro, 2022a)
-- = Not required

Table B.2-4
Analytes Reported Per Method

Organic COPCs				Inorganic COPCs
Method 8260 [a]		**Method 8270** [a]		**Method 6010/6020** [a]
VOCs		**SVOCs**		**Metals**
1,1,1,2-Tetrachloroethane	Carbon tetrachloride	1,4-Dioxane	Bis(2-ethylhexyl)phthalate	Arsenic
1,1,1-Trichloroethane	Chlorobenzene	2,3,4,6-Tetrachlorophenol	Butyl benzyl phthalate	Barium
1,1,2,2-Tetrachloroethane	Chloroethane	2,4,5-Trichlorophenol	Carbazole	Beryllium
1,1,2-Trichloroethane	Chloroform	2,4,6-Trichlorophenol	Chrysene	Cadmium
1,1-Dichloroethane	Chloromethane	2,4-Dimethylphenol	Di-n-butyl phthalate	Chromium
1,1-Dichloroethene	Chloroprene	2,4-Dinitrotoluene	Di-n-octyl phthalate	Lead
1,2,4-Trichlorobenzene	cis-1,2-Dichloroethene	2-Chlorophenol	Dibenzo(a,h)anthracene	Selenium
1,2,4-Trimethylbenzene	Dibromochloromethane	2-Methylnaphthalene	Dibenzofuran	Silver
1,2-Dibromo-3-chloropropane	Dichlorodifluoromethane	2-Methylphenol	Dimethyl phthalate	
1,2-Dichlorobenzene	Ethyl methacrylate	2-Nitrophenol	Fluoranthene	
1,2-Dichloroethane	Ethylbenzene	3-Methylphenol (m-cresol)	Fluorene	
1,2-Dichloropropane	Isobutyl alcohol	4-Methylphenol (p-cresol)	Hexachlorobenzene	
1,3,5-Trimethylbenzene	Isopropylbenzene	4-Chloroaniline	Hexachlorobutadiene	
1,3-Dichlorobenzene	Methacrylonitrile	4-Nitrophenol	Hexachloroethane	
1,4-Dichlorobenzene	Methyl methacrylate	Acenaphthene	Indeno(1,2,3-cd)pyrene	
2-Butanone	Methylene chloride	Acenaphthylene	n-Nitroso-di-n-propylamine	
2-Chlorotoluene	n-Butylbenzene	Aniline	Naphthalene	
2-Hexanone	n-Propylbenzene	Anthracene	Nitrobenzene	
4-Isopropyltoluene	sec-Butylbenzene	Benzo(a)anthracene	Pentachlorophenol	
4-Methyl-2-pentanone	Styrene	Benzo(a)pyrene	Phenanthrene	
Acetone	tert-Butylbenzene	Benzo(b)fluoranthene	Phenol	
Acetonitrile	Tetrachloroethene	Benzo(g,h,i)perylene	Pyrene	
Allyl chloride	Toluene	Benzo(k)fluoranthene	Pyridine	
Benzene	Total xylenes	Benzoic acid	Diethyl phthalate	
Bromodichloromethane	Trichloroethene	Benzyl alcohol		
Bromoform	Trichlorofluoromethane			
Bromomethane	Vinyl acetate			

[a] *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 2013)

B.2.2.3 Contaminant Characteristics

Contaminant characteristics include, but are not limited to, solubility, density, and adsorption potential. In general, contaminants with low solubility, high affinity for soil, and high density can be expected to be found relatively close to release points. Contaminants with small particle size, high solubility, low density, and/or low affinity for soil are found farther from release points or in low areas where evaporation of ponding will concentrate dissolved contaminants.

B.2.2.4 Site Characteristics

Site characteristics are defined by the interaction of physical, topographical, and meteorological attributes and properties including slope stability, precipitation runoff pathways, and drainage channels. Migration pathways of potential contaminants include lateral migration across surface soils/sediments and vertical migration of potential contaminants into and through subsurface soils.

Infiltration and percolation of precipitation serves as a driving force for downward migration of contaminants. Groundwater, however, is not expected to be impacted in the CAU 578 Areas (6, 7, 12, and 23) of the NNSS. The infiltration of precipitation through subsurface media typically serves as the major driving force for migration of contaminants. Because of the arid environment of the NNSS, percolation of precipitation is small, and migration of potential contaminants has been shown to be limited. Evaporation potentials at the NNSS range between 60 to 82 inches per year (in./yr), which significantly exceeds the NNSS annual average precipitation. The annual average precipitation across the NNSS ranges from 3.58 to 7.55 in./yr (Soulé, 2006).

Potential contaminants can be expected to be found relatively close to their release points, or in low areas where settling may occur and evaporation may concentrate the constituents. Given the relatively shallow relief at these CASs, lateral migration of potential contaminants of any major distance is unlikely. Because of the expected limited mobility, the affected media is typically the surface and shallow subsurface soil. Concentrations are expected to decrease with horizontal and vertical distance from the potential sources.

Infiltration of COPCs beyond shallow subsurface soil is not a concern at these CASs as the releases are generally not large. While potential contaminants within weathered hydrocarbon spill/release may cover visible areas, they tend to be present in higher concentrations near the point of discharge and decrease with increased distance, both laterally and vertically.

Depth to groundwater at CAS 06-99-07 is approximately 1,600 ft bgs, and the thickness of the alluvium is approximately 200 ft (Navarro, 2022b). The average annual precipitation recorded at the UCC (Yucca Dry Lake) rain gauge station is 6.60 in. (Soulé, 2006). The area generally has low slopes causing surface water runoff to flow into the Yucca Flat closed hydrographic basin.

Depth to groundwater at CAS 07-99-01 is approximately 1,800 ft bgs, and the thickness of the alluvium is approximately 600 ft (Navarro, 2022b). The average annual precipitation recorded at the BJY (Central Yucca Flat) rain gauge station is 6.32 in. (Soulé, 2006). The area generally has low slopes causing surface water runoff to flow into the Yucca Flat closed hydrographic basin.

Depth to groundwater at CAS 12-02-11 is approximately 1,500 ft bgs (Navarro, 2022b). There is nominal unconsolidated material because the site is situated atop bedrock. The thickness of the unconsolidated overlying material is approximately 12 in. (REECo, 1990). The average annual precipitation recorded at the A12 (Rainier Mesa) rain gauge station is 12.82 in. (Soulé, 2006). The area is located on the side of a hill with high slopes. Surface water flows into a relatively flat playa in the region of Area 12 Camp where the drainage loses definition. Sheet flow from this area would eventually flow into the Yucca Flat closed hydrographic basin. However, surface migration from the release will not occur unless the subsurface contamination is exposed.

Depth to groundwater at CASs 23-12-01 and 23-99-04 is approximately 1,100 ft bgs, and the thickness of the alluvium is approximately 1,200 ft (Navarro, 2022b). The average annual precipitation recorded at the DRA (Desert Rock) rain gauge station is 5.65 in. (Soulé, 2006). The area generally has moderate slopes causing surface water runoff to flow into the Amargosa Flats closed hydrographic basin.

B.2.2.5 Migration Pathways and Transport Mechanisms

Migration pathways include the lateral migration of potential contaminants across surface soils/sediments and vertical migration of potential contaminants through subsurface soils. Contaminants present in ephemeral washes are subject to much higher transport rates than contaminants present in other surface areas. These ephemeral washes are generally dry but are subject to infrequent stormwater flows. These stormwater flow events provide an intermittent mechanism for both vertical and lateral transport of contaminants. Contaminated sediments entrained by these stormwater events would be carried by the drainage channel flow to locations where the flowing water loses energy and the sediments drop out. These locations are visually identifiable as sedimentation areas.

Other migration pathways for contamination from the sites include windborne material and materials displaced from maintenance activities (e.g., moved during road maintenance). Contaminants may also be moved through mechanical disturbance due to maintenance or construction activities at the site. Specifically, this can include activities such as decontamination and demolition of facilities, investigation and resolution of CASs, and disassembly and removal of equipment and support structures.

Migration is influenced by the chemical characteristics of the contaminants (presented in Section B.2.2.3) and the physical characteristics of the vadose zone material (presented in Section B.2.2.4). In general, the chemical contaminants that are reasonably expected to be present at CAU 578 have low solubilities and high affinity for soil. The physical characteristics of the vadose zone material generally include medium and high adsorbive capacities, low moisture contents (i.e., available water-holding capacity), and relatively long distances to groundwater (see Section B.2.2.4). Based on these physical and chemical factors, contamination is expected to be found relatively close to release points.

Infiltration and percolation of precipitation serve as a driving force for downward migration of contaminants. However, due to high PET (annual PET at the Area 3 Radioactive Waste Management Site has been estimated at 61.7 in. [Yucel, 2009]) and limited precipitation for this region (6.3 in./yr [Soulé, 2006]), percolation of infiltrated precipitation at the NNSS does not provide a significant mechanism for vertical migration of contaminants to groundwater.

Subsurface migration pathways at CAU 578 are expected to be predominately vertical, although spills or leaks at the ground surface may also have limited lateral migration before infiltration. The depth of infiltration (shape of the subsurface contaminant plume) will be dependent upon the type, volume, and duration of the discharge as well as the presence of relatively impermeable layers that could modify vertical or lateral transport pathways, both on the ground surface (e.g., concrete) and in the subsurface (e.g., caliche layers).

B.2.2.6 Exposure Scenarios

Human receptors may be exposed to COPCs through oral ingestion or inhalation of, or dermal contact (absorption) with, soil or debris due to inadvertent disturbance of these materials, or external irradiation by radioactive materials. The land-use and exposure scenarios for the CASs that require a CAI in CAU 578 are listed in Table B.2-5. This is based on current and future land use at the NNSS (NNSA/NSO, 2013).

Table B.2-5
Land-Use and Exposure Scenarios

CAS	Record of Decision Land-Use Zone	Exposure Scenario
06-99-07, Sump	**Reserved** Controlled-access land area that provides a buffer between nondefense research, development, and testing activities. The Reserved Zone includes areas and facilities that provide widespread flexible support for diverse short-term nondefense research, testing, and experimentation. This land area is also used for short-duration exercises and training, such as Nuclear Emergency Search Team and Federal Radiological Monitoring and Assessment Center training and land navigation exercises and training.	**Remote Work** Workers exposed to site for portion of workday (42 day/yr, 8 hr/day, 336 hr/yr). Site structures are present. Workers spend 1/3 of their time at the site outdoors and 2/3 of their time at the site indoors.
07-99-01, Miscellaneous Debris	**Nuclear Test** Land area reserved for underground hydrodynamic tests, dynamic experiments, and underground nuclear weapons and weapons effects tests. This zone includes compatible defense and nondefense research, development, and testing activities. The emplacement hole inventory, underground alcove areas where radioactive materials are tested (designed such that radioactive materials will not reach aboveground environments), is located within this zone.	
12-02-11, UST-P-2	**Nuclear and High Explosives Test** Land area designated for additional underground and aboveground high-explosive tests or experiments. This zone includes compatible defense and nondefense research, development, and testing activities.	**Occasional Use Area** Worker will be exposed to the site occasionally (up to 80 hr/yr for 5 years). Site structures are not present for shelter and comfort of the worker.
23-12-01, Boiler (2) 23-99-04, Salvage Yard	**Reserved** Controlled-access land area that provides a buffer between nondefense research, development, and testing activities. The Reserved Zone includes areas and facilities that provide widespread flexible support for diverse short-term nondefense research, testing, and experimentation. This land area is also used for short-duration exercises and training, such as Nuclear Emergency Search Team and Federal Radiological Monitoring and Assessment Center training and land navigation exercises and training.	**Industrial Area** Workers exposed to site daily (250 day/yr, 8 hr/day, 2,000 hr/yr). Active powered buildings with toilets are present. Workers spend 1/3 of their time at the site outdoors and 2/3 of their time at the site indoors.

day/yr = Days per year
hr/day = Hours per day
hr/yr = Hours per year

B.3.0 Step 2 - Identify the Goal of the Study

Step 2 of the DQO process states how environmental data will be used in meeting objectives and solving the problem, identifies study questions or decision statement(s), and considers alternative outcomes or actions that can occur upon answering the question(s).

B.3.1 Decision Statements

The Decision I and Decision II statements are as follows:

- **Decision I.** "Is any COC associated with a CAU 578 release present in environmental media?" Any contaminant that is present (or is assumed to be present) at concentrations exceeding its corresponding FAL will be defined as a COC. A COC may also be defined as a contaminant that, in combination with other like contaminants, is determined to jointly pose an unacceptable risk based on a multiple constituent analysis (DOE/EMNV, 2018).

- **Decision II.** "Is sufficient information available to meet the closure objectives?" Sufficient information is defined to include to following:

  - The lateral and vertical extent of COC contamination
  - The information needed to predict potential remediation waste types and volumes
  - Any other information needed to evaluate the feasibility of remediation alternatives

The SAFER closure objectives for the corrective action of clean closure are defined as follows:

- No contamination remains at the site at concentrations exceeding FALs.
- All wastes have been properly disposed of.
- Site has been returned to a safe configuration.

The SAFER closure objectives for the corrective action of close in place are defined as follows:

- The nature and extent of contamination exceeding FALs has been defined.
- Appropriate controls have been put in place to prevent inadvertent contact with COCs.
- All wastes have been properly disposed of.
- Site has been returned to a safe configuration.

Decision I samples will be submitted to analytical laboratories to determine the presence of a COC. If a COC is present, Decision II samples will be submitted to define the extent of COC contamination.

In addition, samples will be submitted for analyses, as needed, to support waste management decisions.

A corrective action may also be required if a combination of contaminants is determined to jointly pose an unacceptable risk or if PSM is identified as described in the Soils RBCA document (DOE/EMNV, 2018).

If sufficient information is not available to meet the closure objectives, then site conditions will be reevaluated and additional samples will be collected (as long as the scope of the investigation is not exceeded and any CSM assumption has not been shown to be incorrect).

B.3.2 Alternative Actions to the Decisions

This section identifies actions that may be taken to solve the problem depending on the possible outcomes of the investigation.

B.3.2.1 Alternative Actions to Decision I

If no COC associated with a release is detected, further assessment of the release is not required. If a COC associated with a release is detected, the extent of COC contamination will be determined according to the criteria established in Section B.4.1, and additional information required to evaluate potential CAAs will be collected.

If a corrective action is implemented during the CAI and the collection of verification samples confirm that all the contaminated media has been removed, then the clean closure objectives will have been met. If contamination still exists and additional remediation would violate the conditions of the SAFER, then work will stop and a consensus reached with NDEP on the path forward before continuing the investigation of the CAS.

B.3.2.2 Alternative Actions to Decision II

If the lateral and vertical extent of COC contamination have not been defined for chemical COCs, then additional bounding samples will be collected.

If sample analytical results are not sufficient to characterize all generated wastes, then additional waste characterization samples will be collected. If available information is not sufficient to evaluate the potential for migration of COC contamination beyond the corrective action boundary, then additional information will be collected. If sufficient information is not available to confirm that closure objectives have been met, then additional samples will be collected. Otherwise, collection of additional information is not required.

B.4.0 Step 3 - Identify Information Inputs

Step 3 of the DQO process identifies the information needed, determines sources for information, and identifies sampling and analysis methods that will allow reliable comparisons with FALs.

B.4.1 Information Needs

To resolve Decision I (determine whether contamination from the release is present at levels exceeding a FAL) for the areas outside the default contamination boundaries, samples will be collected and analyzed following these two criteria:

- Samples must be collected in areas most likely to contain a COC (judgmental sampling).
- The analytical suite selected must be sufficient to identify any COC present in the samples.

The extent of COC contamination portion of Decision II will be resolved using one of the following methods:

- Method 1, the lateral and vertical extent of COC contamination, will be defined by sample results from locations contiguous to the contamination where COC concentrations are less than the FAL.

- Method 2, the lateral and vertical extent of COC contamination, will be defined by the entire lateral and vertical extent of a material with clearly identifiable physical properties that is assumed to be entirely contaminated at levels exceeding the FAL.

If additional information is needed to confirm that closure objectives have been met, additional samples will be collected and analyzed.

B.4.2 Sources of Information

Information to satisfy Decision I and Decision II will be generated by collecting environmental samples. These samples will be submitted to analytical laboratories meeting the quality criteria stipulated in the Soils QAP (Navarro, 2022a). TLDs will be submitted to the Environmental Technical Services group at the NNSS, which is certified by the DOE Laboratory Accreditation Program for dosimetry. Only validated data from analytical laboratories will be used to make DQO decisions. Sample collection and handling activities will follow standard procedures.

B.4.2.1 Sample Locations

Design of the sampling approaches for the CAU 578 releases must ensure that the data collected are sufficient for selection of the CAAs (EPA, 2002). To meet this objective, the samples collected from each site should either be from locations that most likely contain a COC, if present. These sample locations, therefore, can be selected by means of biasing factors used in judgmental sampling (e.g., a stain, likely containing a spilled substance). The implementation of a judgmental approach for sample location selection for CAU 578 are discussed in Section B.8.0.

B.4.2.2 Analytical Methods

Analytical methods are available to provide the data needed to resolve the decision statements. The analytical methods and laboratory requirements (e.g., precision, and accuracy) for soil samples are provided in the Soils QAP (Navarro, 2022a).

B.5.0 Step 4 - Define the Boundaries of the Study

Step 4 of the DQO process defines the target population of interest and its relevant spatial boundaries, specifies temporal and other practical constraints associated with sample/data collection, and defines the sampling units on which decisions or estimates will be made.

B.5.1 Target Populations of Interest

The population of interest to resolve Decision I ("determine whether a COC from the release is present") is contaminant concentrations exceeding a FAL at the location determined to contain a COC at its highest concentration within the release. The populations of interest to resolve Decision II (If corrective action is required, is sufficient information available to evaluate potential CAAs?) are as follows:

- For chemical contamination, COC concentrations for each one of a set of locations bounding contamination in lateral and vertical directions
- Investigation waste and potential remediation waste characteristics

B.5.2 Spatial Boundaries

Spatial boundaries are the maximum lateral and vertical extent of expected contamination that can be supported by the CSM. These boundaries were agreed to in the DQO meeting with decision-makers. Decision II spatial boundaries are listed in Table B.5-1.

Table B.5-1
Spatial Boundaries

CAS	Description	Vertical	Horizontal
06-99-07	Sump	20 m	Sump berm
12-02-11	UST-P-2	5 m	5 m
23-12-01	Boiler (2)	10 m	10 m
23-99-04	Salvage Yard	2 m	Area fence
07-99-01	Miscellaneous Debris	5 m	20 m

m = Meter

Contamination found beyond these boundaries may indicate a flaw in the CSM and may require reevaluation of the CSM before the investigation can continue. Each release is considered geographically independent, and intrusive activities are not intended to extend into the boundaries of neighboring releases.

B.5.3 Practical Constraints

Practical constraints (e.g., activities by other organizations at the NNSS, utilities, threatened or endangered animals and plants, unstable or steep terrain, and/or access restrictions) may affect the ability to investigate this site.

B.5.4 Define the Sampling Units

The scale of decision-making refers to the smallest, most appropriate area or volume for which decisions will be made. The scale of decision-making in Decision I is the contamination associated with a specific release. The presence of a COC associated with a release will cause the determination that the release requires further evaluation. The scale of decision-making for Decision II is defined as a contiguous area containing a COC originating from a release. Resolution of Decision II requires this contiguous area to be bounded laterally and vertically.

B.6.0 Step 5 - Develop the Analytic Approach

Step 5 of the DQO process specifies appropriate population parameters for making decisions, defines action levels, and generates a decision rule.

B.6.1 Population Parameters

Population parameters are defined for judgmental and probabilistic sampling designs in the following sections. Population parameters are the parameters compared to action levels.

The judgmental design will be implemented as described in the Soils RBCA document (DOE/EMNV, 2018). For chemical contaminants, the population parameter is the observed concentration of each contaminant from each individual analytical sample. Each sample result will be compared to the FALs to determine the appropriate resolution to Decision I and Decision II. A single sample result for any contaminant exceeding a FAL would cause a determination that a corrective action is required (for Decision I), or that the extent of COC contamination is not bounded (for Decision II).

If good prior information about the target site of interest is available, then the sampling may be designed to collect samples only from areas known to have the highest concentration levels on the target site. If the observed concentrations from these samples are below the action level, then a decision can be made that the site contains safe levels of the contaminant without the samples being truly representative of the entire area (EPA, 2006).

B.6.2 Action Levels

The PALs presented in this section are to be used for site screening purposes. They are not necessarily intended to be used as cleanup action levels or FALs. However, they are useful in screening out contaminants that are not present in sufficient concentrations to warrant further evaluation and, therefore, streamline the consideration of remedial alternatives.

The FALs will be established using the RBCA process described in the Soils RBCA document (DOE/EMNV, 2018). This process conforms with NAC 445A.227, which lists the requirements for sites with soil contamination (NAC, 2018a). For the evaluation of corrective actions, NAC 445A.22705 (NAC, 2018b) requires the use of ASTM Method E1739 (ASTM, 1995), or an equivalent method approved by NDEP to "conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards or to establish that corrective action is not necessary." For the evaluation of corrective actions, the FALs are established as the necessary remedial standard. The RBCA process as described in the Soils RBCA document (DOE/EMNV, 2018) defines three tiers (or levels) of evaluation involving increasingly sophisticated analyses (Section 3.2.1).

The comparison of laboratory results to FALs and the evaluation of potential corrective actions will be included in the investigation report. The FALs will be defined (along with the basis for their definition) in the investigation report.

Except as noted herein, the chemical PALs are defined as the RSLs for chemical contaminants in industrial soils (EPA, 2022). Background concentrations for RCRA metals will be used instead of screening levels when natural background concentrations exceed the screening level (e.g., arsenic on the NNSS). Background is considered the average concentration plus two standard deviations of the average concentration for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (formerly the Nellis Air Force Range) (NBMG, 1998; Moore, 1999). For detected chemical COPCs without established screening levels, the protocol used by EPA in establishing screening levels (or similar) will be used to establish PALs. If used, this process will be documented in the investigation report.

B.6.3 Decision Rules

The decision rules applicable to both Decision I and Decision II are as follows:

- If contamination levels are inconsistent with the CSM or extends beyond the spatial boundaries identified in Section B.5.2, then work will be suspended and the investigation strategy will be reconsidered, else the decision will be to continue sampling.

The general decision rules for Decision I are as follows:

- If the population parameter of any COPC in the Decision I population of interest (defined in Step 4) exceeds the corresponding FAL, then Decision II will be resolved and a corrective action will be determined, else no further action will be necessary for that COPC in that population.

- If a waste is present that, if released, has the potential to cause future soil contamination at levels exceeding a FAL, then a corrective action will be determined, else no further action will be necessary.

The decision rules for Decision II are as follows:

- If the spatial extent of any COC has not been defined, then additional samples will be collected, else no further investigation will be necessary.

- If sufficient information is not available to determine potential remediation waste types and evaluate the feasibility of remediation alternatives, additional waste characterization samples will be collected, else no further investigation will be necessary.

B.7.0 Step 6 - Specify Performance or Acceptance Criteria

Step 6 of the DQO process defines the decision hypotheses, specifies controls against false rejection and false acceptance decision errors, examines consequences of making incorrect decisions from the test, and places acceptable limits on the likelihood of making decision errors.

B.7.1 Decision Hypotheses

The baseline condition (i.e., null hypothesis) and alternative condition for Decision I are as follows:

- **Baseline condition.** A COC is present.
- **Alternative condition.** A COC is not present.

The baseline condition (i.e., null hypothesis) and alternative condition for Decision II are as follows:

- **Baseline condition.** The extent of a COC has not been defined.
- **Alternative condition.** The extent of a COC has been defined.

Decisions and/or criteria have false-negative or false-positive errors associated with their determination. The impact of these decision errors and the methods that will be used to control these errors are discussed in the following subsections. In general terms, confidence in DQO decisions based on judgmental sampling results will be established qualitatively by the following:

- Developing a CSM (based on process knowledge) that is agreed to by decision-maker participants during the DQO process.

- Testing the validity of the CSM based on investigation results.

- Evaluating the quality of data based on DQI parameters.

B.7.2 False-Negative Decision Error

The false-negative decision error would mean deciding that a COC is not present when it actually is (Decision I), or deciding that the extent of a COC has been defined when it has not (Decision II). In both cases, the potential consequence is an increased risk to human health and environment.

In judgmental sampling, the selection of the number and location of samples is based on knowledge of the feature or condition under investigation and on professional judgment (EPA, 2002). Judgmental sampling conclusions about the target population depend upon the validity and accuracy of professional judgment.

The false-negative decision error (where consequences are more severe) for judgmental sampling designs is controlled by meeting these criteria:

- For Decision I, having a high degree of confidence that the sample locations selected will identify a COC if present anywhere within the release. For Decision II, having a high degree of confidence that the sample locations selected will identify the extent of a COC.
- Having a high degree of confidence that analyses conducted will be sufficient to detect any COC present in the samples.
- Having a high degree of confidence that the dataset is of sufficient quality and completeness.

To satisfy the first criterion, Decision I samples must be collected in areas most likely to be contaminated by a COC (supplemented by unbiased samples where appropriate). Decision II samples must be collected in areas that represent the lateral and vertical extent of contamination (above FALs). The following characteristics must be considered to control decision errors for the first criterion:

- Source and location of release
- Chemical nature and fate properties
- Physical transport pathways and properties
- Hydrologic drivers

These characteristics were considered during the development of the CSM and selection of sampling locations. Field-screening methods and biasing factors will be used to further ensure that appropriate sampling locations are selected to meet these criteria. The investigation report will present an assessment on the DQI of representativeness that samples were collected from those locations that best represent the populations of interest as defined in Section B.5.1.

To satisfy the second criterion, Decision I soil samples will be analyzed for the chemical and radiological parameters listed in Section 4.1. Decision II soil samples will be analyzed for unbounded COCs. The DQI of sensitivity will be assessed for all analytical results to ensure that all sample analyses had measurement sensitivities (detection limits) that were less than or equal to the corresponding FALs. If this criterion is not achieved, the affected data will be assessed (for usability and potential impacts on meeting site characterization objectives) in the investigation report.

To satisfy the third criterion, the entire dataset of soil sample results, as well as individual soil sample results, will be assessed against the DQIs of precision, accuracy, comparability, and completeness as defined in the Soils QAP (Navarro, 2022a). The DQIs of precision and accuracy will be used to assess overall analytical method performance as well as to assess the need to potentially “flag” (qualify) individual contaminant results when corresponding QC sample results are not within the established control limits for precision and accuracy. Data qualified as estimated for reasons of precision or accuracy may be considered to meet the analyte performance criteria based on an assessment of the data. The DQI for completeness will be assessed to ensure that all data needs identified in the DQO have been met. The DQI of comparability will be assessed to ensure that all analytical methods used are equivalent to standard EPA methods so that results will be comparable to regulatory action levels that have been established using those procedures. Strict adherence to established procedures and QA/QC protocol protects against false negatives.

To provide information for the assessment of the DQIs of precision and accuracy, the following QC samples will be collected (as established in the CAU 578 DQOs):

- Field duplicates (minimum of 1 per 20 environmental grab samples)
- Laboratory QC samples (1 per 20 samples)

B.7.3 False-Positive Decision Error

The false-positive decision error would mean deciding that a COC is present when it is not, or a COC is unbounded when it is not, resulting in increased costs for unnecessary sampling and analysis.

False-positive results are typically attributed to laboratory and/or sampling/handling errors that could cause cross contamination. To control against cross contamination, decontamination of sampling equipment will be conducted in accordance with established and approved procedures, and only clean sample containers will be used. To determine whether a false-positive analytical result may have occurred, the following QC samples will be collected (as established in the CAU 578 DQOs):

- Trip blanks (1 per sample cooler containing VOC environmental samples)
- Equipment rinsate blanks (1 per VOC sampling event)

For probabilistic sampling, false-positive decision error rate goal was established by the DQO meeting participants at 0.20 (or 20 percent probability). Protection against this decision error is also afforded by the controls listed in Section B.7.2 for probabilistic sampling designs.

B.8.0 Step 7 - Develop the Plan for Obtaining Data

Step 7 of the DQO process selects and documents a design for a CAI that will produce data that exceeds performance or acceptance criteria. Judgmental sampling schemes will be implemented to select sample locations. Judgmental sampling will also be used to investigate any newly discovered releases as described in Section B.2.2.1. Investigation results will be compared to FALs to determine the need for corrective action. Potential source material sample results will be evaluated against the PSM criteria listed in the Soils RBCA document (DOE/EMNV, 2018) to determine the need for corrective action.

Information generated from the CAI will be used to resolve the following Decision I and Decision II statements defined in Section B.3.1:

- **Decision I.** "Is any COC present in environmental media?"
- **Decision II.** "Is sufficient information available to meet the closure objectives?"

B.8.1 Decision I

A judgmental sampling design will be implemented for all CAU 578 to establish sample locations and evaluate sample results. Individual sample results, rather than an average concentration, will be used to compare to FALs. Adequate representativeness of the entire target population may not be a requirement in developing a sampling design. If good prior information about the target site of interest is available, then the sampling may be designed to collect samples only from areas known to have the highest concentration levels on the target site. If the observed concentrations from these samples are below the action level, then a decision can be made that the site contains safe levels of the contaminant without the samples being truly representative of the entire area (EPA, 2006).

A biased sampling strategy will be used to target areas with the highest potential to contain a COC, if it is present anywhere in the release. Sample locations will be determined based on process knowledge, previously acquired data, or the field-screening and biasing factors listed in Section B.8.3. If biasing factors are present in soils below locations where Decision I samples were removed, additional Decision I soil samples will be collected at depth intervals selected by the Site Supervisor based on biasing factors to a depth where the biasing factors are no longer present. The

Site Supervisor has the discretion to modify the judgmental sample locations, but only if the modified locations meet the decision needs and criteria stipulated in these DQOs.

B.8.2 Decision II

If a COC is identified at any CAU 578 location, Decision II sampling will consist of further defining the extent of the area where corrective actions will be necessary. One of the following options will be used to resolve Decision II:

- **Option 1.** Additional samples will be collected to define the corrective action boundary until at least two consecutive step-out samples in each direction are found that do not contain a COC. In general, sample locations will be arranged in a triangular pattern around the area containing a COC at distances based on site conditions, process knowledge, and biasing factors. If a COC extends beyond the initial step-outs, Decision II samples will be collected from incremental step-outs. Initial step-outs will be at least as deep as the vertical extent of contamination defined at the Decision I location and the depth of the incremental step-outs will be based on the deepest contamination observed at all locations. A clean sample (i.e., contamination levels less than FALs) collected from each step-out direction (lateral or vertical) will define extent of contamination in that direction.

- **Option 2.** Decision II will be resolved by defining the corrective action boundary based on the boundary of the waste unit or other process knowledge that defines the extent of the waste.

B.8.3 Biasing Factors

The following biasing factors will be considered in selecting locations for analytical samples at CAU 578:

- *Drums, containers, equipment, or debris.* Materials that contain or may have contained hazardous or radioactive substances.

- *Lithology.* Locations where variations in lithology (soil or rock) indicate that different conditions or materials exist.

- *Process knowledge.* Locations for which evidence such as historical photographs, experience from previous investigations, or input from interviewee(s) exists that a release of hazardous or radioactive substances may have occurred.

- *Contaminant characteristics.* Locations that may reasonably have received contamination, selected on the basis of the chemical and/or physical properties of the contaminant(s) in that environmental setting.

- *Previous sample results.* Locations that may reasonably have been contaminated based upon the results of previous field investigations.

- Experience and data from investigations of similar sites.

- Visual indicators such as discoloration, textural discontinuities, disturbance of native soils, or any other indication of potential contamination.

- Odor.

- *Other biasing factors.* If other biasing factors not previously defined for the CAI become evident during the CAI, they will be defined and justified in the CR.

During the course of the CAU 578 investigation, the identification of any biasing factors will be used to determine whether a potential release is present (e.g., stains, spills, debris). Samples will be collected from the material that presents the greatest degree of the biasing factor identified (surface or subsurface as discussed above). Specific analyses requested for these samples will be determined based on the nature of the potential release (e.g., hydrocarbon stain, lead bricks).

B.8.4 Sampling Strategies

Table B.8-1 lists the general sampling strategies for the five releases.

Table B.8-1
General Sampling Strategies

Release	Sampling Strategy
CAS 06-99-07, Sump	Physical site characteristics
CAS 12-02-11, UST-P-2	Previous investigation results
CAS 23-12-01, Boiler (2)	Stains identified in previous report
CAS 23-99-04, Salvage Yard CAS 07-99-01, Miscellaneous Debris	Biasing factors identified in visual survey

B.8.4.1 06-99-07, Sump

A judgmental sampling design will be implemented for locating Decision I samples for CAS 06-99-07, Sump. The sample locations will be identified as the lowest location(s) in the sump based on a visual survey. Each sample will be submitted for laboratory analysis using the RCRA metals, VOC, and SVOC methods. If a COC is identified, the entire sump will be defined as the corrective action boundary.

B.8.4.2 12-02-11, UST-P-2

A judgmental sampling design will be implemented for locating Decision I samples for CAS 12-02-11, UST-P-2. Sample locations will be determined based upon the highest TPH concentration from previous sample results of material at the site that has not been previously removed.

The targeted location of interest for confirming that no further action is needed for these releases of diesel is the location of the highest TPH result at the generator stand (Figure B.8-1). If it can be shown that no hazardous constituents of diesel are present at levels exceeding the EPA RSLs (EPA, 2022) in the location of the highest TPH concentrations, it will be assumed that they are also not present at the other release locations.

According to available records (REECo, 1990): “Limited removal of soil beside the generator stand was accomplished using a hand shovel. The depth to bedrock in this area is approximately 12 inches to eighteen inches. The area of the excavation is approximately five feet by five feet. This area is not totally excavated to the depths indicated. Electrical conduits run under the surface in trenches excavated into the bedrock.”

The area of the generator stand currently contains a vapor extraction well and two guard posts (Figure B.8-1). The surface of the area consists of material similar to road base. A soil sample will be collected from each side of the vapor extraction well. At each location, the surface road base will be removed using hand tools. The sample locations will be as close to the extraction well as possible but beyond the emplacement cement collar of the extraction well. At each location, soil samples will be collected immediately under the road base and at approximately 12 in. bgs. Each of these samples will be submitted for laboratory analysis using the VOC and SVOC methods.

B.8.4.3 23-12-01, Boiler (2)

A judgmental sampling design will be implemented for locating Decision I samples for CAS 23-12-01, Boiler (2). Sample locations will be determined based upon the locations of the soil stains in the PA report (IT, 1998). The PA CAU Phase I Assessment Form dated February 19, 1998,

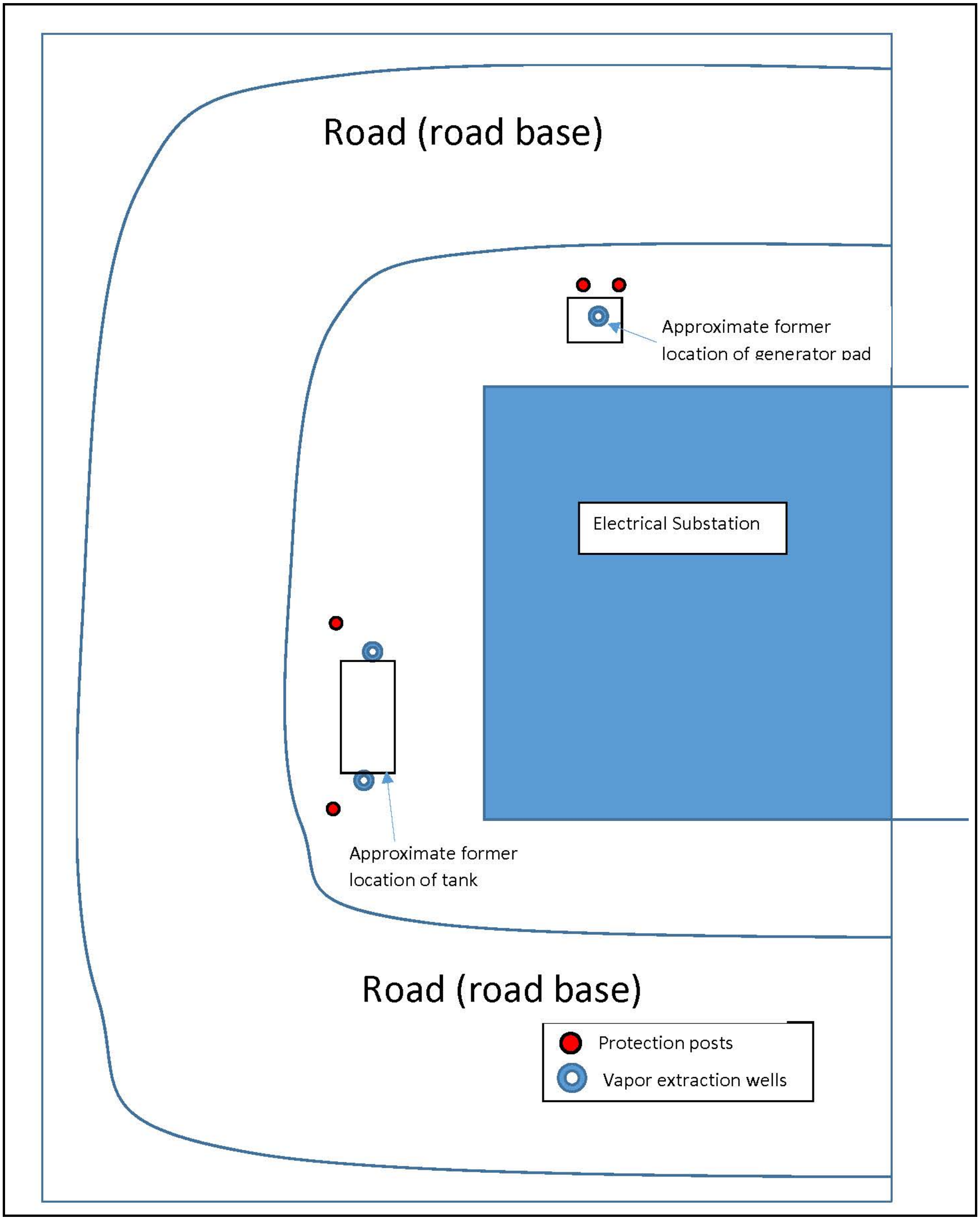

Figure B.8-1
Feature Locations at CAS 12-02-11

identifies two possible oil stains. A photo is available that shows the first stain at the northeast corner of Building 23-754 (Figure B.8-2). This photo will be used to bias a Decision I sample at the location of the approximate center of this stain. The PA report also identifies a large stain from a possible fuel spill leaking from the building with dark stains at the building base that can also be seen in Figure B.8-2. Based on the site sketch in Figure B.8-3, the approximate center line of the spill is 9 ft to the west of the center of the building extending approximately 13 ft north. A Decision I samples will be collected along the defined center line of the stain at the base of Building 23-754 and in the approximate center of the stain at 6.5 ft from the building. An additional sample location will be sampled along the center line of the stain adjacent to the building. Each of these samples will be submitted for laboratory analysis using the VOC and SVOC methods.

Author Unknown, 1998

Figure B.8-2
CAS 23-12-01, Boiler (2) Oil Stain

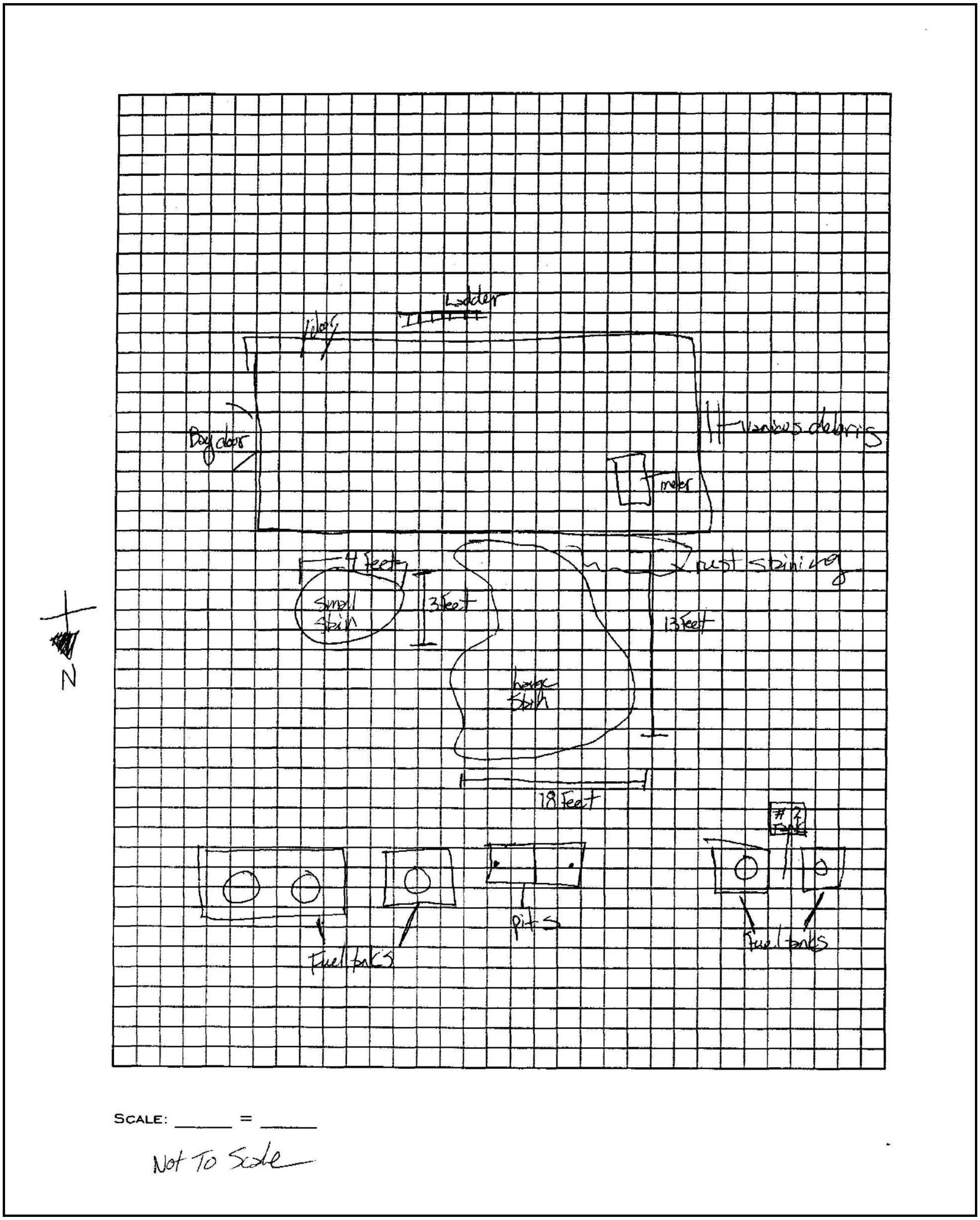

Figure B.8-3
Building 23-754 Site Sketch
Source: IT, 1998

B.8.4.4 23-99-04, Salvage Yard

A judgmental sampling design will be implemented for locating Decision I samples for CAS 23-99-04, Salvage Yard. Previous site visits identified debris piles, soil staining, and possible lead items. A visual survey of the salvage yard will be conducted to identify any biasing factors listed in Section B.8.3. A sample will be collected at each of the locations where a biasing factor was identified or where a PSM item was removed. Each sample will be submitted for laboratory analysis using the RCRA metals, VOC, and SVOC methods.

B.8.4.5 07-99-01, Miscellaneous Debris

A judgmental sampling design will be implemented for locating Decision I samples for CAS 07-99-01, Miscellaneous Debris. Previous site visits identified construction type debris throughout the area. A visual survey of the area will be conducted to identify any biasing factors listed in Section B.8.3. A sample will be collected at each of the locations where a biasing factor was identified or where a PSM item was removed. Each sample will be submitted for laboratory analysis using the RCRA metals, VOC, and SVOC methods.

B.9.0 References

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EPA, see U.S. Environmental Protection Agency.

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Appendix C

Nevada Division of Environmental Protection Comments

(1 Page)

NEVADA ENVIRONMENTAL MANAGEMENT OPERATIONS ACTIVITY
DOCUMENT REVIEW SHEET

1. Document Title/Number: Draft Streamlined Approach for Environmental Restoration (SAFER) Plan for Corrective Action Unit (CAU) 578: Miscellaneous Inactive Sites, Nevada National Security Site, Nevada, Revision 0, March 2023	2. Document Date: March 2023
3. Revision Number: 0	4. Originator/Organization: Environmental Management Nevada Program
5. Responsible EM Nevada Program Activity Lead: Tiffany Gamero	6. Date Comments Due: April 2023
7. Review Criteria: Full	
8. Reviewer/Organization Phone No.: Christine Andres (702) 668-3911; Meghan Lyle (702) 668-3024	9. Reviewer's Signature:

10. Comment Number/Location		11. Type[a]	12. Comment	13. Comment Response
1.	Section 4.3.3 - CAS 23-12-01, Boiler (2), Page 50		The sample locations in this section of the Plan are stated exactly the same as on the CAU 578 DQO slides sent to the NDEP on December 12, 2022. However, during the CAU 578 DQO meeting on December 15, 2022, and reflected in the CAU 578 DQO Meeting Summary NDEP received electronically on December 16, 2022, Navarro and NDEP personnel agreed to additional sampling during the investigation of CAS 23-12-01. Please explain this discrepancy.	Updated text to reflect a third sampling location where two sample depths will be collected. Changes were made to Sections 2.3.1.5, 4.3.3, and B.8.4.3.
2.	Section B.2.2.4 – Site Characteristics, 1st Partial Paragraph, 3rd Full Sentence, Page B-16		Which Area 12 ponds are being referenced in this sentence?	To better define the drainage in this area, the referenced sentence in Section B.2.2.4 was changed from: "Surface water flows into the Area 12 ponds and eventually into the Yucca Flat closed hydrographic basin." to: "Surface water flows into a relatively flat playa in the region of Area 12 Camp where the drainage loses definition. Sheet flow from this area would eventually drain into the Yucca Flat closed hydrographic basin."

[a]Comment Types: M = Mandatory, S = Suggested.
Return Document Review Sheets to Environmental Management Nevada Program Operations Activity, Attn: QAC, M/S NSF 505

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