

Nevada
Environmental
Restoration
Project

DOE/NV--1392



Streamlined Approach for Environmental Restoration (SAFER) Plan for Corrective Action Unit 566: EMAD Compound Nevada Test Site, Nevada

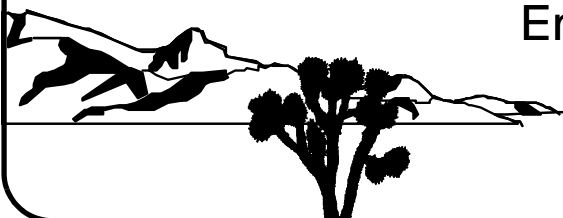
Controlled Copy No.: ____

Revision No.: 0

June 2010

Approved for public release; further dissemination unlimited.

Environmental Restoration
Project



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

UNCONTROLLED when Printed

Available for sale to the public from:

U.S. Department of Commerce
National Technical Information Service
5301 Shawnee Road
Alexandria, VA 22312
Telephone: 800.553.6847
Fax: 703.605.6900
E-mail: orders@ntis.gov
Online Ordering: <http://www.ntis.gov/help/ordermethods.aspx>

Available electronically at <http://www.osti.gov/bridge>

Available for a processing fee to U.S. Department of Energy and its contractors,
in paper, from:

U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
Phone: 865.576.8401
Fax: 865.576.5728
Email: reports@adonis.osti.gov

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.



**STREAMLINED APPROACH FOR ENVIRONMENTAL
RESTORATION (SAFER) PLAN FOR
CORRECTIVE ACTION UNIT 566:
EMAD COMPOUND
NEVADA TEST SITE, NEVADA**

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

Controlled Copy No.: ____

Revision No.: 0

June 2010

Approved for public release; further dissemination unlimited.

Reviewed and determined to be UNCLASSIFIED.
Derivative Classifier: <u>Joseph P. Johnston/NNES CO</u> <small>(Name/personal identifier and position title)</small>
Signature: <u>/s/ Joseph P. Johnston</u>
Date: <u>06/09/2010</u>

UNCONTROLLED When Printed

**STREAMLINED APPROACH FOR ENVIRONMENTAL RESTORATION (SAFER)
PLAN FOR CORRECTIVE ACTION UNIT 566: EMAD COMPOUND
NEVADA TEST SITE, NEVADA**

Approved by: /s/ Kevin J. Cabble Date: 06/09/2010

Kevin J. Cabble
Federal Sub-Project Director
Industrial Sites Sub-Project

Approved by: /s/ Robert F. Boehlecke Date: 06/09/2010

Robert F. Boehlecke
Federal Project Director
Environmental Restoration Project

Table of Contents

List of Figures	v
List of Tables	vi
List of Acronyms and Abbreviations	vii
Executive Summary	ES-1
1.0 Introduction.....	1
1.1 SAFER Process Description.....	4
1.2 Summary of Corrective Actions and Closures	6
1.3 CAU 566 End State.....	8
2.0 Unit Description	9
2.1 General Description Location.....	9
2.1.1 CAS Component: Metallurgy Lab Drain System	9
2.1.2 CAS Component: Storm Drain System	9
2.1.3 CAS Component: Locomotives and Railcars	11
2.1.4 CAS Component: Substations	11
2.1.5 CAS Component: Storage Casks and Drywells.....	15
2.1.6 CAS Component: Construction Debris Piles.....	15
2.2 History and Process Knowledge.....	18
2.3 Previous Investigations.....	18
2.3.1 Potential Impacts of Existing Use Restrictions to the CAU 566 CAI.....	20
3.0 Data Quality Objectives	26
3.1 Summary of DQO Analysis	26
3.2 Results of the DQO Analysis	32
3.2.1 Action Level Determination and Basis.....	32
3.2.1.1 Chemical PALs	33
3.2.1.2 Total Petroleum Hydrocarbon PALs	35
3.2.1.3 Radionuclide PALs	35
3.2.2 Hypothesis Test	35
3.2.3 Statistical Model.....	36
3.2.4 Design Description/Option.....	36
3.2.5 Conceptual Site Model and Drawing	37
4.0 Field Activities and Closure Objectives	40
4.1 Contaminants of Potential Concern	40
4.1.1 Total Petroleum Hydrocarbons.....	40
4.1.2 Volatile and Semivolatile Organic Compounds	40
4.1.3 Polychlorinated Biphenyls	41

Table of Contents (Continued)

4.1.4	Resource Conservation and Recovery Act Metals and Beryllium	41
4.1.5	Pesticides	41
4.1.6	Radionuclides	41
4.2	Remediation	42
4.2.1	Sampling for COCs and PSMs	43
4.3	Verification	43
4.4	Closure	47
4.5	Duration	49
5.0	Reports and Records Availability	50
6.0	Investigation/Remediation Waste Management	51
6.1	Waste Minimization	51
6.2	Potential Waste Types	52
6.2.1	Industrial Waste	52
6.2.2	Low-Level Radioactive Waste	52
6.2.3	Hazardous Waste	53
6.2.4	Hydrocarbon Waste	54
6.2.5	Mixed Low-Level Waste	54
6.2.6	Toxic Substances Control Act Waste	54
6.2.6.1	Polychlorinated Biphenyls	54
6.2.6.2	Asbestos-Containing Material	55
7.0	Quality Assurance/Quality Control	56
7.1	Sample Collection Activities	56
7.2	Applicable Laboratory/Analytical Data Quality Indicators	56
7.2.1	Precision	57
7.2.2	Accuracy/Bias	59
7.2.3	Representativeness	60
7.2.4	Completeness	60
7.2.5	Comparability	61
7.2.6	Sensitivity	61
8.0	References	62

Appendix A - Project Organization

A.1.0	Project Organization	A-1
-------	----------------------------	-----

Table of Contents (Continued)

Appendix B - Data Quality Objective Process

B.1.0	Introduction.....	B-1
B.2.0	Step 1 - State the Problem.....	B-2
B.2.1	Planning Team Members.....	B-2
B.2.2	Conceptual Site Model.....	B-2
B.2.2.1	Contaminant Release.....	B-7
B.2.2.2	Potential Contaminants.....	B-8
B.2.2.3	Contaminant Characteristics.....	B-8
B.2.2.4	Site Characteristics.....	B-9
B.2.2.5	Migration Pathways and Transport Mechanisms.....	B-10
B.2.2.6	Land-Use and Exposure Scenarios.....	B-11
B.3.0	Step 2 - Identify the Goal of the Study.....	B-12
B.3.1	Decision Statements.....	B-12
B.3.2	Alternative Actions to the Decisions.....	B-14
B.3.2.1	Alternative Actions to Decision I.....	B-15
B.3.2.2	Alternative Actions to Decision II.....	B-15
B.4.0	Step 3 - Identify Information Inputs.....	B-16
B.4.1	Information Needs.....	B-16
B.4.2	Sources of Information.....	B-16
B.4.2.1	Sample Locations.....	B-17
B.4.2.2	Analytical Methods.....	B-18
B.5.0	Step 4 - Define the Boundaries of the Study.....	B-19
B.5.1	Target Populations of Interest.....	B-19
B.5.2	Spatial Boundaries.....	B-19
B.5.3	Practical Constraints.....	B-19
B.5.4	Define the Sampling Units.....	B-20
B.6.0	Step 5 - Develop the Analytic Approach.....	B-21
B.6.1	Population Parameters.....	B-21
B.6.2	Action Levels.....	B-21
B.6.2.1	Chemical PALs.....	B-22
B.6.2.2	Total Petroleum Hydrocarbon PALs.....	B-22
B.6.2.3	Radionuclide PALs.....	B-23
B.6.3	Decision Rules.....	B-23

Table of Contents (Continued)

B.7.0	Step 6 - Specify Performance or Acceptance Criteria	B-25
B.7.1	Decision Hypotheses.	B-25
B.7.2	False Negative Decision Error	B-25
B.7.2.1	False Negative Decision Error for Judgmental Sampling	B-26
B.7.3	False Positive Decision Error	B-27
B.8.0	Step 7 - Develop the Plan for Obtaining Data	B-29
B.8.1	Decision I Sampling	B-29
B.8.2	Decision II Sampling	B-30
B.8.3	CAS 25-99-20, EMAD Compound	B-30
B.8.3.1	Metallurgy Lab Drain System Component of CAS 25-99-20	B-31
B.8.3.2	Storm Drain System Component of CAS 25-99-20	B-31
B.8.3.3	Locomotives and Railcars Component of CAS 25-99-20	B-35
B.8.3.4	Substations Component of CAS 25-99-20	B-35
B.8.3.5	Storage Casks and Drywells Component of CAS 25-99-20.	B-37
B.8.3.6	Debris Piles Component of CAS 25-99-20	B-39
B.9.0	References.	B-40

Appendix C - Nevada Division of Environmental Protection Comments

List of Figures

Number	Title	Page
1-1	Nevada Test Site	2
1-2	CAU 566, CAS Location Map	3
1-3	E-MAD Compound CAS Components.	5
1-4	CAU 566 Closure Decision Process	7
2-1	Metallurgy Lab Trailer (top) and Drains (bottom)	10
2-2	Storm Drain Catch Basin (top) and Outfall (bottom)	12
2-3	Locomotives and Railcar (top) and Stained Soil (bottom)	13
2-4	Substations Southeast (top) and Southwest (bottom) of Building 3900.	14
2-5	Storage Casks (top) and One of Four Drywells (bottom).	16
2-6	Construction Debris Piles (top and bottom) Southwest of Building 3900	17
2-7	Previous E-MAD Investigations.	21
3-1	Risk-Based Corrective Action Decision Process	34
3-2	Conceptual Site Model Diagram for CAU 566	38
3-3	Conceptual Site Model for CAU 566	39
B.2-1	Conceptual Site Model for CAU 566	B-6
B.3-1	SAFER Closure Decision Process for CAU 566	B-13
B.8-1	Proposed Decision I Sampling Locations at Metallurgy Lab Drains	B-32
B.8-2	Proposed Decision I Sampling Locations for the Storm Drain System	B-34
B.8-3	Proposed Decision I Sampling Locations at Railcars (top) and Locomotive (bottom)	B-36
B.8-4	Proposed Decision I Sampling Locations at Substations of Building 3900	B-38

List of Tables

Number	Title	Page
2-1	Previous Investigations Associated with the E-MAD Facility	22
3-1	Analytical Program	28
3-2	Constituents Reported by Analytical Methods	29
3-3	Analytical Requirements for Radionuclides for CAU 566	31
3-4	Analytical Requirements for Chemical COPCs for CAU 566	32
4-1	Sampling Approach for CAU 566 CAS Components	44
4-2	Known or Anticipated Potential Source Materials	46
4-3	SAFER Field Activities	49
7-1	Laboratory and Analytical Performance Criteria for CAU 566 DQIs	58
B.2-1	Conceptual Site Model Description of Elements for Each CAS Component in CAU 566	B-4
B.2-2	Analytical Program	B-9
B.2-3	Land-Use and Exposure Scenarios	B-11
B.5-1	Spatial Boundaries of CAU 566 CAS Components	B-20
B.5-2	Practical Constraints for the CAU 566 Field Investigation	B-20

List of Acronyms and Abbreviations

Ac	Actinium
ACM	Asbestos-containing material
Am	Americium
AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
bgs	Below ground surface
CAA	Corrective action alternative
CAI	Corrective action investigation
CAS	Corrective action site
CAU	Corrective action unit
CFR	<i>Code of Federal Regulations</i>
Co	Cobalt
CO ₂	Carbon dioxide
COC	Contaminant of concern
COPC	Contaminant of potential concern
CR	Closure report
Cs	Cesium
CSM	Conceptual site model
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DQI	Data quality indicator
DQO	Data quality objective
DRO	Diesel-range organics
DU	Depleted uranium
EIV	Engine installation vehicle
E-MAD	Engine Maintenance, Assembly, and Disassembly

List of Acronyms and Abbreviations (Continued)

EPA	U.S. Environmental Protection Agency
ETSM	Engine Transport System Maintenance
Eu	Europium
FAL	Final action level
FFACO	<i>Federal Facility Agreement and Consent Order</i>
FSL	Field-screening level
FSR	Field-screening result
ft	Foot
gal	Gallon
HASL	Health and Safety Laboratory
HEPA	High-efficiency particulate air
HWAA	Hazardous waste accumulation area
IDW	Investigation-derived waste
in.	Inch
K	Potassium
LCS	Laboratory control sample
LLW	Low-level waste
M&O	Management and operating
MDC	Minimum detectable concentration
mg/kg	Milligrams per kilogram
mrem/yr	Millirem per year
MS	Matrix spike
NAC	<i>Nevada Administrative Code</i>
NAD	North American Datum
Nb	Niobium
NCRP	National Council on Radiation Protection and Measurements

List of Acronyms and Abbreviations (Continued)

ND	Normalized difference
NDEP	Nevada Division of Environmental Protection
NERVA	Nuclear Engine for Rocket Vehicle Application
NNES	Navarro Nevada Environmental Services, LLC
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NRDS	Nuclear Rocket Development Station
NSTec	National Security Technologies, LLC
NTS	Nevada Test Site
NTSWAC	<i>Nevada Test Site Waste Acceptance Criteria</i>
PAL	Preliminary action level
Pb	Lead
PCB	Polychlorinated biphenyl
PPE	Personal protective equipment
ppm	Parts per million
PSM	Potential source material
Pu	Plutonium
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RBCA	Risk-based corrective action
RBSL	Risk-based screening level
RCA	Radiologically controlled area
RCRA	<i>Resource Conservation and Recovery Act</i>
RESRAD	Residual Radioactive
RL	Reporting limit
RMA	Radioactive material area

List of Acronyms and Abbreviations (Continued)

RPD	Relative percent difference
RSL	Regional screening level
SAFER	Streamlined Approach for Environmental Restoration
SAIC	Science Applications International Corporation
SFDP	Spent Fuel Demonstration Program
SNJV	Stoller-Navarro Joint Venture
Sr	Strontium
SSTL	Site-specific target level
SVOC	Semivolatile organic compound
TBD	To be determined
Th	Thorium
Tl	Thallium
TPH	Total petroleum hydrocarbons
TSCA	<i>Toxic Substances Control Act</i>
U	Uranium
UR	Use restriction
UTM	Universal Transverse Mercator
VOC	Volatile organic compound
yd ³	Cubic yard
µg/100cm ²	Micrograms per 100 square centimeters
%R	Percent recovery

Executive Summary

This Streamlined Approach for Environmental Restoration (SAFER) Plan addresses the actions needed to achieve closure for Corrective Action Unit (CAU) 566, EMAD Compound, identified in the *Federal Facility Agreement and Consent Order* (FFACO). Corrective Action Unit 566 comprises the following corrective action site (CAS) located in Area 25 of the Nevada Test Site:

- 25-99-20, EMAD Compound

This plan provides the methodology for field activities needed to gather the necessary information for closing CAS 25-99-20. 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 566 using the SAFER process. Additional information will be obtained by conducting a field investigation before selecting the appropriate corrective action. It is anticipated that the results of the field investigation and implementation of a corrective action of clean closure will support a defensible recommendation that no further corrective action is necessary. If it is determined that complete clean closure cannot be accomplished during the SAFER, then a hold point will have been reached and the Nevada Division of Environmental Protection (NDEP) will be consulted to determine whether the remaining contamination will be closed under the alternative corrective action of closure in place. This will be presented in a closure report that will be prepared and submitted to NDEP for review and approval.

The data quality objective (DQO) strategy for CAU 566 was developed at a meeting on April 30, 2009, by representatives of NDEP and the U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office. 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 CAU 566.

The following text summarizes the SAFER activities that will support the closure of CAU 566:

- Perform site preparation activities (e.g., utilities clearances, radiological surveys).
- 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.

- Collect samples of materials to determine whether potential source material (PSM) is present that may cause the future release of a COC to environmental media.
- If no COCs or PSMs are present at a CAS, establish no further action as the corrective action.
- If COCs exist, collect environmental samples from designated target populations (e.g., clean soil adjacent to contaminated soil) and submit for laboratory analyses to define the extent of COC contamination.
- If a COC or PSM is present at a CAS, 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.
- Confirm the selected 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, Environmental Management; U.S. Department of Defense; and DOE, Legacy Management. Under the FFACO, this SAFER Plan will be submitted to NDEP for approval. Fieldwork will be conducted following approval of the plan.

1.0 Introduction

This Streamlined Approach for Environmental Restoration (SAFER) Plan addresses the actions necessary for the closure of Corrective Action Unit (CAU) 566: EMAD Compound, located at the Nevada Test Site (NTS), Nevada. It has been developed in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) that was agreed to by the State of Nevada; U.S. Department of Energy (DOE), Environmental Management; U.S. Department of Defense; and DOE, Legacy Management (FFACO, 1996; as amended March 2010).

Note: The acronym used for the Engine Maintenance, Assembly, and Disassembly Facility sometimes appears in documents as “E-MAD” and sometimes as “EMAD.” Throughout this document, “E-MAD” will be used except when “EMAD” appears in document titles and FFACO descriptions.

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 must be limited to an acceptable level of risk.
- The SAFER Plan includes decision points and criteria for making data quality objective (DQO) decisions.

The purpose of the CAI 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, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) will reach consensus with NDEP before beginning the next phase of work.

Corrective Action Unit 566 is located in Area 25 of the NTS, which is approximately 65 miles northwest of Las Vegas, NV ([Figure 1-1](#)). Corrective Action Unit 566 is composed of Corrective Action Site (CAS) 25-99-20, EMAD Compound, which consists of the following ([Figure 1-2](#)):

- Potential current releases to soil associated with CAS components on the exterior of the E-MAD Facility (Building 3900)

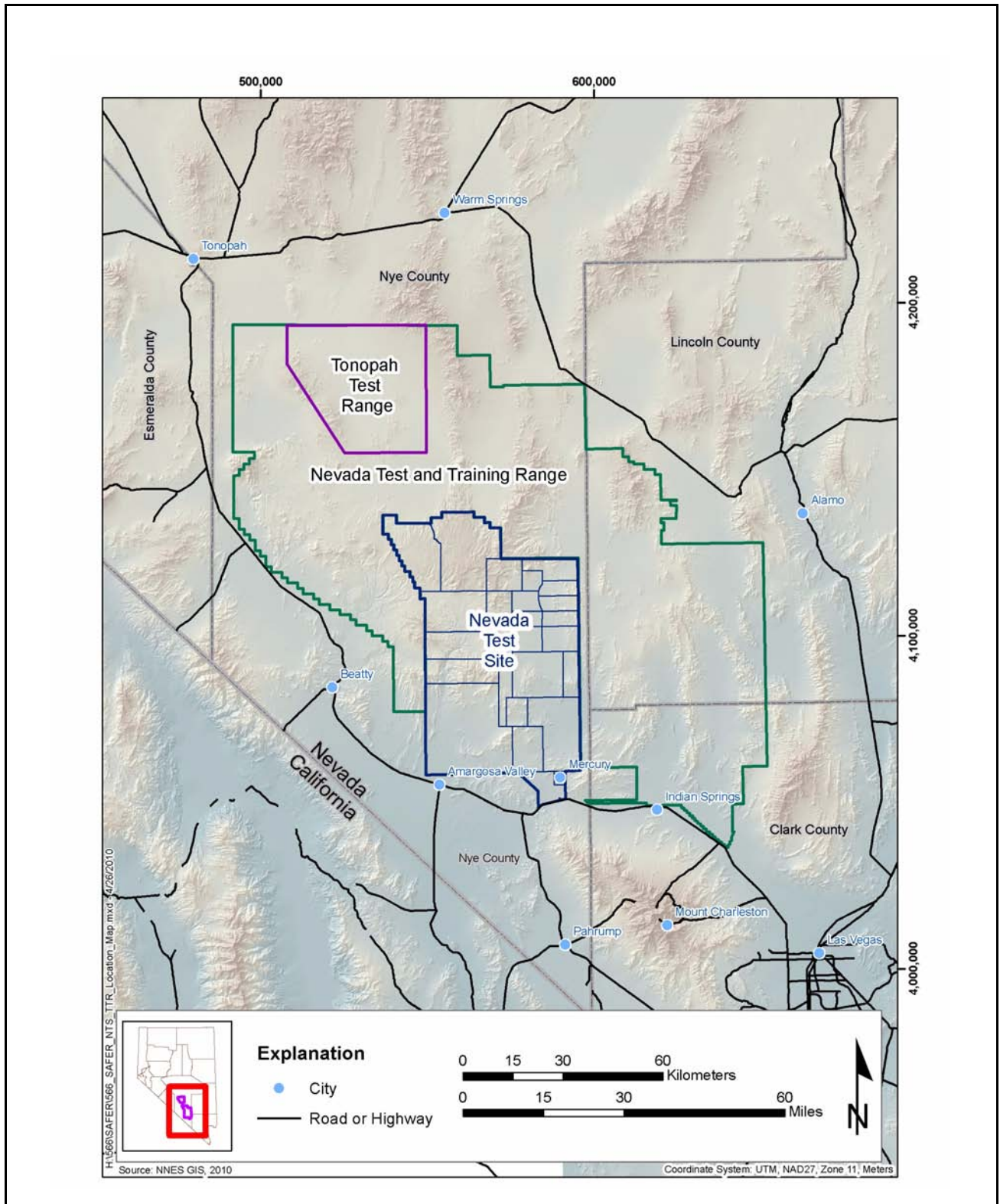


Figure 1-1
Nevada Test Site

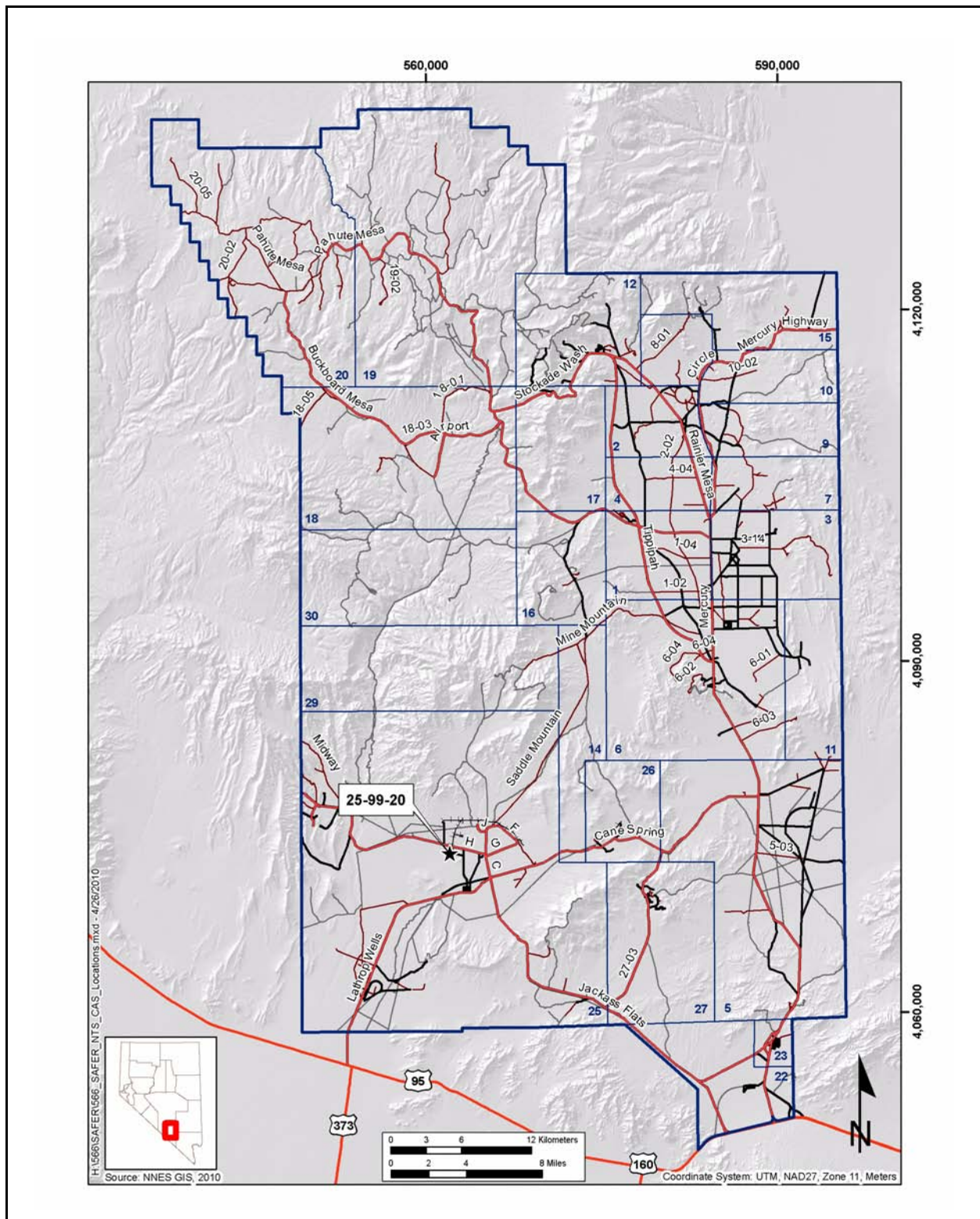


Figure 1-2
CAU 566, CAS Location Map

- Potential future releases from materials suspected to contain a contaminant of potential concern (COPC) that may cause the release of a contaminant of concern (COC) to environmental media

The scope of CAU 566 will include any environmental releases associated with the CAS (or CAS component) (defined in [Section 2.1](#)). Not included in the scope of CAU 566 are Building 3900 (CAU 114, Area 25 EMAD Facility), Building 3901 (Engine Transport System Maintenance [ETSM] Building), and the railroad tracks on the exterior of Building 3900 (CAU 539). Building 3901 is currently on the active roles for Defense Programs and may be included in the FFACO at a later date. The exterior tracks and Building 3901 will not be addressed further in this document.

[Figure 1-3](#) shows an aerial photograph of Building 3900 and the general locations of the CAS 25-99-20 components with the exception of the debris piles and one of the substations, which are beyond the extent of the photo to the southwest. Any other potential releases identified during the field investigation that are associated with Building 3900 operations and support activities (excluding Building 3900 itself) will be included in the scope of the CAI.

There is sufficient information and process knowledge from historical documentation and investigations of similar sites (i.e., the expected nature and extent of COPCs) to recommend closure of CAU 566 using the SAFER process (FFACO, 1996; as amended March 2010).

1.1 SAFER Process Description

Corrective action units 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.

The SAFER process combines elements of the DQO process and the observational approach to plan and conduct closure activities. The DQOs are used to identify the problem and define the type and quality of data needed to complete closure of the CAS (or CAS component). The purpose of the CAI phase is to verify the adequacy of existing information used to determine the chosen corrective action and to confirm that closure objectives were met.

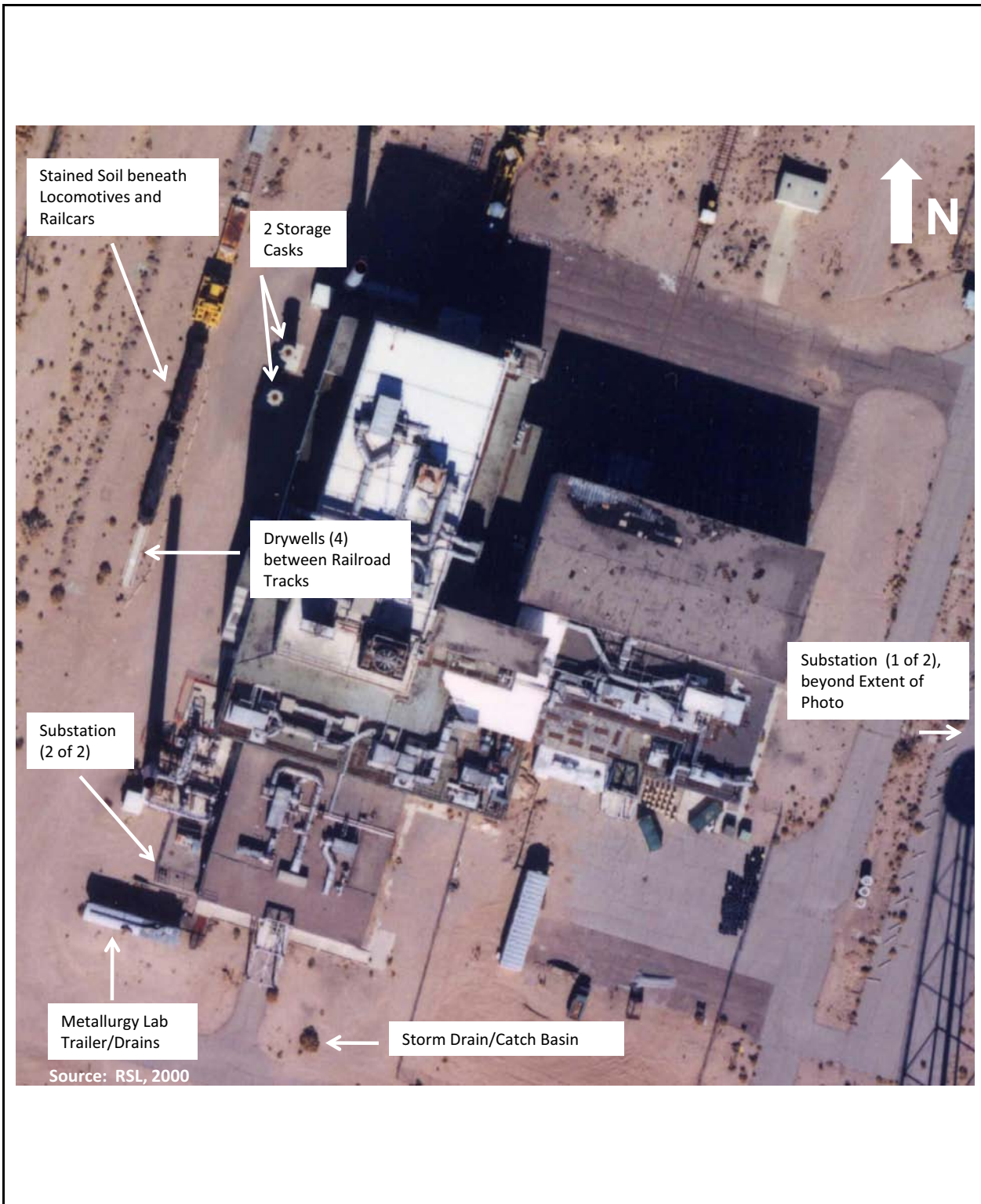


Figure 1-3
E-MAD Compound CAS Components

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 566 using the SAFER process. Any uncertainties are addressed by documented assumptions that are verified by sampling 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 re-evaluated as appropriate.

1.2 Summary of Corrective Actions and Closures

The decision process for closure of CAU 566 is summarized in [Figure 1-4](#). This process starts with the initial CAI in which the appropriate target population(s) within each CAS (or CAS component) (defined in the DQO process, [Appendix B](#)) is sampled. The objectives of the field activities are to determine whether contaminants exist in environmental media or whether potential source material (PSM) is present. If contaminants are detected at concentrations that are above the final action levels (FALs), the nature and extent of contamination will be delineated by additional sampling. The process ends with closure of the site based on laboratory analytical results of the environmental samples and the preparation of a closure report (CR). Decision points that require a consensus be reached between NNSA/NSO and NDEP before continuing are indicated in [Figure 1-4](#).

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.
- Radiological screening yields results that require an upgrade in procedures to continue survey work in specific areas.
- Elevated levels of additional COCs are found that were not originally identified as being present at the sites.
- Unexpected conditions, including unexpected waste and/or contamination, are encountered.

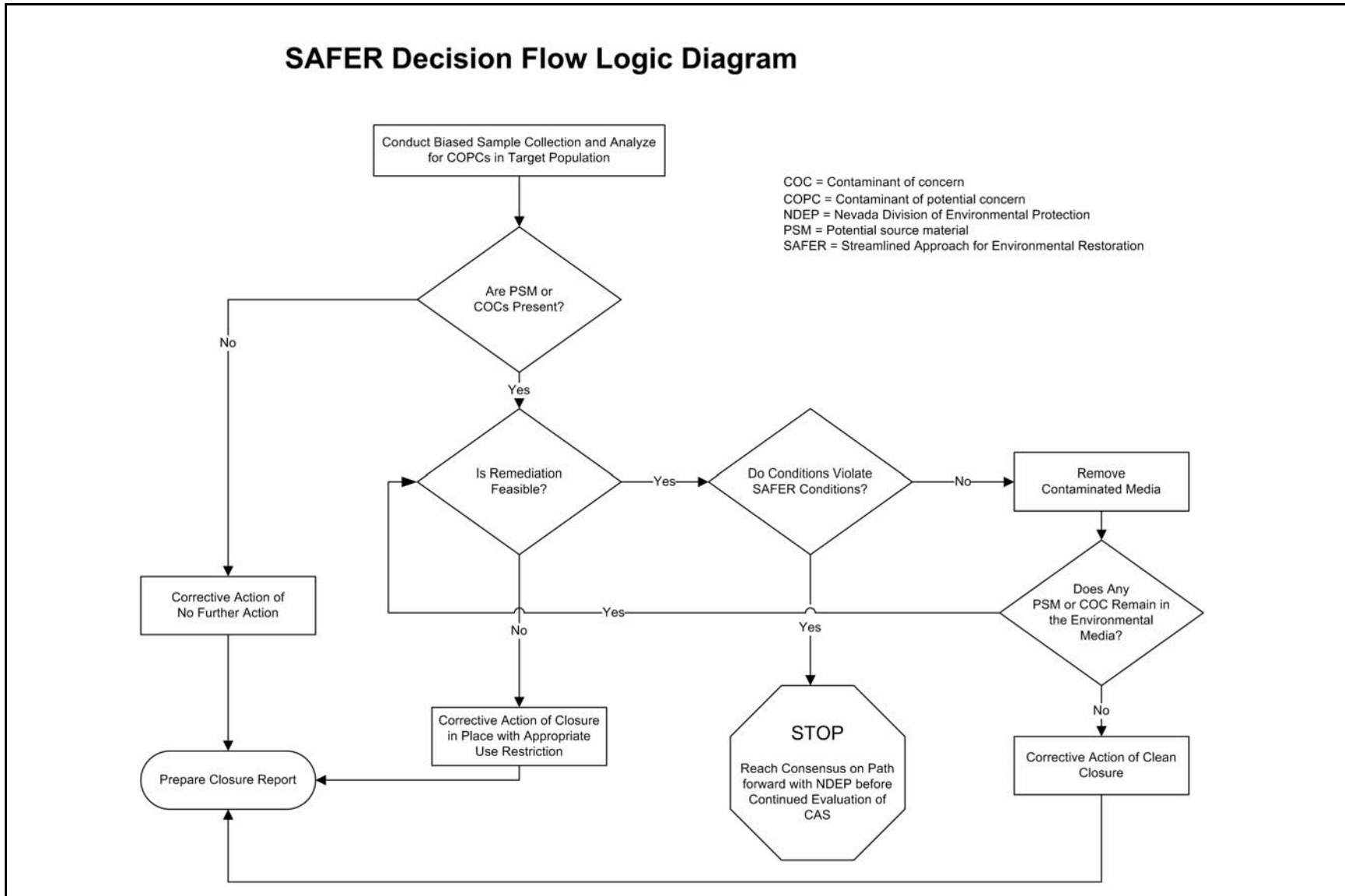


Figure 1-4
CAU 566 Closure Decision Process

- Other COCs are detected that would require re-evaluating a disposal pathway, such as with hazardous or low-level waste (LLW).
- Unsafe conditions or work practices are encountered.

The targeted corrective action is clean closure and will include removal of contaminated media and identified PSMs (see [Section 3.1](#) for a description of PSM criteria). The alternative corrective action of closure in place with implementation of appropriate use restrictions (URs) will only be performed if complete removal of COCs and PSMs cannot be accomplished during the SAFER.

1.3 CAU 566 End State

The FFACO closure for CAU 566 using the SAFER process will include determining whether contaminants exist in environmental media or PSM as described in [Section 1.2](#). Although the planned physical end state for CAU 566 is environmental restoration of the E-MAD Compound, some of the restoration activities may occur independent of FFACO closure. Certain best management practices completed during the CAI to mitigate health and safety hazards, provide access to sampling locations, or facilitate future demolition will also occur outside the FFACO scope of the CAU 566 SAFER Plan. These activities may include:

- Asbestos identification and abatement
- Removal of readily removable nonhazardous wastes (e.g., process wastewater, used oils, debris)

2.0 Unit Description

This section summarizes the operational history, process knowledge, and available characterization information for CAU 566. Process knowledge has been obtained through review of historical documents, engineering drawings, maps, and interviews with past and present NTS employees. Based on the available information regarding the E-MAD Compound, assumptions were made to develop a conceptual site model (CSM) that describes the most probable scenario for the current conditions at the site (see [Section 3.2.5](#)).

2.1 General Description Location

2.1.1 CAS Component: Metallurgy Lab Drain System

This CAS component consists of the potential releases to soil associated with a drain system that serviced the Metallurgy Lab trailer that supported activities at the E-MAD Facility ([Figure 2-1](#)). The drain system consists of three drains within the trailer that originally connected to a radioactive sewer line that led to the radioactive waste holdup tanks of Building 3900 that were closed under CAU 135 (see [Section 2.3](#)). During the CAU 135 corrective actions, the Metallurgy Lab drain lines were cut off and sealed at several locations on the ground surface. Each of the three drains consists of a galvanized steel pipe connected to 4-inch (in.) cast-iron pipes using lead and oakum fittings (approximately 20 joints). Some scrap pipes are currently laying on the ground beside the trailer. During a 2009 walkover survey, the pipes and fittings were determined to contain elevated radioactivity and were subsequently labeled “Caution Radioactive Material.” Miscellaneous hazardous chemicals believed to be related to laboratory activities were removed from the trailer during previous housekeeping activities. The wood deck that provided access to the trailer was removed in May 2009 in preparation for investigation activities at the Metallurgy Lab trailer.

2.1.2 CAS Component: Storm Drain System

This CAS component consists of the potential releases associated with a storm drain system that receives surface water runoff on the south side of Building 3900. The system consists of a single catch basin with an 18-in. corrugated metal pipe outflow that drains to an outfall area located approximately 150 feet (ft) from the perimeter fence ([Figure 2-2](#)). A 3-in. copper water line from the



**Figure 2-1
Metallurgy Lab Trailer (top) and Drains (bottom)**

cooling tower overflow drain on the Building 3900 roof and a separate 4-in. transite clear-water drain both flow to the catch basin. The catch basin is concrete with a metal grate cover and is partially filled with sediment and vegetation debris. A small erosional channel has formed at the outfall area and is mostly filled with sediment and vegetation. A similar storm drainage system (CAU 556) was investigated on the north side of Building 3900, and a UR was placed due to polychlorinated biphenyl (PCB) contamination (see [Section 2.3](#)).

2.1.3 CAS Component: Locomotives and Railcars

This CAS component consists of the releases to soil from leaking locomotives and railcars located on the railroad tracks outside of Building 3900 ([Figure 2-3](#)). There are currently two 120-ton diesel-electric locomotives, a manned control car (shielded diesel-electric locomotive) connected to an engine installation vehicle (EIV) car, one small diesel-electric locomotive/shuttle, and a cable spool car with attached utility flat car. The small locomotive/shuttle, cable car, and utility flat cars are posted “Caution Radioactive Material.” Markings on each of the 120-ton locomotives indicate that the fuel tanks have a 5,200-gallon (gal) capacity. Several areas of heavily stained soil have been identified under the fuel tanks from each of the two locomotives and the railcar with the cable takeup reel. The locomotives and railcars are expected to have remaining fuel, hydraulic and lubricating oils, and potentially other fluids. Other hazardous materials including lead-acid batteries, light bulbs, and carbon dioxide (CO₂) tanks have been identified on the manned control car and may be present on other locomotives.

2.1.4 CAS Component: Substations

This CAS component consists of the potential releases to soil adjacent to two power substations within the fenced perimeter of the E-MAD Facility ([Figure 2-4](#)). One substation is located beside the water tower southeast of Building 3900, and the other is located southwest of Building 3900. The transformers are labeled “non PCB”; however, it is unknown whether any PCB-containing transformers previously serviced the substations, or whether any PCBs leaked to the underlying pad/soil during or before retrofilling of transformers.



Figure 2-2
Storm Drain Catch Basin (top) and Outfall (bottom)



**Figure 2-3
Locomotives and Railcar (top) and Stained Soil (bottom)**



Figure 2-4
Substations Southeast (top) and Southwest (bottom) of Building 3900

2.1.5 CAS Component: Storage Casks and Drywells

This CAS component consists of the potential releases from two aboveground dry fuel storage casks adjacent to the west side of Building 3900 and four underground drywells that are located between the railroad tracks on the west side of Building 3900 (Figure 2-5). These storage canisters were installed as part of the Spent Fuel Demonstration Program (SFDP), which involved testing and development activities related to the dry storage of spent nuclear fuel assemblies (see Section 2.2). The configuration of each aboveground cask is a reinforced concrete cylindrical structure, 104 in. in diameter and 252 in. high. Embedded in the structure is a carbon-steel liner with a 36 in. diameter by 13-in.-thick steel and concrete shield welded to the lower end of the liner. Below the bolted cover is an approximate 3-ft-thick concrete-filled shield plug. Each cask has four lifting trunnions. It has been reported that only the storage cask with numerical markings on the outside was used and that all fuel canisters have been removed. The configuration of each of the drywells consists of a steel liner grouted into a 26-in. diameter hole approximately 23 ft deep. The lower section of the liner is 18-in. carbon-steel pipe, and the upper section consists of a 52-in. length of 22-in. diameter carbon-steel pipe. Below the bolted cover of the drywell is an approximate 3-ft-thick concrete shield plug. An 84-in. square by 27-in. thick concrete shield pad surrounds each drywell liner at the ground surface. Currently, the 120-ton locomotives are located on the tracks directly above the four drywells and will need to be relocated for access and inspection (DOE/NV, 1983).

2.1.6 CAS Component: Construction Debris Piles

This CAS component consists of the potential releases to soil associated with all remaining construction materials and debris piles that are associated with historic E-MAD operations and that are located inside and in the immediate area outside the E-MAD Facility perimeter fence. One notable debris pile consisting of mostly wood and some scrap metal is located just outside the perimeter fence on the southwest side of Building 3900 (Figure 2-6). Debris piles may include lighting fixtures, piles of wood, and scrap metal. Any remaining debris will be inspected for PSMs, underlying soil staining, and other potential contaminants.



**Figure 2-5
Storage Casks (top) and One of Four Drywells (bottom)**



Figure 2-6
Construction Debris Piles (top and bottom) Southwest of Building 3900

2.2 History and Process Knowledge

The E-MAD Facility is one of seven separate but interconnected complexes associated with the Nuclear Rocket Development Station (NRDS) in Area 25 in support of the Rover program, whose goal was the development of nuclear rocket reactors for use in the space program (DRI, 1996). The E-MAD Facility supported the second phase of that program consisting of the design and testing of nuclear powered rockets in the Nuclear Engine for Rocket Vehicle Application (NERVA) project (1965 to 1973). The NERVA engines were assembled in the Cold Bay, transported to the Engine Test Stand for testing, and then returned to E-MAD, where remote handling, inspections, and additional testing activities were conducted in the Hot Bay and post-mortem cells.

From 1977 to 1982, the Westinghouse Electric Corporation hosted the SFDP, which involved testing and development activities related to the dry storage of spent nuclear fuel assemblies (DOE/NV, 1983). Primary program activities included receipt of spent fuel assemblies; design and development of sealed canisters for storage demonstrations; and performance of fuel calorimetry and canister gas sampling. The spent fuel program demonstrated three dry spent fuel storage concepts: (1) aboveground storage within two 252-in. high, 104-in. diameter reinforced concrete silos; (2) near surface drywell storage within four steel casing liners grouted into a shallow hole drilled between the rails on the west set of the railroad tracks; and (3) air-cooled vault (or lag storage pit) located inside the Hot Bay (DOE/NV, 1983). All fuel cores were removed from the site in 1989.

Since the conclusion of the SFDP in the late 1980s, the E-MAD Facility has been mostly inactive with the exception of Fluid Tech, Inc., who occupied portions of the Cold Bay and office areas in the late 1990s. Fluid Tech's primary activities included decontamination of plutonium from a historic XF-90 airplane formerly located in Plutonium Valley of the NTS (Seals, 2004). Other activities included testing of microbial digestion of protective clothing (Geary, 2006). In addition to portions of the Cold Bay, Fluid Tech also used one of the trailers as an office/first-aid station.

2.3 Previous Investigations

The NTS management and operating (M&O) contractor collected soil and swipe samples at the E-MAD Facility in 2003. Seven bulk soil samples were collected (February 2003) and analyzed for beryllium. The results of the analyses ranged from 0.0628 parts per million (ppm) to 0.4630 ppm

(Spezialetti, 2007). Fifteen swipe samples were collected (September 2003) and analyzed for arsenic, beryllium, cadmium, chromium, and lead. The analytical results for arsenic ranged from 0.7 micrograms per 100 square centimeters ($\mu\text{g}/100\text{cm}^2$) to $5.0 \mu\text{g}/100\text{cm}^2$. The analytical results for beryllium ranged from $0.0 \mu\text{g}/100\text{cm}^2$ to $0.13 \mu\text{g}/100\text{cm}^2$. The analytical results for cadmium ranged from $0.03 \mu\text{g}/100\text{cm}^2$ to $9.3 \mu\text{g}/100\text{cm}^2$. The analytical results for chromium ranged from $0.66 \mu\text{g}/100\text{cm}^2$ to $1,800 \mu\text{g}/100\text{cm}^2$. The analytical results for lead ranged from $2.0 \mu\text{g}/100\text{cm}^2$ to $3,700 \mu\text{g}/100\text{cm}^2$ (Spezialetti, 2007). Specific sample locations for the 2003 data are unknown, and the results can only be used to assess initial requirements for personnel protection.

Thirty-five CASs consisting of various types of environmental releases or housekeeping materials related to the historical operations of the E-MAD Facility have previously been investigated and closed under the FFACO. Twenty-eight CASs have been closed under the clean closure strategy (22 of which were housekeeping CASs); 6 CASs have been closed under the closure in place strategy (CASs 25-05-06 and 25-25-17 have since had their associated URs lifted); and 1 CAS (25-25-18) was closed under a corrective action of no further action. Since the URs for CASs 25-05-06 (CAU 262) and 25-25-17 (CAU 398) were originally established, practices and procedures relating to the implementation of risk-based corrective actions (RBCAs) have changed. Therefore, these URs were re-evaluated against the current RBCA criteria as defined in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006). This re-evaluation consisted of comparing the original data (the basis for the UR) to risk-based FALs developed using the current Industrial Sites RBCA process. The re-evaluation resulted in a recommendation to remove the URs because contamination is not present at the site above the risk-based FALs. The potential to remove the other existing URs will be evaluated during the CAI and in consultation with the stakeholders (NNSA/NSO and NDEP).

[Figure 2-7](#) shows the locations of the previously investigated CASs by associated CAU number, and [Table 2-1](#) lists the FFACO reports documenting the previous investigations and corrective actions. As discussed in the following sections, the corrective actions performed at each of these CASs were reviewed and evaluated to determine (1) the potential impacts of existing URs to the CAU 566 CAI, and (2) whether any component of the CAS was not addressed, and therefore should be included in the scope of CAU 566. Although CAS 25-01-14 (CAU 119) is located within the footprint of

the E-MAD Facility, it is not believed to have any impact on CAS 25-99-20. Corrective Action Site 25-01-14 was clean closed under the housekeeping corrective action process (DOE/NV, 2000a).

2.3.1 Potential Impacts of Existing Use Restrictions to the CAU 566 CAI

CAU 127: CAS 25-01-07, Aboveground Storage Tank

This site, located next to the ETSM Building (Building 3901), consisted of releases associated with a 1,000-gal aboveground storage tank (AST), associated piping, and total petroleum hydrocarbons (TPH)-impacted soil. Approximately 20 cubic yards (yd³) of (TPH)-impacted soil were excavated to a depth of approximately 5 ft as part of the corrective action. The AST, piping, and concrete pad were removed for disposal. Due to the close proximity of the AST to the ETSM Building and the fact that the impacted soil may extend under its structure, the remaining impacted soil was not excavated and was closed in place with administrative controls. A UR for TPH was implemented to prohibit unauthorized intrusive activity, and UR warning signs were posted.

This UR is not expected to have any impact on CAU 566 due to the location of the UR away from any planned CAU 566 CAI activities.

CAU 262: CAS 25-02-06, Underground Storage Tank

This site consisted of the releases associated with a septic system that received sanitary effluent from Building 3900. The septic tank was found to contain TPH and PCBs above action levels. These COCs were confined within the septic tank, and a UR was implemented as the boundary of the tank itself. This CAS was closed in place by solidifying the tank contents, and by filling the tank, distribution box, and one upstream access point (manhole) with grout.

This UR is not expected to have any impact on CAU 566 due to the location of the UR outside of the perimeter fence and away from any planned CAU 566 CAI activities.

CAU 143: CAS 25-23-03, Contaminated Waste Dump #2

This site consisted of the releases associated with a waste dump (in the form of a trench) that was generated during operation of the E-MAD Facility. Sampling of the waste dump identified radionuclides above FALs including uranium (U)-235, cesium (Cs)-137, niobium (Nb)-94, and strontium (Sr)-90. A UR was subsequently implemented for subsurface radioactive contamination.

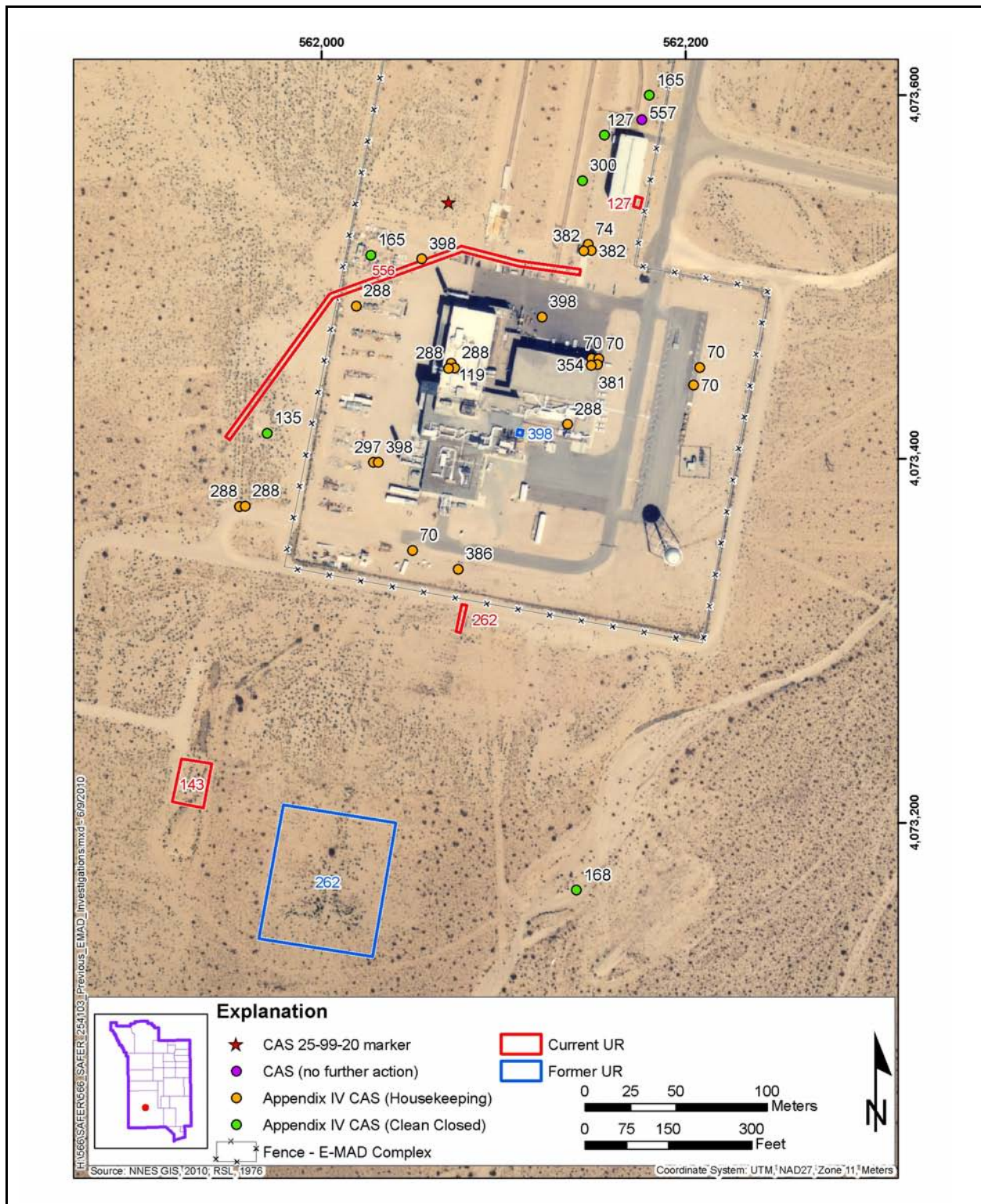


Figure 2-7
Previous E-MAD Investigations

Table 2-1
Previous Investigations Associated with the E-MAD Facility
 (Page 1 of 3)

CAU	CAS	CAS Description	Associated Documents
22 Housekeeping CASs Closed under the Clean Closure Strategy			
70	25-24-08	Batteries (2)	U.S. Department of Energy, Nevada Operations Office. 1995a. <i>Environmental Restoration Sites Inventory - Non-Hazardous Site Cleanup Verification Summary.</i> (DOE/NV, 1995a)
	25-24-10	Batteries (6)	
	25-26-11	Lead Bricks (30)	
	25-26-12	Lead Bricks (339)	
	25-26-20	Lead Bricks (52)	
74	25-29-10	Chemicals (paint and oil)	U.S. Department of Energy, Nevada Operations Office. 1995b. <i>Environmental Restoration Sites Inventory - Site Cleanup Verification Summary.</i> (DOE/NV, 1995b)
119	25-01-14	Contaminated Storage Tank	U.S. Department of Energy, Nevada Operations Office. 2000a. <i>Housekeeping Closure Report for Corrective Action Unit 119: Storage Tanks, Nevada Test Site, Nevada, Rev. 0, DOE/NV--626.</i> (DOE/NV, 2000a)
288	25-23-04	Radioactively Contaminated Crates	U.S. Department of Energy, Nevada Operations Office. 2000b. <i>Housekeeping Closure Report for Corrective Action Unit 288: Area 25 Engine-Maintenance, Assembly, and Disassembly/Treatability Test Facility Chemical Sites, Nevada Test Site, Nevada, Rev. 0, DOE/NV--590.</i> (DOE/NV, 2000b)
	25-23-10	Contaminated Materials	
	25-29-01	Miscellaneous Chemicals	
	25-29-04	Miscellaneous Chemicals	
	25-29-07	Ethylene Glycol	
	25-29-09	Miscellaneous Chemicals	
297	25-25-01	Vacuum Pump Oil Recovery	U.S. Department of Energy, Nevada Operations Office. 1999a. <i>Closure Report for Housekeeping Category Corrective Action Unit 297: Nevada Test Site, Nevada, Rev. 0, DOE/NV--11718-289.</i> (DOE/NV, 1999a)
354	25-99-15	Highway Flares (fuses)	U.S. Department of Energy, Nevada Operations Office. 1998. <i>Closure Report for Housekeeping Category Corrective Action Unit 354: Nevada Test Site, Rev. 0, DOE/NV--11718-169.</i> (DOE/NV, 1998)
381	25-99-14	Gas Cylinders (2)	U.S. Department of Energy, Nevada Operations Office. 1996a. <i>Corrective Action Unit 381 Gas Cylinder Closure Report, 07-CAU381-002.</i> (DOE/NV, 1996a)
382	25-22-14	Drums (2)	U.S. Department of Energy, Nevada Operations Office. 1996b. <i>Corrective Action Unit 382 Housekeeping Closure Report.</i> (DOE/NV, 1996b)
	25-22-15	Drum	
386	25-26-24	Lead Bricks	U.S. Department of Energy, Nevada Operations Office. 1997. <i>Closure Report for Housekeeping Category Corrective Action Unit 386, Nevada Test Site, Rev. 1, DOE/NV--11718-129.</i> (DOE/NV, 1997)

Table 2-1
Previous Investigations Associated with the E-MAD Facility
 (Page 2 of 3)

CAU	CAS	CAS Description	Associated Documents
398	25-25-02	Oil Spills	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2003b. <i>Closure Report for Corrective Action Unit 398: Area 25 Spill Sites, Nevada Test Site, Nevada</i> , Rev. 1, DOE/NV--873-REV 1. (NNSA/NSO, 2003b) -and- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2008b. <i>Addendum to the Closure Report for Corrective Action Unit 398: Area 25 Spill Sites, Nevada Test Site, Nevada</i> , Rev. 0, DOE/NV--873-REV 1-ADD. (NNSA/NSO, 2008b)
	25-25-04	Oil Spills	
	25-25-05	Oil Spills	
6 Additional CASs Closed under the Clean Closure Strategy			
127	25-01-06	Aboveground Storage Tank	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2008c. <i>Closure Report for Corrective Action Unit 127: Areas 25 and 26 Storage Tanks, Nevada Test Site, Nevada</i> , Rev. 0, DOE/NV--1248. (NNSA/NSO, 2008c)
135	25-02-01	Underground Storage Tanks	U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2001. <i>Closure Report for Corrective Action Unit 135: Areas 25 Underground Storage Tanks, Nevada Test Site, Nevada</i> , Rev. 1, DOE/NV--717-Rev. 1. (NNSA/NV, 2001)
165	25-07-06	Train Decontamination Area	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2005. <i>Closure Report for Corrective Action Unit 165: Area 25 and 26 Dry Well and Washdown Areas, Nevada Test Site, Nevada</i> , Rev. 0, DOE/NV--1092. (NNSA/NSO, 2005)
	25-59-01	Septic System	
168	25-16-01	Construction Waste Pile	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2007a. <i>Closure Report for Corrective Action Unit 168: Area 25 and 26 Contaminated Materials and Waste Dumps, Nevada Test Site, Nevada</i> , Rev. 0, DOE/NV--1178. (NNSA/NSO, 2007a)
300	25-60-02	Building 3901 Outfall	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2007b. <i>Closure Report for Corrective Action Unit 300: Surface Release Areas, Nevada Test Site, Nevada</i> , Rev. 0, DOE/NV--1222. (NNSA/NSO, 2007b)
4 CASs Closed under the Closure in Place Strategy with URs			
127	25-01-07	Aboveground Storage Tank	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2008c. <i>Closure Report for Corrective Action Unit 127: Areas 25 and 26 Storage Tanks, Nevada Test Site, Nevada</i> , Rev. 0, DOE/NV--1248. (NNSA/NSO, 2008c)

Table 2-1
Previous Investigations Associated with the E-MAD Facility
 (Page 3 of 3)

CAU	CAS	CAS Description	Associated Documents
262	25-02-06	Underground Storage Tank	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2003a. <i>Closure Report for Corrective Action Unit 262: Area 25 Septic Systems and Underground Discharge Point, Nevada Test Site, Nevada</i> , Rev. 1, DOE/NV--897-REV 1. (NNSA/NSO, 2003a) -and- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2008a. <i>Addendum to the Closure Report for Corrective Action Unit 262: Area 25 Septic Systems and Underground Discharge Point, Nevada Test Site, Nevada</i> , Rev. 0, DOE/NV--897-REV 1-ADD. (NNSA/NSO, 2008a)
143	25-23-03	Contaminated Waste Dump #2	U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002a. <i>Closure Report for Corrective Action Unit 143: Area 25 Contaminated Waste Dumps, Nevada Test Site, Nevada</i> , Rev. 0, DOE/NV--807. (NNSA/NV, 2002a)
556	25-60-03	E-MAD Stormwater Discharge and Piping	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2008d. <i>Corrective Action Decision Document/Closure Report for Corrective Action Unit 556: Dry Wells and Surface Release Points, Nevada Test Site, Nevada</i> , Rev. 0, DOE/NV--1285. (NNSA/NSO, 2008d)
1 CAS No Further Action			
557	25-25-18	Train Maintenance Building 3901 Spill Site	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2009a. <i>Corrective Action Decision Document/Closure Report for Corrective Action Unit 557: Spills and Tank Sites, Nevada Test Site, Nevada</i> , Rev. 0, DOE/NV--1319. (NNSA/NSO, 2009a)
2 CASs with URs Removed			
262	25-05-06	Leachfield	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2003a. <i>Closure Report for Corrective Action Unit 262: Area 25 Septic Systems and Underground Discharge Point, Nevada Test Site, Nevada</i> , Rev. 1, DOE/NV--897-REV 1. (NNSA/NSO, 2003a) -and- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2008a. <i>Addendum to the Closure Report for Corrective Action Unit 262: Area 25 Septic Systems and Underground Discharge Point, Nevada Test Site, Nevada</i> , Rev. 0, DOE/NV--897-REV 1-ADD. (NNSA/NSO, 2008a)
398	25-25-17	Subsurface Hydraulic Oil Spill	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2003b. <i>Closure Report for Corrective Action Unit 398: Area 25 Spill Sites, Nevada Test Site, Nevada</i> , Rev. 1, DOE/NV--873 - REV 1. (NNSA/NSO, 2003b) -and- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2008b. <i>Addendum to the Closure Report for Corrective Action Unit 398: Area 25 Spill Sites, Nevada Test Site, Nevada</i> , Rev. 0, DOE/NV--873-REV 1-ADD. (NNSA/NSO, 2008b)

The existing fence was modified to include a separate enclosure for only the filled portion of the trench that contains contamination. The fence was posted as “Caution-Underground Radioactive Material” area. The trench is located approximately 1/4 mile southwest of Building 3900 and lies about 200 yards beyond the E-MAD Facility perimeter fence.

This UR is not expected to have any impact on CAU 566 due to the location of the UR outside of the perimeter fence and away from any planned CAU 566 CAI activities.

CAU 556: CAS 25-60-03, E-MAD Stormwater Discharge and Piping

This site consisted of the releases associated with three catch basins, an outfall area, and associated subsurface piping. Sampling results identified PCB contamination above the FAL in the surface and/or shallow subsurface soils around Catch Basin 2, at the outfall, and in soils contained within the catch basins and a manhole. The CAS was closed in place with a corrective action of soil removal; grouting catch basins, manholes, and pipe openings; and implementation of a UR for PCB contamination that prohibits surface and subsurface disturbances within 5 ft laterally of the center line of the stormwater drainage system. The UR is located approximately 100 ft north of Building 3900 and extends the width of the north side of Building 3900, angles southwest, and ends beyond the perimeter fencing.

This UR is not expected to impact CAI activities at CAU 566; however, there is a possibility that surface soil contamination that overlaps the spatial boundaries of this UR may be identified if biasing factors are present in this area. If evidence of a release is identified within the boundaries of the UR, NNSA/NSO will be informed to provide approval to work within the UR.

3.0 Data Quality Objectives

This section contains a summary of the DQO process that is presented in [Appendix B](#). 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 CAU 566 was developed at a meeting on April 30, 2009, by representatives of NDEP and NNSA/NSO. The DQOs were developed to identify data needs, clearly define the intended use of the environmental data, and to design a data collection program that will satisfy these purposes. During the DQO discussions for this CAU, the informational inputs or data needs to resolve problem statements and decision statements were documented. This DQO process was conducted in accordance with *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA, 2006).

3.1 Summary of DQO Analysis

The problem statement for CAU 566 is: “Existing information on the nature and extent of potential contamination is insufficient to validate the assumptions used to select the corrective actions or to verify that closure objectives were met for CAU 566.” To address this question, the resolution of two decision statements is required:

- Decision I: “Is any COC present in environmental media?” Any analytical result for a COPC above the FAL will result in that COPC being designated as a COC.
- Decision II: “Is sufficient information available to confirm that closure objectives were met?” Sufficient information is defined to include:
 - Identifying the lateral and vertical extent of COC contamination in media, if present
 - The information needed to characterize investigation-derived waste (IDW) for disposal
 - The information needed to determine remediation waste types

The presence of a COC would require a corrective action. A corrective action may also be necessary if there is a potential for wastes that are present at a site to result in the introduction of COCs into site environmental media. These wastes would be considered PSM, which is defined as waste (solid or liquid) containing contaminants that, if released to soil, would result in soil contamination exceeding a FAL. To determine whether wastes that are present at CAU 566 meet the criteria for PSM, the following conservative assumptions were made:

- Any containment of waste (e.g., fuel/oil reservoirs, pipe, concrete vaults and walls, drums) would fail at some point, and the waste would be released to the surrounding soil.
- A waste, regardless of concentration or configuration, may be assumed to be PSM and handled under a corrective action, if appropriate.
- Based on process knowledge and/or professional judgment, a waste may be assumed to not be PSM if it is clear that it could not result in soil contamination exceeding a FAL.
- If assumptions about the waste cannot be justified, then the waste material will be sampled, and the results will be compared to FALs based on the following criteria:
 - For non-liquid wastes, the concentration of any chemical contaminant in soil (following degradation of the waste and release of contaminants into soil) would be equal to the mass of the contaminant in the waste divided by the mass of the waste (no consideration will be given to dilution into the mass of soil).
 - For non-liquid wastes, the dose resulting from radioactive contaminants in soil (following degradation of the waste and release of contaminants into soil) would be calculated using the activity of the contaminant in the waste divided by the mass of the waste (for each radioactive contaminant) and calculating the combined resulting dose using the Residual Radioactive (RESRAD) code (Murphy, 2004) (no consideration will be given to dilution into the mass of soil). Note: As an initial screening tool, if building materials are primarily externally contaminated and do not present a dose exceeding the FAL to a nearby worker in its current configuration, it will not be considered to meet PSM criteria.
 - For liquid wastes, the resulting concentration of contaminants in the surrounding soil would be calculated based on the concentration of contaminants in the wastes and the liquid holding capacity of the soil.

For example, sludge containing a contaminant exceeding an equivalent FAL concentration would be considered to be PSM and would require a corrective action. Ballasts with capacitors are assumed to contain PCBs based on process knowledge. These ballasts/capacitors would be assumed to be PSM without sampling and would require a corrective action. (See [Table 4-2](#) for a list of known or

anticipated PSMs associated with CAU 566.) It is possible that amounts of these materials below regulatory concern (e.g., lead solder) may remain after corrective actions and would not meet the criteria for PSM as described in [Section 1.2](#).

Decision I samples will be submitted to analytical laboratories for the analyses listed in [Table 3-1](#). The constituents reported for each analytical method are listed in [Table 3-2](#).

**Table 3-1
 Analytical Program^a**

Analyses	CAS 25-99-20 Components					
	Storage Casks and Drywells	Substations	Storm Drain System	Metallurgy Lab Drain System	Locomotives and Railcars	Construction Debris Piles
Organic COPCs						
TPH-DRO	--	--			X	
PCBs	--	X			X	
SVOCs	--	--			X	
VOCs	--	--			X	
Pesticides	--	--			--	
Inorganic COPCs						
RCRA Metals	--	--			X	
Total Beryllium	--	--			X	
Radionuclide COPCs						
Gamma Spectroscopy	X	--			X	
Isotopic U	X	--			X	
Isotopic Pu	X	--			X	
Sr-90	X	--			X	

^aThe COPCs are the constituents reported from the analytical methods listed.

DRO = Diesel-range organics

Pu = Plutonium

RCRA = *Resource Conservation and Recovery Act*

SVOC = Semivolatile organic compound

VOC = Volatile organic compound

X = Required analytical method

-- = Not required

**Table 3-2
 Constituents Reported by Analytical Methods**

VOCs		SVOCs		TPH	PCBs	Pesticides	Metals	Radionuclides
1,1,1,2-Tetrachloroethane	Carbon tetrachloride	2,3,4,6-Tetrachlorophenol	Di-n-octyl Phthalate	DRO	Aroclor 1016	4,4'-DDD	Arsenic	Pu-238
1,1,1-Trichloroethane	Chlorobenzene	2,4,5-Trichlorophenol	Dibenzo(a,h)anthracene		Aroclor 1221	4,4'-DDE	Barium	Pu-239/240
1,1,2,2-Tetrachloroethane	Chloroethane	2,4,6-Trichlorophenol	Dibenzofuran		Aroclor 1232	4,4'-DDT	Beryllium	Sr-90
1,1,2-Trichloroethane	Chloroform	2,4-Dimethylphenol	Diethyl Phthalate		Aroclor 1242	Aldrin	Cadmium	U-234
1,1-Dichloroethane	Chloromethane	2,4-Dinitrotoluene	Dimethyl Phthalate		Aroclor 1248	Alpha-BHC	Chromium	U-235
1,1-Dichloroethene	Chloroprene	2-Chlorophenol	Fluoranthene		Aroclor 1254	Alpha-Chlordane	Lead	U-238
1,2,4-Trichlorobenzene	cis-1,2-Dichloroethene	2-Methylnaphthalene	Fluorene		Aroclor 1260	Beta-BHC	Mercury	
1,2,4-Trimethylbenzene	Dibromochloromethane	2-Methylphenol	Hexachlorobenzene		Aroclor 1268	Chlordane	Selenium	
1,2-Dibromo-3-chloropropane	Dichlorodifluoromethane	2-Nitrophenol	Hexachlorobutadiene			Delta-BHC	Silver	
1,2-Dichlorobenzene	Ethyl methacrylate	3-Methylphenol ^a (m-cresol)	Hexachloroethane			Dieldrin		Gamma-Emitting
1,2-Dichloroethane	Ethylbenzene	4-Methylphenol ^a (p-cresol)	Indeno(1,2,3-cd)pyrene			Endosulfan I		Ac-228
1,2-Dichloropropane	Isobutyl alcohol	4-Chloroaniline	n-Nitroso-di-n-propylamine			Endosulfan II		Am-241
1,3,5-Trimethylbenzene	Isopropylbenzene	4-Nitrophenol	Naphthalene			Endosulfan Sulfate		Co-60
1,3-Dichlorobenzene	Methacrylonitrile	Acenaphthene	Nitrobenzene			Endrin		Cs-137
1,4-Dichlorobenzene	Methyl methacrylate	Acenaphthylene	Pentachlorophenol			Endrin Aldehyde		Eu-152
1,4-Dioxane	Methylene chloride	Aniline	Phenanthrene			Endrin Ketone		Eu-154
2-Butanone	n-Butylbenzene	Anthracene	Phenol			Gamma-BHC		Eu-155
2-Chlorotoluene	n-Propylbenzene	Benzo(a)anthracene	Pyrene			Gamma-Chlordane		K-40
2-Hexanone	sec-Butylbenzene	Benzo(a)pyrene	Pyridine			Heptachlor		Nb-94
4-isopropyltoluene	Styrene	Benzo(b)fluoranthene				Heptachlor Epoxide		Pb-212
4-Methyl-2-pentanone	tert-Butylbenzene	Benzo(g,h,i)perylene				Methoxychlor		Pb-214
Acetone	Tetrachloroethene	Benzo(k)fluoranthene				Toxaphene		Tl-208
Acetonitrile	Toluene	Benzoic Acid						Th-234
Allyl chloride	Total Xylenes	Benzyl Alcohol						U-235
Benzene	Trichloroethene	Bis(2-ethylhexyl) phthalate						
Bromodichloromethane	Trichlorofluoromethane	Butyl benzyl phthalate						
Bromoform	Vinyl acetate	Carbazole						
Bromomethane	Vinyl chloride	Chrysene						
Carbon disulfide		Di-n-butyl Phthalate						

^aMay be reported as 3,4-Methylphenol or m,p-cresol.

Ac = Actinium
 Am = Americium
 Co = Cobalt
 Eu = Europium
 K = Potassium
 Pb = Lead
 Th = Thorium
 Tl = Thallium

The list of COPCs is intended to encompass all of the contaminants that could potentially be present at the CAS (or CAS component). 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 CAS. Contaminants detected at other similar NTS sites were also included in the COPC list to reduce the uncertainty about potential contamination at the CAS because complete information regarding activities performed at the E-MAD Facility is not available.

During the review of site history documentation, process knowledge information, personal interviews, past investigation efforts (where available), and inferred activities associated with the operations at E-MAD, some of the COPCs were identified as targeted contaminants. Targeted contaminants are those COPCs for which evidence in the available site and process information suggests that they may be reasonably suspected to be present. The targeted contaminants are required to meet a more stringent completeness criteria than other COPCs, thus providing greater protection against a decision error. Targeted contaminants for CAU 566 have only been identified for the Metallurgy Lab drain system component of CAS 25-99-20. For this system, information is available regarding elevated radioactivity of the drain lines. Therefore, isotopic U, isotopic Pu, Sr-90, and gamma-emitting radionuclides have been identified as targeted contaminants.

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.

The data quality indicators (DQIs) of precision, accuracy, representativeness, completeness, comparability, and sensitivity needed to satisfy DQO requirements are discussed in [Section 7.2](#). Laboratory data will be assessed in the CR to confirm or refute the CSM and determine whether the DQO data needs were met.

To satisfy the DQI of sensitivity (presented in [Section 7.2.6](#)), the analytical methods must be sufficient to detect contamination that is present in the samples at concentrations equal to the corresponding FALs. Analytical methods and minimum detectable concentrations (MDCs) for each CAU 566 COPC are provided in [Tables 3-3](#) and [3-4](#). The MDC is the lowest concentration of a chemical or radionuclide parameter that can be detected in a sample within an acceptable level of error. The criteria for precision and accuracy in [Tables 3-3](#) and [3-4](#) may vary from information in the

**Table 3-3
 Analytical Requirements for Radionuclides for CAU 566**

Analysis ^a	Medium or Matrix	Analytical Method	MDC ^b	Laboratory Precision	Laboratory Accuracy
Gamma-Emitting Radionuclides					
Gamma Spectroscopy	Aqueous	EPA 901.1 ^c	< PALs	RPD 35% (non-aqueous) ^d 20% (aqueous) ^d	LCS Recovery (%R) 80-120 ^f
	Non-aqueous	HASL-300 ^g		ND -2<ND<2 ^e	
Other Radionuclides					
Isotopic U	All	U-02-RC ^g	< PALs	RPD 35% (non-aqueous) ^d 20% (aqueous) ^d	Chemical Yield Recovery (%R) 30-105 ^h
Isotopic Pu	Aqueous	Pu-10-RC ^g			
	Non-aqueous	Pu-02-RC ^g			
Sr-90	Aqueous	EPA 905.0 ^c		ND -2<ND<2 ^e	LCS Recovery (%R) 80-120 ^h
	Non-aqueous	Sr-02-RC ^g			

^aA list of constituents reported for each method is provided in [Table 3-2](#).

^bThe MDC is the minimum concentration of a constituent that can be measured and reported with 95% confidence (Standard Methods)¹.

^c*Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA, 1980).

^d*Sampling and Analysis Plan Guidance and Template* (EPA, 2000).

^e*Evaluation of Radiochemical Data Usability* (Paar and Porterfield, 1997).

^f*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 2009b).

^g*The Procedures Manual of the Environmental Measurements Laboratory* (DOE, 1997).

^hProfessional judgment and other industry acceptance criteria are used.

ⁱLaboratory standard operating procedures in accordance with industry standards and the NNES Statement of Work requirements (NNES, 2009).

EPA = U.S. Environmental Protection Agency

HASL = Health and Safety Laboratory

LCS = Laboratory control sample

ND = Normalized difference

NNES = Navarro Nevada Environmental Services, LLC

PAL = Preliminary action level

RPD = Relative percent difference

%R = Percent recovery

Industrial Sites Quality Assurance Project Plan (QAPP) as a result of the laboratory used or updated/new methods used by the laboratory (NNSA/NV, 2002b).

**Table 3-4
 Analytical Requirements for Chemical COPCs for CAU 566**

Analysis ^a	Medium or Matrix	Analytical Method	MDC ^b	Laboratory Precision	Laboratory Accuracy
Organics					
VOCs	All	8260 ^c	< PALs	Lab-specific ^d	Lab-specific ^d
SVOCs	All	8270 ^c	< PALs	Lab-specific ^d	Lab-specific ^d
PCBs	All	8082 ^c	< PALs	Lab-specific ^d	Lab-specific ^d
TPH-DRO	All	8015 Modified ^c		Lab-specific ^d	Lab-specific ^d
Pesticides	All	8081 ^c		Lab-specific ^d	Lab-specific ^d
Inorganics					
Metals	All	6010/6020 ^c	< PALs	RPD 35% (non-aqueous) 20% (aqueous) ^e	MS Recovery (%R) 75-125 ^c
Mercury	Aqueous	7470 ^c		Absolute Difference ±2x RL (non-aqueous) ^f ±1x RL (aqueous) ^f	LCS Recovery (%R) 80-120 ^c
	Non-aqueous	7471 ^c			

^aA list of constituents reported for each method is provided in [Table 3-2](#).

^bThe MDC is the minimum concentration of a constituent that can be measured and reported with 99% confidence (EPA, 2009b).

^c*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 2009b).

^dPrecision and accuracy criteria are developed in-house using approved laboratory standard operating procedures in accordance with industry standards and the NNES Statement of Work requirements (NNES, 2009).

^e*Sampling and Analysis Plan Guidance and Template* (EPA, 2000).

^f*USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA, 2004).

MS = Matrix spike
 RL = Reporting limit

3.2 Results of the DQO Analysis

3.2.1 Action Level Determination and Basis

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, therefore streamlining the consideration of remedial alternatives. The RBCA process used to establish FALs is described in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006). This process conforms with *Nevada Administrative Code* (NAC) Section 445A.227, which lists the requirements for sites with soil contamination (NAC, 2008a). For

the evaluation of corrective actions, NAC Section 445A.22705 (NAC, 2008b) requires the use of American Society for Testing and Materials (ASTM) Method E1739 (ASTM, 1995) to “conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards (i.e., FALs) or to establish that corrective action is not necessary.”

This RBCA process, 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 this 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 Site-Specific Target Levels (SSTLs) using site-specific information as inputs to the same or similar methodology used to calculate Tier 1 action levels. The Tier 2 SSTLs are then compared to individual sample results from reasonable points of exposure (as opposed to the source areas as is done in Tier 1) on a point-by-point basis. Total petroleum hydrocarbon concentrations will not be used for risk-based decisions under Tier 2 or Tier 3. Rather, the individual chemicals of concern will be compared to the SSTLs.
- Tier 3 evaluation - conducted by calculating Tier 3 SSTLs on the basis of more sophisticated risk analyses using methodologies described in Method E1739 that consider site-, pathway-, and receptor-specific parameters.

Evaluation of DQO decisions will be based on conditions at the site following completion of any corrective actions. Any corrective actions conducted will be reported in the CR.

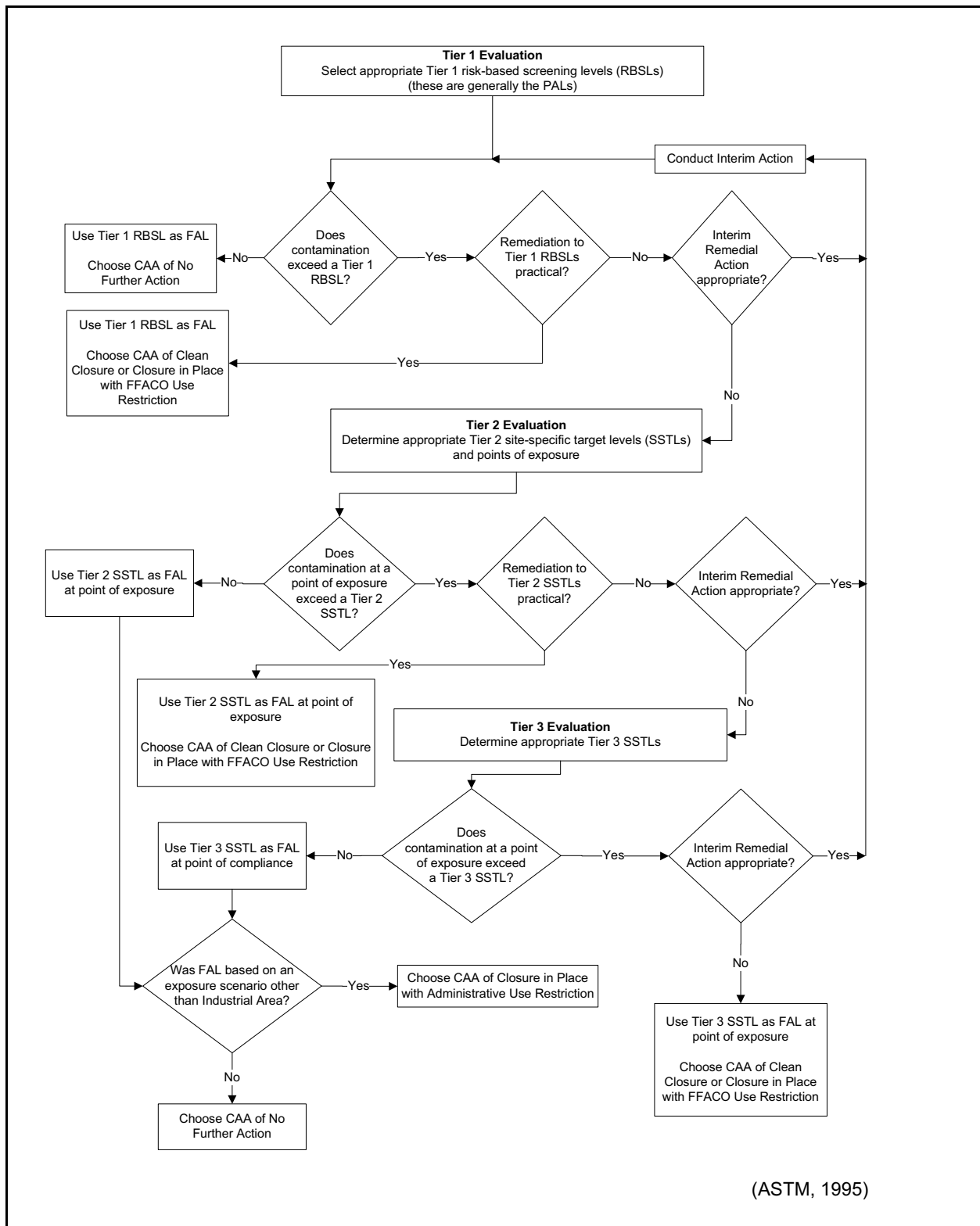
The FALs (along with the basis for their selection) will be defined in the CR, where they will be compared to laboratory results in the evaluation of site closure.

3.2.1.1 Chemical PALs

Except as noted herein, the chemical PALs are defined as the EPA Region 9 Superfund preliminary regional screening levels (RSLs) for chemical contaminants in industrial soils (EPA, 2009a).

Background concentrations for RCRA metals and zinc will be used instead of RSLs when natural background concentrations exceed the RSL, as is often the case with arsenic on the NTS.

Background is considered the mean plus two standard deviations of the mean for sediment samples



(ASTM, 1995)

**Figure 3-1
 Risk-Based Corrective Action Decision Process**

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 RSLs, the protocol used by the EPA Region 9 in establishing RSLs (or similar) will be used to establish PALs (EPA, 2009a). If used, this process will be documented in the CR.

3.2.1.2 Total Petroleum Hydrocarbon PALs

The PAL for TPH is 100 milligrams per kilogram (mg/kg) as listed in NAC 445A.2272 (NAC, 2008c).

3.2.1.3 Radionuclide PALs

The PALs for radiological contaminants are based on the National Council on Radiation Protection and Measurements (NCRP) Report No. 129 recommended screening limits for construction, commercial, industrial land-use scenarios (NCRP, 1999) using a 25-millirem-per-year (mrem/yr) dose constraint (Murphy, 2004) and the generic guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993). These PALs are based on the construction, commercial, and industrial land-use scenario provided in the guidance and are appropriate for the NTS based on future land uses presented in [Section B.2.2.6](#).

3.2.2 Hypothesis Test

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

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

Sufficient evidence to reject the null hypothesis is:

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

3.2.3 Statistical Model

A judgmental sampling design will be implemented to select sample locations and evaluate DQO decisions for CAU 566.

3.2.4 Design Description/Option

Because individual sample results, rather than an average concentration, will be used to compare to FALs at CAS components 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 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.4.2.1](#). 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.

Decision II step-out sampling locations will be selected based on the CSM, biasing factors, and existing data. Analytical suites will include those parameters that exceeded FALs (i.e., COCs) in prior samples. Biasing factors to support Decision II sample locations include Decision I biasing factors plus available analytical results.

3.2.5 Conceptual Site Model 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 CSM is also used to support appropriate sampling strategies and data collection methods. The CSM has been developed for CAU 566 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 3-2](#) depicts a tabular representation of the conceptual pathways to receptors from CAU 566 sources. [Figure 3-3](#) depicts a graphical representation of the CSM for potential surface and shallow subsurface releases. If evidence of contamination that is not consistent with the presented CSM is identified during CAI 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, participants in the DQO process 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](#).

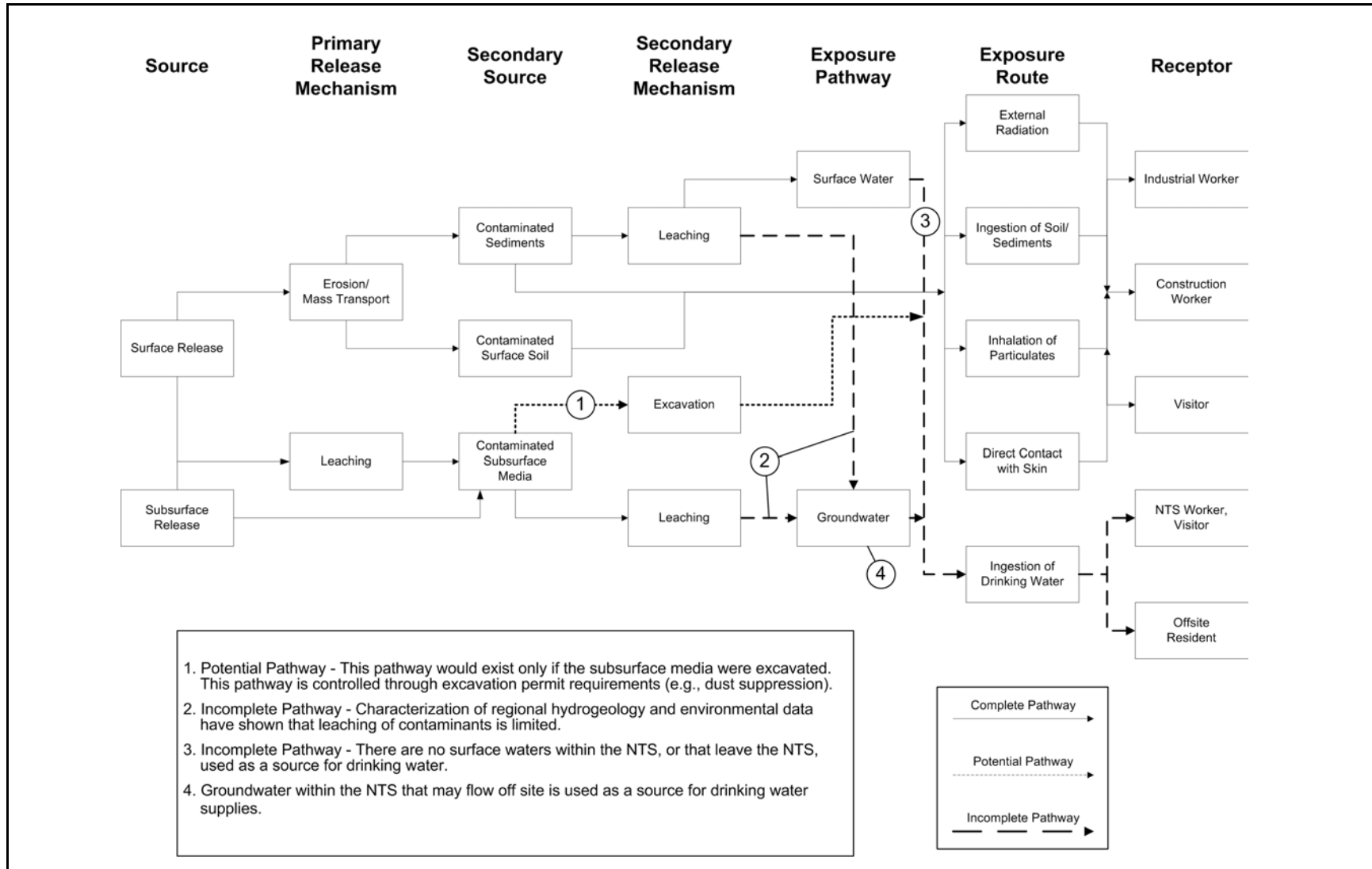


Figure 3-2
Conceptual Site Model Diagram for CAU 566

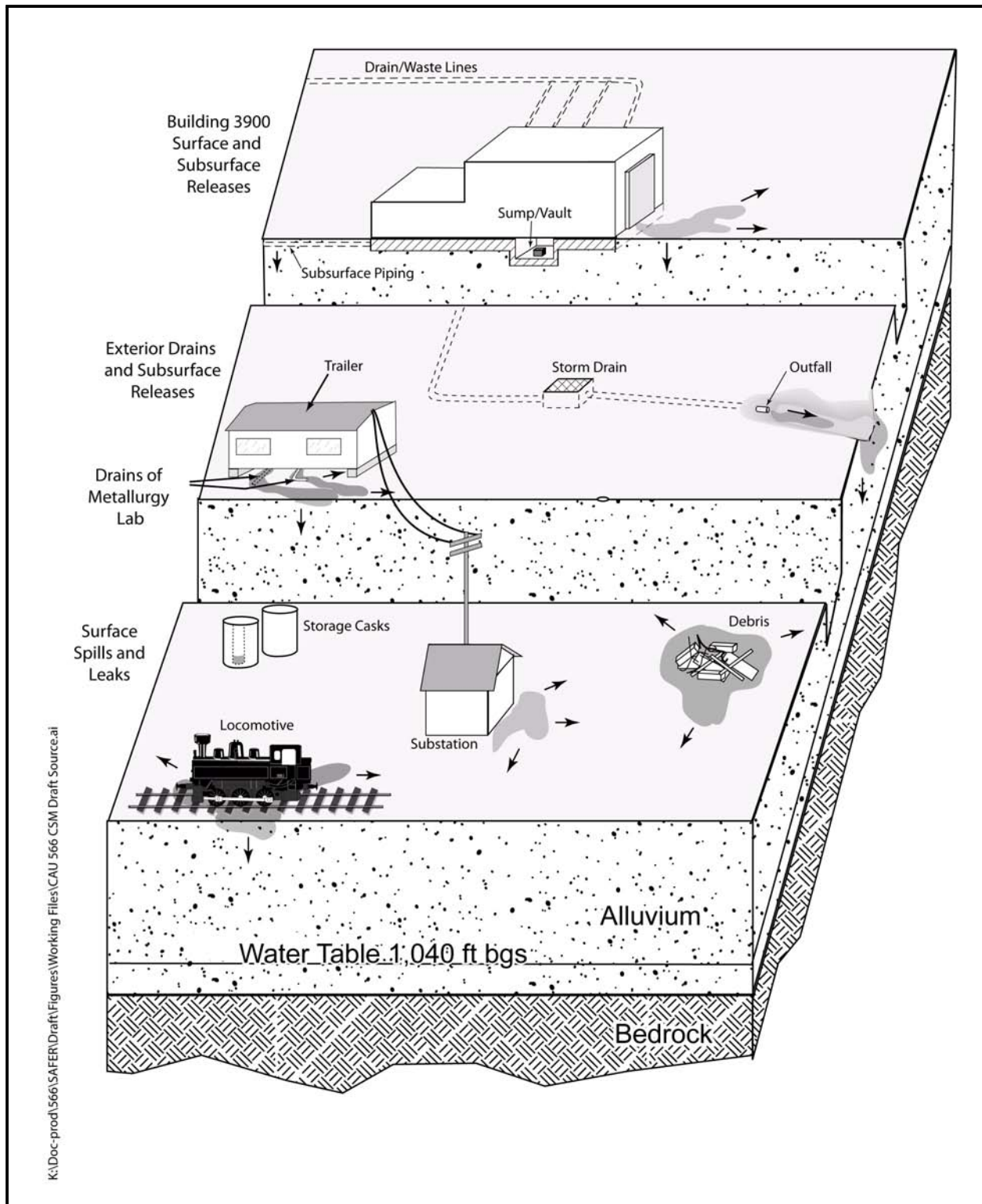


Figure 3-3
Conceptual Site Model for CAU 566

4.0 Field Activities and Closure Objectives

This section of the SAFER Plan provides a description of the field activities and closure objectives for CAU 566. The objectives for the field activities are to determine whether COCs or PSMs exist. If remediation cannot be accomplished during the SAFER, then the extent of COCs will be determined so that closure alternatives may be implemented. If clean closure cannot be accomplished during the SAFER, then a hold point will have been reached and NDEP will be consulted to determine whether the remaining contamination will be closed under the alternative corrective action of closure in place. All sampling activities will be conducted in compliance with the Industrial Sites QAPP (NNSA/NV, 2002b) and other applicable, approved procedures and instructions.

4.1 Contaminants of Potential Concern

The COPCs for CAU 566 are defined as the list of constituents represented by the analytical methods identified in [Table 3-1](#) for Decision I environmental samples taken at each of the CAS components discussed in [Section 2.1](#). The constituents reported for each analytical method are listed in [Table 3-2](#).

The list of COPCs is intended to encompass all of the contaminants that could potentially be present at CAS 25-99-20. These COPCs were identified during the planning process through the review of site history, process knowledge, personal interviews, past investigation efforts, and inferred activities associated with the CAS. Contaminants detected at similar NTS sites were included in the COPC list to reduce the uncertainty about potential contamination because complete information regarding activities performed at the E-MAD Facility and associated components is not available. The following sections discuss each of the COPCs for CAU 566.

4.1.1 Total Petroleum Hydrocarbons

Total petroleum hydrocarbons are primarily associated with oils, greases, and fuels required to operate equipment such as that found throughout the E-MAD Compound.

4.1.2 Volatile and Semivolatile Organic Compounds

Volatile organic compounds and SVOCs are found in fuels, oils, greases, products for cleaning mechanical and electrical parts, and freons. As such, VOCs and SVOCs may be present in all

primary and support areas of Building 3900, the support structures throughout the facility, and the surrounding environment where equipment may have been parked or serviced.

4.1.3 Polychlorinated Biphenyls

Based on visual surveys and process knowledge, it is anticipated that oils from hydraulic equipment outside Building 3900 may contain PCBs (e.g., locomotives, railcars, hydraulic hoses, compressors). Items that contain PCBs, such as light ballasts and capacitors, are known to be present throughout exterior structures (trailers, shacks, and sheds) and debris piles. There is also the potential for PCB-containing transformers that may have been used during the operational history of the E-MAD Facility and Compound.

4.1.4 Resource Conservation and Recovery Act Metals and Beryllium

It is anticipated that RCRA metals may be present in materials associated with the exterior CAS components. Lead-containing items include various types of lead shielding (e.g., leaded-glass windows, lead shot, lead bricks, lead plates), lead-acid batteries, and lead fuses. Mercury-containing items include mercury vapor light bulbs, thermostats, and switches. Based upon process knowledge from similar facilities, there is a potential for pipe systems to contain cadmium foil wrapping. Fuel elements containing a mixture of highly enriched uranium dioxide and beryllium oxide were handled in Building 3900 as part of the NERVA project and, as a result, Building 3900 is listed as a beryllium legacy site. As such, there is a potential to encounter beryllium surface or soil contamination within CAU 566. All surface soil samples will be analyzed for beryllium.

4.1.5 Pesticides

Based on process knowledge from similar CASs at the NTS, pesticides may be present in CAU 566 in surface or shallow subsurface soils.

4.1.6 Radionuclides

Process knowledge of previous activities undertaken at the E-MAD Facility and Compound provides reasonable expectation of the presence of radionuclide contamination. It is expected that radiological contamination of surfaces will be located primarily in process drain lines and potentially in the

Metallurgy Lab trailer, but all samples, including soil samples, collected with the exception of the substation will be analyzed for radionuclides. Potential sources of radiological contamination include, but are not limited to, depleted uranium (DU), radioactive check sources, high-efficiency particulate air (HEPA) ventilation systems, and other miscellaneous materials, including any contents in the storage casks and drywells.

4.2 Remediation

The DQOs developed for CAU 566 identified data gaps that require additional data collection before identifying and implementing the preferred closure alternative for CAS 25-99-20. A decision point approach for making remediation decisions is developed based on the DQOs and summarized in [Figure 1-4](#). The presence of contamination, if any, is assumed to be confined to the spatial boundaries of each CAS component as defined in the DQO process and CSM.

If COCs or PSMs that could cause COCs in environmental media are identified within a CAS component based on the initial CAI results, that CAS component 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 or PSMs 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 throughout the facility and/or within an excavation. If PSM is determined to be present within the CAS, that material will be removed. Materials that do not meet PSM criteria as defined in [Section 3.1](#) may remain in place.

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.

The closure strategy for CAU 566 under this SAFER process consists of the following stages:

- Sampling environmental media for COCs
- Sampling and identifying PSMs
- Removing identified and assumed PSMs

4.2.1 Sampling for COCs and PSMs

Surface and shallow subsurface soils will be sampled using hand sampling (hand scoop, augering) and backhoe excavation methods. [Table 4-1](#) summarizes the sampling approach to achieve closure objectives for each CAS component. Potential source material samples will also be collected from materials that are suspected to contain COCs and that may cause the future release of a COC to environmental media. For CAU 566, there are materials that have been assumed to meet PSM criteria and will therefore be removed and disposed, without the need for sampling. [Table 4-2](#) lists the known or anticipated PSMs at CAU 566 and indicates which materials will be sampled and which will be assumed PSM. Detailed information regarding the sampling plan is outlined in [Appendix B](#).

4.3 Verification

The information necessary to satisfy the closure criteria will be generated for each CAU 566 CAS component by collecting and analyzing samples generated during a field investigation. If a COC is present and removed during the SAFER, 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 from the 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.4.2.1](#), 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 cannot be accomplished during the SAFER, 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 the CAS will be selected based on the

Table 4-1
Sampling Approach for CAU 566 CAS Components
 (Page 1 of 2)

CAS, CAS Component	Sample Location	Minimum Number of Sample Locations	Minimum Number of Samples per Location	Sample Collection/Submittal Requirements ^{a,b}	Sampling Methods
25-99-20 Metallurgy Lab Drain System	Surface and shallow subsurface soil, drain contents (if any)	5	1	<p>Collect surface and underlying subsurface samples directly below each drain connection to trailer floor. Collect surface and underlying subsurface samples adjacent to each sealed pipe end. Collect a sample of drain contents.</p> <p>If FSRs > FSLs, continue collecting samples until FSRs < FSLs in two consecutive samples.</p> <p>If FSRs > FSLs, then submit the surface sample, the sample with the highest FSR > FSL, and the shallowest sample with FSRs < FSLs.</p>	Hand sampling, backhoe excavation
25-99-20 Storm Drain System	Sediment inside catch basin, surface and shallow subsurface soil at outfall area, and PSM if solid, liquid, or sludge phases are present	4: Minimum of 2 locations at outfall area and 2 locations inside catch basin	1	<p>Collect surface and underlying shallow subsurface samples from two locations at outfall area. Collect two samples of catch basin contents (one from the top and one at the interface with bottom, if volume permits). Collect one sample per phase if solid, liquid, or sludge is present.</p> <p>If FSRs > FSLs, continue collecting samples until FSRs < FSLs in two consecutive samples.</p> <p>If FSRs > FSLs, then submit the surface sample, the sample with the highest FSR > FSL, and the shallowest sample with FSRs < FSLs.</p>	Hand sampling, backhoe excavation
25-99-20 Locomotives and Railcars	Surface and shallow subsurface soil from locations of heaviest staining	1 location per distinct area of stained soil	2	<p>Collect surface and underlying shallow subsurface samples.</p> <p>If FSRs > FSLs, continue collecting samples until FSRs < FSLs in two consecutive samples.</p> <p>If FSRs > FSLs, then submit the surface sample, the sample with the highest FSR > FSL, and the shallowest sample with FSRs < FSLs.</p>	Hand sampling, backhoe excavation

Table 4-1
Sampling Approach for CAU 566 CAS Components
 (Page 2 of 2)

CAS, CAS Component	Sample Location	Minimum Number of Sample Locations	Minimum Number of Samples per Location	Sample Collection/Submittal Requirements^{a,b}	Sampling Methods
25-99-20 Substations	Surface and shallow subsurface soil at the perimeter of the pad	1 location on each side of substation pad where soil is present	1	Collect surface and underlying subsurface soil samples on each side of each substation pad where soil is present. If FSRs > FSLs, continue collecting samples until FSRs < FSLs in two consecutive samples. If FSRs > FSLs, then submit the surface sample, the sample with the highest FSR > FSL, and the shallowest sample with FSRs < FSLs.	Hand sampling, backhoe excavation
25-99-20 Storage Casks and Drywells	Interior of storage casks and drywells, surface and shallow subsurface soil if evidence of a release	TBD	TBD	Contents (if any) will be sampled. Surface and shallow subsurface soils may be sampled if there is evidence of a release from the casks/drywells (i.e., breaches).	Hand sampling, backhoe excavation
25-99-20 Construction Debris Piles	Surface and shallow subsurface soil	TBD	1	Collect surface and shallow subsurface soil samples based on identified biasing factors. If FSRs > FSLs, then submit the surface sample, the sample with the highest FSR > FSL, and the shallowest sample with FSRs < FSLs.	Hand sampling, backhoe excavation

^aFor worker protection, field screening will not be conducted if a strong odor and/or visual evidence suggests contamination is present.

^bAdditional samples may be collected and submitted to the lab at the discretion of the Site Supervisor.

FSL = Field-screening level
 FSR = Field-screening result
 TBD = To be determined

**Table 4-2
 Known or Anticipated Potential Source Materials**

Potential Source ^a	Material	Contaminants ^b	Sample/Assumed
PCB-containing ballast capacitors	Ballast material	PCBs	Assumed
Excess chemicals	Chemicals	VOCs, SVOCs, RCRA Metals	Sample
HEPA filters	Filter paper	Radiological	Sample
Fluorescent light bulbs	Gases, RCRA Metals	RCRA Metals	Assumed
Freon	Gases	RCRA Metals	Assumed
Mercury vapor lights	Gases, RCRA Metals	RCRA Metals	Assumed
Sodium vapor lights	Gases	RCRA Metals	Assumed
Radiological check sources	Metals	Radiological	Sample
Lead-containing fuses	Metals	RCRA Metals	Assumed
Lead-acid batteries	Metals	RCRA Metals	Assumed
Mercury-containing items	Metals	RCRA Metals	Assumed
Circuit boards	Metals	RCRA Metals, Radiological	Assumed
Lead solids/shielding	Metals	RCRA Metals, Radiological	Assumed
Diesel fuel	Oils	VOCs, SVOCs, Radiological	Sample
Compressor, gear, and hydraulic oils	Oils	VOCs, SVOCs, PCBs, RCRA Metals, Radiological	Sample
Motor oil	Oils	VOCs, SVOCs, PCBs, RCRA Metals	Sample
Metallurgy Lab drains	Solid, liquid, sludge	Radiological, RCRA Metals, VOCs, SVOCs	Sample

^aOther wastes may be identified during the CAI.

^bThe listed contaminants are the best available based on site history and process knowledge. Actual analytical suites will be determined in the field on a case-by-case basis based on process knowledge, field conditions, etc.

Note: Sample vs. assumed - Some PSMs will be assumed that a contaminant is present and be treated as such with no samples being collected or analyzed. Other PSMs will be sampled to determine whether and what contaminants are present.

CSM, biasing factors, surveys, 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 further 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 re-evaluated, work will be temporarily suspended, NDEP will be notified, and the investigation strategy will be re-evaluated.

The closure objectives will have been met and the CAS will be proposed for closure if the following conditions are true:

- A COC is not present at a CAS, or a COC is present and the extent of each COC has been defined.
- Potential source material is not present at a CAS, or PSM is present and has been removed from the CAS.
- Information is sufficient to characterize remediation waste and IDW for disposal.

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 the railroad tracks will not be addressed in the scope of the CAU 566 CAI.

Modifications to the investigation strategy may be required should unexpected field conditions be encountered at any CAS component. Significant modifications shall be justified and documented in a Record of Technical Change before implementation. If an unexpected condition indicates conditions are significantly different than the corresponding CSM, the activity will be rescoped and the decision makers will be notified. Field activities at CAU 566 include site preparation, sample location selection, sample collection activities, waste characterization, photodocumentation, and collection of geocoordinates.

4.4 Closure

The following activities, at a minimum, have been identified for closure of CAS 25-99-20. The decision logic behind the activities is provided in [Figure 1-4](#):

- If no COCs or PSM are identified during SAFER activities, then a CAA of no further action will be selected.
- If COCs or PSM are identified, then a corrective action is required.

- If COCs or PSM are identified and clean closure cannot be accomplished during the SAFER, then a hold point will have been reached and NDEP will be consulted to determine whether the remaining contamination will be closed under the alternative corrective action of closure in place. The appropriate URs will then be implemented and documented in the CR.
- If COCs or PSM are identified and clean closure can be accomplished during the SAFER, then clean closure will be the selected corrective action. The material to be remediated will be removed and disposed as waste, and verification samples will be collected from remaining soil or debris, as necessary. Verification analytical results will be documented in the CR.

Following completion of CAI and waste management activities, the following actions will be implemented:

- Removing all equipment, wastes, debris, and materials associated with the CAI.
- Removing all CAI signage and fencing (unless part of a corrective action).
- Grading site to pre-investigation condition (unless changed condition is necessary under a corrective action).
- Inspecting the site and certifying that restoration activities have been completed.

Future activities may include demolition of Building 3900 and support buildings/structures. When demolition takes place, it will be completed outside the FFACO process.

4.5 Duration

Table 4-3 provides a tentative duration of activities (in calendar days) for SAFER activities:

**Table 4-3
SAFER Field Activities**

Duration (days)	Activity
10	Site Preparation/Mobilization
30	Sampling for COCs and Identification of PSMs
30	Identification and Removal of Assumed PSMs (those that do not require sampling)
60	Sample Analysis/Validation
60	Waste Characterization

5.0 Reports and Records Availability

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

6.0 Investigation/Remediation Waste Management

Management of IDW will be based on regulatory requirements, field observations, process knowledge, and laboratory results from CAU 566 investigation samples.

Disposable sampling equipment, personal protective equipment (PPE), and rinsate are considered potentially contaminated waste only by virtue of contact with potentially contaminated media (e.g., soil) or potentially contaminated debris (e.g., construction materials). Therefore, sampling and analysis of IDW, separate from analyses of site investigation samples, may not be necessary for all IDW. However, if associated investigation samples are found to contain contaminants above regulatory levels, 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 media. Direct samples of IDW may also be taken to support waste characterization.

Industrial, hazardous, radioactive, and/or mixed waste, if generated, will be managed and disposed of in accordance with applicable DOE orders, U.S. Department of Transportation (DOT) regulations, state and federal waste regulations, and agreements and permits between DOE and NDEP. Materials left in place are not considered generated wastes and are not subject to RCRA or the requirements of the sections below.

6.1 Waste Minimization

Investigation activities are planned to minimize IDW generation. This will be accomplished by incorporating the use of process knowledge, visual examination, and/or radiological survey and swipe results. When possible, disturbed media (such as soil removed during trenching) or debris will be returned to its original location. Contained media (e.g., soil managed as waste) as well as other IDW will be segregated to the greatest extent possible to minimize generation of hazardous, radioactive, or mixed waste. Hazardous material used at the sites will be controlled in order to limit unnecessary generation of hazardous or mixed waste. Administrative controls, including decontamination procedures and waste characterization strategies, will minimize waste generated during investigations.

6.2 Potential Waste Types

Waste generated during the investigation may include the following potential waste types:

- Industrial waste
- Low-level radioactive waste
- Hazardous waste
- Hydrocarbon waste
- Mixed LLW
- *Toxic Substances Control Act (TSCA)* waste: PCBs and asbestos

Process knowledge may be used for waste designation/disposal for commonly disposed items, such as fluorescent and incandescent light bulbs, scrap lead, and light ballasts and capacitors. No sampling for hazardous waste constituents (e.g., RCRA constituents) is required, although radiological surveys may be required to determine whether the waste meets the regulatory requirements of LLW.

The onsite management and ultimate disposition of wastes will be determined based on 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/screening results, and/or radiological survey/swipe results. Onsite IDW management requirements by waste type are detailed in the following sections.

6.2.1 Industrial Waste

Industrial IDW generated at CAU 566 will be collected, managed, and disposed of in accordance with the industrial waste management regulations and the permits for operation of the U10c Industrial Waste Landfill.

6.2.2 Low-Level Radioactive Waste

Low-level waste generated at CAU 566 will be packaged and managed in accordance with all applicable federal, state, and NTS requirements. Low-level waste may be generated as a result of operations in areas where radioactive materials are or were formerly managed. Low-level waste forms expected at CAU 566 include PPE, debris, tools, and equipment.

Nonhazardous solid waste that exceeds the permissible radiological surface and mass concentration for the U10c Industrial Waste Landfill will be managed as LLW. 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 Test Site Waste Acceptance Criteria* (NTSWAC) (NNSA/NSO, 2009b). Potential radioactive waste containers containing soil, PPE, disposable sampling equipment, and/or rinsate may be staged at a designated radioactive material area (RMA) or radiologically controlled area (RCA) when full or at the end of an investigation phase. The waste drums will remain at the RMA pending certification and disposal under the current NTSWAC requirements.

6.2.3 Hazardous Waste

This CAU will have waste accumulation areas established according to the needs of the project. Satellite accumulation areas and hazardous waste accumulation areas (HWAAs) will be managed consistent with the current requirements of applicable *Code of Federal Regulations* (CFR) and state administrative codes (CFR, 2009a; NAC, 2008b). The HWAAs will be controlled for access and equipped with spill kits and appropriate spill containment. Suspected hazardous wastes will be placed in DOT-compliant containers. All containerized hazardous waste will be handled, inspected, and managed in accordance with the current requirements of federal and state regulations. These provisions include managing the waste in containers compatible with the waste type and segregating incompatible waste types so that in the event of a spill, leak, or release, incompatible wastes shall not contact one another. The HWAAs will be covered under a site-specific emergency response and contingency action plan until such time that the waste is determined to be nonhazardous or all containers of hazardous waste have been removed from the storage area. Hazardous waste will be characterized in accordance with the requirements of 40 CFR 261 (CFR, 2009a). No RCRA-“listed” waste has been identified at CAU 566. Any waste determined to be hazardous will be managed and transported to a RCRA-permitted treatment, storage, and disposal facility in accordance with RCRA and DOT requirements. Items with the potential for being RCRA-regulated hazardous waste were identified during previous site visits. These items include mercury-vapor lamps, mercury switches, lead bricks, and similar items.

6.2.4 Hydrocarbon Waste

Hydrocarbon-contaminated soil waste containing more than 100 mg/kg of TPH will be managed on site in a drum or other appropriate container until fully characterized. Hydrocarbon waste may be disposed of at a designated hydrocarbon landfill, an appropriate hydrocarbon waste management facility (e.g., recycling facility), or other method in accordance with the state of Nevada regulations and disposal permits issued by NDEP to NNSA/NSO.

6.2.5 Mixed Low-Level Waste

Mixed waste, if generated, will be managed and dispositioned in accordance with current RCRA requirements (CFR, 2009a), agreements between NNSA/NSO 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 requirements of RCRA unless subject to agreements between NNSA/NSO and the State of Nevada. The mixed waste will be transported via an approved hazardous waste/radioactive waste transporter to the NTS transuranic waste storage pad for storage pending treatment or disposal. Mixed waste meeting Land Disposal Restrictions may be disposed of at the NTS Area 5 Radioactive Waste Management Site if the waste meets the current requirements of the NTSWAC (NNSA/NSO, 2009), the NTS NDEP permit for a Hazardous Waste Management Facility (NDEP, 2005), and the RCRA Part B Permit Application for Waste Management Activities at the NTS (DOE/NV, 1999b). Mixed waste constituent concentrations exceeding Land Disposal Restrictions will require development of a treatment and disposal plan under the current requirements of the Mutual Consent Agreement between DOE and the State of Nevada (NDEP, 1995).

6.2.6 Toxic Substances Control Act Waste

Waste governed by TSCA (USC, 2009) includes PCB waste (solid or liquid) and asbestos.

6.2.6.1 Polychlorinated Biphenyls

The management of PCBs is governed by TSCA and its current implementing regulations at 40 CFR 761 (CFR, 2009b). Polychlorinated biphenyl 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). The IDW will initially be evaluated using analytical results for media samples from the CAI. If any type of PCB waste is generated, it will be managed in accordance with 40 CFR 761 (CFR, 2009b) as well as current State of Nevada requirements (NAC, 2008a), guidance, and agreements with NNSA/NSO.

6.2.6.2 *Asbestos-Containing Material*

Asbestos-containing material (ACM) has been identified within CAU 566. Piping insulation is suspected of containing asbestos. Floor and ceiling tiles used throughout the exterior sheds and trailers may contain asbestos. Asbestos-containing material will be removed by trained asbestos workers. Disposal options for ACM may vary depending on other contaminants present in the waste. All asbestos will be disposed of in accordance with NTSWAC (NNSA/NSO, 2009). Friable asbestos will be disposed of at the Mercury Sanitary Landfill. Non-friable asbestos will be disposed of at the U10c Industrial Waste Landfill or Solid Waste Disposal Site. Radiologically contaminated asbestos waste will be disposed of at the LLW Facility.

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 CAU 566. [Sections 7.1](#) and [7.2](#) discuss the collection of required quality control (QC) samples in the field and quality assurance (QA) requirements for laboratory/analytical data to achieve closure. Unless otherwise stated in this SAFER Plan or required by the results of the DQO process (see [Appendix B](#)), this CAI will adhere to the Industrial Sites QAPP (NNSA/NV, 2002b).

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. The minimum frequencies of collecting and analyzing QC samples for this CAI, as determined in the DQO process, include:

- Trip blanks (1 per sample cooler containing VOC environmental samples)
- Equipment rinsate blanks (1 per sampling event for each type of decontamination method)
- Source blanks (1 per uncharacterized lot of source water)
- Field duplicates (1 per 20 environmental samples)
- Field blanks (minimum of 1 per CAS component, additional if field conditions change)
- Laboratory QC samples (1 per 20 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 shall be analyzed using the same analytical procedures implemented for associated environmental samples. Additional details regarding field QC samples are available in the Industrial Sites QAPP (NNSA/NV, 2002b).

7.2 Applicable Laboratory/Analytical Data Quality Indicators

The DQIs are qualitative and quantitative descriptors used in interpreting the degree of acceptability or utility of data. Data quality indicators are used to evaluate the entire measurement system and laboratory measurement processes (i.e., analytical method performance) as well as to evaluate

individual analytical results (i.e., parameter performance). The quality and usability of data used to make DQO decisions will be assessed based on the following DQIs:

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

Table 7-1 provides the established analytical method/measurement system performance criteria for each of the DQIs and the potential impacts on the decision if the criteria are not met. The following subsections discuss each of the DQIs that will be used to assess the quality of laboratory data. The criteria for precision and accuracy in Tables 3-3 and 3-4 may vary from information in the Industrial Sites QAPP as a result of the laboratory used or updated/new methods (NNSA/NV, 2002b).

7.2.1 Precision

Precision is a measure of the repeatability of the analysis process from sample collection through analysis results. It is used to assess the variability between two equal samples.

Determinations of precision will be made for field duplicate samples and laboratory duplicate samples. Field duplicate samples will be collected simultaneously with samples from the same source under similar conditions in separate containers. The duplicate sample will be treated independently of the original sample in order to assess field impacts and laboratory performance on precision through a comparison of results. Laboratory precision is evaluated as part of the required laboratory internal QC program to assess performance of analytical procedures. The laboratory sample duplicates are an aliquot, or subset, of a field sample generated in the laboratory. They are not a separate sample but a split, or portion, of an existing sample.

Precision is a quantitative measure used to assess overall analytical method and field-sampling performance as well as the need to “flag” (qualify) individual parameter results when corresponding QC sample results are not within established control limits.

**Table 7-1
 Laboratory and Analytical Performance Criteria for CAU 566 DQIs**

DQI	Performance Metric	Potential Impact on Decision If Performance Metric Not Met
Precision	At least 80% of the sample results for each measured contaminant are not qualified for precision based on the criteria for each analytical method-specific and laboratory-specific criteria presented in Section 7.2.1 .	The affected analytical results from each affected CAS will be assessed to determine whether there is sufficient confidence in analytical results to use the data in making DQO decisions.
Accuracy	At least 80% of the sample results for each measured contaminant are not qualified for accuracy based on the method-specific and laboratory-specific criteria presented in Section 7.2.2 .	The affected analytical results from each affected CAS will be assessed to determine whether there is sufficient confidence in analytical results to use the data in making DQO decisions.
Representativeness	Samples contain contaminants at concentrations present in the environmental media from which they were collected.	Analytical results will not represent true site conditions. Inability to make appropriate DQO decisions.
Decision I Completeness	80% of the CAS-specific COPCs have valid results. 100% of CAS-specific targeted contaminants have valid results.	Cannot support/defend decision on whether COCs are present.
Decision II Completeness	100% of COCs used to define extent have valid results.	Extent of contamination cannot be accurately determined.
Comparability	Sampling, handling, preparation, analysis, reporting, and data validation are performed using standard methods and procedures.	Inability to combine data with data obtained from other sources and/or inability to compare data to regulatory action levels.
Sensitivity	Minimum detectable concentrations are less than or equal to respective PALs.	Cannot determine whether COCs are present or migrating at levels of concern.

The criteria used for the assessment of inorganic chemical precision when both results are greater than or equal to 5x RL are 20 and 35 percent for aqueous and soil samples, respectively. When either result is less than 5x RL, a control limit of $\pm 1x$ RL and $\pm 2x$ RL for aqueous and soil samples, respectively, is applied to the absolute difference.

The criteria used for the assessment of organic chemical precision are based on professional judgment using laboratory-derived control limits. The criteria used for the assessment of radiological precision when both results are greater than or equal to 5x MDC are 20 and 35 percent for aqueous and soil samples, respectively. When either result is less than 5x MDC, the ND should be between -2 and +2 for aqueous and soil samples. The parameters to be used for assessment of precision for duplicates are listed in [Table 3-4](#).

Any values outside the specified criteria do not necessarily result in the qualification of analytical data. It is only one factor in making an overall judgment about the quality of the reported analytical results. The performance metric for assessing the DQI of precision on DQO decisions ([Table 7-1](#)) is that at least 80 percent of sample results for each measured contaminant are not qualified due to duplicates exceeding the criteria. If this performance is not met, an assessment will be conducted in the CR of the impacts on DQO decisions specific to affected contaminants and CAS components.

7.2.2 Accuracy/Bias

Accuracy is a measure of the closeness of an individual measurement to the true value. It is used to assess the performance of laboratory measurement processes. Accuracy is determined by analyzing a reference material of known parameter concentration or by reanalyzing a sample to which a material of known concentration or amount of parameter has been added (spiked). Accuracy will be evaluated based on results from three types of spiked samples: MS, LCS, and surrogates (organics). The LCS sample is analyzed with the field samples using the same sample preparation, reagents, and analytical methods employed for the samples. One LCS will be prepared with each batch of samples for analysis by a specific measurement.

The criteria used for the assessment of inorganic chemical accuracy are 75 to 125 percent for MS recoveries and 80 to 120 percent for LCS recoveries. For organic chemical accuracy, MS and LCS laboratory-specific percent recovery criteria developed and generated in-house by the laboratory according to approved laboratory procedures are applied. The criteria used for the assessment of radiochemical accuracy are 80 to 120 percent for LCS and MS recoveries.

Any values outside the specified criteria do not necessarily result in the qualification of analytical data. It is only one factor in making an overall judgment about the quality of the reported analytical results. Factors beyond laboratory control, such as sample matrix effects, can cause the measured values to be outside the established criteria. Therefore, the entire sampling and analytical process may be evaluated when determining the usability of the affected data.

The performance metric for assessing the DQI of accuracy on DQO decisions ([Table 7-1](#)) is that at least 80 percent of the sample results for each measured contaminant are not qualified for accuracy. If

this performance is not met, an assessment will be conducted in the CR of the impacts on DQO decisions specific to affected contaminants and CAS components.

7.2.3 Representativeness

Representativeness is the degree to which sample characteristics accurately and precisely represent characteristics of a population or an environmental condition (EPA, 2002). Representativeness is ensured by carefully developing the CAI sampling strategy during the DQO process such that false negative and false positive decision errors are minimized. Meeting the criteria listed below will ensure that sample results will adequately represent actual site characteristics:

- For Decision I judgmental sampling, having a high degree of confidence that the sample locations selected will identify COCs if present anywhere within the CAS.
- Having a high degree of confidence that analyses conducted will be sufficient to detect any COCs present in the samples.
- For Decision II, having a high degree of confidence that the sample locations selected will identify the extent of COCs.

These are qualitative measures that will be used to assess measurement system performance for representativeness. The assessment of this qualitative criterion will be presented in the CR.

7.2.4 Completeness

Completeness is defined as generating sufficient data of the appropriate quality to satisfy the data needs identified in the DQOs. For judgmental sampling, completeness will be evaluated using both a quantitative measure and a qualitative assessment. The quantitative measurement to be used to evaluate completeness is presented in [Table 7-1](#) and is based on the percentage of measurements made that are judged to be valid. For the judgmental sampling approach, the completeness goal for targeted contaminants and the remaining COPCs is 100 and 80 percent, respectively. If this goal is not achieved, the dataset will be assessed for potential impacts on making DQO decisions.

The qualitative assessment of completeness is an evaluation of the sufficiency of information available to make DQO decisions. This assessment will be based on meeting the data needs identified

in the DQOs and will be presented in the CR. Additional samples will be collected if it is determined that the number of samples does not meet completeness criteria.

7.2.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared to another (EPA, 2002). The criteria for the evaluation of comparability will be that all sampling, handling, preparation, analysis, reporting, and data validation were performed using approved standard methods and procedures. This will ensure that data from this project can be compared to regulatory action levels that were developed based on data generated using the same or comparable methods and procedures. An evaluation of comparability will be presented in the CR.

7.2.6 Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest (EPA, 2002). The evaluation criterion for this parameter will be that measurement sensitivity (detection limits) will be less than or equal to the corresponding PALs. If this criterion is not achieved, the affected data will be assessed for usability and potential impacts on meeting site characterization objectives. This assessment will be presented in the CR.

8.0 References

ASTM, see American Society for Testing and Materials.

American Society for Testing and Materials. 1995 (reapproved 2002). *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites*, ASTM E1739 - 95(2002). Philadelphia, PA.

CFR, see *Code of Federal Regulations*.

Code of Federal Regulations. 2009a. Title 40 CFR, Parts 260–282, “Hazardous Waste Management System: General.” Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 2009b. Title 40 CFR, Part 761, “Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions.” Washington, DC: U.S. Government Printing Office.

DOE, see U.S. Department of Energy.

DOE/NV, see U.S. Department of Energy, Nevada Operations Office.

DRI, see Desert Research Institute.

Desert Research Institute. 1996. *A Historical Evaluation of the Engine Maintenance Assembly and Disassembly Facility, Area 25, Nevada Test Site, Nye County, Nevada*, SR082696-1. Prepared by C.M. Beck, H. Drollinger, R. Jones, D. Winslow, and N.G. Goldenberg. Las Vegas, NV.

EPA, see U.S. Environmental Protection Agency.

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

Federal Facility Agreement and Consent Order. 1996 (as amended March 2010). Agreed to by the State of Nevada; U.S. Department of Energy, Environmental Management; U.S. Department of Defense; and U.S. Department of Energy, Legacy Management.

Geary, K., Peer Consultants. 2006. Telephone interview with T. Thiele (NSTec), J. Myers (SNJV), and S. Engelke (SAIC) regarding CAU 114, CAS 25-41-03, 12 October.

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

Murphy, T., Bureau of Federal Facilities. 2004. Letter to R. Bangerter (NNSA/NSO) titled “Review of Industrial Sites Project Document *Guidance for Calculating Industrial Sites Project Remediation Goals for Radionuclides in Soil Using the Residual Radiation (RESRAD) Computer Code*,” 19 November. Las Vegas, NV.

NAC, see *Nevada Administrative Code*.

NBMG, see Nevada Bureau of Mines and Geology.

NCRP, see National Council on Radiation Protection and Measurements.

NDEP, see Nevada Division of Environmental Protection.

NNES, see Navarro Nevada Environmental Services, LLC.

NNES GIS, see Navarro Nevada Environmental Services Geographic Information Systems.

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

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

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

Navarro Nevada Environmental Services, LLC. 2009. *Statement of Work for Analytical Laboratories*, Section C. Las Vegas, NV.

Navarro Nevada Environmental Services Geographic Information Systems. 2010. ESRI ArcGIS Software.

Nevada Administrative Code. 2008a. NAC 445A.227, “Contamination of Soil: Order by Director for Corrective Action; Factors To Be Considered in Determining Whether Corrective Action Required.” Carson City, NV. As accessed at <http://www.leg.state.nv.us/nac> on 4 May 2009.

Nevada Administrative Code. 2008b. NAC 445A.22705, “Contamination of Soil: Evaluation of Site by Owner or Operator; Review of Evaluation by Division.” Carson City, NV. As accessed at <http://www.leg.state.nv.us/nac> on 4 May 2009.

Nevada Administrative Code. 2008c. NAC 445A.2272, “Contamination of Soil: Establishment of Action Levels.” Carson City, NV. As accessed at <http://www.leg.state.nv.us/nac> on 4 May 2009.

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

Nevada Division of Environmental Protection. 1995. *Mutual Consent Agreement between the State of Nevada and the U.S. Department of Energy for the Storage of Low-Level Land Disposal Restricted Mixed Waste*. Carson City, NV.

Nevada Division of Environmental Protection. 2005. *Nevada Division of Environmental Protection Permit for a Hazardous Waste Management Facility*, Permit Number NEV HW0021. Carson City, NV.

Paar, J.G., and D.R. Porterfield. 1997. *Evaluation of Radiochemical Data Usability*, ES/ER/MS-5. April. Oak Ridge, TN: U.S. Department of Energy.

RSL, see Remote Sensing Laboratory.

Remote Sensing Laboratory. 1976. Aerial photograph "1099-135," 11 August. Las Vegas, NV: EG&G Energy Measurements, Inc.

Remote Sensing Laboratory. 2000. Aerial photograph "10292-254," 2 February. Las Vegas, NV.

Seals, J. 2004. "The Case of the Transuranic-Loving Squirrels, the Decontamination of the XF-90A." In *Radwaste Solutions*, November/December, pp. 41–45.

Spezialetti, J., National Security Technologies, LLC. 2007. Email to J. Petrello (SNJV) titled "EMAD Be Results," March 6.

USC, see *United States Code*.

United States Code. 2009. Title 15 USC 2601 et seq., "Toxic Substances Control Act of 1976," as amended. Washington, DC: U.S. Government Printing Office.

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

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

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2001. *Closure Report for Corrective Action Unit 135: Areas 25 Underground Storage Tanks, Nevada Test Site, Nevada*, Rev. 1, DOE/NV--717-Rev. 1. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002a. *Closure Report for Corrective Action Unit 143: Area 25 Contaminated Waste Dumps, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--807. Las Vegas, NV.

- U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office. 2002b. *Industrial Sites Quality Assurance Project Plan, Nevada Test Site, Nevada*, Rev. 3, DOE/NV--372. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2003a. *Closure Report for Corrective Action Unit 262: Areas 25 Septic Systems and Underground Discharge Point, Nevada Test Site, Nevada*, Rev. 1, DOE/NV--897-REV 1. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2003b. *Closure Report for Corrective Action Unit 398: Area 25 Spill Sites, Nevada Test Site, Nevada*, Rev. 1, DOE/NV--873-REV 1. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2005. *Closure Report for Corrective Action Unit 165: Area 25 and 26 Dry Well and Washdown Areas, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--1092. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2006. *Industrial Sites Project Establishment of Final Action Levels*, Rev. 0, DOE/NV--1107. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2007a. *Closure Report for Corrective Action Unit 168: Area 25 and 26 Contaminated Materials and Waste Dumps, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--1178. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2007b. *Closure Report for Corrective Action Unit 300: Surface Release Areas, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--1222. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2008a. *Addendum to the Closure Report for Corrective Action Unit 262: Area 25 Septic Systems and Underground Discharge Point, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--897-REV 1-ADD. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2008b. *Addendum to the Closure Report for Corrective Action Unit 398: Area 25 Spill Sites, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--873-REV 1-ADD. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2008c. *Closure Report for Corrective Action Unit 127: Areas 25 and 26 Storage Tanks, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--1248. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2008d. *Corrective Action Decision Document/Closure Report for Corrective Action Unit 556: Dry Wells and Surface Release Points, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--1285. Las Vegas, NV.

- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2009a. *Corrective Action Decision Document/Closure Report for Corrective Action Unit 557: Spills and Tank Sites, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--1319. Las Vegas, NV.
- U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2009b. *Nevada Test Site Waste Acceptance Criteria*, DOE/NV-325-Rev. 7-01. Las Vegas, NV.
- U.S. Department of Energy, Nevada Operations Office. 1983. *Histories of Spent Nuclear Fuel Assemblies While at the E-MAD Facility, December 1978 Through September 1982*, DOE/NV/10250-6. Las Vegas, NV.
- U.S. Department of Energy, Nevada Operations Office. 1995a. *Environmental Restoration Sites Inventory - Non-Hazardous Site Cleanup Verification Summary*. Las Vegas, NV.
- U.S. Department of Energy, Nevada Operations Office. 1995b. *Environmental Restoration Sites Inventory - Site Cleanup Verification Summary*. Las Vegas, NV.
- U.S. Department of Energy, Nevada Operations Office. 1996a. *Corrective Action Unit 381 Gas Cylinder Closure Report*, 07-CAU381-002. Las Vegas, NV.
- U.S. Department of Energy, Nevada Operations Office. 1996b. *Corrective Action Unit 382 Housekeeping Closure Report*. Las Vegas, NV.
- U.S. Department of Energy, Nevada Operations Office. 1997. *Closure Report for Housekeeping Category Corrective Action Unit 386, Nevada Test Site*, Rev. 1, DOE/NV--11718-129. Las Vegas, NV.
- U.S. Department of Energy, Nevada Operations Office. 1998. *Closure Report for Housekeeping Category Corrective Action Unit 354: Nevada Test Site*, Rev. 0, DOE/NV--11718-169. Las Vegas, NV.
- U.S. Department of Energy, Nevada Operations Office. 1999a. *Closure Report for Housekeeping Category Corrective Action Unit 297: Nevada Test Site, Nevada*, Rev. 0, DOE/NV--11718-289. Las Vegas, NV.
- U.S. Department of Energy, Nevada Operations Office. 1999b. *RCRA Part B Permit (NEV HW0021) Application for Waste Management Activities at the Nevada Test Site*. Las Vegas, NV.
- U.S. Department of Energy, Nevada Operations Office. 2000a. *Housekeeping Closure Report for Corrective Action Unit 119: Storage Tanks, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--626. Las Vegas, NV.

- U.S. Department of Energy, Nevada Operations Office. 2000b. *Housekeeping Closure Report for Corrective Action Unit 288: Area 25 Engine-Maintenance, Assembly, and Disassembly/Treatability Test Facility Chemical Sites, Nevada Test Site, Nevada*, Rev. 0, DOE/NV--590. Las Vegas, NV.
- U.S. Environmental Protection Agency. 1980. *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA 600/4-80-032. Cincinnati, OH: Environmental Monitoring and Support Laboratory Office of Research and Development.
- U.S. Environmental Protection Agency. 2000. *Sampling and Analysis Plan Guidance and Template*, R9QA/002.1. As accessed at <http://www.epa.gov/region09/qa/projplans.html> on 4 May 2009.
- U.S. Environmental Protection Agency. 2002. *Guidance for Quality Assurance Project Plans*, EPA QA/G5, EPA/240/R-02/009. Washington, DC: Office of Environmental Information.
- U.S. Environmental Protection Agency. 2004. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, OSWER 9240.1-45/EPA 540-R-04-004. October. Washington, DC: Office of Superfund Remediation and Technology Innovation.
- U.S. Environmental Protection Agency. 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4)*, EPA/240/B-06/001. Washington, DC: Office of Environmental Information.
- U.S. Environmental Protection Agency. 2009a. *Region 9: Superfund, Regional Screening Levels (Formerly PRGs) for Chemical Contaminants*. As accessed at <http://www.epa.gov/region09/superfund/prg> on 4 May. Prepared by EPA Office of Superfund and Oak Ridge National Laboratory.
- U.S. Environmental Protection Agency. 2009b. *SW-846 On-Line, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. As accessed at <http://www.epa.gov/epaoswer/hazwaste/test/main.htm> on 4 May.

Appendix A
Project Organization

A.1.0 Project Organization

The NNSA/NSO Federal Sub-Project Director is Kevin Cabble. He can be contacted at (702) 295-5000. The NNSA/NSO Task Manager is Tiffany Lantow. She can be contacted at (702) 295-7645.

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

Appendix B

Data Quality Objective Process

B.1.0 Introduction

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 566, EMAD Compound, field investigation. The DQOs are designed to ensure that the data collected will provide sufficient and reliable information to determine the appropriate corrective actions, to verify the adequacy of existing information, to provide sufficient data to implement the corrective actions, and to verify that closure was achieved.

The CAU 566 CAI will be based on the DQOs presented in this appendix as developed by representatives of NDEP and NNSA/NSO. 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) and the CAS-specific information presented in [Section B.2.0](#).

The DQO process presents a judgmental sampling approach. In general, the procedures used in the DQO process provide:

- 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.
 - 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 CAU 566 is: “Existing information on the nature and extent of potential contamination is insufficient to evaluate and confirm closure of CAU 566.”

Corrective Action Unit 566 comprises CAS 25-99-20, EMAD Compound, which consists of the following:

- Potential current releases to soil associated with CAS components on the exterior of the E-MAD Facility (Building 3900)
- Potential future releases from wastes suspected to contain a material that could cause the release of a COC to environmental media

B.2.1 Planning Team Members

The DQO planning team consists of representatives from NDEP and NNSA/NSO. The DQO meeting was held on April 30, 2009.

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 any 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 define the assumptions that are the basis for identifying appropriate sampling strategy and data collection methods. Accurate CSMs are important as they serve as the basis for all subsequent inputs and decisions throughout the DQO process.

The CSM was developed for CAU 566 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.

The CSM consists of:

- Potential contaminant releases associated with CAS components on the exterior of Building 3900, including affected media.
- 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 the CAS.
- 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 and NNSA/NSO will be notified and given the opportunity to comment on, and concur with, the recommendation.

The applicability of the CSM to each CAS component 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](#) represents site conditions applicable to the CSM and depicts the various potential surface and shallow subsurface releases associated with the EMAD Compound.

Table B.2-1
Conceptual Site Model Description of Elements for Each CAS Component in CAU 566
(Page 1 of 2)

CAS Identifier	25-99-20					
CAS Description/ CAS Components	Locomotives and Railcars	Debris Piles	Storm Drain System	Metallurgy Lab Drains	Storage Casks and Drywells	Substations
Site Status	The cable-spool car, locomotives, and manned control car are currently leaking.	Inactive and abandoned.	Surface water may drain to the catch basin and outfall area during rainfall events.	Inactive and abandoned. The drains have been cut off at the surface and sealed, and all fuel assemblies have been removed from the casks and drywells.		Both substations are currently active.
Exposure Scenario	Occasional Use					
Sources of Potential Soil Contamination	Diesel fuel, oils, and other fluids in equipment reservoirs	Hazardous or radioactive materials contained in debris piles	Hazardous or radioactive materials that have been discharged to the storm drain system	Hazardous or radioactive materials or chemicals related to metallurgical activities that have been discharged to the drain system	Former storage of fuel assemblies, or any remaining hazardous or radioactive items	Transformers used in the past potentially contain PCBs.
Location of Contamination/ Release Point	Surface release points directly below or adjacent to equipment	Surface release points below or adjacent to debris items	Catch basin contents, adjacent to outfall, and sediment accumulation areas downgradient	Directly below drain connections to trailer, adjacent to cut and sealed pipe ends, potential breaches	Internal surface of casks and drywells, adjacent soils if any breaches	Surface release points adjacent to transformer pads

Table B.2-1
Conceptual Site Model Description of Elements for Each CAS Component in CAU 566
(Page 2 of 2)

CAS Identifier	25-99-20					
CAS Description/ CAS Components	Locomotives and Railcars	Debris Piles	Storm Drain System	Metallurgy Lab Drains	Storage Casks and Drywells	Substations
Amount Released	Unknown					
Affected Media	Surface and shallow subsurface soil					
Potential Contaminants	VOCs, SVOCs, TPH-DRO, RCRA Metals + Beryllium, PCBs, Gamma Spectrometry, Isotopic U, Isotopic Pu, Sr-90 (+Pesticides at Building 3900)				Gamma Spectrometry, Isotopic U, Isotopic Pu, Sr-90	PCBs
Transport Mechanisms	Percolation of precipitation through subsurface media served 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 CAS components (e.g., storm drain system, debris piles). Leaks from fuel tanks and/or oil reservoirs on equipment located outside Building 3900 onto the soil.					
Migration Pathways	Vertical transport is expected to be more dominant than lateral transport due to small surface gradients (with exception of storm drain system).					
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. Groundwater contamination is not expected. Lateral and vertical extent of COC contamination 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, inhalation, and dermal contact (absorption) of contaminated soil and/or debris due to inadvertent disturbance of these materials, or irradiation by radioactive materials.					

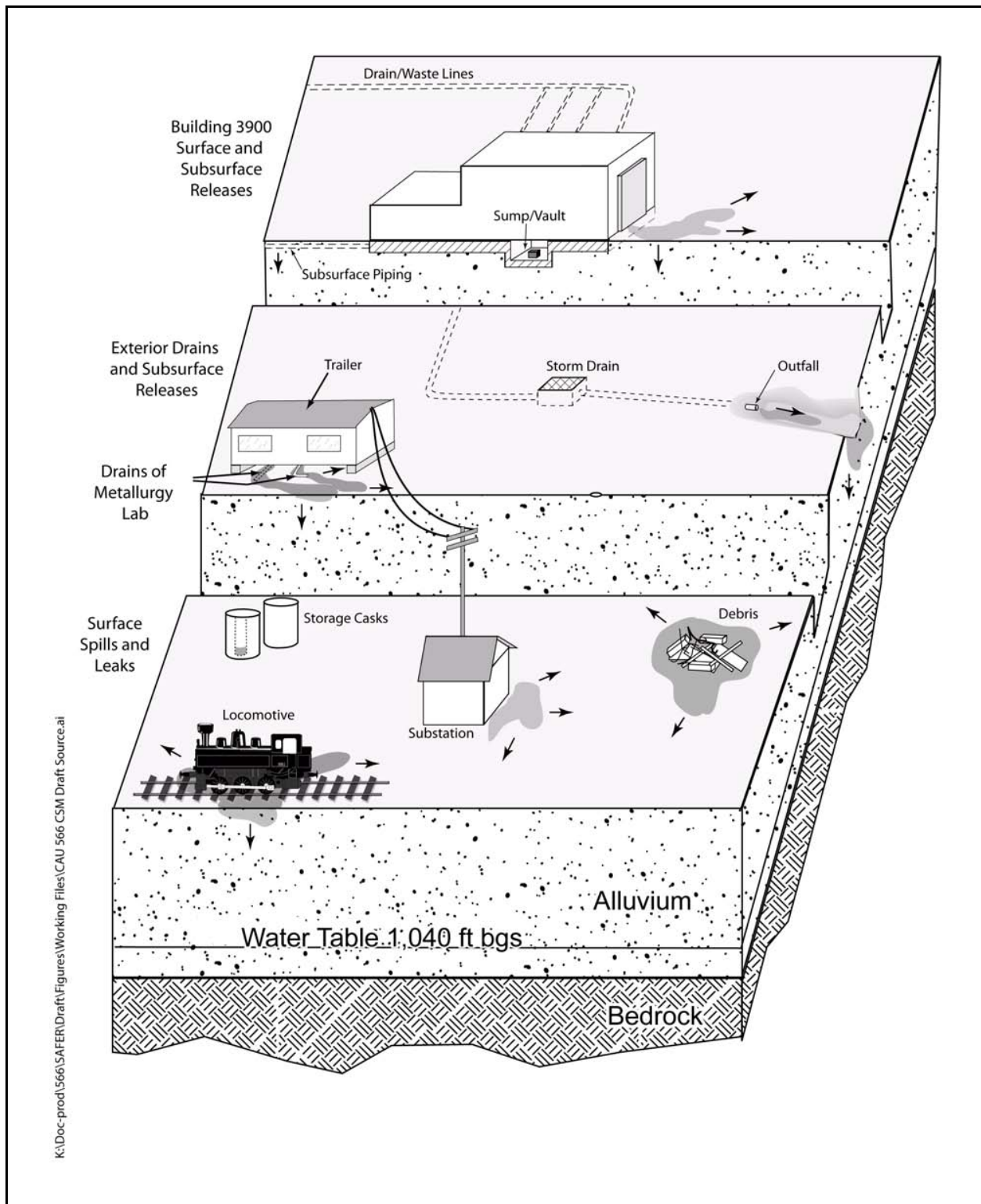


Figure B.2-1
Conceptual Site Model for CAU 566

B.2.2.1 Contaminant Release

Any contaminants released from CAU 566, regardless of physical or chemical characteristics, are expected to exist in the soil adjacent to their sources in lateral and vertical directions. The CAS-specific release points are described below.

For releases from the leaking locomotives and railcars component of CAS 25-99-20, the primary locations for contaminant release are the surface and shallow subsurface soils directly below or adjacent to fuel and oil reservoirs that have leaked, or may currently be leaking. Several areas of stained soil have been observed beneath the fuel reservoirs of each locomotive and below the cable-spool car located on the same set of railroad tracks.

For releases from the debris pile component of CAS 25-99-20, the primary locations for contaminant release are the surface soils directly below or adjacent to debris items. The majority of the debris consists of scrap wood, likely from temporary storage sheds; however, there is a potential for hazardous or radioactive items to be present.

For the storm drain system component of CAS 25-99-20, the primary locations for contaminant release are surface soils adjacent to the outfall pipe and sediment accumulation areas in the drainage channel that formed in the outfall area. Contaminants may also be present in the sediment contained within the concrete catch basin located upgradient of the outfall area.

For the Metallurgy Lab drain system component of CAS 25-99-20, the primary locations for contaminant release are in the surface soils directly below the three locations where the drains connect to the trailer and the locations where the drains have been cut and sealed at the ground surface. There is also the potential for releases to have occurred at elbows, joint connections, or any breaches in the piping. The pipe itself may be radiologically contaminated based on recent radiological surveys.

For the electrical substation component of CAS 25-99-20, the primary locations for contaminant release are the surface soils immediately adjacent to the transformer pads of each substation. The substations currently contain non-PCB-containing transformers; however, there is the potential for PCB-containing transformers to have serviced the substations in the past.

For the storage casks (2) and drywells (4) component of CAS 25-99-20, the primary locations for contaminant release are the interiors of each containment structure. Releases to surface and shallow subsurface soils are not expected based on the design of the storage casks (carbon-steel liner set in concrete) and drywells (steel liner grouted in place); however, each structure will be visually inspected.

B.2.2.2 Potential Contaminants

The 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 each CAS component. Because complete information regarding activities performed at the CAU 566 site is not available, contaminants detected at similar NTS sites were included in the contaminant lists to reduce uncertainty. The list of COPCs is intended to encompass all of the contaminants that could potentially be present. The COPCs applicable to Decision I environmental samples from the CAU 566 CAS components are defined as the constituents reported from the analytical methods stipulated in [Table B.2-2](#). (See [Section 4.1](#) for a description of the potential sources of the listed COPCs.)

During the review of site history documentation, process knowledge information, personal interviews, past investigation efforts (where available), and inferred activities associated with the CAS, some of the COPCs were identified as targeted contaminants. Targeted contaminants are those COPCs for which evidence in the available site and process information suggests that they may be reasonably suspected to be present at a given CAS. The targeted contaminants are required to meet a more stringent completeness criteria than other COPCs, thus providing greater protection against a decision error (see [Section B.7.1](#)). Targeted contaminants for CAU 566 have only been identified for the Metallurgy Lab drain system component of CAS 25-99-20. For this system, there is available information regarding elevated radioactivity associated with the drain lines. Therefore, isotopic U, isotopic Pu, Sr-90, and gamma-emitting radionuclides have been identified as targeted contaminants.

B.2.2.3 Contaminant Characteristics

Contaminant characteristics include, but are not limited to, solubility, density, and adsorption potential. In general, contaminants with large particle size, low solubility, high affinity for media, and/or high density can be expected to be found relatively close to release points. Contaminants with

**Table B.2-2
Analytical Program^a**

Analyses	CAS 25-99-20 Components					
	Storage Casks and Drywells	Substations	Storm Drain System	Metallurgy Lab Drains	Locomotives and Railcars	Construction Debris Piles
Organic COPCs						
TPH-DRO	--	--		X		
PCBs	--	X		X		
SVOCs	--	--		X		
VOCs	--	--		X		
Pesticides	--	--			--	
Inorganic COPCs						
RCRA Metals	--	--		X		
Total Beryllium	--	--		X		
Radionuclide COPCs						
Gamma Spectroscopy	X	--		X		
Isotopic U	X	--		X		
Isotopic Pu	X	--		X		
Sr-90	X	--		X		

^aThe COPCs are the constituents reported from the analytical methods listed.

X = Required analytical method
-- = Not required

small particle size, high solubility, low affinity for media, and/or low density are found farther from release points or in low areas where evaporation of ponding will concentrate dissolved constituents.

B.2.2.4 Site Characteristics

Site characteristics are defined by the interaction of physical, topographical, and meteorological attributes and properties. Physical properties include permeability, porosity, hydraulic conductivity, degree of saturation, sorting, chemical composition, and organic content. Topographical and

meteorological properties and attributes include slope stability, precipitation frequency and amounts, precipitation runoff pathways, drainage channels and ephemeral streams, and evapotranspiration potential.

The E-MAD Facility and Compound are located in Jackass Flats in Area 25 of the NTS. Jackass Flats is between Yucca Mountain on the west and southwest and Little Skull Mountain to the south. The Calico Hills are directly north, Mid Valley and Lookout Peak are to the northeast, and Skull Mountain is to the southeast. Jackass Flats is a broad alluvial valley with alluvium and colluvium accumulations up to 1,205 ft (USGS, 1964; DOE, 1988). The alluvium in Jackass Flats is underlain by welded and semi-welded ash-flow and ash-fall tuffs of Tertiary age. Beneath the tuff layers lie Paleozoic carbonate and clastic sediments with a depth of up to 22,000 ft in some areas. The Paleozoic rocks are made up of shales, quartzites, and carbonates of lower to middle Cambrian age; carbonate and thin shale layers of middle Cambrian to Devonian age; and argillites, cherty limestones, and conglomerates of Devonian to Permian age (SNPO, 1970).

Elevation of the flats ranges from 3,600 ft in the north to 3,200 ft in the south, with the E-MAD Facility at 3,520 ft. Surface water flow at the north end of the E-MAD Facility drains to the southwest; at the south end of the facility, surface water drains to the south. The nearest natural water source is Topopah Springs at the head of Topopah Wash 8.7 miles to the north. The closest well to the site is J-11 Water Well, which is located approximately 9,500 ft southeast of the E-MAD Facility. The depth to groundwater as measured from this well is approximately 1,040 ft below ground surface (bgs) (DRI, 1996; USGS and DOE, 2009).

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.

The E-MAD Compound is toward the middle of Jackass Flats, about 500 ft west of Topopah Wash. Fortymile Wash, the major drainage in the area, meanders along the east base of Yucca Mountain and the west side of Jackass Flats, and eventually joins with the Amargosa River to the south. Topopah Wash, originating in the Calico Hills, bisects Jackass Flats and also joins with the Amargosa River, further to the east (DRI, 1996). Contaminants released into the Topopah Wash are subject to much

higher transport mechanisms than contaminants released to other surface areas. Topopah Wash is generally dry but is subject to infrequent, potentially intense, stormwater flows. These stormwater flow events provide an intermittent mechanism for both vertical and horizontal transport of contaminants. Contaminated sediments entrained by these stormwater events would be carried by the streamflow to locations where the flowing water loses energy and the sediments drop out. These locations are readily identifiable by hydrologists as sedimentation areas.

Infiltration and percolation of precipitation serves as a driving force for downward migration of contaminants. However, due to the low permeability of the alluvium throughout the area, and high potential evapotranspiration rates and low precipitation rates (approximately 5.72 in. per year as measured from station 4JA [ARL/SORD, 2009]), percolation of infiltrated precipitation at the NTS does not provide a significant mechanism for vertical migration of contaminants to groundwater (DOE/NV, 1992). Environmental contamination is, therefore, expected to be limited to the area near release points.

B.2.2.6 Land-Use and Exposure Scenarios

Human receptors may be exposed to COPCs through oral ingestion, inhalation, dermal contact (absorption) of soil or debris due to inadvertent disturbance of these materials, or irradiation by radioactive materials. The land-use and exposure scenarios for CAS 25-99-20 are listed in [Table B.2-3](#). These are based on NTS current and future land use (DOE/NV, 1998).

Although CAU 566 is located in an area where structures from past activities exist, no facilities are present that would allow these to be used as an assigned work station for NTS site personnel; therefore, CAU 566 is considered an occasional use area.

**Table B.2-3
 Land-Use and Exposure Scenarios**

CAS	Record of Decision Land Use Zone	Exposure Scenario
25-99-20	<p align="center">Research Test and Experiment Zone</p> This area is designated for small-scale research and development projects and demonstrations; pilot projects; outdoor tests; and experiments for the development, QA, or reliability of material and equipment under controlled conditions. This zone includes compatible defense and nondefense research, development, and testing projects and activities.	<p align="center">Occasional Use Area</p> Worker will be exposed to the site occasionally (up to 80 hours per year for 5 years). Site structures are not present for shelter and comfort of the worker.

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). [Figure B.3-1](#) depicts the sequential flow of questions, answers, and action alternatives required to fulfill the objectives of the SAFER process.

B.3.1 Decision Statements

The Decision I statement is: “Is any COC present in environmental media within the CAS?” For judgmental sampling design, any analytical result for a COPC above the FAL will result in that COPC being designated 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 (NNSA/NSO, 2006). If a COC is detected, then Decision II must be resolved.

The Decision II statement is: “Is sufficient information available to meet the closure objectives?”

Sufficient information to meet these closure objectives is defined to include:

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

The presence of a COC would require a corrective action. A corrective action may also be necessary if there is a potential for wastes that are present at a site to result in the introduction of COCs into site environmental media. These wastes would be considered PSM, which is defined as waste (solid or liquid) containing contaminants that, if released to soil, would result in soil contamination exceeding a FAL. To determine whether wastes that are present at CAU 566 meet the criteria for PSM, the following conservative assumptions were made:

- Any containment of waste (e.g., fuel/oil reservoirs, pipe, concrete vaults and walls, drums) would fail at some point, and the waste would be released to the surrounding soil.

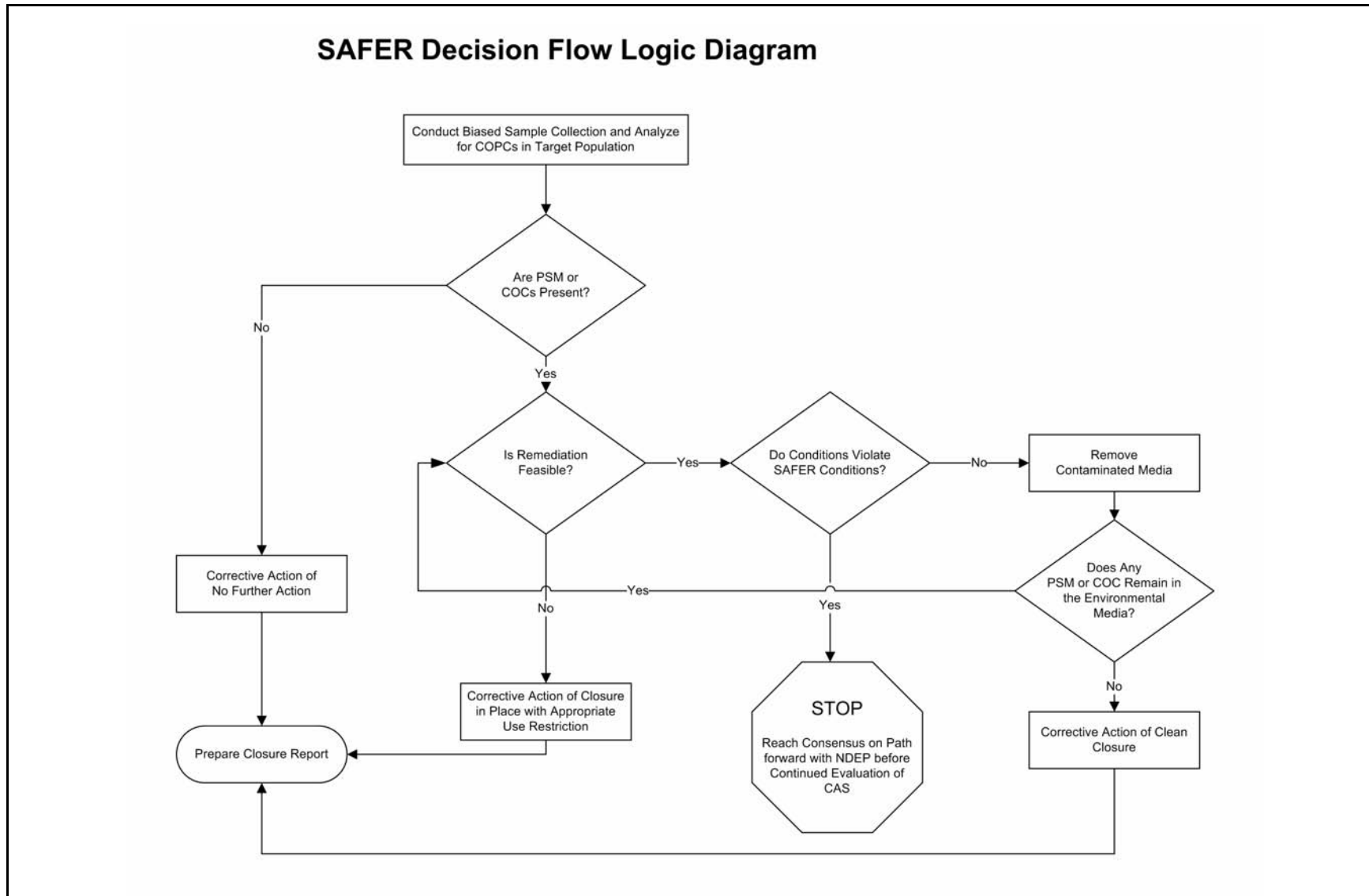


Figure B.3-1
SAFER Closure Decision Process for CAU 566

- A waste, regardless of concentration or configuration, may be assumed to be PSM and handled under a corrective action, if appropriate.
- Based on process knowledge and/or professional judgment, a waste may be assumed to not be PSM if it is clear that it could not result in soil contamination exceeding a FAL.
- If assumptions about the waste cannot be justified, then the waste material will be sampled, and the results will be compared to FALs based on the following criteria:
 - For non-liquid wastes, the concentration of any chemical contaminant in soil (following degradation of the waste and release of contaminants into soil) would be equal to the mass of the contaminant in the waste divided by the mass of the waste (no consideration will be given to dilution into the mass of soil).
 - For non-liquid wastes, the dose resulting from radioactive contaminants in soil (following degradation of the waste and release of contaminants into soil) would be calculated using the activity of the contaminant in the waste divided by the mass of the waste (for each radioactive contaminant) and calculating the combined resulting dose using the RESRAD code (Murphy, 2004) (no consideration will be given to dilution into the mass of soil). Note: As an initial screening tool, if building materials are primarily externally contaminated and do not present a dose exceeding the FAL to a nearby worker in its current configuration, it will not be considered to meet PSM criteria.
 - For liquid wastes, the resulting concentration of contaminants in the surrounding soil would be calculated based on the concentration of contaminants in the wastes and the liquid holding capacity of the soil.

For example, sludge containing a contaminant exceeding an equivalent FAL concentration would be considered to be PSM and would require a corrective action. Light ballasts with capacitors are assumed to contain PCBs based on process knowledge. These ballasts/capacitors would be assumed to be PSM without sampling and would require a corrective action.

If sufficient information is not available to meet the closure objectives, then site conditions will be re-evaluated, and additional samples will be collected (as long as the scope of the CAI 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 CAI.

B.3.2.1 Alternative Actions to Decision I

If no COC associated with a release from a CAS is detected, then further assessment of the CAS is not required, and the CAA of no further action will be selected. If a COC associated with a release from a CAS is detected, then additional sampling will be conducted to determine the extent of COC contamination. If the extent of the contamination is defined, then clean close the site by removing the contaminated media until all contamination has been removed. If the extent of contamination has been determined and additional remediation cannot be completed during the SAFER, then a hold point will have been reached and NDEP will be consulted to determine whether the remaining contamination will be closed under the alternative corrective action of closure in place.

If 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 sufficient information is available to define the extent of COC contamination and confirm that closure objectives were met, then further assessment of the CAS is not required. If sufficient information is not available to define the extent of contamination or confirm that closure objectives were met, then additional samples will be collected until the extent is defined.

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 a COC is present at a given CAS), samples need to 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 sufficiently sensitive to identify any COCs present in the samples.

To resolve Decision II (determine whether sufficient information is available to confirm that closure objectives were met at the CAS), samples must be collected and analyzed to meet the following criteria:

- Samples must be collected in areas contiguous to the contamination but where contaminant concentrations are below FALs.
- Samples of the waste or environmental media must provide sufficient information to characterize the IDW for disposal.
- Samples of the waste or environmental media must provide sufficient information to determine potential remediation waste types.
- Samples of waste must provide sufficient information to determine whether materials meet PSM criteria.
- The analytical suites selected must be sufficient to detect contaminants at concentrations equal to or less than their corresponding FALs.

B.4.2 Sources of Information

Information to satisfy Decision I and Decision II will be generated by collecting samples using hand sampling (e.g., grab, auger, bailer), power auguring, core drilling, backhoe excavation, or other appropriate sampling methods. Sampling for COCs will be conducted in areas most likely to contain

a COC (judgmental sampling), and will include samples of environmental media and PSM that could cause future environmental contamination. These areas include soils adjacent to or directly below contaminant pathways if it is determined that a pathway from the CAS exists. These samples will be submitted to analytical laboratories meeting the quality criteria stipulated in the Industrial Sites QAPP (NNSA/NV, 2002). Only validated data from analytical laboratories will be used to make DQO decisions. For some materials, it will be assumed that a contaminant is present based on process knowledge and that material will be assumed to meet PSM criteria without the need for sampling. Radiological surveys of surfaces (e.g., locomotives, railcars, casks) will be used to determine the extent of any remaining surface contamination and to assist in evaluating the potential for a receptor to receive a dose greater than 25 mrem/yr.

All waste characterization data must be sufficient to meet the quality requirements of the designated waste acceptance criteria. Waste disposal documentation, field surveys, and other appropriate information may also be used to ensure corrective actions were completed as planned.

B.4.2.1 Sample Locations

Design of the sampling approaches for the CAU 566 CAS components must ensure that the data collected are sufficient for selection of the CAAs. To meet this objective, the samples collected from each component should 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). Because sufficient data are available to develop a judgmental sampling plan, this approach was used to develop plans for sampling environmental media and PSM at the CAS components. A judgmental sampling design has been developed for CAU 566 due to the presence and significance of biasing factors.

Field-survey techniques may be used to select appropriate sampling locations by providing semiquantitative data. The following field-survey methods and biasing factors may be used to select biased sample locations at CAU 566:

- Walkover surface area radiological surveys: A radiological survey instrument will be used to detect elevated radioactivity of soil, surfaces, piping, and various other materials.
- Stains: Any discolored soil, building, material, or other surfaces.

- Drums, containers, equipment, or debris: Materials that may have been used at, or added to, a location, and that may have contained, or come in contact with, hazardous or radioactive substances at some point during their use.
- Preselected areas based on process knowledge of the site: Locations for which evidence, such as historical photographs, experience from previous investigations, or interviewee's input, exists that a release of hazardous or radioactive substances may have occurred.
- Preselected areas based on process knowledge of the contaminant(s): 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.
- Experience and data from investigations of similar sites.
- Other biasing factors: Factors not previously defined for the CAI, but become evident once the investigation of the site is under way.

Decision II sample step-out locations will be selected based on the CSM, biasing factors, and existing data. Analytical suites will include those parameters that exceeded FALs (i.e., COCs) in prior samples. Biasing factors to support Decision II sample locations include Decision I biasing factors plus available analytical results.

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., detection limits, precision, and accuracy) are provided in [Tables 3-3](#) and [3-4](#).

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 (“Is any COC present in environmental media within the CAS?”) is any location within the site that is contaminated with any contaminant above a FAL. The populations of interest to resolve Decision II (“If a COC is present, is sufficient information available to evaluate potential CAAs?”) are as follows:

- Each one of a set of locations bounding contamination in lateral and vertical directions
- Environmental media or IDW that must be characterized for disposal
- Potential remediation waste
- Environmental media where natural attenuation or biodegradation or construction/evaluation of barriers is considered

B.5.2 Spatial Boundaries

Spatial boundaries are the maximum lateral and vertical extent of expected contamination at each CAS component, as shown in [Table B.5-1](#). Contamination found beyond these boundaries may indicate a flaw in the CSM and may require re-evaluation of the CSM before the investigation could continue. Each CAS component is considered geographically independent, and intrusive activities are not intended to extend into the boundaries of neighboring CASs or CAS components, or existing URs from previously investigated CAUs.

B.5.3 Practical Constraints

Practical constraints, such as military activities, utilities, threatened or endangered animals and plants, unstable or steep terrain, and/or access restrictions, may affect the ability to investigate this site. The practical constraints associated with the CAI are summarized in [Table B.5-2](#).

**Table B.5-1
Spatial Boundaries of CAU 566 CAS Components**

CAS ID	CAS Name or Component	Lateral Spatial Boundary	Vertical Spatial Boundaries
25-99-20	Locomotives/railcars	25 ft beyond perimeter of stained soil	15 ft bgs
	Debris piles	25 ft beyond perimeter of debris item	15 ft bgs
	Storm drain	15 ft beyond perimeter of catch basin, 200 ft downgradient of outfall pipe	15 ft below bottom of catch basin and associated piping, 15 ft bgs at outfall
	Metallurgy Lab drains	25 ft beyond associated piping	15 ft bgs
	Casks/drywells	15 ft beyond perimeter of casks/drywells	15 ft below bottom of casks/drywells
	Substations	25 ft beyond perimeter of transformer pad	15 ft bgs

**Table B.5-2
Practical Constraints for the CAU 566 Field Investigation**

CAS/Component	Practical Constraints
All CAS Components	Military exercises; excavation access due to underground utilities; other access issues due to aboveground structures, limited working spaces, etc.
25-99-20 Locomotives/railcars	Railroad ties/bedding may present excavation difficulties. Locomotives and railcars may need to be relocated in order to access sampling locations or conduct remediation activities.
25-99-20 Metallurgy Lab drains	Presence of trailer may limit access to sampling surface and shallow subsurface soils beneath the trailer.
25-99-20 Casks/drywells	Locomotives and railcars will need to be relocated in order to access the four drywells located in the west railroad tracks.

B.5.4 Define the Sampling Units

The scale of decision making in Decision I is defined as the CAS component. This allows for releases associated with the individual components of CAS 25-99-20 to be closed independent of each other. Any COC detected at any location within the CAS (or CAS component) will cause the determination that the CAS (or CAS component) is contaminated and needs further evaluation. The scale of decision making for Decision II is defined as a contiguous area contaminated with any COC originating from the CAS (or CAS component). 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 an “If ... then ... else” decision rule that defines the conditions under which possible alternative actions will be chosen. This step also specifies the parameters that characterize the population of interest, specifies the FALs, and confirms that the analytical detection limits are capable of detecting FALs.

B.6.1 Population Parameters

For judgmental sampling results, 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. For Decision I, a single sample result for any contaminant exceeding a FAL would cause a determination that a COC is present within the CAS.

The Decision II population parameter is an individual analytical result from a bounding sample. For Decision II, a single bounding sample result for any contaminant exceeding a FAL would cause a determination that the contamination is not bounded.

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 RBCA process used to establish FALs is described in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006). This process conforms with NAC Section 445A.227, which lists the requirements for sites with soil contamination (NAC, 2008a). For the evaluation of corrective actions, NAC Section 445A.22705 (NAC, 2008b) requires the use of ASTM Method E1739 (ASTM, 1995) to “conduct an evaluation of the site, based on the risk it poses to public health and the environment, to determine the necessary remediation standards (i.e., FALs) or to establish that corrective action is not necessary.”

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

- Tier 1 evaluation - sample results from source areas (highest concentrations) are compared to action levels based on generic (non-site-specific) conditions (i.e., the PALs established in the SAFER Plan). 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 SSTLs using site-specific information as inputs to the same or similar methodology used to calculate Tier 1 action levels. The Tier 2 SSTLs are then compared to individual sample results from reasonable points of exposure (as opposed to the source areas as is done in Tier 1) on a point-by-point basis. Total petroleum hydrocarbon concentrations will not be used for risk-based decisions under Tier 2 or Tier 3. Rather, the individual chemicals of concern will be compared to the SSTLs.
- Tier 3 evaluation - conducted by calculating Tier 3 SSTLs on the basis of more sophisticated risk analyses using methodologies described in Method E1739 that consider site-, pathway-, and receptor-specific parameters.

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.

B.6.2.1 Chemical PALs

Except as noted herein, the chemical PALs are defined as the EPA Region 9 Superfund preliminary RSLs for chemical contaminants in industrial soils (EPA, 2009). Background concentrations for RCRA metals and zinc will be used instead of RSLs when natural background concentrations exceed the RSL, as is often the case with arsenic on the NTS. 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 RSLs, the protocol used by the EPA Region 9 in establishing RSLs (or similar) will be used to establish PALs (EPA, 2009). If used, this process will be documented in the CR.

B.6.2.2 Total Petroleum Hydrocarbon PALs

The PAL for TPH is 100 mg/kg as listed in NAC 445A.2272 (NAC, 2008c).

B.6.2.3 Radionuclide PALs

The PALs for radiological contaminants are based on the NCRP Report No. 129 recommended screening limits for construction, commercial, industrial land-use scenarios (NCRP, 1999) scaled to 25-mrem/yr dose constraint (Murphy, 2004) and the generic guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993). These PALs are based on the construction, commercial, and industrial land-use scenario provided in the guidance and are appropriate for the NTS based on future land use scenarios as presented in [Section B.2.2.6](#).

B.6.3 Decision Rules

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

- If COC contamination is 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 to define the extent.

The decision rules for Decision I are:

- If the population parameter of any COPC in the Decision I population of interest (defined in [Section B.5.1](#)) exceeds the corresponding FAL, then that contaminant is identified as a COC, the contaminated material will be removed, or Decision II samples will be collected until an estimate of the extent of contaminated material has been made.
- If no COC associated with a release from the CAS is detected, then further assessment of the CAS is not required, and the CAA of no further action will be selected. If a COC associated with a release from the CAS is detected, then additional sampling will be conducted to determine the extent of COC contamination. If the extent of the contamination is defined, then clean close the site by removing the contaminated media until all contamination has been removed. If the extent of contamination has been determined and remediation cannot be completed during the SAFER, then a hold point will have been reached and NDEP will be consulted to determine whether the remaining contamination will be closed under the alternative corrective action of closure in place.
- If a waste is present that, if released, has the potential to cause the future contamination of site environmental media, then a corrective action will be determined, else no further action will be necessary.

The decision rules for Decision II are:

- If the population parameter (the observed concentration of any COC) in the Decision II population of interest (defined in [Section B.5.1](#)) exceeds the corresponding FAL, then additional samples will be collected to complete the Decision II evaluation. If sufficient information is available to define the extent of COC contamination and confirm that closure objectives were met, then further assessment of the CAS is not required. If sufficient information is not available to define the extent of contamination or confirm that closure objectives were met, then additional samples will be collected until the extent is defined.
- If valid analytical results are available for the waste characterization samples defined in [Section B.8.0](#), then the decision will be that sufficient information exists to characterize the IDW for disposal and determine potential remediation waste types, else collect additional waste characterization samples.

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:

- 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:

- Developing and achieving concurrence of CSMs (based on process knowledge) by stakeholder participants during the DQO process.
- Conducting validity testing of CSMs based on investigation results.
- Evaluating data quality 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 the environment.

B.7.2.1 False Negative Decision Error for Judgmental Sampling

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 COCs if present anywhere within the CAS. For Decision II, having a high degree of confidence that the sample locations selected will identify the extent of COCs.
- Having a high degree of confidence that analyses conducted will be sufficient to detect any COCs 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 COCs (supplemented by random 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 CSMs and selection of sampling locations. The field-survey methods and biasing factors listed in [Section B.4.2.1](#) will be used to further ensure that appropriate sampling locations are selected to meet these criteria. Radiological survey instruments and field-screening equipment will be calibrated and checked in accordance with the manufacturer's instructions and approved procedures. The investigation report will present an assessment of 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 samples will be analyzed for the chemical and radiological parameters listed in [Section 3.2](#). Decision II samples will be analyzed only for those chemical and radiological parameters that were identified as 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, as well as individual sample results, will be assessed against the DQIs of precision, accuracy, comparability, and completeness as defined in the Industrial Sites QAPP (NNSA/NV, 2002) and in [Section 7.2](#) of this SAFER Plan. 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 constituent 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. Site-specific DQIs are discussed in more detail in [Section 7.2](#) of this SAFER Plan.

To provide information for the assessment of the DQIs of precision and accuracy, the following QC samples will be collected as required by the Industrial Sites QAPP (NNSA/NV, 2002):

- Field duplicates (1 per 20 environmental samples)
- Laboratory QC samples (1 per 20 environmental 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 required by the Industrial Sites QAPP (NNSA/NV, 2002):

- Trip blanks (1 per sample cooler containing VOC environmental samples)
- Equipment blanks (1 per sampling event for each type of decontamination method)
- Source blanks (1 per uncharacterized lot of source water)
- Field blanks (minimum of 1 per CAS, additional if field conditions change)

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

Step 7 of the DQO process selects and documents a design that will yield data that will best achieve performance or acceptance criteria. Judgmental sampling schemes will be implemented to select sample locations and evaluate analytical results for CAU 566. [Sections B.8.1](#) and [B.8.2](#) contain general information about collecting Decision I and Decision II samples under a judgmental sampling design, while the subsequent sections provide sampling activities, including proposed sample locations.

B.8.1 Decision I Sampling

A judgmental sampling design will be implemented for CAU 566. Because individual sample results, rather than an average concentration, will be used to compare to the FALs, 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 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-survey methods and biasing factors listed in [Section B.4.2.1](#). 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.

B.8.2 Decision II Sampling

To meet the DQI of representativeness for Decision II samples (that Decision II sample locations represent the population of interest as defined in [Section B.5.1](#)), judgmental sampling locations at each CAS component will be selected based on the outer boundary sample locations where COCs were detected, the CSM, and other field-survey methods and biasing factors listed in [Section B.4.2.1](#). In general, sample locations will be arranged in a triangular pattern around the Decision I location or area at distances based on site conditions, process knowledge, and biasing factors. If COCs extend 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., COCs less than FALs) collected from each step-out direction (lateral or vertical) will define the extent of contamination in that direction. The number, location, and spacing of step-outs may be modified by the Site Supervisor, as warranted by site conditions.

B.8.3 CAS 25-99-20, EMAD Compound

This section discusses the specific sampling design for CAS 25-99-20, EMAD Compound.

Corrective Action Site 25-99-20 consists of the following CAS components:

- Metallurgy Lab trailer drain system
- Storm drain system
- Leaking locomotives and railcars
- Debris piles
- Storage casks and drywells
- Electrical power substations

Any other potential releases identified during the field investigation that are associated with EMAD Compound operations and support activities will be included in the scope of the CAI. Figures showing the planned Decision I sample locations, where applicable, are located in the subsections that follow.

B.8.3.1 Metallurgy Lab Drain System Component of CAS 25-99-20

This CAS component consists of the potential releases to soil associated with a drain system that serviced the Metallurgy Lab trailer that supported activities at the E-MAD Facility (Figure 2-1). Each of the three drains consists of a galvanized steel pipe connected to 4-in. cast-iron pipes using lead and oakum fittings (approximately 20 joints). Some scrap pipes are currently on the ground beside the trailer. During a 2009 walkover survey, the pipes and fittings were determined to contain elevated radioactivity and were subsequently labeled “Caution Radioactive Material.”

Figure B.8-1 shows a photograph of the Metallurgy Lab trailer with the proposed sampling locations for the drain system. The following is the Decision I sampling strategy:

- Surface soil samples will be collected at each end of the pipes that have previously been cut off at the ground surface and sealed to account for any releases that may have occurred during piping cutting operations.
- The contents, if any, of drains will be sampled provided there is sufficient volume. Drains may be accessed at joint or elbow locations.
- Surface soil samples will be collected directly below locations where each of three drains connects to the trailer floor to account for any leaks at these connections.
- Additional surface soil samples may be collected based on radiological surveys and other biasing factors identified (e.g., stained soil, pipe breaches).
- Subsurface soil samples may be collected beneath Decision I locations to obtain potential Decision II information.

B.8.3.2 Storm Drain System Component of CAS 25-99-20

This CAS component consists of the potential releases associated with a storm drain system that receives surface water runoff on the south side of Building 3900. The system consists of a single catch basin with an 18-in. corrugated metal pipe outflow that drains the catch basin to an outfall area located approximately 150 ft outside of the perimeter fence (Figure 2-2). A 3-in. copper cooling tower overflow drain and a separate 4-in. transite clear-water drain both flow to the catch basin. The catch basin is concrete with a metal grate cover and is partially filled with sediment and vegetation

Proposed Sample Location ●



Figure B.8-1
Proposed Decision I Sampling Locations at Metallurgy Lab Drains

debris. A small erosional channel has formed at the outfall area and is mostly filled with sediment and vegetation.

Figure B.8-2 shows a conceptual sketch of the storm drain system with the proposed sampling locations. The following is the Decision I sampling strategy:

- Collect a minimum of one sample at the surface of the catch basin contents and one sample of the contents at the interface with the bottom of the catch basin.
- Collect additional samples from each phase change of the contents within the catch basin, or based on other biasing factors (e.g., debris, staining).
- Collect one surface soil sample adjacent to the outfall pipe where the effluent from the catch basin is released.
- Collect one surface soil sample from the first downgradient sediment accumulation area where effluent from the outfall naturally pools.
- Additional surface soil samples may be collected based on radiological surveys and other biasing factors identified (e.g., stained soil, elevated radioactivity, debris).

Subsurface soil samples may be collected beneath Decision I locations to obtain potential Decision II information.

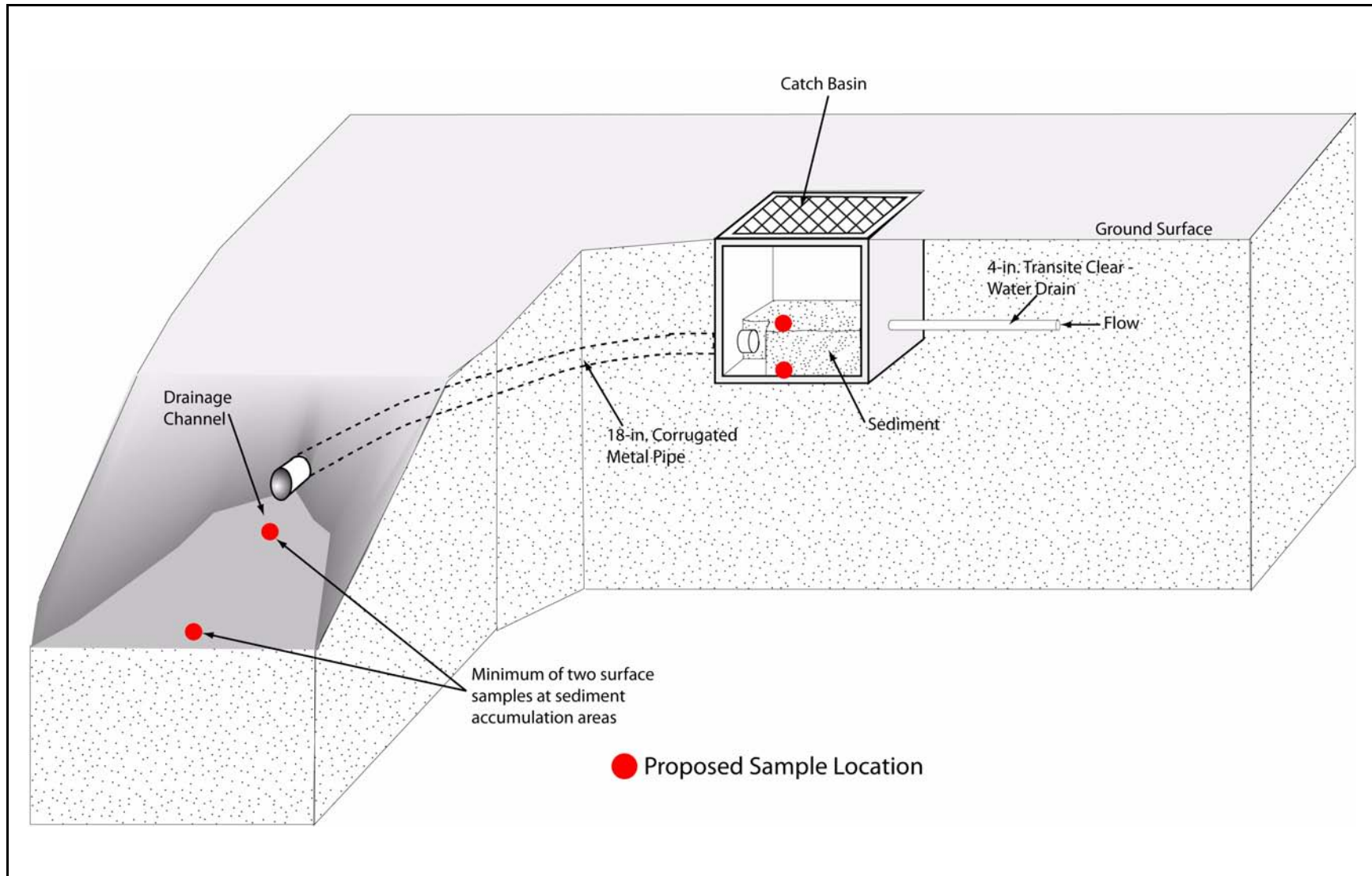


Figure B.8-2
Proposed Decision I Sampling Locations for the Storm Drain System

B.8.3.3 Locomotives and Railcars Component of CAS 25-99-20

This CAS component consists of the releases to soil from leaking locomotives and railcars located on the railroad tracks adjacent to Building 3900 (Figure 2-3). There are currently two 120-ton diesel-electric locomotives, a manned control car (shielded diesel-electric locomotive) connected to an EIV car, a small diesel-electric locomotive/shuttle, and a cable spool car with an attached utility flat car. The small locomotive/shuttle, cable car, and utility flat cars are posted “Caution Radioactive Material.” Several areas of heavily stained soil have been identified under the fuel tanks from each of the two locomotives and the railcar with the cable takeup reel. The locomotives and railcars are expected to have remaining fuel, hydraulic and lubricating oils, and potentially other fluids that will be drained and sampled, as necessary, as part of the CAI. Other hazardous materials including lead-acid batteries, light bulbs, and CO₂ tanks have been identified on the locomotives.

Draining liquids from equipment will involve a visual inspection of the equipment as well as a review of engineering drawings in an effort to identify all tanks or reservoirs that may contain liquids or lubricants. This may involve using the skill and experience of various types of engineers and skilled labor personnel to provide a complete evaluation and identification of all potential locations.

Figure B.8-3 shows a photograph of the locomotives and adjacent cable railcar with proposed sampling locations of the stained soil. The following is the Decision I sampling strategy:

- Collect a minimum of one surface soil sample at each distinct area of stained soil.
- Additional surface soil samples may be collected based on radiological surveys and other biasing factors identified.
- Subsurface soil samples may be collected beneath Decision I locations to obtain potential Decision II information.

B.8.3.4 Substations Component of CAS 25-99-20

This CAS component consists of the potential releases to soil adjacent to two power substations within the fenced perimeter of the E-MAD Facility (Figure 2-4). One substation is located beside the water tower on the southeast side of Building 3900, and the other is located on the southwest side of

Proposed Sample Location ●



Figure B.8-3
Proposed Decision I Sampling Locations at Railcars (top) and Locomotive (bottom)

Building 3900. The current transformers are labeled “non PCB”; however, it is unknown whether any PCB-containing transformers previously serviced the substations.

Figure B.8-4 shows a photograph of the substations with proposed sampling locations. The following is the Decision I sampling strategy:

- Collect a minimum of one surface soil sample at the middle edge of each side of each transformer concrete pad, where soil is present.
- Additional surface soil samples may be collected based on radiological surveys and other biasing factors identified.
- Subsurface soil samples may be collected beneath Decision I locations to obtain potential Decision II information.

B.8.3.5 Storage Casks and Drywells Component of CAS 25-99-20

This CAS component consists of the potential releases from two aboveground dry fuel storage casks adjacent to the west side of Building 3900 and four underground drywells that are located between the railroad tracks on the west side of Building 3900 (Figure 2-5). The configuration of each aboveground cask is a reinforced concrete cylindrical structure, 104 in. in diameter and 252 in. high. Embedded in the structure is a carbon-steel liner with a 36 in. diameter by 13-in.-thick steel and concrete shield welded to the lower end of the liner. Below the bolted cover is an approximate 3-ft-thick concrete-filled shield plug. Each cask has four lifting trunnions. It has been reported that only the storage cask with numerical markings on the outside was used and that all fuel canisters have been removed. The configuration of each of the drywells consists of a steel liner grouted into a 26-in. diameter hole approximately 23 ft deep. The lower section of the liner is 18-in. carbon-steel pipe and the upper section consists of a 52-in. length of 22-in. diameter carbon steel pipe. Below the bolted cover of the drywell is an approximate 3-ft-thick concrete shield plug. An 84-in. square by 27-in. thick concrete shield pad surrounds each drywell liner at the ground surface. Currently, the 120-ton locomotives are located on the tracks directly above the four drywells and will need to be relocated for access and inspection. Access to the casks and drywells will also require the concrete shield plugs to be removed using heavy equipment operations (DOE/NV, 1983).

Decision I surface and subsurface soil samples may be collected if there is evidence of a release from these structures; however, based on their design, breaches and releases are not anticipated. The

Proposed Sample Location ●



Figure B.8-4
Proposed Decision I Sampling Locations at Substations of Building 3900

interior of each cask and drywell will be visually inspected and surveyed for radiological contamination. Contents (if any) may be sampled to determine whether materials meet PSM criteria.

B.8.3.6 Debris Piles Component of CAS 25-99-20

This CAS component consists of the potential releases to soil associated with all remaining construction materials and debris piles located inside and in the immediate area outside the E-MAD Facility perimeter fence. One notable debris pile consisting of mostly wood and some scrap metal is located just outside the perimeter fence on the southwest side of the facility (Figure 2-6). Debris piles like this may include items such as lighting fixtures, piles of wood, and scrap metal. Any remaining debris will be inspected for PSM, underlying soil staining, and other signs of contamination.

For this CAS component, the number and locations of Decision I environmental samples to be collected will be based on radiological surveys and visual inspections of the debris and surrounding soil. Surface (0 to 0.5 ft bgs) and shallow subsurface soil samples will be collected where biasing factors are identified. Subsurface samples may be collected beneath Decision I locations to obtain potential Decision II information.

B.9.0 References

ARL/SORD, see Air Resources Laboratory/Special Operations and Research Division.

ASTM, see American Society for Testing and Materials.

Air Resources Laboratory/Special Operations and Research Division. 2009. *NTS Climatological Rain Gauge Data*. As accessed at http://www.sord.nv.doe.gov/home_climate_rain.htm on 4 May.

American Society for Testing and Materials. 1995 (reapproved 2002). *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites*, ASTM E1739 - 95(2002). Philadelphia, PA.

DOE, see U.S. Department of Energy.

DOE/NV, see U.S. Department of Energy, Nevada Operations Office.

DRI, see Desert Research Institute.

Desert Research Institute. 1996. *A Historical Evaluation of the Engine Maintenance Assembly and Disassembly Facility, Area 25, Nevada Test Site, Nye County, Nevada*, SR082696-1. Prepared by C.M. Beck, H. Drollinger, R. Jones, D. Winslow, and N.G. Goldenberg. Las Vegas, NV.

EPA, see U.S. Environmental Protection Agency.

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

Murphy, T., Bureau of Federal Facilities. 2004. Letter to R. Bangerter (NNSA/NSO) titled "Review of Industrial Sites Project Document *Guidance for Calculating Industrial Sites Project Remediation Goals for Radionuclides in Soil Using the Residual Radiation (RESRAD) Computer Code*." 19 November. Las Vegas, NV.

NAC, see *Nevada Administrative Code*.

NBMG, see Nevada Bureau of Mines and Geology.

NCRP, see National Council on Radiation Protection and Measurements.

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

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

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

Nevada Administrative Code. 2008a. NAC 445A.227, “Contamination of Soil: Order by Director for Corrective Action; Factors To Be Considered in Determining Whether Corrective Action Required.” As accessed at <http://www.leg.state.nv.us/nac> on 4 May 2009.

Nevada Administrative Code. 2008b. NAC 445A.22705, “Contamination of Soil: Evaluation of Site by Owner or Operator; Review of Evaluation by Division.” As accessed at <http://www.leg.state.nv.us/nac> on 4 May 2009.

Nevada Administrative Code. 2008c. NAC 445A.2272, “Contamination of Soil: Establishment of Action Levels.” As accessed at <http://www.leg.state.nv.us/nac> on 4 May 2009.

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

SNPO, see Space Nuclear Propulsion Office.

Space Nuclear Propulsion Office. 1970. *NRDS Master Plan, 1969–1970*. Prepared by IT Corporation. Las Vegas, NV.

USGS, see U.S. Geological Survey.

USGS and DOE, see U.S. Geological Survey and U.S. Department of Energy.

U.S. Department of Energy. 1988. *Environmental Survey Preliminary Report, Nevada Test Site, Mercury, Nevada*, DOE/EH/OEV-15P. April. Washington, DC: Environmental, Safety, and Health Office of Environmental Audit.

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

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

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

- U.S. Department of Energy, Nevada Operations Office. 1983. *Histories of Spent Nuclear Fuel Assemblies While at the E-MAD Facility, December 1978 Through September 1982*, U.S. DOE/NV/10250-6.
- U.S. Department of Energy, Nevada Operations Office. 1992. *Remedial Investigation and Feasibility Study for the Plutonium Contaminated Soils at Nevada Test Site, Nellis Air Force Range and Tonopah Test Range*. April. Las Vegas, NV.
- U.S. Department of Energy, Nevada Operations Office. 1998. *Nevada Test Site Resource Management Plan*, DOE/NV--518. Las Vegas, NV.
- U.S. Environmental Protection Agency. 2002. *Guidance for Quality Assurance Project Plans*, EPA QA/G5, EPA/240/R-02/009. Washington, DC: Office of Environmental Information.
- U.S. Environmental Protection Agency. 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4)*, EPA/240/B-06/001. Washington, DC: Office of Environmental Information.
- U.S. Environmental Protection Agency. 2009. *Region 9: Superfund, Regional Screening Levels (Formerly PRGs) for Chemical Contaminants*. As accessed at <http://www.epa.gov/region09/superfund/prg> on 4 May. Prepared by EPA Office of Superfund and Oak Ridge National Laboratory.
- U.S. Geological Survey. 1964. *Geology of the Jackass Flats Quadrangle, Nye County, Nevada*. Prepared by E.J. McKay and W.P. Williams.
- U.S. Geological Survey and U.S. Department of Energy. 2009. "USGS/USDOE Cooperative Studies in Nevada: J-11 WW Web Page." As accessed at http://nevada.usgs.gov/doe_nv/ntsmmap.htm on 4 May.

Appendix C

Nevada Division of Environmental Protection Comments

(11 Pages)

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number:		Draft Streamlined Approach for Environmental Restoration Plan for CAU 114: Area 25 EMAD Facility, Nevada Test Site, Nevada		2. Document Date:		6/29/2009	
3. Revision Number:		0		4. Originator/Organization:		Stoller-Navarro	
5. Responsible NNSA/NSO Federal Sub-Project Director:		Kevin J. Cabble		6. Date Comments Due:		7/29/2009	
7. Review Criteria:		Full					
8. Reviewer/Organization/Phone No:		Jeff MacDougall and John Wong, NDEP, 486-2850, extensions 233 and 245		9. Reviewer's Signature:			
10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response			14. Accept	
1.) Section 2.1.7, Page 21	Mandatory	Specify, perhaps in a diagram, the locations from where bulk soil samples (February 2003) and swipe samples (September 2003) were collected - the general location/area of sample collection is pertinent with respect to interpreting the significance of the available characterization information.	<p>Revise the last 2 paragraphs of Section 2.1.7 as follows:</p> <p>The NTS management and operating (M&O) contractor collected soil and and swipe samples at the E-MAD Facility in 2003. Seven bulk soil samples were collected (February 2003) and analyzed for beryllium. The results of the analyses ranged from 0.0628 parts per million (ppm) to 0.4630 ppm (Spezialetti, 2007). Fifteen swipe samples were collected (September 2003) and analyzed for arsenic, beryllium, cadmium, chromium, and lead. The analytical results for arsenic ranged from 0.7 micrograms per 100 square centimeters ($\mu\text{g}/100\text{cm}^2$) to 5.0 $\mu\text{g}/100\text{cm}^2$. The analytical results for beryllium ranged from 0.0 $\mu\text{g}/100\text{cm}^2$ to 0.13 $\mu\text{g}/100\text{cm}^2$. The analytical results for cadmium ranged from 0.03 $\mu\text{g}/100\text{cm}^2$ to 9.3 $\mu\text{g}/100\text{cm}^2$. The analytical results for chromium ranged from 0.66 $\mu\text{g}/100\text{cm}^2$ to 1,800 $\mu\text{g}/100\text{cm}^2$. The analytical results for lead ranged from 2.0 $\mu\text{g}/100\text{cm}^2$ to 3,700 $\mu\text{g}/100\text{cm}^2$ (Spezialetti, 2007). Specific sample locations for the 2003 data are unknown, and the results can only be used to assess initial requirements for personnel protection.</p>				

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number:		Draft Streamlined Approach for Environmental Restoration Plan for CAU 114: Area 25 EMAD Facility, Nevada Test Site, Nevada		2. Document Date:		6/29/2009	
3. Revision Number:		0		4. Originator/Organization:		Stoller-Navarro	
5. Responsible NNSA/NSO Federal Sub-Project Director:		Kevin J. Cabble		6. Date Comments Due:		7/29/2009	
7. Review Criteria:		Full					
8. Reviewer/Organization/Phone No:		Jeff MacDougall and John Wong, NDEP, 486-2850, extensions 233 and 245		9. Reviewer's Signature:			
10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response	14. Accept			
2.) Section 2.3.1, Pages 32-38	Mandatory	Include appropriate discussion on CAU 119 and CAS 25-01-14 since this site is within the footprint of Building 3900 (CAS 25-41-03).	<p>The following text has been inserted at the end of Section 2.3.</p> <p>Although CAS 25-01-14 (CAU 119) is located within the footprint of the E-MAD Facility, it is not believed to have any impact on CAS 25-41-03. Corrective Action Site 25-01-14 was clean closed under the housekeeping corrective action process (DOE/NV, 2000a).</p>				

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number:		Draft Streamlined Approach for Environmental Restoration Plan for CAU 114: Area 25 EMAD Facility, Nevada Test Site, Nevada	2. Document Date:	6/29/2009
3. Revision Number:		0	4. Originator/Organization:	Stoller-Navarro
5. Responsible NNSA/NSO Federal Sub-Project Director:		Kevin J. Cabble	6. Date Comments Due:	7/29/2009
7. Review Criteria:		Full		
8. Reviewer/Organization/Phone No:		Jeff MacDougall and John Wong, NDEP, 486-2850, extensions 233 and 245	9. Reviewer's Signature:	
10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response	14. Accept
3.) Section 4.0, Page 53	Mandatory	In the first paragraph of this section, general objectives are described; it may also be appropriate to specify the course of action to be taken if remediation is found to be not feasible.	<p>The course of action to be taken if remediation is found to be not feasible was added to this paragraph. Revised text removes the term "feasible" and makes clear that a hold point will be implemented should NNSA not be able to complete the planned activity. In this case, NDEP will be involved with NNSA to determine the appropriate path forward.</p> <p>For consistency, this correction was made throughout the document wherever the term "feasible" was used. To implement this clarification, the following changes were made throughout the document.</p> <p>Revised 1st paragraph of Section 4.0, Page 53 as follows:</p> <p>This section of the SAFER Plan provides a description of the field activities and closure objectives for CAU 114. The objectives for the field activities are to determine whether COCs or PSMs exist. If remediation cannot be accomplished during the SAFER, then the extent of COCs will be determined so that closure alternatives may be implemented. If clean closure cannot be accomplished during the SAFER, then a hold point will have been reached and NDEP will be consulted to determine whether the remaining contamination will be closed under the alternative corrective action of closure in place. All sampling activities will be conducted in compliance with the Industrial Sites</p>	

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number:		Draft Streamlined Approach for Environmental Restoration Plan for CAU 114: Area 25 EMAD Facility, Nevada Test Site, Nevada		2. Document Date:		6/29/2009	
3. Revision Number:		0		4. Originator/Organization:		Stoller-Navarro	
5. Responsible NNSA/NSO Federal Sub-Project Director:		Kevin J. Cabble		6. Date Comments Due:		7/29/2009	
7. Review Criteria:		Full					
8. Reviewer/Organization/Phone No:		Jeff MacDougall and John Wong, NDEP, 486-2850, extensions 233 and 245		9. Reviewer's Signature:			
10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response			14. Accept	
	Mandatory		<p>QAPP (NNSA/NV, 2002b) and other applicable, approved procedures and instructions.</p> <p>Revised 2nd paragraph of Executive Summary, page ES-1 as follows:</p> <p>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 114 using the SAFER process. Additional information will be obtained by conducting a field investigation before selecting the appropriate corrective action for each CAS. It is anticipated that the results of the field investigation and implementation of a corrective action of clean closure will support a defensible recommendation that no further corrective action is necessary. If it is determined that complete clean closure cannot be accomplished during the SAFER, then a hold point will have been reached and the Nevada Division of Environmental Protection (NDEP) will be consulted to determine whether the remaining contamination will be closed under the alternative corrective action of closure in place. This will be presented in a closure report that will be prepared and submitted to NDEP for review and approval.</p> <p>Revised 1st paragraph of page 8 as follows:</p>				

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number:		Draft Streamlined Approach for Environmental Restoration Plan for CAU 114: Area 25 EMAD Facility, Nevada Test Site, Nevada		2. Document Date:		6/29/2009	
3. Revision Number:		0		4. Originator/Organization:		Stoller-Navarro	
5. Responsible NNSA/NSO Federal Sub-Project Director:		Kevin J. Cabble		6. Date Comments Due:		7/29/2009	
7. Review Criteria:		Full					
8. Reviewer/Organization/Phone No:		Jeff MacDougall and John Wong, NDEP, 486-2850, extensions 233 and 245		9. Reviewer's Signature:			
10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response	14. Accept			
	Mandatory		<p>The targeted corrective action is clean closure and will include removal of contaminated media and identified potential source materials (PSMs) (see Section 3.1 for a description of PSM criteria). The alternative corrective action of closure in place with implementation of appropriate use restrictions (URs) will only be performed if complete removal of COCs and PSMs cannot be accomplished during the SAFER. There is the potential for implemented URs to be removed following demolition of Building 3900 if it becomes feasible to remove the PSM during demolition activities. For example, it may not be technically feasible to remove certain lead-shielding items (that meet PSM criteria) from inside concrete walls until demolition activities take place, allowing more efficient access to these items.</p> <p>Revise 3rd paragraph of Section 4.2, page 55 as follows:</p> <p>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 throughout the facility and/or within an excavation. If PSM is determined to be present within the CAS, that material will be removed. Materials that do not meet PSM criteria as defined in Section 3.1 may remain in place.</p>				

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number:		Draft Streamlined Approach for Environmental Restoration Plan for CAU 114: Area 25 EMAD Facility, Nevada Test Site, Nevada		2. Document Date:		6/29/2009	
3. Revision Number:		0		4. Originator/Organization:		Stoller-Navarro	
5. Responsible NNSA/NSO Federal Sub-Project Director:		Kevin J. Cabble		6. Date Comments Due:		7/29/2009	
7. Review Criteria:		Full					
8. Reviewer/Organization/Phone No:		Jeff MacDougall and John Wong, NDEP, 486-2850, extensions 233 and 245		9. Reviewer's Signature:			
10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response			14. Accept	
	Mandatory		<p>Revised 3rd bullet at the top of page 56 as follows:</p> <ul style="list-style-type: none"> •Removing PSM and assumed PSM <p>Revised Section 4.2.1 on page 56 as follows:</p> <p>Surface and shallow subsurface soils will be sampled using hand sampling (hand scoop, augering) and backhoe excavation methods. Table 4-1 summarizes the sampling approach to achieve closure objectives for each CAS (or CAS component). Potential source material samples will also be collected from materials that are suspected to contain COPCs and that may cause the future release of a COC to environmental media. For CAU 114, there are materials that have been assumed to meet PSM criteria and will therefore be removed and disposed, without the need for sampling. Table 4-2 lists the known or anticipated PSMs at CAU 114 and indicates which materials will be sampled and which will be assumed PSM. Detailed information regarding the sampling plan is outlined in Appendix B.</p> <p>Revised 1st paragraph of page 60, in Section 4.3 as follows:</p> <p>If a COC is present and removal of the COC cannot be accomplished during the SAFER, 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</p>				

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number:		Draft Streamlined Approach for Environmental Restoration Plan for CAU 114: Area 25 EMAD Facility, Nevada Test Site, Nevada		2. Document Date:		6/29/2009	
3. Revision Number:		0		4. Originator/Organization:		Stoller-Navarro	
5. Responsible NNSA/NSO Federal Sub-Project Director:		Kevin J. Cabble		6. Date Comments Due:		7/29/2009	
7. Review Criteria:		Full					
8. Reviewer/Organization/Phone No:		Jeff MacDougall and John Wong, NDEP, 486-2850, extensions 233 and 245		9. Reviewer's Signature:			
10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response	14. Accept			
	Mandatory		<p>have been confirmed. Step-out (Decision II) sampling locations at each CAS will be selected based on the CSM, biasing factors, surveys, 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 further 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 re-evaluated, work will be temporarily suspended, NDEP will be notified, and the investigation strategy will be re-evaluated.</p> <p>Revised 1st paragraph of Section B.3.2.1, page B-17 as follows:</p> <p>If no COC associated with a release from a CAS is detected, then further assessment of the CAS is not required, and the CAA of no further action will be selected. If a COC associated with a release from a CAS is detected, then additional sampling will be conducted to determine the extent of COC contamination. If the extent of the contamination is defined, then clean close the site by removing the contaminated media until all contamination has been removed. If the extent of contamination has been</p>				

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number:		Draft Streamlined Approach for Environmental Restoration Plan for CAU 114: Area 25 EMAD Facility, Nevada Test Site, Nevada		2. Document Date:		6/29/2009	
3. Revision Number:		0		4. Originator/Organization:		Stoller-Navarro	
5. Responsible NNSA/NSO Federal Sub-Project Director:		Kevin J. Cabble		6. Date Comments Due:		7/29/2009	
7. Review Criteria:		Full					
8. Reviewer/Organization/Phone No:		Jeff MacDougall and John Wong, NDEP, 486-2850, extensions 233 and 245		9. Reviewer's Signature:			
10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response	14. Accept			
	Mandatory		<p>determined and additional remediation cannot be completed during the SAFER, then a hold point will have been reached and NDEP will be consulted to determine whether the remaining contamination will be closed under the alternative corrective action of closure in place.</p> <p>Revised Section B.6.3, 3rd bullet on page B-25 as follows:</p> <ul style="list-style-type: none"> •If no COC associated with a release from the CAS is detected, then further assessment of the CAS is not required, and the CAA of no further action will be selected. If a COC associated with a release from the CAS is detected, then additional sampling will be conducted to determine the extent of COC contamination. If the extent of the contamination is defined, then clean close the site by removing the contaminated media until all contamination has been removed. If the extent of contamination has been determined and remediation cannot be completed during the SAFER, then a hold point will have been reached and NDEP will be consulted to determine whether the remaining contamination will be closed under the alternative corrective action of closure in place. <p>Revised Section B.8.3.1 1st paragraph on page B-33 as follows:</p> <p>This CAS consists of the potential releases to soil associated with historic operations at Building 3900, the E-</p>				

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number:		Draft Streamlined Approach for Environmental Restoration Plan for CAU 114: Area 25 EMAD Facility, Nevada Test Site, Nevada		2. Document Date:		6/29/2009	
3. Revision Number:		0		4. Originator/Organization:		Stoller-Navarro	
5. Responsible NNSA/NSO Federal Sub-Project Director:		Kevin J. Cabble		6. Date Comments Due:		7/29/2009	
7. Review Criteria:		Full					
8. Reviewer/Organization/Phone No:		Jeff MacDougall and John Wong, NDEP, 486-2850, extensions 233 and 245		9. Reviewer's Signature:			
10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response	14. Accept			
	Mandatory		MAD Facility. The Decision I sampling strategy at this CAS will involve the collection of environmental soil samples and PSM samples. Potential source material samples will be collected from materials within Building 3900 that are suspected to contain COPCs and that may cause the future release of a COC to environmental media. For CAS 25-41-03, there are materials that have been assumed to meet PSM criteria and will therefore be removed and disposed without the need for environmental sampling. Table B.8-1 lists the known or anticipated PSMs at Building 3900 and indicates which materials will be sampled and which will be assumed PSM. For the process water systems (chilled water, condenser water, heating hot water, potable cold water, potable hot water, process cold water, and process hot water), it is assumed that the fluids would not meet PSM criteria, and samples will not be required. It is also anticipated that concrete samples of floor and wall surfaces may be collected using core drilling techniques based on identified elevated radioactivity or other biasing factors. Samples of material removed during SAFER activities will be taken for waste characterization purposes, as such material is identified.				

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number:		Draft Streamlined Approach for Environmental Restoration Plan for CAU 114: Area 25 EMAD Facility, Nevada Test Site, Nevada		2. Document Date:		6/29/2009	
3. Revision Number:		0		4. Originator/Organization:		Stoller-Navarro	
5. Responsible NNSA/NSO Federal Sub-Project Director:		Kevin J. Cabble		6. Date Comments Due:		7/29/2009	
7. Review Criteria:		Full					
8. Reviewer/Organization/Phone No:		Jeff MacDougall and John Wong, NDEP, 486-2850, extensions 233 and 245		9. Reviewer's Signature:			
10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response			14. Accept	
4.) Section 4.3, Page 56	Mandatory	It is stated that "...if feasible, removal of COC..."; define feasible more precisely and also indicate what the course of action will be in the event that it is determined to be not feasible to remove COCs.	<p>Based on the response to Comment 3, the definition of "feasible" is no longer needed as the term "feasible" was deleted from the document. The course of action to be taken if NNSA cannot complete the planned clean closure activities was addressed in the response to Comment 3.</p> <p>Revised text in Section 4.3, Page 56 as follows:</p> <p>The information necessary to satisfy the closure criteria will be generated for each CAU 114 CAS by collecting and analyzing samples generated during a field investigation. If a COC is present and removed during the SAFER, 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 from the 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.4.2.1, 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.</p>				

NEVADA ENVIRONMENTAL RESTORATION PROJECT DOCUMENT REVIEW SHEET

1. Document Title/Number:		Draft Streamlined Approach for Environmental Restoration Plan for CAU 114: Area 25 EMAD Facility, Nevada Test Site, Nevada	2. Document Date:	6/29/2009
3. Revision Number:		0	4. Originator/Organization:	Stoller-Navarro
5. Responsible NNSA/NSO Federal Sub-Project Director:		Kevin J. Cabble	6. Date Comments Due:	7/29/2009
7. Review Criteria:		Full		
8. Reviewer/Organization/Phone No:			9. Reviewer's Signature:	
10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response	14. Accept
5.) Section 4.4, Page 61	Mandatory	Provide a more specific definition of "feasible," by identifying conditions and criteria which qualify as either "feasible" or "not feasible" (i.e., what will these decisions be based on)...in the current context, "feasible" is quite general and subjective.	<p>Based on the response to Comment 3, the definition "feasible" is no longer needed as the term "feasible" was deleted from the document. Therefore, this comment was addressed in the response to Comment 3.</p> <p>Revised text in Section 4.4, Page 61 as follows:</p> <p>The following activities, at a minimum, have been identified for closure of these CASs. The decision logic behind the activities is provided in Figure 1-4:</p> <ul style="list-style-type: none"> •If no COCs or PSM are identified during SAFER activities, a CAA of no further action will be selected. •If COCs or PSM are identified, then a corrective action is required. •If COCs or PSM are identified and clean closure cannot be accomplished during the SAFER, then a hold point will have been reached and NDEP will be consulted to determine whether the remaining contamination will be closed under the alternative corrective action of closure in place. The appropriate URs will then be implemented and documented in the CR. •If COCs or PSM are identified and clean closure can be accomplished during the SAFER, clean closure will be the selected corrective action. The material to be remediated will be removed and disposed as waste, and verification samples will be collected from remaining soil or debris, as necessary. Verification analytical results will be documented in the CR. 	

Library Distribution List

Copies

U.S. Department of Energy National Nuclear Security Administration Nevada Site Office Technical Library P.O. Box 98518, M/S 505 Las Vegas, NV 89193-8518	1 (Uncontrolled, electronic copy)
U.S. Department of Energy Office of Scientific and Technical Information P.O. Box 62 Oak Ridge, TN 37831-0062	1 (Uncontrolled, electronic copy)
Southern Nevada Public Reading Facility c/o Nuclear Testing Archive P.O. Box 98521, M/S 400 Las Vegas, NV 89193-8521	2 (Uncontrolled, electronic copies)
Manager, Northern Nevada FFACO Public Reading Facility c/o Nevada State Library & Archives 100 N Stewart Street Carson City, NV 89701-4285	1 (Uncontrolled, electronic copy)